



West Zone Power Distribution Company Ltd. (WZPDCL)

Tender Document for

**Design, Manufacture, Supply, Installation, Testing &
Commissioning of 51,801 nos. Smart Pre-Payment Meter
with Related Equipment and Services on Turnkey Basis.**

**(International)
Open Tendering Method
(One Stage Two Envelope Method)**

Invitation for Tender No. 27.22.4785.700.50.008.24/48

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Package No. GD4 (FY: 2024-25)

**Project Director
Smart Pre-Payment Metering Project
for West Zone Power Distribution Company Ltd. (WZPDCL) Area (Phase-II),
WZPDCL, 35 Boyra Main Road, Khulna-9000.**

November 2024

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REJECTION CLAUSES

(Tender shall be rejected if the Tenderer in its Tender, does not comply but not limited to the following criteria)

1. Tender will be rejected if the Tender Document was not purchased directly from the Purchaser, or through its agents [ITT 8.2].
2. Tenderer shall have to comply with Eligibility criteria [ITT 5], Litigation history [ITT 13], Experience criteria [ITT 14], Financial Criteria [ITT15.1] JVCA as ITT 18;
3. Tender must be accompanied by Letter of Authorization to the Signatory to sign the Tender on behalf of the Tenderer [ITT37.4, ITT 24.2(f), ITT 24.3(c), GCC 48.2(f)];
4. Tender Submission Letter for technical proposal (Form PG5A-1a), Tenderer Information Sheet (PG5A – 2a), JVCA Partner Information (PG5A– 2b), Subcontractor Information (PG5A – 2c) shall be properly filled up by the Tenderer and valid trade license, TIN and VAT registration number must be submitted by the tenderer [ITT24.2, ITT29].
5. Tender Submission Letter for Financial offer (Form PG5A-1b), Price Schedule for Plant and Service (Form PG5A-3) shall be properly filled up by the Tenderer [ITT24.3] Tenderers are not allowed to change/ modify the format of Price Schedule;
6. If Tenderer does not manufacture or produce the Goods it offers to supply shall submit the Manufacturer's Authorization Letter (PG5A– 5) [ITT 28.1(b)] for offered major items like smart pre-payment meter (single phase and three phase), Data Concentrator Unit (DCU) and Hand Held Unit (HHU).
7. Tender shall remain valid for the period specified in the TDS and Tender must be accompanied by a valid Tender Security after the date of Tender submission deadline (Form PG5A – 6); [ITT 24.2 (c), ITT 30.2, ITT 32, ITT 33]
8. Tenderer shall submit properly filled up Guaranteed Technical Particulars (GTP) in Section- 6.2.2 in Manufacturer Official Pad with submission of related supporting documents and seal & signed by both Manufacturer & Tenderer as per TDS [ITT 24.2(r) (19)];
9. Tenderer shall submit Warranty Certificate (Form PG5A-12) as per TDS [ITT 24.2(r) (12)];
10. Tenderer shall submit sample(s) as per TDS [ITT 24.2(r) (24)]; and shall qualify the demonstration and interfacing as stated in TDS [ITT 49.2 (f)];
11. Tenderer shall have to submit the test reports of the offered goods as specified in TDS [ITT 24.2(r) (20)].
12. Any Financial offer associated with the Technical offer in the same Envelope will be rejected TDS[ITT 38.2(e)].
13. If a tender is not responsive to the mandatory requirements set out in the tender document, it shall be rejected [ITT 49.6].

14. Tenders submitted after the deadline will be rejected [ITT 40].
15. Any effort by a Tenderer to influence a Purchaser in its decision concerning the evaluation of Tenders, Contract awards may result in the rejection of its Tender [ITT 51.3] .
16. The Tenderer who submits or participates in more than one (1) Tender for each lot will cause all the Tenders with that Tenderer's participation to be rejected.[ITT 20]
17. A tender submitted with an adjustable price quotation will be treated as non-responsive and rejected.[ITT 26.8].
18. Tender security must be furnished in the Technical Proposal, not in the Financial Proposal. The Tenderer if furnish the tender security in the Financial Proposal the tender will be rejected as per TDS[ITT32.2]

Section 1. Instructions to Tenderers

A. General

1. Scope of Tender	1.1 The Purchaser named in the Tender Data Sheet (TDS) (hereinafter referred to as the “Purchaser”) wishes to issue these Tender Documents for the supply and installation of plant & equipment incidental thereto, as specified in the TDS and as detailed in Section 6: Employer’s Requirements.
	1.2 The name of the Tender and the number and identification of its constituent lot(s) are stated in the TDS .
	1.3 Unless otherwise stated, throughout this Tender Document definitions and interpretations shall be as prescribed in the Section 3: General Conditions of Contract.
2. Interpretation	<p>2.1 Throughout this Tender Document</p> <ul style="list-style-type: none"> (a) the term “in writing” means communication written by hand or machine duly signed and includes properly authenticated messages by facsimile or electronic mail; (b) if the context so requires, singular means plural and vice versa; and (c) “day” means calendar days unless otherwise specified as working days; (d) "Tender Document ", means the Document provided by a Purchaser to a Tenderer as a basis for preparation of its Tender; (e) "Tender ", depending on the context, means a Tender submitted by a Tenderer for delivery of Goods and Related Services to a Purchaser in response to an Invitation for Tender ;
3. Source of Funds	3.1 The Purchaser has been allocated public funds from the source as indicated in the TDS and intends to apply a portion of the funds to eligible payments under the contract for which this Tender Document is issued.
	3.2 For the purpose of this provision, “ public funds ” means any funds allocated to a Purchaser under Government budget, or loan, grants and credits placed at the disposal of a Purchaser through the Government by the development partners or foreign states or organizations.
	3.3 Payments by the development partner, if so indicated in the TDS , will be made only at the request of the Government and upon approval by the development partner in accordance with the applicable Loan/Credit/Grant Agreement, and will be subject in all respects to the terms and conditions of that Agreement.

<p>4. Corrupt, Fraudulent, Collusive, Coercive (or Obstructive in case of Development Partner) Practices</p>	<p>4.1 The Government and the Development Partner, if applicable requires that the Procuring Entity as well as the Tenderers and Contracts (including , sub-contractors, agents, personnel, consultants, and service providers) shall observe the highest standard of ethics during implementation of procurement proceedings and the execution of Contracts under public funds.</p> <p>4.2 For the purposes of ITT Sub Clause 4.3, the terms set forth below as follows:</p> <ul style="list-style-type: none"> (a) “corrupt practice” means offering, giving or promising to give, receiving, or soliciting either directly or indirectly, to any officer or employee of the Procuring Entity or other public or private authority or individual, a gratuity in any form; employment or any other thing or service of value as an inducement with respect to an act or decision or method followed by the Procuring Entity in connection with a Procurement proceeding or Contract execution; (b) “fraudulent practice” means the misrepresentation or omission of facts in order to influence a decision to be taken in a Procurement proceeding or Contract execution; (c) “collusive practice” means a scheme or arrangement between two (2) or more Persons, with or without the knowledge of the Procuring Entity, that is designed to arbitrarily reduce the number of Tenders submitted or fix Tender prices at artificial, non-competitive levels, thereby denying the Procuring Entity the benefits of competitive price arising from genuine and open competition; (d) “coercive practice” means harming or threatening to harm, directly or indirectly, Persons or their property to influence a decision to be taken in the Procurement proceeding or the execution of a Contract, and this will include creating obstructions in the normal submission process used for Tenders. (e) “Obstructive practice” (applicable in case of Development Partner) means deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede an investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and /or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation. <p>4.3 Should any corrupt, fraudulent, collusive, coercive (or obstructive in case of Development Partner) practice of any kind is determined by the Procuring Entity or the Development Partner, if applicable, this will be dealt in accordance with the provisions of the Public Procurement Act and Rules and Guidelines of the Development Partners as stated in the ITT sub-clause 3.3.</p>
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	<p>In case of obstructive practice, this will be dealt in accordance with Development Partners Guidelines.</p>
	<p>4.4 If corrupt, fraudulent, collusive, coercive (or obstructive in case of Development Partner) practices of any kind is determined by the Procuring Entity against any Tenderer or Contracts (including sub-contractors, agents, personnel, consultants, and service providers) in competing for, or in executing, a contract under public fund:</p> <ul style="list-style-type: none"> (a) Procuring Entity and/or the Development Partner shall exclude the concerned Tenderer from further participation in the concerned procurement proceedings; (b) Procuring Entity and/or the Development Partner shall reject any recommendation for award that had been proposed for that concerned Tenderer; (c) Procuring Entity and/or the Development Partner shall declare, at its discretion, the concerned Tenderer to be ineligible to participate in further Procurement proceedings, either indefinitely or for a specific period of time; (d) Development Partner shall sanction the concerned Tenderer or individual, at any time, in accordance with prevailing Development Partner' sanctions procedures, including by publicly declaring such Tenderer or individual ineligible, either indefinitely or for a stated period of time: (i) to be awarded a Development Partner-financed contract; and (ii) to be a nominated sub-contractor, consultant, manufacturer or Contractor, or service provider of an otherwise eligible firm being awarded a Development Partner-financed contract; and (e) Development Partner shall cancel the portion of the loan allocated to a contract if it determines at any time that representatives of the Procuring Entity or of a beneficiary of the loan engaged in corrupt, fraudulent, collusive, coercive or obstructive practices during the procurement or the execution of that Development Partner financed contract, without the Procuring Entity having taken timely and appropriate action satisfactory to the Development Partner to remedy the situation. <p>4.5 Tenderer shall be aware of the provisions on corruption, fraudulence, collusion, coercion (and obstruction, in case of Development Partner) of the Public Procurement Act, 2006, the Public Procurement Rules, 2008 and others as stated in GCC Clause 38.</p> <p>4.6 In further pursuance of this policy, Tenderers, Contractors and their sub-contractors, agents, personnel, consultants, service providers shall permit the Government and the Development Partner to inspect any accounts and records and other documents relating to the Tender submission and</p>

	contract performance, and to have them audited by auditors appointed by the Government and/or the Development Partner during the procurement or the execution of that Development Partner financed contract.
5. Eligible Tenderers	<p>5.1 This Invitation for Tenders is open to all potential Tenderers from all countries, except for any specified in the TDS.</p> <p>5.2 Tenderers shall have the legal capacity to enter into the Contract under the Applicable law.</p> <p>5.3 Tenderers shall be enrolled in the relevant professional or trade organisations registered in Bangladesh.</p> <p>5.4 Tenderers may be a physical or juridical individual or body of individuals, or company, association or any combination of them in the form of a Joint Venture(JV) invited to take part in public procurement or seeking to be so invited or submitting a Tender in response to an Invitation for Tenders.</p> <p>5.5 Tenderers shall have fulfilled its obligations to pay taxes and social security contributions under the provisions of laws and regulations of the country of its origin.</p> <p>5.6 Tenderers should not be associated, or have been associated in the past, directly or indirectly, with a consultant or any of its affiliates which have been engaged by the Procuring Entity to provide consulting services for the preparation of the design, specifications, and other documents to be used for the procurement of the works to be performed under this Invitation for Tenders.</p> <p>5.7 Tenderers in its own name or its other names or also in the case of its Persons in different names shall not be under a declaration of ineligibility for corrupt, fraudulent, collusive or coercive practices as stated under ITT Sub Clause 4.4 (or obstructive practice, in case of Development Partner) in relation to the Development Partner's Guidelines in projects financed by Development Partner.</p> <p>5.8 Tenderers are not restrained or barred from participating in Public Procurement on grounds of poor performance in the past under any Contract.</p> <p>5.9 Tenderers shall not be insolvent, be in receivership, be bankrupt, be in the process of bankruptcy, be not temporarily barred from undertaking business and it shall not be the subject of legal proceedings for any of the foregoing.</p> <p>5.10 Government-owned enterprise in Bangladesh may also participate in the Tender if it is legally and financially autonomous, it operates under commercial law, and it is not a dependent agency of the Procuring Entity.</p> <p>5.11 Tenderers shall provide such evidence of their continued eligibility satisfactory to the Procuring Entity, as the Procuring Entity will reasonably request.</p>

	<p>5.12 These above requirements for eligibility will extend, as applicable, to each JV partner and Subcontractor proposed by the Tenderers.</p> <p>5.13 Tenderers shall have the up-to-date valid license(s), issued by the corresponding competent authority, as specified in the TDS.</p>
<p>6. Eligible Plant and Services</p>	<p>6.1 The plant and services to be supplied under the contract are eligible, unless their origin is from a country specified in the TDS and all expenditures under the contract will be limited to such plant, and services.</p>
	<p>6.2 For purposes of this Clause, the term “plant” means permanent plant, equipment, machinery, apparatus, articles and things of all kinds to be provided in the facilities; and “installation services” means all those services ancillary to the supply of the Plant for the Facilities, such as transportation and provision of marine or other similar insurance, inspection, expediting, site preparation, installation, testing, pre-commissioning, commissioning, operations, maintenance, the provision of operations and maintenance manuals, training etc</p>
	<p>6.3 For purposes of this clause, “origin” means the place where the plant, or component parts thereof are mined, grown, produced or manufactured, and from which the services are provided. Plant components are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that is substantially different in its basic characteristics or in purpose or utility from its components or country where the goods have been mined, grown, cultivated, produced, manufactured or processed; or through manufacture, processing, or assembly, another commercially recognized article results that differs substantially in its basic characteristics from its components.</p>
	<p>6.4 The origin of plant & equipment is distinct from the nationality of the Tenderer. The nationality of the firm that produces, assembles, distributes, or sells the goods shall not determine their origin.</p>
<p>7. Site Visit</p>	<p>7.1 The Tenderer is advised to visit and examine the site where the plant is to be installed and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the tender and entering into a contract for the provision of Plant and Installation Services.</p>
	<p>7.2 The Tenderer and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the Tenderer, its personnel, and agents will release and indemnify the</p>

	Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.
	7.3 The Tenderer should ensure that the Purchaser is informed of the visit in adequate time to allow it to make appropriate arrangements.
	7.4 The costs of visiting the Site shall be at the Tenderer's own expense.
B. Tender Document	
8. Tender Document: General	8.1 The Sections comprising the Tender Document are listed below, and should be read in conjunction with any Addendum issued under ITT Clause 11. <ul style="list-style-type: none"> • Section 1 Instructions to Tenderers (ITT) • Section 2 Tender Data Sheet (TDS) • Section 3 General Conditions of Contract (GCC) • Section 4 Particular Conditions of Contract (PCC) • Section 5 Tender and Contract Forms • Section 6 Employer's Requirements • Section 7 Drawings
	8.2 The Purchaser shall reject any Tender if the Tender Document was not purchased directly from the Purchaser, or through its agent as stated in the TDS .
	8.3 The Tenderer is expected to examine all instructions, forms, terms, and specifications in the Tender Document as well as addendum to Tender Documents.
9. Clarification of Tender Document	9.1 A prospective Tenderer requiring any clarification of the Tender Document shall contact the Purchaser in writing at the Purchaser's address indicated in the TDS before two-third of time allowed for preparation and submission of Tender elapses.
	9.2 The Procuring Entity is not obliged to answer any clarification request received after that date as stated under ITT Sub Clause 9.1.
	9.3 The Procuring Entity shall respond in writing within five (5) working days of receipt of any such request for clarification received under ITT Sub Clause 9.1.
	9.4 The Procuring Entity shall forward copies of its response to all those who have purchased the Tender Document, including a description of the enquiry but without identifying its source.
	9.5 Should the Procuring Entity deem it necessary to revise the Tender Document as a result of a clarification, it will do so following the procedure under ITT Clause 11.

<p>10. Pre-Tender Meeting</p>	<p>10.1 To clarify issues and to answer questions on any matter arising in the Tender Document, the Purchaser may, if stated in the TDS, hold a Pre-Tender Meeting at the place, date and time as specified in the TDS. All Potential Tenderers are encouraged to attend the meeting, if it is held.</p> <p>10.2 Minutes of the pre-Tender meeting, including the text of the questions raised and the responses given, together with any responses prepared after the meeting, will be transmitted within one week (7 days) after holding the meeting to all those who purchased the Tender Document and even those who did not attend the meeting.</p> <p>10.3 Any amendment to the Tender Documents listed in ITT Sub-Clause 8.1 that may become necessary as a result of the pre-Tender meeting shall be made by the Purchaser exclusively through the issue of an Addendum as stated under ITT Sub-Clause 11 and not through the minutes of the pre-Tender meeting.</p> <p>10.4 Non-attendance at the Pre-Tender meeting will not be a cause for disqualification of a Tenderer.</p>
<p>11. Addendum to Tender Document</p>	<p>11.1 At any time prior to the deadline for submission of Tenders, the Purchaser on its own initiative or in response to a clarification request in writing from a Tenderer, having purchased the Tender Document or as a result of a Pre-Tender meeting, may revise the Tender Document by issuing an addendum pursuant to Rule 95 of the Public Procurement Rules, 2008.</p> <p>11.2 The addendum issued under ITT Sub-Clause 11.1 shall become an integral part of the Tender Document and shall have a date and an issue number and shall be circulated by fax, mail or e-mail, to Tenderers who have purchased the Tender Documents within five (5) working days of issuance of such addendum, to enable Tenderers to take appropriate action.</p> <p>11.3 The Tenderer shall acknowledge receipt of an addendum.</p> <p>11.4 Tenderers who have purchased the Tender Documents but have not received any addendum issued under ITT Sub-clause 11.1 shall inform the Purchaser of the fact by fax, mail or e-mail before two-third of the time allowed for the submission of Tenders has elapsed.</p> <p>11.5 Procuring Entities shall also ensure posting of relevant addenda with the reference number and date on their website.</p> <p>11.6 To give a prospective Tenderer reasonable time in which to take an amendment into account in preparing its Tender, the Purchaser may, at its discretion, extend the deadline for the submission of Tenders, pursuant to Rule 95(6) of the Public Procurement Rule, 2008 and under ITT Clause 36.</p>

	<p>11.7 If an addendum is issued when time remaining is less than one-third of the time allowed for the preparation of Tenders, a Purchaser shall extend the deadline by an appropriate number of days for the submission of Tenders, depending upon the nature of the Procurement requirement and the addendum. The minimum time for such extension shall not be less than seven (7) days.</p>
<p>C. Qualification Criteria</p>	
<p>12. General Criteria</p>	<p>12.1 The Tenderer shall possess the necessary professional and technical qualifications and competence, financial resources, equipment and other physical facilities, managerial capability, specific experience, reputation, and the personnel, to perform the contract.</p>
	<p>12.2 In addition to meeting the eligibility criteria, as stated in ITT Clause 5, the Tenderer must satisfy the other criteria stated in ITT Clauses 13 to 15 inclusive.</p>
	<p>12.3 To qualify for multiple number of contracts/lots in a package made up of this and other individual contracts/lots for which tenders are invited in the Invitation for Tenders, the Tenderer shall demonstrate having resources and experience sufficient to meet the aggregate of the qualifying criteria for the individual contracts.</p>
<p>13. Litigation History</p>	<p>13.1 The maximum number of arbitration awards against the Tenderer over a period shall be as specified in the TDS.</p>
<p>14. Experience Criteria</p>	<p>14.1 Tenderers shall have the following minimum level of supply experience to qualify for supplying the Plant and Services under the contract:</p> <ul style="list-style-type: none"> (a) a minimum number of years of general experience in the role of Contractor or Subcontractor or Management Contractor as specified in the TDS; and (b) Specific experience as a Contractor or Subcontractor or Management Contractor that are similar to the proposed plant and services in at least a number of contract(s) and of a minimum value over the period, as specified in the TDS.
<p>15. Financial Criteria</p>	<p>15.1 Tenderers shall have the following minimum level of financial capacity of qualify for the supply, execution and performance of plant and services under the contract.</p> <ul style="list-style-type: none"> (a) the average annual turnover as specified in the TDS calculated as total certified payments received for contracts in progress or completed, during the period specified in the TDS; (b) availability of minimum liquid assets or working capital or credit facilities, as specified in the TDS; and;

	(c) satisfactory resolution of all claims, arbitrations or other litigation cases and shall not have serious negative impact on the financial capacity of the Tenderer.
16. Personnel Capacity	<p>16.1 The Tenderer shall have the following minimum level of personnel capacity to qualify for the performance of the plant and services under the Contract.</p> <p>A Project Manager, Engineers, and other key staff with qualifications and experience as specified in the TDS;</p>
17. Equipment Capacity	<p>17.1 The Tenderer shall own suitable equipment and other physical facilities or have proven access through contractual arrangement to hire or lease such equipment or facilities for the desired period, where necessary or have assured access through lease, hire, or other such method, of the essential equipment, in full working order, as specified in the TDS.</p>
18. Joint Venture, Consortium or Association	<p>18.1 The Tenderer may participate in the procurement proceedings forming a Joint Venture, Consortium or Associations (JVCA) by an agreement, executed case by case on a non judicial stamp of value as stated in TDS or alternately with the intent to enter into such an agreement supported by a Letter of Intent along with the proposed agreement duly signed by all partners of the intended JVCA and authenticated by a Notary Public.</p>
	<p>18.2 The figures for each of the partners of a JVCA shall be added together to determine the Tenderer's compliance with the minimum qualifying criteria; however, for a JVCA to qualify, lead partner and its other partners must meet the criteria stated in the TDS. Failure to comply with these requirements will result in rejection of the JVCA Tender. Subcontractors' experience and resources will not be taken into account in determining the Tenderer's compliance with the qualifying criteria.</p>
	<p>18.3 Each partner of the JVCA shall be jointly and severally liable for the execution of the Contract, all liabilities and ethical and legal obligations in accordance with the Contract terms.</p>
	<p>18.4 The JVCA shall nominate a Representative (partner-in-charge/Lead Firm) who shall have the authority to conduct all business for and on behalf of any and all the partners of the JVCA during the tendering process and, in the event the JVCA is awarded the Contract, during contract execution including the receipt of payments for and on behalf of the JVCA.</p>
	<p>18.5 Each partner of the JVCA shall complete the JVCA Partner Information (Form PG5A-2b) for submission with the Tender</p>
19. Subcontractor(s)	<p>19.1 Tenderer, pursuant to Rule 53 of the PPR2008, is allowed to sub-contract a portion of the Supply.</p>
	<p>19.2 The Tenderer shall specify in its Tender all portion of the Plant and Services that will be subcontracted, if any,</p>

	including the entity(ies) to whom each portion will be subcontracted to, subject to the maximum allowable limit for subcontracting of Plant and Services specified in the TDS .
19.3	The Purchaser may require Tenderers to provide more information about their subcontracting arrangements. If any Subcontractor is found ineligible or unsuitable to carry out the subcontracted tasks, the Procuring Entity may request the Tenderer to propose an acceptable substitute.
19.4	The Purchaser may also select nominated Subcontractor(s) to execute certain specific components of the Works and if so, those will be specified in the TDS .
19.5	The successful Tenderer shall under no circumstances assign the goods/works/services or any part of it to a Subcontractor
19.6	Subcontractors must comply with the provision of ITT Clause 5. For this purpose contractor shall complete the Subcontractor's information in Form PG5A-2c for submission with tender
19.7	If the Purchaser determines that a subcontractor is ineligible, the subcontracting of such portion of the Plants and Services assigned to the ineligible subcontractor shall be disallowed
D. Tender Preparation	
20. Only one Tender	20.1 If a Tender for Plant and Services is invited on 'lot-by-lot' basis, each lot shall constitute a tender. A Tenderer shall submit only one (1) Tender for each lot, either individually or as a JVCA. The Tenderer who submits or participates in more than one (1) Tender for each lot will cause all the Tenders with that Tenderer's participation to be rejected.
21. Cost of Tendering	21.1 Tenderers shall bear all costs associated with the preparation and submission of its Tender, and the Purchaser shall not be responsible or liable for those costs, regardless of the conduct or outcome of the Tendering process.
22. Issuance and Sale of Tender Document	22.1 A Purchaser, pursuant to Rule 94 of the Public Procurement Rules, 2008 shall make Tender Documents available immediately to the potential Tenderers, requesting and willing to purchase at the corresponding price if the advertisement has been published in the newspaper pursuant to Rule 90 of the Public Procurement Rules, 2008.
	22.2 Full contact details with mailing address, telephone and facsimile numbers and electronic mail address, as applicable, of those to whom Tender Documents have been issued shall be recorded with a reference number by the Purchaser or its agent.
	22.3 There shall not be any pre-conditions whatsoever, for sale of Tender Document and the sale of such Document shall

	be permitted up to the day prior to the day of deadline for the submission of Tender.
23. Language of Tender	23.1 Tenders shall be written in the English language. Correspondences and documents relating to the Tender may be written in English or <i>Bangla</i> . Supporting documents and printed literature furnished by the Tenderers that are part of the Tender may be in another language, provided they are accompanied by an accurate translation of the relevant passages in the English or <i>Bangla</i> language, in which case, for purposes of interpretation of the Tender, such translation shall govern.
	23.2 Tenderers shall bear all costs of translation to the governing language and all risks of the accuracy of such translation.
24. Contents of Tender (Document establishing the tender's qualification)	24.1 The Tender prepared by the Tenderers shall comprise Two Envelope submitted simultaneously, one called the Technical Offer (Envelope-01) containing the documents listed in ITT 24.2 and other called the Financial Offer containing the documents listed in 24.3, both envelopes enclosed together in an outer Single envelope.
	24.2 The Technical Offer (Envelope-01) prepared by the Tenderers will comprise the following: <ul style="list-style-type: none"> (a) Technical Submission Letter (Form PG5A-1a) as furnished in Section 5: Tender and Contract Forms. This form must be completed without any alterations to its format, and no substitutes shall be accepted. All blank spaces shall be filled in with the information requested (b) Tenderer Information Sheet (Form PG5A-2) as furnished in Section 5: Tender and Contract Forms; (c) Tender Security as stated under ITT Clause 32,33 and 34; (d) Technical Proposal (Form PG5A-4) as furnished in Section 5: Tender and Contract Forms. (e) Alternatives, if permitted, as stated under with ITT Clause 25; (f) Written confirmation authorising the signatory of the Tender to commit the Tenderer, as stated under ITT Sub-Clause 37.3; (g) The completed eligibility declarations, to establish its eligibility as stated under ITT Clause 5, in the Tender Submission Sheet (Form PG5A-1a & 1b), as furnished in section 5: Tender and Contract Forms; (h) An affidavit confirming the legal capacity stating that there are no existing orders of any judicial court that prevents either the Tenderer or employees of a Tenderer entering into or signing a Contract with

	<p>the Purchaser as stated under ITT clause 5;</p> <p>(i) An affidavit confirming that the Tenderer is not insolvent, in receivership or not bankrupt or not in the process of bankruptcy, not temporarily barred from undertaking their business for financial reasons and shall not be the subject of legal proceedings for any of the foregoing as stated under ITT Clause 5;</p> <p>(j) A certificate issued by the competent authority stating that the Tenderer is a Tax payer having valid Tax Identification Number (TIN) and VAT registration number or in lieu any other document acceptable to the Purchaser demonstrating that the Tenderer is a genuine Tax payer and has a VAT registration number as a proof of fulfillment of taxation obligations as stated under ITT Clause 5. In the case of foreign Tenderers, a certificate of competent authority in that country of which the Tenderer is citizen shall be provided ;</p> <p>(k) Documentary evidence demonstrating that they are enrolled in the relevant professional or trade organizations registered in Bangladesh or in case of foreign tenderer in their country of origin or a certificate concerning their competency issued by a professional institution in accordance with the law of the country of their origin, as stated under ITT Clause 5;</p> <p>(l) The country of origin declarations, to establish the eligibility of the Plant and Services as stated under ITT Clause 6, in the Price Schedule for Plant and Services (Form PG5A-3) as, applicable, furnished in Section 5: Tender and Contract Forms;</p> <p>(m) Documentary evidence as stated under ITT Clauses 28, that the Goods and Related Services conform to the Tender Documents;</p> <p>(n) Documentary evidence as stated under ITT Clause 29 that the Tenderer's qualifications conform to the Tender Documents;</p> <p>(o) Documents establishing legal and financial autonomy and compliance with commercial law, as stated under ITT Sub-clause 5.3 in case of government owned entity; and</p> <p>(p) In addition to the requirements stated under ITT Sub Clause 18.1, Tenders submitted by a JVCA or proposing a Subcontractor shall include.</p> <p>i. a Joint Venture Agreement entered into by all partners, executed on a non-judicial stamp of value or equivalent as stated under ITT Sub Clause 18.1; or</p>
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	<ul style="list-style-type: none"> ii. a Letter of Intent along with the proposed agreement duly signed by all partners of the intended JVCA with the declaration that it will execute the Joint Venture agreement in the event the Tenderer is successful; iii. the JVCA Partner Information (Form PG5A-2b); iv. the Subcontractor Information (Form PG5A-2c). <p>(q) the completed Specifications Submission and Compliance Sheet (Form PG5A-4a) as stated under ITT clause 28.1;</p> <p>(r) Any other document as specified in the TDS.</p> <p>24.3 The Financial Offer (Financial Envelope -02) prepared by the Tenderers shall comprise the following:</p> <ul style="list-style-type: none"> (a) The Financial offer Submission Letter (Form PG5A-1b) as furnished in Section 5: (b) The Tenderer shall submit the completed Price Schedule for Plant and Services (Form PG5A-3), according to their origin as appropriate as furnished in section 5: Tender and Contract Forms. (c) the written confirmation authorizing the signatory of the Tender to commit the Tenderer, as stated under ITT Sub Clause 37.3; (d) any other document as specified in the TDS.
<p>25. Alternatives</p>	<p>25.1 Unless otherwise stated in the TDS, alternatives shall not be considered.</p>
<p>26. Tender Prices, Discounts & Price adjustment</p>	<p>26.1 Unless otherwise specified in the TDS, tenderers shall quote for the entire Plant and Installation Services on a “single responsibility” basis such that the total tender price covers all the Contractor’s obligations mentioned in or to be reasonably inferred from the tender document in respect of the design, manufacture, including procurement and subcontracting (if any), delivery, construction, installation and completion of the plant. This includes all requirements under the Contractor’s responsibilities for testing, pre-commissioning and commissioning of the plant and, where so required by the tender document, the acquisition of all permits, approvals and licenses, etc.; the operation, maintenance and training services and such other items and services as may be specified in the Tender Document, all in accordance with the requirements of the General Conditions of Contract. Items against which no price is entered by the Tenderer will not be paid for by the Purchaser when executed and shall be deemed to be covered by the prices for other items.</p> <p>26.2 Tenderers are required to quote the price for the commercial, contractual and technical obligations outlined in the tender document</p>

	<p>26.3 Tenderers shall give a breakdown of the prices in the manner and detail called for in the Price Schedules included in Section 5, Tender and Contract Forms.</p> <p>26.4 Depending on the scope of the Contract, the Price Schedules may comprise up to the six (6) schedules listed below. Separate numbered Schedules included in Section IV, Tender Forms, from those numbered 1-4 below, shall be used for each of the elements of the Plant and Installation Services. The total amount from each Schedule corresponding to an element of the Plant and Installation Services shall be summarized in the schedule titled Grand Summary, (Schedule 6), giving the total tender price(s) to be entered in the Letter of Tender.</p> <p>Schedule No. 1 Plant (including Mandatory Spare Parts) Supplied from Abroad</p> <p>Schedule No. 2 Plant (including Mandatory Spare Parts) Supplied from within the Purchaser's Country</p> <p>Schedule No. 3 Design Services</p> <p>Schedule No. 4 Civil works part</p> <p>Schedule No. 5 Installation Services</p> <p>Schedule No. 6 Grand Summary (Schedule Nos. 1 to 4)</p> <p>Schedule No. 7 Recommended Spare Parts</p> <p>Tenderers shall note that the plant and equipment included in Schedule Nos. 1 and 2 above exclude materials used for civil, building and other construction works. All such materials shall be included and priced under Schedule No. 4, Civil works part.</p> <p>26.5 In the Schedules, tenderers shall give the required details and a breakdown of their prices as follows:</p> <ol style="list-style-type: none"> a) Plant to be supplied from abroad (Schedule No. 1): The price of the plant shall be quoted on CIP-named place of destination/CIF basis as specified in the TDS and as applicable. (b) Plant manufactured within the Purchaser's country (Schedule No. 2): <ol style="list-style-type: none"> i) The price of the plant shall be quoted on an EXW INCOTERM basis (such as "ex-works," "ex-factory," "ex-warehouse" or "off-the-shelf," as applicable), (ii) Sales tax and all other taxes payable in the Employer's country on the plant if the contract is awarded to the Tenderer, and (iii) The total price for the item. (c) Design Services (Schedule No. 3). (d) Installation Services shall be quoted separately (Schedule No. 5) and shall include rates or prices for local transportation to named place of final destination as specified in the TDS, insurance
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	<p>and other services incidental to delivery of the plant, all labor, contractor's equipment, temporary works, materials, consumables and all matters and things of whatsoever nature, including operations and maintenance services, the provision of operations and maintenance manuals, training, etc., where identified in the Tender Document, as necessary for the proper execution of the installation and other services, including all taxes, duties, levies and charges payable in the Employer's country as of twenty-eight (28) days prior to the deadline for submission of tenders.</p> <p>(e) Recommended spare parts shall be quoted separately (Schedule 7) as specified in either subparagraph (a) or (b) above in accordance with the origin of the spare parts</p> <p>26.6 The current edition of INCOTERMS, published by the International Chamber of Commerce shall govern.</p> <p>26.7 The prices shall be either fixed or adjustable as specified in the TDS.</p> <p>26.8 In the case of Fixed Price, prices quoted by the Tenderer shall be fixed during the Tenderer's performance of the contract and not subject to variation on any account. A tender submitted with an adjustable price quotation will be treated as non-responsive and rejected.</p> <p>26.9 In the case of Adjustable Price, prices quoted by the Tenderer shall be subject to adjustment during performance of the contract to reflect changes in the cost elements such as labor, material, transport and contractor's equipment in accordance with the procedures specified in the corresponding Appendix to the Contract Agreement. A tender submitted with a fixed price quotation will not be rejected, but the price adjustment will be treated as zero. Tenderers are required to indicate the source of labor and material indices in the corresponding Form in Section 5, Tender and Contract Forms</p> <p>26.10 If so indicated in ITT 1.2, tenders are to be invited for individual lots or for any combination of lots (packages). Tenderers wishing to offer any price reduction (discount) for the award of more than one lot shall specify in their Tender Submission Letter the price reductions applicable to each package, or alternatively, to individual Contracts within the package, and the manner in which the price reductions will apply.</p> <p>26.11 Tenderers wishing to offer any unconditional discount shall specify in their Letter of Tender the offered discounts and the manner in which price discounts will apply.</p> <p>26.12 If so indicated under ITT Sub Clause 26.9, Tenders are being invited with a provision for price adjustments. The unit rates or prices quoted by the Tenderer are subject to</p>
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	<p>adjustment during the performance of the Contract in accordance with the provisions of the relevant GCC Clause and, in such case the Employer shall provide the indexes and weightings or coefficients in Appendix to the Tender for the price adjustment formulae specified in the PCC.</p> <p>26.13 The Employer may require the Tenderer to justify its proposed indexes, if any of those as stated under ITT Sub Clause 26.12, are instructed to be quoted by the Tenderer in Appendix to the Tender.</p> <p>26.14 The price adjustment stated under ITT Sub Clause 26.9 and 26.12 shall be dealt with in accordance with the provisions in Section 12 and 22 of the Public Procurement Act, 2006 and Rule 5 and 38 of the Public Procurement Rules, 2008.</p>
<p>27. Tender Currency</p>	<p>27.1 For expenditures that will be incurred in Bangladesh, the Tenderer shall quote the prices in Bangladesh Taka</p> <p>27.2 Suppliers offering Goods manufactured or assembled in Bangladesh are permitted to submit their Tender in a combination of local and foreign currencies.</p> <p>27.3 In case of National Tender, all quoted price shall be in local currency.</p> <p>27.4 In case of international competitive tender, for expenditures that will be incurred outside Bangladesh, the Tenderer may quote the prices as specified in TDS.</p>
<p>28. Documents Establishing the Conformity of Plant, and Services</p>	<p>28.1 To establish the conformity of the plant and services to the Tender Documents, the Tenderer shall furnish as part of its Tender the documentary evidence that the Goods and Related services conform to the technical specifications and standards in Section 6, Employer's Requirement.</p> <ol style="list-style-type: none"> a. a detailed description of the essential technical and performance characteristics of the plant and services, including the functional guarantees of the proposed plant and services, in response to the Specification b. a list giving full particulars, including available sources, of all spare parts and special tools necessary for the proper and continuing functioning of the plant for the period named in the TDS, following completion of plant and services in accordance with provisions of contract; and c. a commentary on the Employer's Specification and adequate evidence demonstrating the substantial responsiveness of the plant and services to those specifications. Tenderers shall note that standards for workmanship, materials and equipment designated by the Employer in the Tender Document are intended to be descriptive (establishing standards of quality and performance) only and not restrictive. The Tenderer may substitute alternative standards,

	brand names and/or catalog numbers in its tender, provided that it demonstrates to the Employer's satisfaction that the substitutions are substantially equivalent or superior to the standards designated in the Specification.
29. Documents Establishing Eligibility of the Tenderer	29.1 Tenderers, if applying as a sole Tenderer, shall submit documentary evidence to establish its eligibility as stated under ITT Clause 5 and, in particular, it shall: <ul style="list-style-type: none"> (a) complete the eligibility declarations in the Tender Submission Letter (Form PG5A-1a); (b) complete the Tenderer Information (Form PG5A-2a); (c) complete Subcontractor Information (Form PG5A-2c), if it intends to engage any Subcontractor(s).
	29.2 Tenderers, if applying as a partner of an existing or intended JV shall submit documentary evidence to establish its eligibility as stated under ITT Clause 5 and, in particular, in addition to as stated under ITT Sub Clause 29.1, it shall: <ul style="list-style-type: none"> (a) provide for each JV partner, completed JV Partner Information (Form PG5A-2b); (b) provide the JV agreement or Letter of Intent along with the proposed agreement of the intended JV as stated under ITT Sub Clause 18.1
30. Validity Period of Tender	30.1 Tender validities shall be determined on the basis of the complexity of the Tender and the time needed for its examination, evaluation, approval of the Tender and issuance of the Notification of Award (NOA).
	30.2 Tenders shall remain valid for the period specified in the TDS after the date of Tender submission deadline prescribed by the Purchaser, as stated under ITT Clause 39. A Tender valid for a period shorter than that specified will be rejected by the Purchaser as non- responsive.
31. Extension of Tender Validity and Tender Security	31.1 In justified exceptional circumstances, prior to the expiration of the Tender validity period, the Purchaser following Rule 21 of the Public Procurement Rules, 2008 may solicit, not later than ten (10) days before the expiry date of the Tender validity, compulsorily all the Tenderers' consent to an extension of the period of validity of their Tenders.
	31.2 The request for extension of Tender validity period shall state the new date of the validity of the Tender.
	31.3 The request from the Purchaser and the responses from the Tenderers will be made in writing.
	31.4 Tenderers consenting in writing to the request made by the Purchaser under ITT Sub-Clause 30.1 shall also correspondingly extend the validity of its Tender Security

	<p>for twenty-eight (28) days beyond the new date for the expiry of Tender validity.</p> <p>31.5 Tenderers consenting in writing to the request under ITT Sub-Clause 31.1 shall not be required or permitted to modify its Tender in any circumstances.</p> <p>31.6 If the Tenderers are not consenting in writing to the request made by the Purchaser under ITT Sub-Clause 31.1, its Tender will not be considered for subsequent evaluation.</p>
32. Tender Security	<p>32.1 The Tender Security and its amount shall be determined sufficient to discourage the submission of frivolous and irresponsible tenders pursuant to Rule 22 of the Public Procurement Rule 2008 and shall be expressed as a rounded fixed amount and, shall not be stated as a precise percentage of the estimated total Contract value.</p> <p>32.2 The Tenderer shall furnish as part of its Technical offer (envelope-1) Tender, in favour of the Purchaser or as otherwise directed on account of the Tenderer, a tender security in original form (not copy) and in the amount as specified in TDS.</p> <p>32.3 If the Tender is a Joint Venture, the Tenderer shall furnish as part of its Tender, in favour of the Procuring Entity or as otherwise directed on account of the title of the existing or intended JVCA or any of the partners of that JVCA or in the names of all future partners as named in the Letter of Intent of the JVCA, a Tender Security in original form and in the amount as stated under ITT Sub Clause 32.1.</p>
33. Form of Tender security	<p>33.1 The Tender Security shall:</p> <p>(a) In case of NCT, at the Tenderer's option, be either;</p> <p>(i) In the form of a Bank Draft, Pay order or</p> <p>(ii) in the form of an irrevocable bank guarantee issued by any scheduled Bank of Bangladesh, in the format (Form PG5A-6) furnished in Section 5: Tender and Contract Forms.</p> <p>(b) In case of ICT, in the form of an irrevocable bank guarantee issued by an internationally reputable bank and shall require to be endorsed by its any correspondent bank located in Bangladesh, to make it enforceable, in the format (Form PG5A-6) furnished in Section 5: Tender and Contract Forms;</p> <p>33.2 Tender security shall be payable promptly upon written demand by the Purchaser in the case of the conditions listed in ITT Clause 36 being invoked; and</p> <p>33.3 Tender security shall remain valid for at least twenty eight (28) days beyond the expiry date of the Tender Validity in order to make a claim in due course against a Tenderer in the circumstances detailed under ITT Clause 36.</p>
34. Authenticity of Tender Security	<p>34.1 The authenticity of the Tender security submitted by a Tenderer shall be examined and verified by the Purchaser</p>

	<p>in writing from the Bank issuing the security, prior to finalization of the Evaluation Report pursuant to Rule, 24 of the Public Procurement Rule, 2008.</p> <p>34.2 If a Tender Security is found to be not authentic, the Tender which it covers shall not be considered for subsequent evaluation and in such case the Purchaser shall proceed to take punitive measures against that Tenderer as stated under ITT Sub-Clause 4.6, pursuant to Rule 127 of the Public Procurement Rules, 2008 and in accordance with Section 64(5) of the Public Procurement Act, 2006.</p> <p>34.3 Tender not accompanied by a valid Tender Security as stated under Sub-Clause 29, 30 and 31, shall be considered as non-responsive.</p>
<p>35. Return of Tender Security</p>	<p>35.1 No Tender security shall be returned by the Tender Opening Committee (TOC) during and after the opening of the Tenders pursuant to Rule 26 of the Public Procurement Rules 2008.</p> <p>35.2 No Tender security shall be returned to the Tenderers before contract signing, except to those who are found non-responsive.</p> <p>35.3 Tender securities of the non-responsive Tenders shall be returned immediately after the Evaluation Report has been approved by the Purchaser.</p> <p>35.4 Tender securities of the responsive Tenderers shall be returned only after the lowest evaluated responsive Tenderer has submitted the performance security and signed the contract, that being even before the expiration of the validity period specified in Clause 30.</p> <p>35.5 Tender Securities of the Tenderers not consenting within the specified date in writing to the request made by the Purchaser under ITT Sub-Clause 31.1 in regard to extension of its Tender validity shall be discharged or returned forthwith.</p>
<p>36. Forfeiture of Tender Security.</p>	<p>36.1 The Tender security pursuant to Rule 25 of the Public Procurement Rules,2008 may be forfeited if a Tenderer:</p> <ul style="list-style-type: none"> (a) withdraws its Tender after opening of Tenders but within the validity of the Tender as stated under ITT Clauses 30, and 31, pursuant to Rule 19 of the Public Procurement Rules 2008; or (b) refuses to accept a Notification of Award as stated under ITT Sub-Clause 65.3, pursuant to Rule 102 of the Public Procurement Rules 2008; or (c) fails to furnish performance security as stated under ITT Sub-Clause 66.2, pursuant to Rule 102 of the Public Procurement Rules 2008; or (d) refuses to sign the Contract as stated under ITT Sub-Clause 70.2 pursuant to Rule 102 of the Public Procurement Rules 2008; or (e) does not accept the correction of the Tender price following the correction of arithmetic errors as stated under ITT Clause 55, pursuant to Rule

	98(11) of the Public Procurement Rules 2008.
37. Format and Signing of Tender	37.1 Tenderers shall prepare one (1) original of the documents comprising the Technical Offer as described in ITT Clause 24.2 and clearly mark it “ ORIGINAL OF TECHNICAL OFFER ” In addition, the Tenderers shall prepare the number of copies of the Technical Offer, as specified in the TDS and clearly mark each of them “ COPY OF THE TECHNICAL OFFER. ” In the event of any discrepancy between the original and the copies, the ORIGINAL shall prevail.
	37.2 Tenderers shall prepare one (1) original of the documents comprising the Financial Offer as described in ITT Clause 24.3 and clearly mark it “ ORIGINAL OF FINANCIAL OFFER ” In addition, the Tenderers shall prepare the number of copies of the Financial Offer, as specified in the TDS and clearly mark each of them “ COPY OF THE FINANCIAL OFFER ” In the event of any discrepancy between the original and the copies, the ORIGINAL shall prevail.
	37.3 Alternatives, if permitted under ITT Clause 25, shall be clearly marked “Alternative”.
	37.4 The original and each copy of the Offer shall be typed or written in indelible ink and shall be signed by the Person duly authorized to sign on behalf of the Tenderer. This Tender specific authorization shall be attached to the Technical Offer Submission Letter (Form PW5A-1a) and Financial Offer Submission Letter (Form PW5A-1b). The name and position held by each Person(s) signing the authorization must be typed or printed below the signature. All pages of the original and of each copy of the Tender, except for un-amended printed literature, shall be numbered sequentially and signed by the person signing the Tender.
	37.5 Any interlineations, erasures, or overwriting will be valid only if they are signed or initialled by the Person (s) signing the Tender.
E. Tender Submission	
38. Sealing, Marking and Submission of Tender	38.1 Tenderers shall enclose the original of Technical Offer in one (1) envelope and all the copies of the Technical Offer , including the alternatives, if permitted under ITT Clause 25, in another envelope, duly marking the envelopes as “ ORIGINAL OF TECHNICAL OFFER ” “ ALTERNATIVES ” (if permitted), “ COPY OF TECHNICAL OFFER ”, “ ALTERNATIVES ” (if permitted) These sealed envelopes for the original and copies of the technical Tender shall then be enclosed and sealed in one single envelope and clearly mark it “ Envelope-01: TECHNICAL OFFER ”.
	38.2 The inner and outer envelopes of Technical Offer shall:

	<ul style="list-style-type: none"> (a) be addressed to the Procuring Entity at the address as stated under ITT Sub Clause 39.1; (b) bear the name of the Tender and the Tender Number as stated under ITT Sub Clause 1.1; (c) bear the name and address of the Tenderer; (d) bear a statement “DO NOT OPEN BEFORE -----” the time and date for Tender opening as stated under ITT Sub Clause 45.2 (e) bear any additional identification marks as specified in the TDS.
	<p>38.3 Tenderers shall enclose the original of Financial Offer in one (1) envelope and all the copies of the Financial Offer in another envelope, duly marking the envelopes as “ORIGINAL OF FINANCIAL OFFER” & “COPY OF FINANCIAL OFFER”. These sealed envelopes for the original and copies of the Financial Tender shall then be enclosed and sealed in one single envelope and clearly mark it “ENVELOPE-02: FINANCIAL OFFER”.</p>
	<p>38.4 The inner and outer envelopes of Financial Offer shall:</p> <ul style="list-style-type: none"> (a) be addressed to the Procuring Entity at the address as stated under ITT Sub Clause 39.1; (b) bear the name of the Tender and the Tender Number as stated under ITT Sub Clause 1.1; (c) bear the name and address of the Tenderer; (d) bear a statement “DO NOT OPEN BEFORE THE TECHNICAL OFFER EVALUATION AND APPROVAL”. (e) bear any additional identification marks as specified in the TDS.
	<p>38.5 The Envelope-01 as stated in ITT Clause 38.1 and Envelope-02 as in ITT Clause 38.3 shall then be enclosed and sealed in one single outer envelope which shall contain the information as stated under ITT Clause 38.2 (a) to (e) & ITT Clause 38.4 (a) to (e)</p>
	<p>38.6 Tenderers are solely and entirely responsible for pre-disclosure of Tender information if the envelope(s) are not properly sealed and marked.</p>
	<p>38.7 Tenders shall be delivered by hand or by mail, including courier services at the address(s) as stated under ITT Sub Clause 39.1.</p>
	<p>38.8 The Procuring Entity will, on request, provide the Tenderer with acknowledgement of receipt showing the date and time when it’s Tender was received.</p>
<p>39. Deadline for Submission of tenders</p>	<p>39.1 Tenders shall be delivered to the Purchaser at the address specified in the TDS and no later than the date and time</p>

	<p>specified in the TDS.</p> <p>39.2 The Purchaser may, at its discretion on justifiably acceptable grounds duly recorded, extend the deadline for submission of Tender as stated under ITT Sub Clause 39.1, in which case all rights and obligations of the Purchaser and Tenderers previously subject to the deadline will thereafter be subject to the new deadline as extended.</p> <p>39.3 If submission of Tenders is allowed in more than one location, the date and time, for submission of Tenders for both the primary and the secondary place(s), shall be the “same and not different” as specified in the TDS.</p> <p>39.4 The Procuring Entity shall ensure that the Tenders received at the secondary place(s) are hand-delivered at the primary place as stated under ITT Sub Clause 39.1, within THREE (3) HOURS after the deadline for submission of Tenders at the secondary place (s), in case of MULTIPLE DROPPING as stated under ITT Sub Clause 39.3, as specified in the TDS.</p>
40. Late tender	<p>37.6 Any Tender received by the Purchaser after the deadline for submission of Tenders as stated under ITT Clause 39, shall be declared LATE, rejected, returned unopened to the Tenderer.</p>
41. Modification, Substitution or Withdrawal of Tenders	<p>41.1 Tenderers may modify, substitute or withdraw its Tender after it has been submitted by sending a written notice duly signed by the authorized signatory and properly sealed, and shall include a copy of the authorization; provided that such written notice including the affidavit is received by the Procuring Entity prior to the deadline for submission of Tenders as stated under ITT Clause 39</p>
42. Tender Modification	<p>42.1 Tenderers shall not be allowed to retrieve its original Tender, but shall be allowed to submit corresponding modification either to its original Technical Offer or Financial Offer or both, marked as “MODIFICATION FOR TECHNICAL OFFER(MTO)” or “MODIFICATION FOR FINANCIAL OFFER (MFO)”with two separate envelopes. The envelope/envelopes marked as MTO and/or MFO then be enclosed and sealed in one single outer envelope with a written notice duly as stated under ITT Sub Clause 41.1. The outer envelope shall contain the information as stated under ITT Sub Clause 38.2(a) to (d) and clearly marked as “MODIFICATION (M)”.</p>
43. Tender Substitution	<p>43.1 Tenderers shall not be allowed to retrieve its original Tender, but shall be allowed to submit another Technical Offer or Financial Offer or both, marked as “SUBSTITUTION FOR TECHNICAL OFFER (STO)” or “SUBSTITUTION FOR FINANCIAL OFFER (SFO)”with two separate envelopes. The envelope/envelopes marked as STO and/or SFO then be enclosed and sealed in one single outer envelope with a written notice duly as stated under ITT Sub</p>

	Clause 41.1. The outer envelope shall contain the information as stated under ITT Sub Clause 38.2(a) to (d) and clearly marked as “ SUBSTITUTION (S) ”.
44. Withdrawal of Tender	44.1 The Tenderer shall be allowed to withdraw its Tender by a Letter of Withdrawal marked as “WITHDRAWAL” prior to the deadline for submission of Tenders as stated under ITT Clause 39.
F. Tender Opening and Evaluation	
45. Tender Opening	<p>45.1 Only the Technical Offer (Envelope-01) shall be opened immediately after the deadline for submission of Tenders at the primary place as specified in the TDS but not later than ONE HOUR, after expiry of the submission deadline at the same primary place unless otherwise stated under ITT Sub Clause 39.2. But with in THREE HOURS after the dateline of submission of tender at primary place in case of multiple dropping. Tender opening shall not be delayed on the plea of absences of Tenderers or his or her representatives. Financial offer (Envelope-02) shall not open with Technical offer (Envelope-01) and shall be kept unopened at the Custody of the Head of the Procuring Entity or his Authorised Officer (AO).</p> <p>45.2 Persons not associated with the Tender may not be allowed to attend the public opening of Technical Offers.</p> <p>45.3 Tenderers’ representatives shall be duly authorised by the Tenderer. Tenderers or their authorised representatives will be allowed to attend and witness the opening of Technical Offers, and will sign a register evidencing their attendance. Technical Offers Opening shall not be delayed on the plea of absence of Tenderers or his or her representatives.</p> <p>45.4 The authenticity of withdrawal or substitution of, or modifications to original Tender, if any made by a Tenderer in specified manner, shall be examined and verified by the Tender Opening Committee (TOC) based on documents submitted as stated under ITT Sub Clause 41.1. Any envelope related to financial modification, substitute shall be recorded but not open with technical offer.</p> <p>45.5 Verify (M), (S), (W), (A), (O) by following step by steps</p> <p>(a) Step 1: envelopes marked “Withdrawal (W)” shall be opened and “Withdrawal” notice read aloud & recorded in the opening sheet. After verify the withdrawal letter is genuine, corresponding tender shall not be opened, but returned unopened to the Tenderer by Procuring Entity (PE) at a late time. No Tender withdrawal shall be permitted unless the corresponding withdrawal notice shall be as stated in 41.1& 44.1 and in such case the Tender shall be opened and recorded.</p> <p>(b) Step 2: the remaining Tenders will be sorted out and those marked “SUBSTITUTION (S)” or</p>

	<p>“MODIFICATION (M)” of Tender will be linked with their corresponding Original Tender.</p> <p>(c) Step 3: outer envelopes marked “SUBSTITUTION (S)” shall be opened. The inner envelopes containing the “Substitution of Technical Offer (STO)” and/or “Substitution of Financial Offer (SFO)” shall be exchanged for the corresponding envelopes being substituted, which are to be returned to the Tenderer unopened by the Procuring Entity at a later time immediately after opening of Technical Offers. Only the Substitution of Technical Offer, if any, shall be opened, read out, and recorded. Substitution of Financial Offer will remain unopened in accordance with ITT Sub Clause 45.1. No envelope shall be substituted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out and recorded at Technical Offer opening.</p> <p>(d) Step 4: outer envelopes marked “MODIFICATION (M)” shall be opened. No Technical Offer and/or Financial Offer shall be modified unless the corresponding modification notice contains a valid authorization to request the modification and is read out and recorded at the opening of Technical Offers. Only the Technical Offers, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Financial Offers, both Original as well as Modification, will remain unopened in accordance with ITT Sub Clause 45.1</p> <p>(e) Step5: if so specified in this Tender Document, the envelopes marked “Alternative of Technical Offer (ATO)” shall be opened and read aloud with the corresponding Technical Offer and recorded.</p> <p>45.6 Ensuring that only the correct (MTO), (STO), (ATO), (OTO) envelopes are opened, details of each Technical Offer will be dealt with as follows:</p> <p>(a) the Chairperson of the TOC will read aloud each Technical Offer and record in the Technical Offer Opening Sheet (TOOS):</p> <ul style="list-style-type: none"> (i) the name and address of the Tenderer; (ii) state if it is a withdrawn, modified, substituted or original Technical Offer; (iii) any alternatives; (iv) record the rejection of the Tender which submitted Technical Offer and Financial Offer together in one envelope. (v) the presence or absence of any requisite Tender Security; and (vi) such other details as the Procuring Entity, at its discretion, may consider appropriate. <p>(b) Only Technical Offer and alternatives read aloud at</p>
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	<p>the Technical Offer Opening will be considered in evaluation.</p> <p>(c) all pages of the original version of the Technical Offer, except for un-amended printed literature, will be initialled by members of the TOC. Remember, No financial Offer shall be open with Technical Offer</p> <p>45.7 Upon completion of Technical Offer opening, all members of the TOC and the Tenderers or Tenderer's duly authorised representatives attending the Technical Offer opening shall sign by name, address, designation, the TOS, copies of which shall be issued to the Head of the Procuring Entity or an officer authorised by him or her and also to the members of the TOC and any authorised Consultants and, to the Tenderers immediately.</p> <p>45.8 The omission of a Tenderer's signature on the record shall not invalidate the contents and effect of the record under ITT Sub Clause 45.7</p> <p>45.9 No Tender i.e., Technical or Financial Offer shall be rejected at the Tender opening stage except the LATE Tenders as stated in the ITT Clause 40.</p>
<p>46. Evaluation of Tenders</p>	<p>46.1 Technical Offers shall be examined and evaluated only on the basis of the criteria specified in the Tender Document.</p> <p>46.2 Tender Evaluation Committee (TEC) shall examine, evaluate and compare Tenders that are responsive to the requirements of Tender Documents in order to identify the successful Tenderer.</p>
<p>47. Evaluation Process</p>	<p>47.1 TEC may consider a Tender Offer as responsive in the Evaluation, only if it is submitted in compliance with the mandatory requirements set out in the Tender Document. The evaluation process should begin immediately after Technical Offer opening following Two steps:</p> <ul style="list-style-type: none"> (a) Preliminary examination (b) Technical examination and responsiveness
<p>48. Preliminary Examination</p>	<p>48.1 Compliance, adequacy and authenticity of the documentary evidences for meeting the qualification criterion specified in the corresponding section of the Tender document shall have to be preliminarily examined and verified.</p> <p>48.2 The TEC shall firstly examine the Tenders to confirm that all documentation requested in ITT Clause 24 has been provided. Examination of the compliance, adequacy and authenticity of the documentary evidence may follow the order below:</p> <ul style="list-style-type: none"> (a) verification of the completeness of the eligibility declaration in the Tender Submission Letter (Form PG5A-1), to determine the eligibility of the tenderer as stated under ITT Sub-Clause 24(h). Any alterations to its format, filling in all blank spaces with the information requested, failing which the

	<p>tender may lead to rejection of the Tender;</p> <ul style="list-style-type: none"> (b) verification of that the Tenderer is enrolled in the relevant professional or trade organisations as stated under ITT Clause 24(l); (c) verification of the eligibility in terms of legal capacity and fulfilment of taxation obligation by the tenderer in accordance as stated under ITT Sub-Clause 24(i) and 24(k); (d) verification of eligibility that the tenderer is not insolvent, in receivership, bankrupt, not in the process of bankruptcy, not temporarily barred as stated under ITT Sub-Clause 24(j); (e) verification of eligibility of Tenderer's country of origin as stated under ITT Sub-Clause 24(b); (f) verification of the written authorization confirming the signatory of the Tenderer to commit the Tender has been attached with Tender Submission Letter (Form PG5A-1) as stated under ITT Sub-Clause 24(g); in order to check the authenticity of Tender and Tenderer itself ; (g) verification of the Tender Security as stated under ITT Sub-Clause 24(d); and <p>48.3 The TEC shall confirm that the above documents and information have been provided in the Tender and the completeness of the documents and compliance of instructions given in corresponding ITT Clauses shall be verified, failing which the tender shall be considered rejection of that tender.</p>
<p>49. Technical Evaluation and Responsiveness</p>	<p>49.1 Only those Tenders surviving preliminary examination need to be examined in this phase.</p> <p>49.2 Secondly, the TEC will examine the adequacy and authenticity of the documentary evidence which may follow the order below:</p> <ul style="list-style-type: none"> (a) verification of the completeness of the country of origin declaration in the Price Schedule for Plant and Services (Form PG5A-3) as furnished in Section 5: Tender and Contract Forms to determine the eligibility of the Goods and Related Services as stated under ITT Sub Clause 24(m). (b) verification and examination of the documentary evidence and completed Technical Proposal (Form PG5A-4) as furnished in Section 5: Tender and Contract Forms to establish the conformity of the Goods and Related Services to the Tender Documents as stated under ITT Sub Clause 24(e) and 24(n). (c) verification and examination of the documentary evidence that the Tenderer's qualifications conform to the Tender Documents and the

	<p>Tenderer meets each of the qualification criterion specified in Sub-Section C, Qualification Criteria as stated under ITT Sub Clause 24(o).</p> <p>(d) verification and examination of the documentary evidence that Tenderer has met all the requirements in regards under Section 6, Employer's Requirements, without any material deviation or reservation.</p> <p>(e) verification and examination of the documentary evidence and completed Specification Submission Sheet (Form PG5A-4a) to determine the conformity of the Goods and related services.</p>
49.3	TEC may consider a Tender as responsive in the evaluation, only if comply with the mandatory requirements as stated under Clause 49.2.
49.4	The TEC's determination of a Tender's responsiveness is to be based on the documentary evidence as requested in Clause 49.2 without recourse to extrinsic evidence.
49.5	Information contained in a Tender, that was not requested in the Tender Document shall not be considered in evaluation of the Tender.
49.6	If a Tender is not responsive to the mandatory requirements set out in the Tender Document it shall be rejected by the TEC and shall not subsequently be made responsive by the Tenderer by correction of the material deviation, reservation.
49.7	<p>A material deviation or reservation is one-</p> <p>(a) which affects in any substantial way the scope, quality, or performance of the Goods and Related Services and Tenderer's qualifications mentioned in the Tender Document</p> <p>(b) which limits in any substantial way, inconsistent with the Tender Documents, the Purchaser's rights or the Tenderer's obligations under the Contract; or</p> <p>(c) whose rectification would anyway affect unfairly the competitive position of other Tenderers presenting responsive Tenders.</p>
49.8	<p>During the evaluation of Tender, the following definitions apply:</p> <p>(a) "Deviation" is a departure from the requirements specified in the Tender Document;</p> <p>(d) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Tender Document;</p>
49.9	A TEC may regard a Tender as responsive, even if it contains-minor or insignificant deviations, which do not meaningfully alter or depart from the technical specifications, characteristics and commercial terms and

	<p>conditions or other requirements set out in the Tender Document; errors or oversights, which if corrected, would not alter the key aspects of the Tender.</p>
<p>50. Clarification on Technical Offer</p>	<p>50.1 TEC may ask Tenderers for clarification of their Technical Offers in order to facilitate the examination and evaluation of Technical Offers. The request for clarification by the TEC and the response from the Tenderer shall be in writing, and Technical Offers clarifications which may lead to a change in the substance of the Technical Offers or in any of the key elements of the Technical Offers as stated under ITT Sub Clause 49.2, will neither be sought nor be permitted.</p> <p>50.2 Any request for clarifications by the TEC shall not be directed towards making an apparently non-responsive Tender responsive and reciprocally the response from the concerned Tenderer shall not be articulated towards any addition, alteration or modification to its Technical Offer.</p> <p>50.3 If a Tenderer does not provide clarifications of its Technical Offer by the date and time, its Tender shall not be considered in the evaluation</p>
<p>51. Restrictions on Disclosure of Information</p>	<p>51.1 Following the opening of Technical Offers until issuance of Notification of Award no Tenderer shall, unless requested to provide clarification to its Tender or unless necessary for submission of a complaint, communicate with the concerned Procuring Entity</p> <p>51.2 Tenderers shall not seek to influence in anyway, the examination and evaluation of the Tenders</p> <p>51.3 Any effort by a Tenderer to influence the Procuring Entity in its decision concerning the evaluation of Tenders, Contract awards may result in the non-responsiveness of its Tender as well as further action in accordance with Section 64 (5) of the Public Procurement Act, 2006.</p> <p>51.4 All clarification requests shall remind Tenderers of the need for confidentiality and that any breach of confidentiality on the part of the Tenderer may result in their Tender being non-responsive.</p>
<p>52. Approval of Technical Offer</p>	<p>52.1 TEC shall prepare the Technical Offer Evaluation Report and shall directly submit the Evaluation Report to the Head of the Procuring Entity (HOPE) or Authorized Officer for approval.</p>
<p>53. Financial Offer Opening</p>	<p>53.1 After receiving approval of the Technical Offer Evaluation Report, Financial Offer (Envelope-2) of only the Responsive Tenderers who have been determined as qualified to the requirements of the Technical Offer, shall be opened publicly, The Date, time and place of Financial Offer Opening shall be communicated to the Responsive Tenderers in writing by issuing a Financial Offer Opening notice not less than SEVEN DAYS before the opening.</p>

	<p>53.2 Ensuring that only the correct MFO, SFO, OFO envelopes of the Responsive Tenderers shall be opened, in the presence of the Responsive Tenderer's representatives who choose to attend, on the date, time and at the place as notified by the Procuring Entity in accordance with ITT Clause 53.1. Details of each Financial Offer will be dealt with as follows:</p> <p>(a) the Chairperson of the Tender Evaluation Committee will read aloud each Financial Offer and record in the Financial Offer Opening Sheet (FOOS):</p> <ul style="list-style-type: none"> (i) the name and address of the Tenderer; (ii) state if it is a modified, substituted or original Financial Offer; (iii) the Tender Price; (iv) the number of initialled corrections; (v) any discounts; and (vi) any other details as the Procuring Entity, at its discretion, may consider appropriate <p>(b) only the discounts and alternatives read aloud and recorded at the Financial Offer Opening will be considered in Financial Offer Evaluation. No Tenders shall be rejected at the opening of the Financial Offer.</p> <p>(c) all pages of the original version of the Financial Offer, except for un-amended printed literature, will be initialled by members of the Tender Evaluation Committee.</p> <p>(d) The Procuring Entity shall, in writing, notify the Non-responsive Tenderers who have not been determined as qualified to the requirements of the Technical Offer and shall return their Financial Offers (Envelope-02) unopened after signing of the contract.</p>
<p>54. Clarification on Financial Offer</p>	<p>54.1 TEC may ask Tenderers for clarification of their Financial Offers, about the breakdowns of unit rates, in order to facilitate the examination and evaluation of Financial Offers. The request for clarification by the TEC and the response from the Tenderer shall be in writing.</p> <p>54.2 Changes in the Tender price shall not be sought or permitted, except to confirm the correction of arithmetical errors discovered by the TEC in the evaluation of the Tenders, as stated under ITT Sub Clause 55.1.</p> <p>54.3 If a Tenderer does not provide clarifications of its Financial Offer by the date and time, its Tender shall not be considered in the evaluation.</p> <p>54.4 Requests for clarifications on Financial Offers shall be duly signed only by the TEC Chairperson.</p>
<p>55. Correction of Arithmetical Errors</p>	<p>55.1 The TEC shall correct any arithmetic errors that are discovered during the examination of Tenders, and shall</p>

	<p>promptly notify the concerned Tenderer(s) of any such correction(s) pursuant to Rule 98(11) of the Public Procurement Rule, 2008.</p> <p>55.2 Provided that the Tender is responsive, TEC shall correct arithmetical errors on the following basis:</p> <p>(a) If there is a discrepancy between the unit price and the line item total that is obtained by multiplying the unit price by the quantity, the <u>unit price</u> shall prevail and the line item total shall be corrected, unless in the opinion of the TEC there is an obvious <u>misplacement of the decimal point</u> in the unit price, in which case the total price as quoted will govern and the unit price will be corrected;</p> <p>(b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the <u>sub-totals</u> shall prevail and the total shall be corrected.</p> <p>55.3 Any Tenderer that does not accept the correction of the Tender amount following correction of arithmetic errors as determined by the application of ITT Sub-Clause 55.2 shall be considered as non-responsive.</p>
<p>56. Conversion to Single Currency</p>	<p>56.1 For evaluation and comparison purpose, TEC shall convert all Tender prices expressed in the amounts in various currencies into an amount in Bangladeshi Taka currency, using the selling exchange rates established by the Bangladesh Bank, on the date of Tender opening.</p>
<p>57. Financial Evaluation</p>	<p>57.1 Thirdly the TEC, pursuant to Rule 98 of the Public Procurement Rules, 2008 shall evaluate each Tender that has been determined, up to this stage of the evaluation, to be responsive to the mandatory requirements in the Tender Document..</p> <p>57.2 To evaluate a Tender in this stage , the Purchaser shall consider the following</p> <p>(a) Verification and examination of the Price Schedule for Plant and Services (Form PG5-3) as furnished by the Tenderer and checking the compliance with the instructions provided under ITT Clause 26;</p> <p>(b) Evaluation will be done for Items or lot by lot as stated under ITT Clause 26 and the Total Tender Price as quoted in accordance with Clause 26;</p> <p>(c) Adjustment for correction of arithmetical errors as stated under ITT Sub-Clause 55.2;</p> <p>(d) Adjustment for price modification offered as stated under ITT Clause 41;</p> <p>(e) Adjustment due to discount as stated under ITT Sub-Clauses 26.11 and 57.3;</p> <p>(f) Adjustment due to the application of economic factors of evaluation as stated under ITT Sub-</p>

	<p>Clause 57.5 if any;</p> <p>(g) Adjustment due to the assessment of the price of unpriced items as stated under ITT Clause 58 if any;</p>
	<p>57.3 If Tenders are invited for a single lot or for a number of lots as stated under ITT Sub-clauses 26.10, TEC shall evaluate only lots that have included at least the percentage of items per lot. The TEC shall evaluate and compare the Tenders taking into account:</p> <p>(a) Lowest evaluated tender for each lot ;</p> <p>(b) The price discount/reduction per lot;</p> <p>(c) Least cost combination for the Purchaser, considering discounts and the methodology for its application as stated under ITT Sub-clauses 26.10 and 26.11 offered by the Tenderer in its Tender.</p> <p>57.4 Only those spare parts and tools which are specified as a item in the List of Goods and Related Services in Section 6, Employer’s Requirement or adjustment as stated under ITT Sub-clause 54.5, shall be taken into account in the Tender evaluation. Supplier-recommended spare parts for a specified operating requirement as stated under ITT Sub-clause 28.2(b) shall not be considered in Tender evaluation.</p>
	<p>57.5 The Purchaser’s evaluation of a tender may require the consideration of other factors, in addition to the Tender Price quoted as stated under ITT Clause 26. The effect of the factors selected, if any, shall be expressed in monetary terms to facilitate comparison of tenders. The factors, methodologies and criteria to be used shall be as specified in TDS. The applicable economic factors, for the purposes of evaluation of Tenders shall be:</p> <p>(a) Adjustment for Deviations in the Delivery and Completion Schedule.</p> <p>(b) Cost of major replacement components, mandatory spare parts, and service.</p>
	<p>57.6 Variations, deviations, and alternatives and other factors which are in excess of the requirements of the Tender Document or otherwise result in unsolicited benefits for the Purchaser will not be taken into account in Tender evaluation.</p>
<p>58. Price Comparison</p>	<p>58.1 The TEC shall compare all responsive Tenders to determine the lowest-evaluated Tender, as stated in ITT 57.2.</p> <p>58.2 In the extremely unlikely event that there is a tie for the lowest evaluated price, the Tenderer with the superior past performance with the Purchaser shall be selected, whereby factors such as delivery period, quality of Goods delivered, complaints history and performance indicators could be</p>

	<p>taken into consideration.</p>
	<p>58.3 In the event that there is a tie for the lowest price and none of the Tenderers has the record of past performance with the Purchaser, then the Tenderer shall be selected, subject to firm confirmation through the Post-qualification process described in ITT Clause 61, after consideration as to whether the quality of Goods that is considered more advantageous by the end-users.</p>
	<p>58.4 The successful Tenderer as stated under ITT Sub Clauses 58.1, 60.2 and 60.3 shall not be selected through lottery under any circumstances.</p>
<p>59. Post-qualification</p>	<p>59.1 After determining the lowest-evaluated responsive tender as sated under ITT Sub-Clause 58.1, the Purchaser’s TEC pursuant to Rule 100 of the Public Procurement Rules, 2008, shall carry out the Post-Qualification of the Tenderer, using only the requirements specified in Sub-Section C, Qualification Criteria.</p> <p>59.2 The TEC shall contact the references given by Tenderers about their previous Supply experiences to verify, if necessary, statements made by them in their Tender and to obtain the most up-to-date information concerning the Tenderers.</p> <p>59.3 The TEC may visit the premises of the Tenderer as a part of the post-qualification process, if practical and appropriate, to verify information contained in its Tender.</p> <p>59.4 The TEC shall determine to its satisfaction whether the Tenderer that is selected as having submitted the lowest evaluated responsive Tender is qualified to perform the Contract satisfactorily.</p> <p>59.5 The objective of any visit under ITT Sub-Clause 59.3 shall be limited to a general and visual inspection of the Tenderer’s facilities and its plant and equipment, and there shall be no discussion concerning the Tender or its evaluation with the Tenderer during such visit(s).</p> <p>59.6 In the event that the Tenderer with lowest evaluated cost fails the post-qualification, the TEC shall make a similar determination for the Tenderer offering the next lowest evaluated cost and so on from the remaining responsive Tenders, provided that,</p> <ul style="list-style-type: none"> (a) such action shall only be taken if the evaluated costs of the Tenders under consideration are acceptable to the Purchaser; (b) when the point is reached whereby the evaluated costs of the remaining responsive Tenders are significantly higher than that of the official estimate, or the market price, the Purchaser may take action pursuant to Rule 33 of the PPR 2008 and may

	<p>proceed for re-Tendering, using a revised Tender Document designed to achieve a more successful result.</p>
<p>60. Negotiation</p>	<p>60.1 No negotiations shall be held during the financial offer evaluation or award, with the lowest or any other Tenderer.</p> <p>60.2 The Procuring Entity through the TEC may, however, negotiate with the lowest evaluated Tenderer with the objective to reduce the Contract Price by reducing the scope of works or a reallocation of risks and responsibilities, only when it is found that the lowest evaluated Tender is significantly higher than the official estimated cost; the reasons for such higher price being duly investigated.</p> <p>60.3 If the Procuring Entity decides to negotiate for reducing the scope of the requirements under ITT Sub Clause 60.2, it will be required to guarantee that the lowest Tenderer remains the lowest Tenderer even after the scope of work has been revised and shall further be ensured that the objective of the Procurement will not be seriously affected through this reduction.</p> <p>60.4 In the event that the Procuring Entity decides because of a high Tender price to reduce the scope of the requirements to meet the available budget, the Tenderer is not obliged to accept the award and shall not be penalised in any way for un-accepting the proposed award.</p>
<p>61. Rejection of All Tenders</p>	<p>61.1 The Purchaser may, in the circumstances as stated under ITT Sub-Clause 61.2 and pursuant to Rule 33 of the Public Procurement Rules 2008, reject all Tenders following recommendations from the Tender Evaluation Committee only after the approval of such recommendations by the Head of the Purchaser. rejected, if –</p> <p>61.2 All Tenders can be rejected, if -</p> <ul style="list-style-type: none"> (a) the price of the lowest evaluated Tender exceeds the official estimate, provided the estimate is realistic; or (b) there is evidence of lack of effective competition; such as non-participation by a number of potential Tenderers; or (c) the Tenderers are unable to propose completion of the delivery within the stipulated time in its offer, though the stipulated time is reasonable and realistic; or (d) all Tenders are non-responsive; or (e) evidence of professional misconduct, affecting seriously the Procurement process, is established pursuant to Rule 127 of the Public Procurement Rules, 2008. <p>61.3 Notwithstanding anything contained in ITT Sub-Clause 61.2 Tenders may not be rejected if the lowest evaluated price is in conformity with the market price.</p>

	<p>61.4 A Purchaser may pursuant to Rule 35 of the Public Procurement Rules, 2008, on justifiable grounds, annul the Procurement proceedings prior to the deadline for the submission of Tenders.</p> <p>61.5 All Tenders received by the Purchaser shall be returned unopened to the Tenderers in the event Procurement proceedings are annulled under ITT Sub-Clause 61.4.</p>
62. Informing Reasons for Rejection	62.1 Notice of the rejection, pursuant to Rule 35 of the Public Procurement Rules, 2008, will be given promptly within <u>seven (7) days</u> of decision taken by the Purchaser to all Tenderers and, the Purchaser will, upon receipt of a written request, communicate to any Tenderer the reason(s) for its rejection but is not required to justify those reason(s).
G. Contract Award	
63. Award Criteria	<p>63.1 The Purchaser shall award the Contract to the Tenderer whose offer is responsive to the Tender Document and that has been determined to be the lowest evaluated Tender, provided further that the Tenderer is determined to be Post-Qualified as stated under ITT Clause 59.</p> <p>63.2 A Tenderer shall not be required, as a condition for award of contract, to undertake obligations not stipulated in the Tender Document, to change its price, or otherwise to modify its Tender.</p>
64. Notification of Award	<p>64.1 Prior to the expiry of the Tender validity period and within <u>seven (7)</u> working days of receipt of the approval of the award by the Approving Authority, the Purchaser pursuant to Rule 102 of the Public procurement Rules, 2008, shall issue the Notification of Award (NOA) to the successful Tenderer.</p> <p>64.2 The Notification of Award, attaching the contract as per the sample (Form PG5A-7) to be signed, shall state:</p> <ul style="list-style-type: none"> (a) the acceptance of the Tender by the Purchaser; (b) the price at which the contract is awarded; (c) the amount of the Performance Security and its format; (d) the date and time within which the Performance Security shall be submitted; and (e) the date and time within which the contract shall be signed. <p>64.3 The Notification of Award shall be accepted in writing by the successful Tenderer within <u>seven (7)</u> working days from the date of issuance of NOA.</p> <p>64.4 Until a formal contract is signed, the Notification of Award shall constitute a Contract, which shall become binding upon the furnishing of a Performance Security and the signing of the Contract by both parties.</p>

	64.5 The Notification of Award establishes a Contract between the Purchaser and the successful Tenderer and the existence of a Contract is confirmed through the signature of the Contract Document that includes all agreements between the Purchaser and the successful Tenderer.
65. Performance Security	65.1 The Performance Security shall be determined sufficient to protect the performance of the Contract pursuant to Rule 27 of the Public Procurement Rules, 2008.
	65.2 Performance Security shall be furnished by the successful Tenderer in the amount specified in the TDS and denominated in the currencies in which the Contract Price is payable pursuant to Rule 102 (8) of the Public Procurement Rules, 2008.
	65.3 The proceeds of the Performance Security shall be payable to the Purchaser unconditionally upon first written demand as compensation for any loss resulting from the Supplier's failure to complete its obligations under the Contract.
66. Form and Time Limit for furnishing of Performance security	66.1 The Performance Security shall be in the form of irrevocable Bank Guarantee in the format (Form PG5A-9) as stated under ITT Clause 65, shall be issued by an internationally reputable bank and it shall have correspondent bank located in Bangladesh, to make it enforceable pursuant to Rule 27(4) of the Public Procurement Rules, 2008..
	66.2 Within twenty-eight (28) days from issue of the Notification of Award, the successful Tenderer shall furnish the Performance Security for the due performance of the Contract in the amount specified under ITT Sub Clause 65.2.
67. Validity of Performance Security	67.1 The Performance Security shall be required to be valid until a date twenty-eight (28) days beyond the date of completion of the Supplier's performance obligations under the Contract, including any warranty obligations.
	67.2 If under any circumstances date of completion of the Supplier's performance obligations under the Contract, including any warranty obligations is to be extended, the Performance Security shall correspondingly be extended for the extended period.
68. Authenticity of performance Security	69.1 The Purchaser shall verify the authenticity of the Performance Security submitted by the successful Tenderer by sending a written request to the branch of the bank issuing irrevocable Bank Guarantee in specified format.
	69.2 If the Performance Security submitted under ITT Sub Clause 65.2 is not found to be authentic, the Purchaser

	shall proceed to take measures against the Tenderer in accordance with Section 64 of the Act and pursuant to Rule 127 of the Public Procurement Rules, 2008.
69. Contract Signing	<p>69.1 At the same time as the Purchaser issues the Notification of Award, the Purchaser shall send the draft Contract Agreement and all documents forming the Contract pursuant to Rule 102 of the Public Procurement Rule, 2008, to the successful Tenderer.</p> <p>69.2 Within twenty-eight (28) days of the issuance of Notification of Award, the successful Tenderer and the Purchaser shall sign the contract provided that the Performance Security submitted by the Tenderer is found to be genuine.</p> <p>69.3 If the successful Tenderer fails to provide the required Performance Security, as stated under ITT Clause 65 or to sign the Contract , as stated under ITT Sub-Clause 69.2, Purchaser shall proceed to award the Contract to the next lowest evaluated Tenderer, and so on, by order of ranking pursuant to Rule 102 of the Public Procurement Rules,2008.</p>
70. Publication of Notification of Award of Contract	<p>70.1 Notification of Awards for Contracts of Taka 10 (ten) million and above shall be notified by the Purchaser to the Central Procurement Technical Unit within 7(seven) days of issuance of the NOA for publication in their website, and that notice shall be kept posted for not less than a month pursuant to Rule 37 of the Public Procurement Rules, 2008.</p> <p>70.2 Notification of Award for Contracts below Taka 10(ten) million, shall be published by the Purchaser on its Notice Board and where applicable on the website of the Purchaser and that notice shall be kept posted for not less than a month pursuant to Rule 37 of the Public Procurement Rules, 2008..</p>
71. Debriefing of Tenderers	<p>72.1 Debriefing of Tenderers by Purchaser shall outline the relative status and weakness only of his or her Tender requesting to be informed of the grounds for not accepting the Tender submitted by him or her pursuant to Rule 37 of the Public Procurement Rule, 2008, without disclosing information about any other Tenderer.</p> <p>72.2 In the case of debriefing confidentiality of the evaluation process shall be maintained.</p>
72. Right to Complains	<p>72.1 Any Tenderer has the right to complain if it has suffered or likely to suffer loss or damage due to a failure of a duty imposed on the Purchaser to fulfil its obligations in accordance with Section 29 of the Public Procurement Act 2006 and pursuant to Part 12 of Chapter Three of the Public Procurement Rules, 2008.</p>

<p>72.2 Circumstances in which a formal complaint may be lodged in sequence by a potential Tenderer against a Purchaser pursuant to Rule 56 of the Public Procurement Rules, 2008, and the complaints, if any, be also processed pursuant to Rule 57 of the Public Procurement Rules 2008.</p>
<p>72.3 The potential Tenderer shall submit his or her complaint in writing within seven (7) calendar days of becoming aware of the circumstances giving rise to the complaint.</p>
<p>72.4 In the first instance, the potential Tenderer shall submit his or her complaint to the Purchaser who issued the Tender Document.</p>
<p>72.5 The place and address for the first stage in the submission of complaints to the Administrative Authority is provided in the TDS.</p>
<p>72.6 The Tenderer may appeal to a Review Panel only if the Tenderer has exhausted all his or her options of complaints to the administrative authority as stated under ITT Sub-Clause 72.2.</p>

Section 2. Tender Data Sheet

Instructions for completing the Tender Data Sheet are provided, as needed, in the notes in italics and under lined mentioned for the relevant ITT clauses.

ITT Clause	Amendments of, and Supplements to, Clauses in the Instruction to Tenderers
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A. General

ITT 1.1	<p>The Purchaser is :</p> <p><i>Project Director, Smart Pre-Payment Metering Project for West Zone Power Distribution Company Ltd. (WZPDCL) Area (Phase-II), WZPDCL, Khulna.</i></p> <p><i>The Name and identification number of Tender are:</i></p> <p><i>Design, Manufacture, Supply, Installation, Testing & Commissioning of 1,38,811 nos. Smart Pre-Payment Meter with Related Services on Turn Key Basis.</i></p> <p><i>Package No.: GD2</i></p>
ITT 1.2	The number, identification and name of lots comprising the Tender are: Single Lot, One Stage Two Envelope (The list of goods and related services are identified in Section 6: Schedule of Requirements).
ITT3.1	The source of public fund is GoB and WZPDCL own fund.
ITT3.3	The name of the Development Partner is: Not Applicable.
ITT5.1	Tenderers from the following countries are not eligible: Countries having no diplomatic relation with the Government of Bangladesh.
ITT 5.13	Tenderers shall have the following up to date valid License: Trade/Business License.
ITT6.1	Materials, Equipment and associated services from the following countries are not eligible: Countries having no diplomatic relation with the Government of Bangladesh
ITT 7.5 (Additional Clause)	<p>Added immediate after Clause No. 7.4</p> <p>Each Tenderer before submitting his Tender will carefully examine the tender requirements and visit the site(s) to determine the existing conditions, facilities and limitations. Tenderer shall have to make all necessary arrangement to carry out the Contract if awarded for the Supply & Installation of Plant & Equipment to complete the Scope of Work as described in Section 6: Employer's Requirement. Any negligence or delay or failure on the part of the tenderer to obtain reliable information upon the foregoing or any matter effecting the work and completion period shall not relieve the successful tenderer of his responsibilities, risks or liabilities until final acceptance of the Supply & Installation of Plant & Equipment in case of award of the contract.</p>

B. Tender Document	
ITT8.2	<p>The following are the offices of the Purchaser or authorised agents for the purpose of providing the Tender Document:</p> <ol style="list-style-type: none"> I. Project Director, Smart Pre-Payment Metering Project for West Zone Power Distribution Company Ltd. (WZPDCL) Area (Phase-II), WZPDCL, Khulna. II. Office of the Divisional Commissioner, Khulna. III. Office of the Director of Purchase, BPDB, WAPDA Building (9th Floor), Motijheel C/A, Dhaka-1000.
ITT9.1	<p>For clarification of Tender Document purposes only, the Procuring Entity's address is: Attention: Project Director, Smart Pre-Payment Metering Project for West Zone Power Distribution Company Ltd. (WZPDCL) Area (Phase-II), WZPDCL, Khulna Address: Bidyut Bhaban, Boyra Main Road, Khulna-9000 Telephone: +88 01766690830 Electronic mail address: sppmp2@gmail.com</p>
ITT10.1	<p>The Pre- Tender meeting shall be held at Address, Time & Date: As mentioned in the Tender Notice.</p>
C. Qualification Criteria	
ITT 13.1	<p>The maximum Three (3) number of arbitrations against the Tenderer over a period of last five (5) years.</p>
ITT14.1(a)	<p>The Tenderer shall have a minimum of <i>03(three)</i> years of overall experience in the role of contractor, subcontractor, or management contractor.</p>
ITT 14.1(b)	<p>The minimum specific experience/qualification of shall be as follows:</p> <p>i) The manufacturer shall have satisfactory completion of supply of minimum 30,000 nos. Smart Prepaid Meter with PLC communication and 200 nos. of Data concentrators to an Electricity Utility under a single contract during last 5 (five) calendar years. It must be supported by end user certificate.</p> <p>Or,</p> <p>The manufacturer shall have satisfactory completion of supply of Smart Prepaid Meter with PLC communication and Data concentrators with a minimum value of 1.5 million USD or equivalent to an Electricity Utility under a single contract during last 5 (five) calendar years. It must be supported by end user certificate.</p> <p>ii) The tenderer shall have Satisfactory Performance Certificate from the End User (must be a Electricity Utility) with at least 2(Two) contracts of Design, Manufacture, Supply, Installation, Testing & Commissioning of Smart Pre-Payment meters & Online Smart Pre-Payment Metering System with PLC communication during last 5 (five) calendar years.</p> <p>*All end user certificates shall be in Bangla/English in End User's official pad and shall contain end-user's full mailing address, domain e-mail address, website address and fax / telephone number for the convenience of authentication. Certificate(s) those are not in Bangla/English must be notarized on translated English version.</p> <p>iii) The tenderer/manufacturer shall have local establishment or local representatives having proper establishment in Bangladesh for providing instant services as and when</p>

	<p>required. Duly sealed & signed CV's of the relevant personnels [<i>along with properly filled in Personnel Information (Form PG5A-5)</i>] have to be submitted with the technical offer.</p> <p>Note: Electricity Utility means an organization/company that engages in electricity transmission/distribution and sales of electricity in a regulated market.</p>																									
ITT 15.1(a)	<p>The required average annual turnover shall be greater than USD 3 million or equivalent for the best three (3) years in the last five (5) years; years counting backward from the date of publication of IFT in the newspaper.</p> <p>[Note: Average Annual Turnover shall be calculated as total certified payments received for contracts in progress or completed]</p>																									
ITT 15.1(b)	<p>The minimum amount of liquid assets i.e. working capital or credit line(s) of the Tenderer shall be 3 million USD or equivalent to satisfy the assessment of Financial Resources Availability as mentioned in Table- 4B of Annexure: 4-4.</p> <p>[<i>Submission of audited balance sheets or other financial statements acceptable to the purchaser shall be submitted by the tenderer to demonstrate the current soundness of the tenderer's position and its prospective long-term profitability</i>]</p>																									
ITT 16.1(a)	<p>A Project Manager, Engineer, and other key staff shall have the following qualifications and experience:</p> <p>For the Duration of Design, Manufacture, Supply, Installation, Testing & Commissioning:</p> <table border="1"> <thead> <tr> <th>SL No</th> <th>Position</th> <th>person</th> <th>Qualification</th> <th>Experience in similar work (years)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Project Manager</td> <td>1</td> <td>B.Sc.Engg.(CSE/EEE)</td> <td>Working experience with minimum 10(ten) years on project management plus minimum 4 years experience on Software base & network oriented project development.</td> </tr> <tr> <td>2</td> <td>Software Architect</td> <td>1</td> <td>B.Sc.Engg.(01CSE+01EEE)</td> <td>Working experience with minimum 3 (three) years on project management & Organizational Software Architect management with minimum 2 (two) years experience</td> </tr> <tr> <td>3</td> <td>System Analyst</td> <td>1</td> <td>B.Sc.Engg(CSE/EEE) with related training.</td> <td>Working experience with minimum 3 (three) years on system analysis & design, Oracle under AIX/UNIX/Linux/windows based, C#, Oracle Developer, PL/SQL and more.</td> </tr> <tr> <td>4</td> <td>Oracle Database Administrator</td> <td>1</td> <td>B.Sc.Engg.(CSE/EEE)with OCP(DBATrack)</td> <td>Working experience with minimum 03 (three) years on DBA, Oracle under AIX/UNIX/Linux of field oriented project.</td> </tr> </tbody> </table>	SL No	Position	person	Qualification	Experience in similar work (years)	1	Project Manager	1	B.Sc.Engg.(CSE/EEE)	Working experience with minimum 10(ten) years on project management plus minimum 4 years experience on Software base & network oriented project development.	2	Software Architect	1	B.Sc.Engg.(01CSE+01EEE)	Working experience with minimum 3 (three) years on project management & Organizational Software Architect management with minimum 2 (two) years experience	3	System Analyst	1	B.Sc.Engg(CSE/EEE) with related training.	Working experience with minimum 3 (three) years on system analysis & design, Oracle under AIX/UNIX/Linux/windows based, C#, Oracle Developer, PL/SQL and more.	4	Oracle Database Administrator	1	B.Sc.Engg.(CSE/EEE)with OCP(DBATrack)	Working experience with minimum 03 (three) years on DBA, Oracle under AIX/UNIX/Linux of field oriented project.
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5	System Administrator	1	B.Sc.Engg(CSE/EEE)/ Masters in any Discipline with related training.	Working experience with minimum 03 (three) years on AIX/UNIX/RHCE & CCNA
6	Programmer	1	B.Sc.Engg(CSE/EEE)/ Masters in any Discipline.	Working experience with minimum 02 (two) years on C#, Oracle Database, Oracle Developer, PL/SQL
7	Core Developer	04	B.Sc. Engg (CSE/EEE)/ Masters in any Discipline.	Working experience with minimum 02(two) years on Pro*C/C, Oracle Database, Oracle Developer, PL/SQL.
8	Mobile Application & Network Developer	01	B.Sc. Engg (3 nos CSE/3 nos EEE)	Working experience with minimum 3(three)years with CCNA on with convensional wireless network like mobile network.
9	Network Engineer/Hardware Engineer	2	Bachelor in any Discipline with A+/CCNA/RHCE/MCSE certification	Working experience with minimum 3(three)years on interfacing with convensional wireless network like mobile network.
10	Software Tester	2	B.Sc.Engg(CSE/EEE) with related training.	Working experience with minimum 02years
11	Quality Controller	1	B.Sc.Engg(CSE/EEE) with related training.	Working experience with minimum 02 years
12	Documentation	2	Bachelor in any Discipline	-
13	Technician	15	Diploma In engineering (Electrical)	Working experience with minimum 5(Five)years

For the Duration of Support Service:

No	Position	Person	Total Works Experience (Years)	Experience in similar works (Years)
1	Coordinator	1	15	5
2	System Administrator	1	10	5
3	Network Engineer	1	10	5
4	Hardware Engineer	1	10	5
5	Programmer	1	10	5
6	Database Administrator	1	10	5
7	Electrical Supervisor	11	5	3

	8	UCC/ operator	UVS	11	3	2																												
	<p>The tenderer shall provide details of proposed personnel [in Personnel Information (Form PG5A-5)] and signed CV of the employee. Expertise shall be endorsed by the Tenderer in its letter head pad.</p> <p>Since, “Design, Manufacture, Supply, Installation, Testing & Commissioning” and “Support Service” have different timeframe, same person can be offered for both of these services as long as his/her qualifications matches the respective requirements.</p>																																	
ITT 17.1	<p>The Tenderer shall own or have proven access to hire or lease of the major equipment, in full working order as follows :</p> <table border="1"> <thead> <tr> <th>No</th> <th>Equipment Characteristics</th> <th>Type</th> <th>and</th> <th>Minimum Number Required</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Transport Vehicle</td> <td></td> <td></td> <td>As required</td> </tr> <tr> <td>2</td> <td>Laptop computers</td> <td></td> <td></td> <td>As required</td> </tr> </tbody> </table>						No	Equipment Characteristics	Type	and	Minimum Number Required	1	Transport Vehicle			As required	2	Laptop computers			As required													
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ITT 18.1	<p>The value of non-judicial stamp for execution of the Joint Venture Agreement shall be Tk 300 only.</p>																																	
ITT 18.2	<p>Maximum number of partners in the JV shall be 3 (three). For a JV, at least, one JV member must be enrolled in the relevant professional or trade organizations registered in Bangladesh.</p> <p>The minimum qualification requirements of Leading Partner, other Partner(s) and requirements by summation of a JV shall be as follows:</p> <table border="1"> <thead> <tr> <th>TDS Clauses References</th> <th>Requirements by summation</th> <th>Requirements for Leading Partner</th> <th>Requirements for other Partner(s)</th> </tr> </thead> <tbody> <tr> <td>ITT-14.1(a)</td> <td>Summation not applicable</td> <td>Same as stated in TDS</td> <td>Same as for Leading Partner</td> </tr> <tr> <td>ITT-14.1(b)</td> <td>100%</td> <td>At least one Contract</td> <td>Not applicable</td> </tr> <tr> <td>ITT-15.1(a)</td> <td>100%</td> <td>40%</td> <td>25%</td> </tr> <tr> <td>ITT-15.1(b)</td> <td>100%</td> <td>40%</td> <td>25%</td> </tr> <tr> <td>ITT-16.1(a)</td> <td>100%</td> <td>Not applicable</td> <td>Not applicable</td> </tr> <tr> <td>ITT-17.1</td> <td>100%</td> <td>Not applicable</td> <td>Not applicable</td> </tr> </tbody> </table> <p>Percent share of business of the JVCA partners shall not be taken into account in determining the qualification of a JVCA]</p>						TDS Clauses References	Requirements by summation	Requirements for Leading Partner	Requirements for other Partner(s)	ITT-14.1(a)	Summation not applicable	Same as stated in TDS	Same as for Leading Partner	ITT-14.1(b)	100%	At least one Contract	Not applicable	ITT-15.1(a)	100%	40%	25%	ITT-15.1(b)	100%	40%	25%	ITT-16.1(a)	100%	Not applicable	Not applicable	ITT-17.1	100%	Not applicable	Not applicable
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ITT 19.2	<p><i>The maximum of percentage [0%] of Goods allowed to be subcontracted.</i> [i.e., Subcontracting shall not be allowed]</p>																																	
ITT 19.4	<p>The Nominated Subcontractor(s) shall execute the following specific components of the proposed Works: None</p>																																	
ITT 20.1	<p>Tenders are being invited for a single lot.</p>																																	
ITT 24.2(r)	<p>The Tenderer shall submit with its Technical Proposal the following additional documents:</p>																																	

	<ol style="list-style-type: none"> 1) Sealed & Signed original Tender Document (which was issued by WZPDCL) by a person duly authorized to sign on behalf of the tenderer. Copy of issued tender document will not be acceptable. 2) Registration/Certificate of Incorporation/Trade license in tenderer's country of origin/ relevant documents as documentary evidence to satisfy experience criteria as stated in ITT 14.1(a). 3) End User certificate (s) as documentary evidence to satisfy experience criteria as stated in ITT 14.1(b)(i), 14.1(b)(ii). 4) Duly sealed & signed CVs of the relevant local personnels [<i>along with properly filled in Personnel Information (Form PG5A-5)</i>] and detailed information of establishment of the tenderer/manufacturer in Bangladesh as evidence to satisfy qualification criteria as stated in ITT 14.1(b)(iii). 5) Updated brochures of the supplier and/or manufacturer. 6) Audited Financial reports or bank statement or credit line(s) of the tenderer for 3 years substantiated by any scheduled Bank as documentary evidence to satisfy financial criteria as stated in ITT 15.1(a) & ITT 15.1(b). 7) Specifications Submission and Compliance Sheets [Form- PG5A-4a] sealed & signed by the manufacturer & the bidder. 8) A declaration that the tenderer is in full compliance with the terms and conditions of the tender document other than what is stated in the deviation list. This declaration shall accompany a properly filled Deviation List [Form- PG5A-13]. If Tenderer has any reservation, Tenderer has to mention it in Deviation list. 9) A declaration listing the names of manufacturers, places of manufacture and testing, country of Origin and port of shipment (where applicable) of the offered equipment / items. 10) Manufacturer's authorization for offered major items like smart pre-payment meter (single phase and three phase) DCU and HHU. 11) Authorization Letter from data network service provider at their letter head pad as confirmation. 12) Warranty Certificate (Form PG5A-12) from Tenderer as per GCC Clause-42. 13) Time schedule Appendix 4. 14) Manufacturer's Printed Catalogue describing specification and technical data of offered type equipment. 15) Outline and General Arrangement drawings of the offered type equipment. 16) Detail description of testing facilities at manufacturer's plant including calibration certificates of testing equipment. 17) Manufacturer's valid ISO 9001 Certificate. 18) Certification from the manufacturer confirming that his offered item is unused, new and in good condition and confirmed all features & accessories stated in Section 7: Technical Specification. 19) Guaranteed Technical Particulars (GTP) in Section 6.2.2 shall be properly filled up in manufacturer's official pad with submission of related supporting documents & signed by the Manufacturer & Tenderer. 20) The following Documents/materials shall have to be submitted with the tender otherwise bid will be rejected: <ol style="list-style-type: none"> A. Complete Type Test report with ref. number as per relevant international standard in English along with test results of the offered smart pre-payment meter from anyone of the following independent testing laboratory. Product type shall clearly mention "Smart Pre-payment Meter" in the type test report. Reports from other laboratories except the following will not be accepted. <ol style="list-style-type: none"> i. KEMA, Netherland. ii. UL International New Zealand/Parkside Laboratories, New Zealand.
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- iii. South African Bureau of Standards (SABS).
- iv. MET Laboratories Inc., USA
- v. Office of the Gas and Electricity Market, UK /SGS, UK
- vi. European Measuring Instruments Directive (MID) recognized labs.
- vii. CESI, Italy.
- viii. Essef, France
- ix. CPRI, India

The Test Report includes the following tests as per relevant international standard with results (but not limited to):

- i. Impulse voltage test
- ii. AC Voltage test
- iii. Accuracy test
 - a. Test of variation of current
 - b. Test of meter constant
 - c. Test of starting condition
 - d. Test of no-load condition
 - e. Test of ambient temperature influence
 - f. Test of influence quantities
- iv. Test of power consumption
- v. Test of influence of supply voltage, short-time over currents, self-heating & heating.
- vi. Electromagnetic compatibility (EMC) test
- vii. Dry heat test
- viii. Cold test
- ix. Damp heat accuracy, cyclic test
- x. Vibration test
- xi. Shock test
- xii. Spring hammer test
- xiii. Test of protection against penetration of dust and water
- xiv. Test of resistance to heat and fire

B. The manufacturer shall submit the test report of the offered meter on pre-payment mode as per IEC 62055-31 or SANS 1524-1 from any accredited Independent Testing Laboratory that includes the following test with results (but not limited to):

- i. Functionality Test
- ii. Load switching Test

C. Manufacturer/Tenderer shall submit the Accelerated reliability/Life Cycle/Durability Test certificate of the offered meter.

D. The Tenderer shall submit the DLMS/COSEM CTT3.1 (or updated) certificate of the proposed meters. The Manufacturer's own test report will not be accepted.

21) The manufacturer/tenderer shall submit BPLC communication Test Report and certification of meters and data concentrators as per latest Communication protocol from any accredited Independent Testing Laboratory.

22) Bought out items: A detailed list of bought out items which are used in the manufacturing of the meter, shall be furnished indicating the name of firm/company from whom these items are procured.

23) The Technical specification of the offered Communication Module shall be submitted along with the technical offer.

	<p>24) The following samples shall be submitted with the tender to conform to the tender requirement. Late submission of samples shall not be allowed.</p> <ul style="list-style-type: none"> i. Single phase smart pre-payment meter with both GPRS (4G module which will also support all other available bands in Bangladesh) and Broadband PLC Communication and RF Communication (plug and play) module (Keypad based): 02 (Two) nos. ii. Three phase smart pre-payment meter with both GPRS (4G module which will also support all other available bands in Bangladesh) and Broadband PLC Communication and RF Communication (plug and play) module (Keypad based): 02(Two) nos. iii. Data Concentrator Unit (DCU): 01 (one) nos. <p>N.B. The contractor must maintain the same quality in all aspects of the equipment (meters with modules and DCU) to be supplied under the contract as the submitted samples mentioned above, if awarded.</p> <p>25) Tenderer shall have to submit in the format attached as Annexure: 4-1[a] and Annexure: 4-1[b] the information of all the completed similar contracts [having offered type major hardware items like smart pre-payment meter (single phase and three phase) and DCU] of the tenderer and the manufacturer in any electricity utility within last 5 (five) years, i.e. years counting backward from the date of publication of IFT in the newspaper, with supporting documents (Copy of NOA/Contract Agreement/Purchasers Certificate/ End user's satisfactory performance certificate/ Acceptance Certificate).</p> <p>26) Tenderer shall have to submit in the format attached as Annexure: 4-2[a] and Annexure: 4-2[b] the information of all the ongoing contract(s) (if any) of the tenderer and the manufacturer with supporting document (Acceptance of NOA/Contact agreement) along with the Acceptance certificate / R&I certificate from end user (if any).</p>
24.3(c)	The Tenderer shall submit with its financial offer the following additional documents: None
ITT 25.1	Alternatives <i>shall not be</i> permitted.
ITT 26.1	Tenderers shall quote for the entire Plant and Installation Services on a single responsibility basis
26.5(a)	Price of Plant and Mandatory Spare parts shall be quoted on CIP . Port of Landing: Any port of Chittagong/Dhaka/Khulna (Mongla)/Benapole Place of Destination: Project site or Project Store, Khulna or WZPDCL's store near to the final destination or any store/place as directed by Consignee.
26.5(d)	Local transportation to named place of final destination is: Project Site)- WZPDCL Area in Kushtia, Kumarkhali, Bheramara, Meherpur District/Upazilla.
ITT 26.7	The prices quoted by the Tenderer shall be fixed for the duration of the Contract.
ITT 27.4	Name of the foreign currency: USD
ITT 28.1 (b)	Spare parts are: Under turnkey contract supply of spare parts up to the warranty period is the responsibility of the supplier. Period of time the Goods are expected to be functioning (for the purpose of spare parts): 03 Years (including the battery)

ITT 28.1(b)	<p>Manufacturer's authorization is: <i>Required</i></p> <p>Manufacturer's Authorization Letter is required for major items like smart pre-payment meter (single phase and three phase), Data Concentrator Unit (DCU) and Han Held Unit (HHU).</p> <p>Authorization Letter from Manufacturer's Sales office (if located outside the manufacturing country) and Dealer/ Trading house will not be accepted if not supported by Manufacturer's letter. In this regard, Scanning Paper, E-mail copy, Faxed copy & Sealed signature will not be accepted. Manufacturer's signature in Authorization letter shall be handwritten by Pen i.e. signature through stamping/seal is not accepted. The Authorization letter shall mention domain E-mail address, Telephone/Fax, designation with detail address of the manufacturer representative duly signed in the manufacturer official pad.</p>
ITT 30.2	<p>The Tender validity period shall be 150 (One hundred and Fifty) days.</p>
ITT 32.2	<p>The amount of the Tender Security shall be as per tender notice.</p> <p>The Tender Security shall be furnished in favour of Project Director, Smart Pre-Payment Metering Project for West Zone Power Distribution Company Ltd. (WZPDCL) Area (Phase-II), WZPDCL, Khulna.</p> <p>Tender security must be furnished in the Technical Proposal, not in the Financial Proposal. The Tenderer if furnish the tender security in the Financial Proposal the tender will be rejected.</p> <p>Tender Security must be endorsed by any scheduled bank of Bangladesh.</p>
ITT 37.1	<p>In addition to the original of the Tender, 02 (two) hardcopies (copy-1 & copy-2) and 01 (One) electronic copy (Copy-3) shall be submitted.</p> <p>In case of discrepancies, the information provided in the "Original" hard copy of the tender shall prevail.</p> <p><input type="checkbox"/> The electronic copy of the technical proposal shall be included in the envelope with the original technical proposal. Data storage medium for electronic submission will be USB memory/Pendrive.</p> <p><input type="checkbox"/> The electronic copy of the Financial Proposal (Price schedules in editable format (MS Excel)) shall be included in the envelope with the original Financial proposal. Data storage medium for electronic submission will be USB memory.</p>
E. Submission of Tender	
ITT 38.2(e)	<p>The inner and outer envelopes shall bear the following additional identification marks: [insert the name and/or number that must appear on the Technical offer envelope to identify this specific Tendering process]</p> <ol style="list-style-type: none"> 1. Date of Submission 2. Seal & Signature of the Tenderer <p>Book Binding and Page Number is required for original and copies. Any Technical offer associated with Financial offer in the same envelopes will be reject</p>
ITT 38.4(e)	<p>The inner and outer envelopes shall bear the following additional identification marks: [insert the name and/or number that must appear on the Financial offer envelope to identify this specific Tendering process]</p> <ol style="list-style-type: none"> 1. Date of Submission

	<p>2. Seal & Signature of the Tenderer.</p> <p>Book Binding and Page Number is required for original and copies. Any Technical offer associated with Financial offer in the same envelopes will be reject.</p>
ITT 39.1	<p>For <u>Tender submission purposes</u> ,the Purchaser’s address is:</p> <p>For Tender submission purposes, the Purchaser’s address is: Attention: Engr. Md. Rakib Uddin, Project Director, Smart Pre-Payment Metering Project for West Zone Power Distribution Company Ltd. (WZPDCL) Area (Phase-II), WZPDCL. Phone: +8801766690830.</p> <p>Address of submission: Office of the Director of Purchase, BPDB WAPDA Building (9th Floor), Motijheel C/A, Dhaka-1000.</p> <p><u>[Note: important to avoid delays or misplacement of tenders]</u></p> <p>The deadline for submission of Tenders is: as specified in tender notice or amendment of submission time (if any).</p>
ITT 39.3	<p>Submission of Tenders in more than one location, i.e., MULTIPLE DROPPING is not allowed.</p>
ITT 39.4	<p>The deadline for hand-delivering of the Tenders at the PRIMARY PLACE is: Time & Date: As specified in tender notice or amendment of submission time (if any).</p>
<h2>F. Opening and Evaluation of Tenders</h2>	
ITT 45.1	<p>The Technical offer opening shall take place at (<i>always the PRIMARY PLACE</i>):</p> <p>Address: The Office of the Director, Directorate of Purchase, BPDB, WAPDA Building (9th floor), Motijheel C/A, Dhaka-1000</p> <p>Time & Date: On Time & Date: As specified in tender notice or subsequent amendment for tender submission (if any).</p> <p>The tender shall be opened in presence of the tenderers. Electronic Tender opening procedures is not applicable.</p>
ITT 49.2 (f) [Additional Clause]	<p>Demonstration & Interfacing of sample(s) submitted as per ITT 24.2(r) (24):</p> <p>i) Demonstration of sample:</p> <p>Preliminary responsive Tenderers shall have to successfully present & demonstrate the functionality of the submitted sample meters and DCU with WZPDCL’s existing Smart Pre-payment Metering System (Unified system as well as HES/MDM system) as per Technical Specifications and requirements of the Tender. WZPDCL shall not bear any expense. The Tenderer’s submitted DCU shall have ability to interface and integrate with WZPDCL’s existing BPLC communicable meters as well as the Tenderer’s submitted meters shall have the ability to interface and integrate with WZPDCL’s existing BPLC communicable DCUs to ensure interoperability on demonstration. The respective preliminary qualified tenderer will be notified the date of presentation/demonstration at least 07 (Seven) days ahead of the presentation/demonstration. This presentation/demonstration will be a part of the technical evaluation. Without changing the sample meter, the tenderer may perform the demonstration with necessary firmware upgradation. The tenderers, who will fail to perform this presentation/demonstration on sample meters & Smart Pre-payment Metering System or whose presentation/demonstration will be unsatisfactory as per technical specification of tender</p>

	<p>requirements, will be considered Technically Non-responsive and as such their tender will be rejected and shall not be considered for further evaluation.</p> <p>ii) Interfacing: The system software has been developed and erected. The prescribed interfacing protocol has been developed in JAVA which is attached in Part -2 of the tender document. The tenderer's meters will follow that protocol and the tenderer will complete their interfacing on or before demonstration date. No tender will be technically responsive until and unless the interfacing API works and complies with requirements and also fully satisfy the Engineers authorized by the purchaser. Otherwise, the tender shall be rejected and will not be considered for further evaluation.</p>
ITT 57.5	<p>The applicable economic factors, for the purposes of evaluation of Tenders shall be:</p> <p>(a) <u>Adjustment for Deviations in the Delivery and Completion Schedule: Not Applicable</u></p> <p><i>"The Plant and Service covered by this Tendering process are required to be delivered in accordance with, and completed within, the Delivery and Completion Schedule specified in the tender document, as Employer's Requirement. No credit will be given for earlier completion. Tender offering delivery schedules beyond of the date specified in the tender document, as Employer's Requirement, shall be rejected."</i></p> <p>(b) <u>Cost of major replacement components, mandatory spare parts, and service: Not Applicable</u></p> <p>(c) <u>Other factors affecting the true economic value : Not Applicable</u></p>
G. Award of Contract	
ITT 65.2	<p>The amount of Performance Security shall be Ten percent 10% of the Contract Price for the Facility or for the part of the Facility for which a separate Time for Completion is provided.</p> <p>If the lowest Evaluated Tender is significantly below the official estimated cost or unbalanced as a result of front loading in the opinion of the TEC, the TEC may require the Tenderer to produce detailed breakdown of unit price or rates for any or all items of the Price Schedule, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the breakdown of the unit price or rates, taking into consideration the schedule of estimated Contract payments, the Purchaser may require that the amount of the Performance Security be increased at the expenses of the Tenderer to a level not exceeding twenty-five (25) percent of the Contract price to protect the Employer against financial loss in the event of default by such Tenderer during Contract implementation, if awarded the Contract.</p>
ITT 67.1	<p>The Performance Security shall be required to be valid until a date twenty-eight (28) Days beyond the date of any warranty obligations/defect liability period</p>
ITT 72.5	<p>The name and address of the office where complaints to the Procuring Entity under Regulation 51 are to be submitted is:</p> <p>First Stage : Attention: Engr. Md. Rakib Uddin, Project Director, Smart Pre-Payment Metering Project for West Zone Power Distribution Company Ltd. (WZPDCL) Area (Phase-II), WZPDCL. Address: Bidyut Bhaban, Boyra Main Road, Khulna-9000.</p> <p>Second Stage : Attention: Managing Director, WZPDCL, Khulna Address: Bidyut Bhaban, Boyra Main Road, Khulna-9000.</p>

Section 3. General Conditions of Contract

A. General

1. Definitions

1.1 In the Conditions of Contract, which include Particular Conditions and these General Conditions, the following words and expressions shall have the meaning hereby assigned to them. Boldface type is used to identify the defined terms:

- (a) **Approving Authority** means the authority which, in accordance with the Delegation of Financial powers, approves the award of Contract for the Procurement of Goods, Works and Services.
- (b) **Act** means The Public Procurement Act, 2006 (Act 24 of 2006).
- (c) **Commissioning** means operation of the Facilities or any part thereof by the Contractor following Completion, which operation is to be carried out by the Contractor for the purpose of carrying out Guarantee Test(s).
- (d) **Competent Authority** means the authority that gives decision on specific issues as per delegation of administrative and/or financial powers.
- (e) **Completion** means that the Facilities (or a specific part thereof where specific parts are specified in the Contract) have been completed operationally and structurally and put in a tight and clean condition, that all work in respect of Pre Commissioning of the Facilities or such specific part thereof has been completed, and that the Facilities or specific part thereof are ready for Commissioning.
- (f) **Completion Certificate** means the Certificate issued by the Project Manager as evidence that the Contractor has executed the services in all respects as per design, drawing, specifications and Conditions of Contract.
- (g) **Completion Date** is the actual date of completion of the plant and services certified by the Project Manager, in accordance with GCC Clause 24.
- (h) **Contract Agreement** means the Agreement entered into between the Procuring Entity and the Contractor, together with the Contract Documents referred to therein, including all attachments, appendices, and all documents incorporated by reference therein to supply and install Plant & Equipment
- (i) **Contract Documents** means the documents listed in GCC Clause 6, including any amendments thereto.
- (j) **Contractor/supplier** means the Person under contract with the Procuring Entity for the supply and installation of Plant & Equipment under the Rules and the Act as stated in the PCC.
- (k) **Contractor's Representative** means any person nominated by the Contractor and approved by the Employer to perform

	<p>the duties delegated by the Contractor.</p> <p>(l) Contract Price means the price payable to the Contractor as specified in the Contract Agreement, subject to such additions and adjustments thereto or deductions therefrom, for the supply and installation of plant & equipment in accordance with the provisions of the Contract, subject to such additions and adjustments thereto or deductions therefrom, as may be made pursuant to the Contract.</p> <p>(m) Cost means all expenditures reasonably incurred or to be incurred by the Contractor, whether on or off the Site, including overhead ,profit, taxes, duties, fees, and such other similar levies</p> <p>(n) Day means calendar day unless otherwise specified as working days.</p> <p>(o) Dayworks means work carried out following the instructions of the Procuring Entity or the authorised Project Manager and is paid for on the basis of time spent by the Contractor’s workers and equipment at the rates specified in the Schedules, in addition to payments for associated Materials and Plant.</p> <p>(p) Defect is any part of the Works not completed in accordance with the Contract.</p> <p>(q) Defect Liability Period means the period of validity of the warranties given by the Contractor commencing at Completion of the Facilities or a part thereof, during which the Contractor is responsible for defects with respect to the Facilities (or the relevant part thereof) as provided in contract document.</p> <p>(r) Defects Correction Certificate is the certificate issued by the Project Manager upon correction of defects by the Contractor.</p> <p>(s) Drawings include calculations and other information provided in Section 7 or as approved by the Project Manager for the execution and completion of the Contract.</p> <p>(t) Effective Date means the date of fulfillment of all conditions of the Contract Agreement, from which the Time for Completion shall be counted.</p> <p>(u) Equipment means all facilities, equipment, machinery, tools, apparatus, appliances or things of every kind required in or for installation, completion and maintenance of Facilities that are to be provided by the Contractor, but does not include Plant, or other things intended to form or forming part of the Facilities.</p> <p>(v) Facilities means the Plant to be supplied and installed, as well as all the Installation Services to be carried out by the Contractor under the Contract. It also includes any ancillary building or infra structure that needs to be constructed/built/erected to support the plant.</p>
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	<p>(w) Force Majeure means an event or situation beyond the control of the Contractor that is not foreseeable, is unavoidable, and its origins not due to negligence or lack of care on the part of the Contractor; such events may include, but not be limited to, acts of the Government in its sovereign capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions, and freight embargoes or more as included in GCC Clause 52.</p> <p>(x) Goods mean the Contractor's Plant, Equipment, Materials or any of them as appropriate.</p> <p>(y) GCC means the General Conditions of Contract.</p> <p>(z) Government means the Government of the People's Republic of Bangladesh.</p> <p>(aa) Guarantee Test(s) means the test(s) specified in the Employer's Requirements to be carried out to ascertain whether the Facilities or a specified part thereof is able to attain the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, in accordance with the provisions of GCC Sub-Clause 25.2 (Guarantee Test) hereof.</p> <p>(bb) Head of the Procuring Entity means the Secretary of a Ministry or a Division, the Head of a Government Department or Directorate; or the Chief Executive, by whatever designation called, of a local Government agency, an autonomous or semi-autonomous body or a corporation, or a corporate body established under the Companies Act;</p> <p>(cc) Installation Services means all those services ancillary to the supply of the Plant for the Facilities, to be provided by the Contractor under the Contract, such as transportation and provision of marine or other similar insurance, inspection, expediting, site preparation works (including the provision and use of Contractor's Equipment and the supply of all construction materials required), installation, testing, pre-commissioning, commissioning, operations, maintenance, the provision of operations and maintenance manuals, training, etc. as the case may require.</p> <p>(dd) Intended Completion Date is the date calculated from the Commencement Date as specified in the PCC, on which it is intended that the Contractor shall complete the Works and Physical services as specified in the Contract and may be revised only by the Project Manager by issuing an extension of time or an acceleration order.</p> <p>(ee) Materials means things of all kinds other than Plant intended to form or forming part of the Permanent Works, including the supply-only materials, if any, to be supplied by the Contractor under the Contract.</p> <p>(ff) Month means calendar month.</p> <p>(gg) Original Contract Price is the Contract Price stated in the Procuring Entity's Notification of Award (Form PG5A-7) and</p>
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	<p>further clearly determined in the PCC.</p> <p>(hh) Operational Acceptance means the acceptance by the Employer of the Facilities (or any part of the Facilities where the Contract provides for acceptance of the Facilities in parts), which certifies the Contractor's fulfillment of the Contract in respect of Functional Guarantees of the Facilities (or the relevant part thereof) in accordance with the provisions of contract</p> <p>(ii) PCC means the Particular Conditions of Contract.</p> <p>(jj) Plant means permanent plant, equipment, machinery, apparatus, materials, articles, ancillary buildings/structure and things of all kinds to be provided and incorporated in the Facilities by the Contractor under the Contract (including the spare parts to be supplied by the Contractor), but does not include Contractor's Equipment.</p> <p>(kk) Pre Commissioning means the testing, checking and other requirements specified in the Employer's Requirements that are to be carried out by the Contractor in preparation for Commissioning.</p> <p>(ll) Procuring Entity/Employer/Purchaser means, as the context so applies, an Entity having administrative and financial powers to undertake procurement of Plant and Physical services using public funds and is as named in the PCC who employs the Contractor to carry out the contractual obligations.</p> <p>(mm) Project Manager is the person named in the PCC or any other competent person appointed by the Procuring Entity and notified to the Contractor who is responsible for supervising the execution and completion of the plant and services and administering the Contract.</p> <p>(nn) Schedules means the document(s) entitled schedules, completed by the Contractor and submitted with the Tender Submission Letter, as included in the Contract. Such document may include the data, lists and schedules of rates and/or prices.</p> <p>(oo) Site means the land and other places upon which the Facilities are to be installed, and such other land or places as may be specified in the PCC as forming part of the Site</p> <p>(pp) Site Investigation Reports are those that were included in the Tender Document and are factual and interpretative reports about the surface and subsurface conditions at the Site.</p> <p>(qq) Specification means the Specification of the goods/works/related services included in the Contract and any modifications or additions to the specifications made or approved by the Project Manager in accordance with the Contract.</p> <p>(rr) Start Date is the date defined in the PCC and it is the last date when the Contractor shall commence execution of the</p>
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	<p>goods/works/services under the Contract.</p> <p>(ss) Subcontractor means a person or corporate body, who has a contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.</p> <p>(tt) Time for Completion means the time within which Completion of the Facilities as a whole (or of a part of the Facilities where a separate Time for Completion of such part has been prescribed) is to be attained, in accordance with the relevant provisions of the Contract.</p> <p>(uu) Variation means any change to the plant and services directly procured from the original Contractor to cover increases or decreases in quantities, including the introduction of new work items that are either due to change of plans, design or alignment to suit actual field conditions, within the general scope and physical boundaries of the contract.</p> <p>(vv) Works means all works associated with the construction, reconstruction, site preparation, demolition, repair, maintenance or renovation of railways, roads, highways, or a building, an infrastructure or structure or an installation or any construction work relating to excavation, installation of equipment and materials, decoration, as well as physical services ancillary to works as detailed in the PCC, if the value of those services does not exceed that of the Works themselves.</p> <p>(ww) Writing means communication written by hand or machine duly signed and includes properly authenticated messages by facsimile or electronic mail.</p>
<p>2. Interpretation</p>	<p>2.1 In interpreting the GCC, singular also means plural, male also means female or neuter, and the other way around. Headings in the GCC shall not be deemed part thereof or be taken into consideration in the interpretation or construance of the Contract. Words have their normal meaning under the language of the Contract unless specifically defined.</p> <p>2.2 Entire Agreement.</p> <p>The Contract constitutes the entire agreement between the Employer and the Contractor and supersedes all communications, negotiations and agreements (whether written or verbal) of parties with respect thereto made prior to the date of Contract Agreement; except those stated under GCC Sub Clause 6.1(j).</p> <p>2.3 Non waiver.</p> <p>(a) Subject to GCC Sub Clause 2.3(b), no relaxation, forbearance, delay, or indulgence by either party in enforcing any of the terms and conditions of the Contract or the granting of time by either party to the other shall prejudice, affect, or restrict the rights of that party under the Contract, neither shall any waiver by either party of any breach of Contract operate as waiver of any subsequent or continuing breach of Contract.</p>

	<p>(b) Any waiver of a party’s rights, powers, or remedies under the Contract must be in writing, dated, and signed by an authorized representative of the party granting such waiver, and must specify the right and the extent to which it is being waived.</p>
	<p>2.4. Severability</p> <p>If any provision or condition of the Contract is prohibited or rendered invalid or unenforceable, such prohibition, invalidity or unenforceability shall not affect the validity or enforceability of any other provisions and conditions of the Contract.</p>
	<p>2.5. Sectional completion</p> <p>If sectional completion is specified in the PCC, references in the GCC to the Works, the Completion Date, and the Intended Completion Date apply to any section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).</p>
3. Communications & Notices	<p>3.1 Communications between Parties such as notice, request or consent required or permitted to be given or made by one party to the other pursuant to the Contract shall be in writing to the addresses specified in the PCC.</p>
	<p>3.2 A notice shall be effective when delivered or on the notice’s effective date, whichever is later.</p>
	<p>3.3 A Party may change its address for notice hereunder by giving the other Party notice of such change to the address.</p>
4. Governing Law	<p>4.1 The Contract shall be governed by and interpreted in accordance with the laws of the People’s Republic of Bangladesh.</p>
5. Governing Language	<p>5.1 The Contract shall be written in English. All correspondences and documents relating to the Contract may be written in English. Supporting documents and printed literature that are part of the Contract may be in another language, provided they are accompanied by an accurate translation of the relevant passages in English, in which case, for purposes of interpretation of the Contract, such translation shall govern.</p>
	<p>5.2 The Contractor shall bear all costs of translation to the governing language and all risks of the accuracy of such translation.</p>
6. Documents Forming the Contract and Priority of Documents	<p>6.1 The following documents forming the Contract shall be interpreted in the following order of priority:</p> <ul style="list-style-type: none"> (a) the signed Contract Agreement (Form PG5A-8); (b) the Notification of Award (PG5A-7); (c) the completed Tender and the Appendix to the Tender; (d) the Price Schedule for Plant and Services (PG5A-3); (e) the Particular Conditions of Contract;

	<ul style="list-style-type: none"> (f) the General Conditions of Contract; (g) the Technical Specifications; (h) Personnel Information; (i) Equipment Information; (j) the Drawings; and (k) Any other document listed in the PCC forming part of the Contract.
7. Contract Agreement	7.1 The parties shall enter into a Contract Agreement within twenty eight (28) days from the date of issuance of the Notification of Award (NOA). The costs of stamp duties and similar charges, if any, designated by the applicable law in connection with entry into the Contract Agreement, shall be borne by the Employer.
8. Assignment	8.1 Neither the Contractor nor the Employer shall assign, in whole or in part, its obligations under the Contract; except with the Employer's prior written approval.
9. Eligibility	9.1 The Contractor and its Subcontractor(s) shall have the nationality of a country other than that specified in the PCC.
	9.2 All materials, equipment, plant, and supplies used by the Contractor in both permanent and temporary works and services supplied under the Contract shall have their origin in the countries except any specified in the PCC.
10. Gratuities / Agency fees	10.1 No fees, gratuities, rebates, gifts, commissions or other payments, other than those included in the Contract, shall be given or received in connection with the procurement process or in the Contract execution.
11. Confidential Details	11.1 The Employer and the Contractor shall keep confidential and shall not, without the written consent of the other party hereto, divulge to any third party any documents, data, or other information furnished directly or indirectly by the other party hereto in connection with the Contract, whether such information has been furnished prior to, during or following completion or termination of the Contract. Notwithstanding the above, the Contractor may furnish to its Subcontractor such documents, data, and other information it receives from the Employer to the extent required for the Subcontractor to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor an undertaking of confidentiality similar to that imposed on the Contractor under GCC Clause 11.
	11.2 The Employer shall not use such documents, data, and other information received from the Contractor for any purposes unrelated to the Contract. Similarly, the Contractor shall not use such documents, data, and other information received from the Employer for any purpose other than the design, construction, or other work and services required for the performance of the Contract.

	<p>11.3 The obligations of a party under GCC Sub Clauses 11.1 and 11.2 above, however, shall not apply to information that: the Employer or Contractor needs to share with institutions participating in the financing of the Contract; now or hereafter enters the public domain through no fault of that party; can be proven to have been possessed by that party at the time of disclosure and which was not previously obtained, directly or indirectly, from the other party; or otherwise lawfully becomes available to that party from a third party that has no obligation of confidentiality.</p>
	<p>11.4 The above provisions of GCC Clause 11 shall not in any way modify any undertaking of confidentiality given by either of the parties hereto prior to the date of the Contract in respect of the Works or any part thereof.</p>
	<p>11.5 The provisions of GCC Clause 11 shall survive completion or termination, for whatever reason.</p>
<p>12. Joint Venture (JV)</p>	<p>12.1 If the Contractor is a Joint Venture, Consortium, or Association (JVCA),</p> <ul style="list-style-type: none"> (a) each partner of the JV shall be jointly and severally liable for all liabilities and ethical or legal obligations to the Employer for the performance of the Contract; (b) the JV partners shall nominate a representative who shall have the authority to conduct all business including the receipt of payments for and on behalf of all partners of the JV; (c) in the event of a dispute that results in legal action against all partners of the JV, if they are available and if only one partner is available, then that partner alone shall answer on behalf of all partners and, if the complaint lodged is proven, the penalty shall be applicable on that lone partner as whatever penalty all the partners would have received. (d) the JV shall notify the Employer of its composition and legal status which shall not be altered without the prior approval of the Employer. (e) alteration of partners shall only be allowed if any of the partners is found to be incompetent or has any serious difficulties which may impact the overall implementation of the goods/works/service, whereby the incoming partner shall require to possess qualifications equal to or higher than that of the outgoing partner. (f) if any of the partners of JV has been debarred from participating in any procurement activity due to corrupt, fraudulent, collusive or coercive practices, that JV partner shall be altered following provisions under GCC Sub Clause 12.1 (d) and (e), while in case the Leading Partner has been debarred due to the same reasons stated herein the Contract shall be terminated as stated under GCC Sub Clause 67.1(b).
<p>13. Possession of the Site</p>	<p>13.1 The Employer shall give possession of the Site or part(s) of the Site, to the Contractor on the date(s) stated in the PCC. If possession of a part of the Site is not given by the date stated in the PCC, the Employer will be deemed to have delayed the start of the</p>

	relevant activities, and this will be a Compensation Event.
14. Access to the Site	14.1 The Contractor shall allow the Engineer and any person authorised by the Engineer access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.
15. Safety, Security and Protection of the Environment	15.1 The Contractor shall throughout the execution and completion of the Works and the remedying of any defects therein: <ul style="list-style-type: none"> (a) take all reasonable steps to safeguard the health and safety of all workers working on the Site and other persons entitled to be on it, and to keep the Site in an orderly state; (b) provide and maintain at the Contractor's own cost all lights, guards, fencing, warning signs and watching for the protection of the Works or for the safety on-site; and (c) take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of the Contractor's methods of operation.
16. Working Hours	16.1 The Contractor shall not perform any work on the Site on the weekly holidays, or during the night or outside the normal working hours, or on any religious or public holiday, without the prior written approval of the Project Manager.
17. Welfare of Laborers	17.1 The Contractor shall comply with all the relevant labour Laws applicable to the Contractor's personnel relating to their employment, health, safety, welfare, immigration and shall allow them all their legal rights.
	17.2 The Contractor, in particular, shall provide proper accommodation to his or her labourers and arrange proper water supply, conservancy and sanitation arrangements at the site for all necessary hygienic requirements and for the prevention of epidemics in accordance with relevant regulations, rules and orders of the government.
	17.3 The Contractor, further in particular, shall pay reasonable wages to his or her labourers, and pay them in time. In the event of delay in payment the Employer may effect payments to the labourers and recover the cost from the Contractor.
	17.4 The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take appropriate protective measures to prevent accidents that could result in injury. Throughout the execution of the Works, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.
18. Child Labor	18.1 The Contractor shall not employ any child to perform any work that is economically exploitative, or is likely to be hazardous to, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development

	in compliance with the applicable laws and other relevant treaties ratified by the government.
19. Fossils & antiquities	19.1 All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the Employer. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.
	19.2 The Contractor shall, upon discovery of any such finding, promptly give notice to the Project Manager, who shall issue instructions for dealing with it. If the Contractor suffers delay and/or incurs cost from complying with the instructions, the Contractor shall give a further notice to the Project Manager and shall be entitled subject to Claims under GCC Clause 71
20. Corrupt, Fraudulent, Collusive or Coercive Practices	20.1 The Government requires that Employer, as well as the Contractor shall observe the highest standard of ethics during the implementation of procurement proceedings and the execution of the Contract.
	20.2 The Government requires that Employer, as well as the Contractor shall, during the Procurement proceedings and the execution of the Contract under public funds, ensure- <ul style="list-style-type: none"> (a) strict compliance with the provisions of Section 64 of the Public Procurement Act, 2006 (b) abiding by the code of ethics as mentioned in the Rule 127 of the Public Procurement Rules, 2008; (c) that neither it, nor any other member of its staff, or any other agents or intermediaries working on its behalf engages in any such practice as detailed in GCC Sub Clause 20.2.
	20.3 For the purposes of GCC Sub Clause 20.2, the terms set forth below as follows <ul style="list-style-type: none"> (a) “corrupt practice” means offering, giving or promising to give, receiving, or soliciting either directly or indirectly, to any officer or employee of a Employer or other public or private authority or individual, a gratuity in any form; employment or any other thing or service of value as an inducement with respect to an act or decision or method followed by a Employer in connection with a Procurement proceeding or Contract execution; (b) “fraudulent practice” means the misrepresentation or omission of facts in order to influence a decision to be taken in a Procurement proceeding or Contract execution; (c) collusive practice” means a scheme or arrangement between two (2) or more Persons, with or without the knowledge of the Employer, that is designed to arbitrarily reduce the number of Tenders submitted or fix Tender prices at artificial, non-competitive levels, thereby denying a Employer the benefits of competitive price arising from genuine and open competition; or

	<p>(d) “Coercive practice” means harming or threatening to harm, directly or indirectly, Persons or their property to influence a decision to be taken in the Procurement proceeding or the execution of the Contract, and this will include creating obstructions in the normal submission process used for Tenders.</p> <p>20.4 Should any corrupt, fraudulent, collusive or coercive practice of any kind come to the knowledge of the Employer, it will, in the first place, allow the Contractor to provide an explanation and shall, take actions only when a satisfactory explanation is not received. Such decision and the reasons thereof, shall be recorded in the record of the procurement proceedings and promptly communicated to the Contractor. Any communications between the Contractor and the Employer related to matters of alleged fraud or corruption shall be in writing.</p> <p>20.5 If corrupt, fraudulent, collusive or coercive practices of any kind determined by the Employer against the Contractor alleged to have carried out such practices, the Employer will :</p> <p>(a) exclude the Contractor from further participation in the particular Procurement proceeding; or</p> <p>(b) declare, at its discretion, the Contractor to be ineligible to participate in further Procurement proceedings, either indefinitely or for a specific period of time.</p> <p>20.6 20.6 The Contractor shall be aware of the provisions on corruption, fraudulence, collusion and coercion in Section 64 of the Public Procurement Act, 2006 and Rule 127 of the Public Procurement Rules, 2008.</p>
<p>21. License/ Use of Technical Information</p>	<p>21.1 For the operation and maintenance of the Plant, the Contractor hereby grants a non-exclusive and non-transferable license (without the right to sub-license) to the Employer under the patents, utility models or other industrial property rights owned by the Contractor or by a third Party from whom the Contractor has received the right to grant licenses thereunder, and shall also grant to the Employer a non-exclusive and non-transferable right (without the right to sub-license) to use the know-how and other technical information disclosed to the Employer under the Contract. Nothing contained herein shall be construed as transferring ownership of any patent, utility model, trademark, design, copyright, know-how or other intellectual property right from the Contractor or any third Party to the Employer.</p> <p>21.2 The copyright in all drawings, documents and other materials containing data and information furnished to the Employer by the Contractor herein shall remain vested in the Contractor or, if they are furnished to the Employer directly or through the Contractor by any third Party, including suppliers of materials, the copyright in such materials shall remain vested in such third Party.</p>

B. Subject Matter of Contract

22. Scope of Facilities	<p>22.1 Unless otherwise expressly limited in the Employer's Requirements, the Contractor's obligations cover the provision of all Plant and the performance of all Installation Services required for the design, and the manufacture (including procurement, quality assurance, construction, installation, associated civil works, Pre Commissioning and delivery) of the Plant, and the installation, completion and commissioning of the Facilities in accordance with the plans, procedures, specifications, drawings, codes and any other documents as specified in the Section, Employer's Requirements. Such specifications include, but are not limited to, the provision of supervision and engineering services; the supply of labor, materials, equipment, spare parts and accessories; Contractor's Equipment; construction utilities and supplies; temporary materials, structures and facilities; transportation (including, without limitation, unloading and hauling to, from and at the Site); and storage, except for those supplies, works and services that will be provided or performed by the Employer, as set forth in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer.</p>
	<p>22.2 The Contractor shall, unless specifically excluded in the Contract, perform all such work and/or supply all such items and materials not specifically mentioned in the Contract but that can be reasonably inferred from the Contract as being required for attaining Completion of the Facilities as if such work and/or items and materials were expressly mentioned in the Contract.</p>
	<p>22.3 In addition to the supply of Mandatory Spare Parts included in the Contract, the Contractor agrees to supply spare parts required for the operation and maintenance of the Facilities for the period specified in the PCC and the provisions, if any, specified in the PCC. However, the identity, specifications and quantities of such spare parts and the terms and conditions relating to the supply thereof are to be agreed between the Employer and the Contractor, and the price of such spare parts shall be that given in Price Schedule No.1 & 2 under form PG5A-3, which shall be added to the Contract Price. The price of such spare parts shall include the purchase price therefor and other costs and expenses (including the Contractor's fees) relating to the supply of spare parts.</p>
23. Time for Commencement	<p>23.1 The Contractor shall attain Completion of the Facilities or of a part where a separate time for Completion of such part is specified in the Contract, within the time stated in the PCC or within such extended time to which the Contractor shall be entitled under GCC Clause 65.1 hereof.</p>
24. Time for Completion	<p>24.1 The Contractor shall attain Completion of the Facilities or of a part where a separate time for Completion of such part is specified in the Contract, within the time stated in the PCC or within such extended time to which the Contractor shall be entitled under GCC Clause 65.1 hereof.</p>

<p>25. Employer's Responsibilities</p>	<p>25.1 All information and/or data to be supplied by the Employer as described in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer, shall be deemed to be accurate, except when the Employer expressly states otherwise</p> <p>25.2 The Employer shall be responsible for acquiring and providing legal and physical possession of the Site and access thereto, and for providing possession of and access to all other areas reasonably required for the proper execution of the Contract, including all requisite rights of way, as specified in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer. The Employer shall give full possession of and accord all rights of access thereto on or before the date(s) specified in that Appendix.</p> <p>25.3 The Employer shall acquire and pay for all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located which (a) such authorities or undertakings require the Employer to obtain in the Employer's name, (b) are necessary for the execution of the Contract, including those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract, and (c) are specified in the Appendix (Scope of Works and Supply by the Employer).</p> <p>25.4 If requested by the Contractor, the Employer shall use its best endeavors to assist the Contractor in obtaining in a timely and expeditious manner all permits, approvals and/or licenses necessary for the execution of the Contract from all local, state or national government authorities or public service undertakings that such authorities or undertakings require the Contractor or Subcontractors or the personnel of the Contractor or Subcontractors, as the case may be, to obtain</p> <p>25.5 Unless otherwise specified in the Contract or agreed upon by the Employer and the Contractor, the Employer shall provide sufficient, properly qualified operating and maintenance personnel; shall supply and make available all raw materials, utilities, lubricants, chemicals, catalysts, other materials and facilities; and shall perform all work and services of whatsoever nature, including those required by the Contractor to properly carry out Pre Commissioning, Commissioning and Guarantee Tests, all in accordance with the provisions of the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer, at or before the time specified in the program furnished by the Contractor under the provisions of contract specified or as otherwise agreed upon by the Employer and the Contractor.</p> <p>25.6 The Employer shall be responsible for the continued operation of the Facilities after Completion, in accordance with GCC Sub-Clause 39.8, and shall be responsible for facilitating the Guarantee Test(s) for the Facilities, in accordance with GCC Sub-Clause 40.2.</p> <p>25.7 All costs and expenses involved in the performance of the obligations under this GCC Clause 25 shall be the responsibility of the Employer, save those to be incurred by the Contractor with respect to the performance of Guarantee Tests, in accordance with</p>
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	<p>GCC Sub-Clause 40.2.</p> <p>25.8 In the event that the Employer shall be in breach of any of his obligations under this Clause, the additional cost incurred by the Contractor in consequence thereof shall be determined by the Project Manager and added to the Contract Price</p>
26. Contractor's Responsibilities	<p>26.1 The Contractor shall design, manufacture including associated purchases and/or subcontracting, install and complete the Facilities in accordance with the Contract. When completed, the Facilities should be fit for the purposes for which they are intended as defined in the Contract.</p>
	<p>26.2 The Contractor confirms that it has entered into this Contract on the basis of a proper examination of the data relating to the Facilities including any data as to boring tests provided by the Employer, and on the basis of information that the Contractor could have obtained from a visual inspection of the Site if access thereto was available and of other data readily available to it relating to the Facilities as of the date twenty-eight (28) days prior to tender submission. The Contractor acknowledges that any failure to acquaint itself with all such data and information shall not relieve its responsibility for properly estimating the difficulty or cost of successfully performing the Facilities.</p>
	<p>26.3 The Contractor shall acquire and pay for all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located which such authorities or undertakings require the Contractor to obtain in its name and which are necessary for the performance of the Contract, including, without limitation, visas for the Contractor's and Subcontractor's personnel and entry permits for all imported Contractor's Equipment. The Contractor shall acquire all other permits, approvals and/or licenses that are not the responsibility of the Employer under GCC Sub-Clause 25.3 hereof and that are necessary for the performance of the Contract.</p>
27. Employer's and Contractor's Risks	<p>27.1 The Employer carries the risks that the Contract states are Employer's risks and the Contractor carries the risks that the Contract states are Contractor's risks.</p>
28. Employer's Risks	<p>28.1 From the Start Date until the Defects Correction Certificate has been issued, the following are Employer's risks:</p> <p>(a) the risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to</p> <ul style="list-style-type: none"> i. use or occupation of the Site by the Works or for the purpose of the Works, which is the unavoidable result of the Works or ii. negligence, breach of statutory duty, or interference with any legal right by the Employer or by any person employed by or Contracted to him except the Contractor. iii. the risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer's design, or due to war or radioactive contamination directly affecting the country

	where the Works are to be executed.
	<p>28.2 From the Completion Date until the Defects Correction Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is Employer's risk, except loss or damage due to:</p> <ul style="list-style-type: none"> (a) a Defect which existed on the Completion Date; (b) an event occurring before the Completion Date, which was not itself Employer's risk; or (c) the activities of the Contractor on the Site after the Completion Date.
29. Contractor's Risks	<p>29.1 From the Start Date until the Defects Correction Certificate has been issued the risks of personal injury, death, and loss of or damage to property including without limitation, the Works, Plant, Materials, and Equipment, which are not Employer's risks are Contractor's risks.</p>
C. Execution of the Facilities	
30. Representatives	<p>31.1 <u>Project Manager</u> If the Project Manager is not named in the Contract, then within fourteen (14) days of the Effective Date, the Employer shall appoint and notify the Contractor in writing of the name of the Project Manager. The Employer may from time to time appoint some other person as the Project Manager in place of the person previously so appointed, and shall give a notice of the name of such other person to the Contractor without delay. No such appointment shall be made at such a time or in such a manner as to impede the progress of work on the Facilities. Such appointment shall only take effect upon receipt of such notice by the Contractor. The Project Manager shall represent and act for the Employer at all times during the performance of the Contract. All notices, instructions, orders, certificates, approvals and all other communications under the Contract shall be given by the Project Manager, except as herein otherwise provided.</p> <p>All notices, instructions, information and other communications given by the Contractor to the Employer under the Contract shall be given to the Project Manager, except as herein otherwise provided.</p> <p>30.2 <u>Contractor's Representative & Construction Manager</u></p> <p>30.2.1 If the Contractor's Representative is not named in the Contract, then within fourteen (14) days of the Effective Date, the Contractor shall appoint the Contractor's Representative and shall request the Employer in writing to approve the person so appointed. If the Employer makes no objection to the appointment within fourteen (14) days, the Contractor's Representative shall be deemed to have been approved. If the Employer objects to the appointment within fourteen (14) days giving the reason therefor, then the Contractor shall appoint a replacement within fourteen (14) days of such objection, and the foregoing provisions of this GCC Sub-Clause 30.2.1 shall apply thereto.</p> <p>30.2.2 The Contractor's Representative shall represent and act for</p>

	<p>the Contractor at all times during the performance of the Contract and shall give to the Project Manager all the Contractor's notices, instructions, information and all other communications under the Contract.</p> <p>The Contractor shall not revoke the appointment of the Contractor's Representative without the Employer's prior written consent, which shall not be unreasonably withheld. If the Employer consents thereto, the Contractor shall appoint some other person as the Contractor's Representative, pursuant to the procedure set out in GCC Sub-Clause 30.2.1.</p>
	<p>30.2.3 . The Contractor's Representative may, subject to the approval of the Employer which shall not be unreasonably withheld, at any time delegate to any person any of the powers, functions and authorities vested in him or her. Any such delegation may be revoked at any time. Any such delegation or revocation shall be subject to a prior notice signed by the Contractor's Representative, and shall specify the powers, functions and authorities thereby delegated or revoked. No such delegation or revocation shall take effect unless and until a copy thereof has been delivered to the Employer and the Project Manager.</p> <p>Any act or exercise by any person of powers, functions and authorities so delegated to him or her in accordance with this GCC Sub-Clause 30.2.3 shall be deemed to be an act or exercise by the Contractor's Representative.</p>
	<p>30.2.4 From the commencement of installation of the Facilities at the Site until Completion, the Contractor's Representative shall appoint a suitable person as the Construction Manager. The Construction Manager shall supervise all work done at the Site by the Contractor and shall be present at the Site throughout normal working hours except when on leave, sick or absent for reasons connected with the proper performance of the Contract. Whenever the Construction Manager is absent from the Site, a suitable person shall be appointed to act as the Construction Manager's deputy.</p>
	<p>30.2.5 The Employer may by notice to the Contractor object to any representative or person employed by the Contractor in the execution of the Contract who, in the reasonable opinion of the Employer, may behave inappropriately, may be incompetent or negligent, or may commit a serious breach of the Site regulations provided under GCC Sub-Clause 37.4. The Employer shall provide evidence of the same, whereupon the Contractor shall remove such person from the Facilities.</p>
	<p>30.2.6 If any representative or person employed by the Contractor is removed in accordance with GCC Sub-Clause 30.2.5, the Contractor shall, where required, promptly appoint a replacement.</p>

31. Work Program	<p>31.1 <u>Contractor's Organization</u> The Contractor shall supply to the Employer and the Project Manager a chart showing the proposed organization to be established by the Contractor for carrying out work on the Facilities within twenty-one (21) days of the Effective Date. The chart shall include the identities of the key personnel and the curricula vitae of such key personnel to be employed shall be supplied together with the chart. The Contractor shall promptly inform the Employer and the Project Manager in writing of any revision or alteration of such an organization chart.</p>
	<p>31.2 <u>Program of Performance</u> Within twenty-eight (28) days after the Effective Date, the Contractor shall submit to the Project Manager a detailed program of performance of the Contract, made in a form acceptable to the Project Manager and showing the sequence in which it proposes to design, manufacture, transport, assemble, install and Pre Commission the Facilities, as well as the date by which the Contractor reasonably requires that the Employer shall have fulfilled its obligations under the Contract so as to enable the Contractor to execute the Contract in accordance with the program and to achieve Completion, Commissioning and Acceptance of the Facilities in accordance with the Contract. The program so submitted by the Contractor shall accord with the Time Schedule included in the Appendix to the Contract Agreement titled Time Schedule, and any other dates and periods specified in the Contract. The Contractor shall update and revise the program as and when appropriate or when required by the Project Manager, but without modification in the Times for Completion specified in the PCC pursuant to Sub-Clause 24.1 and any extension granted in accordance with GCC Clause 65.1, and shall submit all such revisions to the Project Manager.</p>
	<p>31.3 <u>Progress Report</u> The Contractor shall monitor progress of all the activities specified in the program referred to in GCC Sub-Clause 31.2 above, and supply a progress report to the Project Manager every month.</p> <p>The progress report shall be in a form acceptable to the Project Manager and shall indicate: (a) percentage completion achieved compared with the planned percentage completion for each activity; and (b) where any activity is behind the program, giving comments and likely consequences and stating the corrective action being taken.</p>
	<p>31.4 <u>Progress of Performance</u> If at any time the Contractor's actual progress falls behind the program referred to in GCC Sub-Clause 31.2, or it becomes apparent that it will so fall behind, the Contractor shall, at the request of the Employer or the Project Manager, prepare and submit to the Project Manager a revised program, taking into account the prevailing circumstances, and shall notify the Project Manager of the steps being taken to expedite progress so as to attain Completion of the Facilities within the Time for Completion</p>

	<p>under GCC Sub-Clause 24.1, any extension thereof entitled under GCC Sub-Clause 65.1, or any extended period as may otherwise be agreed upon between the Employer and the Contractor.</p> <p>31.5 <u>Procedures</u> The Contract shall be executed in accordance with the Contract Documents including the procedures given in the Forms and Procedures of the Employer's Requirements. The Contractor may execute the Contract in accordance with its own standard project execution plans and procedures to the extent that they do not conflict with the provisions contained in the Contract.</p>
32. Subcontractor	32.1 Subcontracting the whole of the Plant and Service by the Contractor shall not be permissible. The Contractor shall be responsible for the acts or defaults of any Subcontractor, his or her agents or employees, as if they were the acts or defaults of the Contractor.
	32.2 The Contractor shall not be required to obtain consent from the Project Manager or his representative, for suppliers solely of Materials or to a subcontract for which the Specialist Subcontractor(s) is already named in the Contract.
	32.3 The prior consent, in writing, of the Engineer shall however be obtained for other proposed Subcontractor(s).
33. Nominated Subcontractor	33.1 Nominated Subcontractor named in the Contract shall be entitled to execute the specific components of the Works stated in the PCC .
	33.2 The Contractor shall not be under obligations to employ a Nominated Subcontractor against whom the Contractor raises reasonable objection by notice to the Engineer as soon as practicable, with supporting particulars while there are reasons to believe that the Subcontractor does not have sufficient competence, resources or financial strength, or does not accept to indemnify the Contractor against and from any negligence or misuse of Goods by the nominated Subcontractor, or does not accept to enter into a subcontract which specifies that, for the subcontracted work including design, if any, the Nominated Subcontractor shall undertake to the Contractor such obligations and liabilities as will enable the contractor to discharge his or her liabilities under the Contract.
34. Other Contractors	34.1 The Contractor shall cooperate and share the Site with other Contractors, public authorities, utilities, the Engineer and the Employer between the dates given in the Schedule of other Contractors. The Contractor shall also provide facilities and services for them as described in the Schedule. The Employer may modify the Schedule of other Contractors, and shall notify the Contractor of any such modification.

<p>35. Design and Engineering</p>	<p>35.1 <u>Specifications and Drawings</u></p> <p>35.1.1 The Contractor shall execute the basic and detailed design and the engineering work in compliance with the provisions of the Contract, or where not so specified, in accordance with good engineering practice. The Contractor shall be responsible for any discrepancies, errors or omissions in the specifications, drawings and other technical documents that it has prepared, whether such specifications, drawings and other documents have been approved by the Project Manager or not, provided that such discrepancies, errors or omissions are not because of inaccurate information furnished in writing to the Contractor by or on behalf of the Employer.</p> <p>35.1.2 The Contractor shall be entitled to disclaim responsibility for any design, data, drawing, specification or other document, or any modification thereof provided or designated by or on behalf of the Employer, by giving a notice of such disclaimer to the Project Manager.</p> <p>35.2 <u>Codes and Standards</u></p> <p>Wherever references are made in the Contract to codes and standards in accordance with which the Contract shall be executed, the edition or the revised version of such codes and standards current at the date twenty-eight (28) days prior to date of tender submission shall apply unless otherwise specified. During Contract execution, any changes in such codes and standards shall be applied subject to approval by the Employer and shall be treated in accordance with GCC Clause 64.</p> <p>35.3. <u>Approval/Review of Technical Documents by Project Manager</u></p>
	<p>35.3.1 The Contractor shall prepare or cause its Subcontractors to prepare, and furnish to the Project Manager the documents listed in the Appendix to the Contract Agreement titled List of Documents for Approval or Review, for its approval or review as specified and in accordance with the requirements of GCC Sub-Clause 31.2 (Program of Performance).</p> <p>Any part of the Facilities covered by or related to the documents to be approved by the Project Manager shall be executed only after the Project Manager’s approval thereof.</p> <p>GCC Sub-Clauses 35.3.2 through 35.3.6 shall apply to those documents requiring the Project Manager’s approval, but not to those furnished to the Project Manager for its review only</p>
	<p>35.3.2 Within fourteen (14) days after receipt by the Project Manager of any document requiring the Project Manager’s approval in accordance with GCC Sub-Clause 35.3.1, the Project Manager shall either return one copy thereof to the Contractor with its approval endorsed thereon or shall notify the Contractor in writing of its disapproval thereof and the reasons therefor and the modifications that the Project Manager proposes. If the Project Manager fails to take such</p>

	<p>action within the said fourteen (14) days, then the said document shall be deemed to have been approved by the Project Manager.</p> <p>35.3.3. The Project Manager shall not disapprove any document, except on the grounds that the document does not comply with the Contract or that it is contrary to good engineering practice.</p> <p>35.3.4 If the Project Manager disapproves the document, the Contractor shall modify the document and resubmit it for the Project Manager's approval in accordance with GCC Sub-Clause 35.3.2. If the Project Manager approves the document subject to modification(s), the Contractor shall make the required modification(s), whereupon the document shall be deemed to have been approved.</p> <p>35.3.5 The Project Manager's approval, with or without modification of the document furnished by the Contractor, shall not relieve the Contractor of any responsibility or liability imposed upon it by any provisions of the Contract except to the extent that any subsequent failure results from modifications required by the Project Manager.</p> <p>35.3.6 The Contractor shall not depart from any approved document unless the Contractor has first submitted to the Project Manager an amended document and obtained the Project Manager's approval thereof, pursuant to the provisions of this GCC Sub-Clause 35.3. If the Project Manager requests any change in any already approved document and/or in any document based thereon, the provisions of GCC Clause 64 shall apply to such request.</p>
<p>36. Procurement</p>	<p>36.1 <u>Plant</u></p> <p>Subject to GCC Sub-Clause 60.2, the Contractor shall procure and transport all Plant in an expeditious and orderly manner to the Site.</p> <p>36.2 <u>Employer-Supplied Plant</u></p> <p>If the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer, provides that the Employer shall furnish any specific items to the Contractor, the following provisions shall apply:</p> <p>36.2.1 The Employer shall, at its own risk and expense, transport each item to the place on or near the Site as agreed upon by the Parties and make such item available to the Contractor at the time specified in the program furnished by the Contractor, pursuant to GCC Sub-Clause 31.2, unless otherwise mutually agreed.</p> <p>36.2.2 Upon receipt of such item, the Contractor shall inspect the same visually and notify the Project Manager of any detected shortage, defect or default. The Employer shall immediately remedy any shortage, defect or default, or the Contractor shall, if practicable and possible, at the request of the Employer, remedy such shortage, defect or default at the Employer's cost and expense. After inspection, such item shall fall under the care,</p>

	<p>custody and control of the Contractor. The provision of this GCC Sub-Clause 36.2.2 shall apply to any item supplied to remedy any such shortage or default or to substitute for any defective item, or shall apply to defective items that have been repaired.</p> <p>36.2.3 The foregoing responsibilities of the Contractor and its obligations of care, custody and control shall not relieve the Employer of liability for any undetected shortage, defect or default, nor place the Contractor under any liability for any such shortage, defect or default whether under GCC Clause 42 or under any other provision of Contract.</p>
	<p>36.3 <u>Transportation</u></p> <p>36.3.1 The Contractor shall at its own risk and expense transport all the materials and the Contractor's Equipment to the Site by the mode of transport that the Contractor judges most suitable under all the circumstances.</p> <p>36.3.2 Unless otherwise provided in the Contract, the Contractor shall be entitled to select any safe mode of transport operated by any person to carry the materials and the Contractor's Equipment.</p> <p>36.3.3 Upon dispatch of each shipment of materials and the Contractor's Equipment, the Contractor shall notify the Employer by telex, cable, facsimile or electronic means, of the description of the materials and of the Contractor's Equipment, the point and means of dispatch, and the estimated time and point of arrival in the country where the Site is located, if applicable, and at the Site. The Contractor shall furnish the Employer with relevant shipping documents to be agreed upon between the Parties.</p> <p>36.3.4 The Contractor shall be responsible for obtaining, if necessary, approvals from the authorities for transportation of the materials and the Contractor's Equipment to the Site. The Employer shall use its best endeavors in a timely and expeditious manner to assist the Contractor in obtaining such approvals, if requested by the Contractor. The Contractor shall indemnify and hold harmless the Employer from and against any claim for damage to roads, bridges or any other traffic facilities that may be caused by the transport of the materials and the Contractor's Equipment to the Site.</p>
	<p>36.4 <u>Customs Clearance</u></p> <p>The Contractor shall, at its own expense, handle all imported materials and Contractor's Equipment at the point(s) of import and shall handle any formalities for customs clearance, subject to the Employer's obligations under GCC Sub-Clause 60.2, provided that if applicable laws or regulations require any application or act to be made by or in the name of the Employer, the Employer shall take all necessary steps to comply with such laws or regulations. In the event of delays in customs clearance that are not the fault of the Contractor, the Contractor shall be entitled to an extension in the Time for Completion, pursuant to GCC Clause 65.</p>
<p>37. Installation</p>	<p>37.1 <u>Setting Out/Supervision</u></p> <p>37.1.1 Bench Mark: The Contractor shall be responsible for the true and proper setting-out of the Facilities in relation to bench</p>

marks, reference marks and lines provided to it in writing by or on behalf of the Employer.

If, at any time during the progress of installation of the Facilities, any error shall appear in the position, level or alignment of the Facilities, the Contractor shall forthwith notify the Project Manager of such error and, at its own expense, immediately rectify such error to the reasonable satisfaction of the Project Manager. If such error is based on incorrect data provided in writing by or on behalf of the Employer, the expense of rectifying the same shall be borne by the Employer.

37.1.2 Contractor's Supervision: The Contractor shall give or provide all necessary superintendence during the installation of the Facilities, and the Construction Manager or its deputy shall be constantly on the Site to provide full-time superintendence of the installation. The Contractor shall provide and employ only technical personnel who are skilled and experienced in their respective callings and supervisory staff who are competent to adequately supervise the work at hand.

37.2 Labor:

37.2.1 Engagement of Staff and Labor

(a) Except as otherwise stated in the Specification, the Contractor shall make arrangements for the engagement of all staff and labor, local or otherwise, and for their payment, housing, feeding and transport.

(b) The Contractor shall provide and employ on the Site in the installation of the Facilities such skilled, semi-skilled and unskilled labor as is necessary for the proper and timely execution of the Contract. The Contractor is encouraged to use local labor that has the necessary skills.

(c) The Contractor shall be responsible for obtaining all necessary permit(s) and/or visa(s) from the appropriate authorities for the entry of all labor and personnel to be employed on the Site into the country where the Site is located. The Employer will, if requested by the Contractor, use his best endeavors in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national or government permission required for bringing in the Contractor's personnel.

(d) The Contractor shall at its own expense provide the means of repatriation to all of its and its Subcontractor's personnel employed on the Contract at the Site to the place where they were recruited or to their domicile. It shall also provide suitable temporary maintenance of all such persons from the cessation of their employment on the Contract to the date programmed for their departure. In the event that the Contractor defaults in providing such means of transportation and temporary maintenance, the Employer may provide the same to such personnel and recover the cost of doing so

from the Contractor.

37.2.2 Persons in the Service of Employer

The Contractor shall not recruit, or attempt to recruit, staff and labor from amongst the Employer's Personnel.

37.2.3 Facilities for Staff and Labor

Except as otherwise stated in the Specification, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel. The Contractor shall also provide facilities for the Employer's Personnel as stated in the Specification.

The Contractor shall not permit any of the Contractor's Personnel to maintain any temporary or permanent living quarters within the structures forming part of the Permanent Works

37.3 **Contractor's Equipment**

37.3.1 All Contractor's Equipment brought by the Contractor onto the Site shall be deemed to be intended to be used exclusively for the execution of the Contract. The Contractor shall not remove the same from the Site without the Project Manager's consent that such Contractor's Equipment is no longer required for the execution of the Contract.

37.3.2 Unless otherwise specified in the Contract, upon completion of the Facilities, the Contractor shall remove from the Site all Equipment brought by the Contractor onto the Site and any surplus materials remaining thereon.

37.3.3 The Employer will, if requested, use its best endeavors to assist the Contractor in obtaining any local, state or national government permission required by the Contractor for the export of the Contractor's Equipment imported by the Contractor for use in the execution of the Contract that is no longer required for the execution of the Contract.

37.4 **Site Regulations and Safety**

The Employer and the Contractor shall establish Site regulations setting out the rules to be observed in the execution of the Contract at the Site and shall comply therewith. The Contractor shall prepare and submit to the Employer, with a copy to the Project Manager, proposed Site regulations for the Employer's approval, which approval shall not be unreasonably withheld.

Such Site regulations shall include, but shall not be limited to, rules in respect of security, safety of the Facilities, gate control, sanitation, medical care, and fire prevention. reasonable costs incurred by the Employer in connection therewith shall be paid by the Contractor to the Employer. Otherwise, the cost of such remedial work shall be borne by the Employer.

37.5 Site Clearance

37.5.1 Site Clearance in Course of Performance: In the course of carrying out the Contract, the Contractor shall keep the Site reasonably free from all unnecessary obstruction, store or remove any surplus materials, clear away any wreckage, rubbish or temporary works from the Site, and remove any Contractor's Equipment no longer required for execution of the Contract

37.6 Opportunities for Other Contractors

37.6.1 The Contractor shall, upon written request from the Employer or the Project Manager, give all reasonable opportunities for carrying out the work to any other contractors employed by the Employer on or near the Site.

37.6.2 If the Contractor, upon written request from the Employer or the Project Manager, makes available to other contractors any roads or ways the maintenance for which the Contractor is responsible, permits the use by such other contractors of the Contractor's Equipment, or provides any other service of whatsoever nature for such other contractors, the Employer shall fully compensate the Contractor for any loss or damage caused or occasioned by such other contractors in respect of any such use or service, and shall pay to the Contractor reasonable remuneration for the use of such equipment or the provision of such services.

37.7 Emergency Work

37.7.1 If, by reason of an emergency arising in connection with and during the execution of the Contract, any protective or remedial work is necessary as a matter of urgency to prevent damage to the Facilities, the Contractor shall immediately carry out such work.

If the Contractor is unable or unwilling to do such work immediately, the Employer may do or cause such work to be done as the Employer may determine is necessary in order to prevent damage to the Facilities. In such event the Employer shall, as soon as practicable after the occurrence of any such emergency, notify the Contractor in writing of such emergency, the work done and the reasons therefor. If the work done or caused to be done by the Employer is work that the Contractor was liable to do at its own expense under the Contract.

37.7.2 Clearance of Site after Completion: After Completion of all parts of the Facilities, the Contractor shall clear away and remove all wreckage, rubbish and debris of any kind from the Site, and shall leave the Site and Facilities in a clean and safe condition.

37.8 Watching and Lighting

The Contractor shall provide and maintain at its own expense all lighting, fencing, and watching when and where necessary for the proper execution and the protection of the Facilities, or for the safety of the owners and occupiers of adjacent property and for the safety of the public.

38. Test & Inspection	38.1	The Contractor shall at its own expense carry out at the place of manufacture and/or on the Site all such tests and/or inspections of the Plant and any part of the Facilities as are specified in the Contract.
	38.2	The Employer and the Project Manager or their designated representatives shall be entitled to attend the aforesaid test and/or inspection, provided that the Employer shall bear all costs and expenses incurred in connection with such attendance including, but not limited to, all traveling and board and lodging expenses.
	38.3	38.3 Whenever the Contractor is ready to carry out any such test and/or inspection, the Contractor shall give a reasonable advance notice of such test and/or inspection and of the place and time thereof to the Project Manager. The Contractor shall obtain from any relevant third Party or manufacturer any necessary permission or consent to enable the Employer and the Project Manager or their designated representatives to attend the test and/or inspection.
	38.4	The Contractor shall provide the Project Manager with a certified report of the results of any such test and/or inspection. If the Employer or Project Manager or their designated representatives fails to attend the test and/or inspection, or if it is agreed between the Parties that such persons shall not do so, then the Contractor may proceed with the test and/or inspection in the absence of such persons, and may provide the Project Manager with a certified report of the results thereof.
	38.5	38.5 The Project Manager may require the Contractor to carry out any test and/or inspection not required by the Contract, provided that the Contractor's reasonable costs and expenses incurred in the carrying out of such test and/or inspection shall be added to the Contract Price. Further, if such test and/or inspection impede the progress of work on the Facilities and/or the Contractor's performance of its other obligations under the Contract, due allowance will be made in respect of the Time for Completion and the other obligations so affected.
	38.6	If any Plant or any part of the Facilities fails to pass any test and/or inspection, the Contractor shall either rectify or replace such Plant or part of the Facilities and shall repeat the test and/or inspection upon giving a notice under GCC Sub-Clause 38.3.
	38.7	If any dispute or difference of opinion shall arise between the Parties in connection with or arising out of the test and/or inspection of the Plant or part of the Facilities that cannot be settled between the Parties within a reasonable period of time, it may be referred to an 72.2.

	<p>38.8 The Contractor shall afford the Employer and the Project Manager, at the Employer's expense, access at any reasonable time to any place where the Plant are being manufactured or the Facilities are being installed, in order to inspect the progress and the manner of manufacture or installation, provided that the Project Manager shall give the Contractor a reasonable prior notice.</p> <p>38.9 The Contractor agrees that neither the execution of a test and/or inspection of Plant or any part of the Facilities, nor the attendance by the Employer or the Project Manager, nor the issue of any test certificate pursuant to GCC Sub-Clause 38.4, shall release the Contractor from any other responsibilities under the Contract.</p> <p>38.10 39.10 No part of the Facilities or foundations shall be covered up on the Site without the Contractor carrying out any test and/or inspection required under the Contract. The Contractor shall give a reasonable notice to the Project Manager whenever any such parts of the Facilities or foundations are ready or about to be ready for test and/or inspection; such test and/or inspection and notice thereof shall be subject to the requirements of the Contract.</p> <p>38.11 The Contractor shall uncover any part of the Facilities or foundations, or shall make openings in or through the same as the Project Manager may from time to time require at the Site, and shall reinstate and make good such part or parts.</p> <p>38.12 If any parts of the Facilities or foundations have been covered up at the Site after compliance with the requirement of GCC Sub-Clause 38.10 and are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating, and making good the same shall be borne by the Employer, and the Time for Completion shall be reasonably adjusted to the extent that the Contractor has thereby been delayed or impeded in the performance of any of its obligations under the Contract.</p>
<p>39. Completion of the Facilities</p>	<p>39.1 As soon as the Facilities or any part thereof has, in the opinion of the Contractor, been completed operationally and structurally and put in a tight and clean condition as specified in the Employer's Requirements, excluding minor items not materially affecting the operation or safety of the Facilities, the Contractor shall so notify the Employer in writing.</p> <p>39.2 Within seven (7) days after receipt of the notice from the Contractor under GCC Sub-Clause 39.1, the Employer shall supply the operating and maintenance personnel specified in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer for Pre Commissioning of the Facilities or any part thereof.</p> <p>Pursuant to the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer, the Employer shall also provide, within the said seven (7) day period, the raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters required for Pre Commissioning of the Facilities or any part thereof.</p>

	<p>39.3 As soon as reasonably practicable after the operating and maintenance personnel have been supplied by the Employer and the raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters have been provided by the Employer in accordance with GCC Sub-Clause 39.2, the Contractor shall commence Pre-commissioning of the Facilities or the relevant part thereof in preparation for Commissioning, subject to GCC Sub-Clause 40.5.</p> <p>39.4 As soon as all works in respect of Pre-commissioning are completed and, in the opinion of the Contractor, the Facilities or</p>
	<p>39.5 The Project Manager shall, within fourteen (14) days after receipt of the Contractor's notice under GCC Sub-Clause 39.4, either issue a Completion Certificate in the form specified in the Employer's Requirements (Forms and Procedures), stating that the Facilities or that part thereof have reached Completion as of the date of the Contractor's notice under GCC Sub-Clause 39.4, or notify the Contractor in writing of any defects and/or deficiencies.</p> <p>If the Project Manager notifies the Contractor of any defects and/or deficiencies, the Contractor shall then correct such defects and/or deficiencies, and shall repeat the procedure described in GCC Sub-Clause 39.4.</p>
	<p>39.6 If the Project Manager is satisfied that the Facilities or that part thereof have reached Completion, the Project Manager shall, within seven (7) days after receipt of the Contractor's repeated notice, issue a Completion Certificate stating that the Facilities or that part thereof have reached Completion as of the date of the Contractor's repeated notice.</p> <p>39.7 If the Project Manager is not so satisfied, then it shall notify the Contractor in writing of any defects and/or deficiencies within seven (7) days after receipt of the Contractor's repeated notice, and the above procedure shall be repeated.</p>
	<p>39.8 If the Project Manager fails to issue the Completion Certificate and fails to inform the Contractor of any defects and/or deficiencies within fourteen (14) days after receipt of the Contractor's notice under GCC Sub-Clause 39.4 or within seven (7) days after receipt of the Contractor's repeated notice under GCC Sub-Clause 39.5, or if the Employer makes use of the Facilities or part thereof, then the Facilities or that part thereof shall be deemed to have reached Completion as of the date of the Contractor's notice or repeated notice, or as of the Employer's use of the Facilities, as the case may be.</p> <p>39.9 As soon as possible after Completion, the Contractor shall complete all outstanding minor items so that the Facilities are fully in accordance with the requirements of the Contract, failing which the Employer will undertake such completion and deduct the costs thereof from any monies owing to the Contractor.</p> <p>39.10 Upon Completion, the Employer shall be responsible for the care and custody of the Facilities or the relevant part thereof, together with the risk of loss or damage thereto, and shall thereafter take over the Facilities or the relevant part thereof.</p>

<p>40. Commissioning and Operational Acceptance</p>	<p>40.1 Commissioning</p> <p>40.1.1 Commissioning of the Facilities or any part thereof shall be commenced by the Contractor immediately after issue of the Completion Certificate by the Project Manager, pursuant to GCC Sub-Clause 39.5, or immediately after the date of the deemed Completion, under GCC Sub-Clause 39.6.</p> <p>40.1.2 The Employer shall supply the operating and maintenance personnel and all raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters required for Commissioning.</p> <p>40.1.3 In accordance with the requirements of the Contract, the Contractor's and Project Manager's advisory personnel shall attend the Commissioning, including the Guarantee Test, and shall advise and assist the Employer.</p>
	<p>40.2 Guarantee Test</p> <p>40.2.1 Subject to GCC Sub-Clause 40.5, the Guarantee Test and repeats thereof shall be conducted by the Contractor during Commissioning of the Facilities or the relevant part thereof to ascertain whether the Facilities or the relevant part can attain the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees. The Employer shall promptly provide the Contractor with such information as the Contractor may reasonably require in relation to the conduct and results of the Guarantee Test and any repeats thereof.</p> <p>40.2.2 If for reasons not attributable to the Contractor, the Guarantee Test of the Facilities or the relevant part thereof cannot be successfully completed within the period from the date of Completion specified in the PCC or any other period agreed upon by the Employer and the Contractor, the Contractor shall be deemed to have fulfilled its obligations with respect to the Functional Guarantees, and GCC Sub-Clauses 43.2 and 43.3 shall not apply.</p> <p>40.3 Operational Acceptance</p> <p>40.3.2 At any time after any of the events set out in GCC Sub-Clause 40.3.1 have occurred, the Contractor may give a notice to the Project Manager requesting the issue of an Operational Acceptance Certificate in the form provided in the Employer's Requirements (Forms and Procedures) in respect of the Facilities or the part thereof specified in such notice as of the date of such notice.</p> <p>40.3.3 The Project Manager shall, after consultation with the Employer, and within seven (7) days after receipt of the Contractor's notice, issue an Operational Acceptance Certificate.</p>

	<p>40.3.4 If within seven (7) days after receipt of the Contractor's notice, the Project Manager fails to issue the Operational Acceptance Certificate or fails to inform the Contractor in writing of the justifiable reasons why the Project Manager has not issued the Operational Acceptance Certificate, the Facilities or the relevant part thereof shall be deemed to have been accepted as of the date of the Contractor's said notice.</p>
	<p>40.4 <u>Partial Acceptance</u></p> <p>40.4.1 If the Contract specifies that Completion and Commissioning shall be carried out in respect of parts of the Facilities, the provisions relating to Completion and Commissioning including the Guarantee Test shall apply to each such part of the Facilities individually, and the Operational Acceptance Certificate shall be issued accordingly for each such part of the Facilities.</p> <p>40.4.2 If a part of the Facilities comprises facilities such as buildings, for which no Commissioning or Guarantee Test is required, then the Project Manager shall issue the Operational Acceptance Certificate for such facility when it attains Completion, provided that the Contractor shall thereafter complete any outstanding minor items that are listed in the Operational Acceptance Certificate</p> <p>40.5 <u>Delayed Pre-commissioning and/or Guarantee Test</u></p> <p>40.5.1 In the event that the Contractor is unable to proceed with the Pre-commissioning of the Facilities pursuant to Sub-Clause 39.3, or with the Guarantee Test pursuant to Sub-Clause 40.2, for reasons attributable to the Employer either on account of non-availability of other facilities under the responsibilities of other contractor(s), or for reasons beyond the Contractor's control, the provisions leading to "deemed" completion of activities such as Completion, pursuant to GCC Sub-Clause 39.6, and Operational Acceptance, pursuant to GCC Sub-Clause 40.3.4, and Contractor's obligations regarding Defect Liability Period, pursuant to GCC Sub-Clause 42.2, Functional Guarantee, pursuant to GCC Clause 43, and Care of Facilities, pursuant to GCC Clause 48, and GCC Clause 66.1, Suspension, shall not apply. In this case, the following provisions shall apply.</p> <p>40.5.2 When the Contractor is notified by the Project Manager that he will be unable to proceed with the activities and obligations pursuant to clauses 58 & 59, the Contractor shall be entitled to the following:</p>

	<p>(a) the Time of Completion shall be extended for the period of suspension without imposition of liquidated damages pursuant to GCC Sub-Clause 41.2;</p> <p>(b) payments due to the Contractor in accordance with the provision specified in the Appendix to the Contract Agreement titled Terms and Procedures of Payment, which would not have been payable in normal circumstances due to non-completion of the subject activities, shall be released to the Contractor against submission of a security in the form of a bank guarantee of equivalent amount acceptable to the Employer, and which shall become null and void when the Contractor will have complied with its obligations regarding those payments, subject to the provision of Sub-Clause 40.5.3 below;</p> <p>(c) the expenses towards the above security and extension of other securities under the contract, of which validity needs to be extended, shall be reimbursed to the Contractor by the Employer;</p> <p>(d) the additional charges towards the care of the Facilities pursuant to GCC Sub-Clause 48.1 shall be reimbursed to the Contractor by the Employer for the period between the notification mentioned above and the notification mentioned in Sub-Clause 40.5.4 below. The provision of GCC Sub-Clause 49.2 shall apply to the Facilities during the same period.</p> <p>40.5.3 In the event that the period of suspension under above Sub-Clause 40.5.1 actually exceeds one hundred eighty (180) days, the Employer and Contractor shall mutually agree to any additional compensation payable to the Contractor.</p> <p>40.5.4 When the Contractor is notified by the Project Manager that the plant is ready for Pre-commissioning, the Contractor shall proceed without delay in performing Pre-commissioning, in accordance with Clause 39.</p>
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D. Guarantees and Liabilities

<p>41. Completion Time Guarantee</p>	<p>41.1 The Contractor guarantees that it shall attain Completion of the Facilities (or a part for which a separate time for completion is specified) within the Time for Completion specified in the PCC pursuant to GCC Sub-Clause 24.1, or within such extended time to which the Contractor shall be entitled under GCC Clause 65 hereof</p> <p>41.2 If the Contractor fails to attain Completion of the Facilities or any part thereof within the Time for Completion or any extension thereof under GCC Clause 65, the Contractor shall pay to the Employer liquidated damages in the amount specified in the PCC as a percentage rate of the Contract Price or the relevant part thereof. The aggregate amount of such liquidated damages shall in no event exceed the amount specified as “Maximum” in the PCC as a percentage rate of the Contract Price. Once the “Maximum” is reached, the Employer may consider termination of the Contract,</p>
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	<p>pursuant to GCC Sub-Clause 67.2.2.</p> <p>Such payment shall completely satisfy the Contractor’s obligation to attain Completion of the Facilities or the relevant part thereof within the Time for Completion or any extension thereof under GCC Clause 65. The Contractor shall have no further liability whatsoever to the Employer in respect thereof.</p> <p>However, the payment of liquidated damages shall not in any way relieve the Contractor from any of its obligations to complete the Facilities or from any other obligations and liabilities of the Contractor under the Contract.</p> <p>Save for liquidated damages payable under this GCC Sub-Clause 41.2, the failure by the Contractor to attain any milestone or other act, matter or thing by any date specified in the Appendix to the Contract Agreement titled Time Schedule, and/or other program of work prepared pursuant to GCC Sub-Clause 31.2 shall not render the Contractor liable for any loss or damage thereby suffered by the Employer..</p> <p>41.3 If the Contractor attains Completion of the Facilities or any part thereof before the Time for Completion or any extension thereof under GCC Clause 65, the Employer shall pay to the Contractor a bonus in the amount specified in the PCC. The aggregate amount of such bonus shall in no event exceed the amount specified as “Maximum” in the PCC.</p>
<p>42. Defect Liability</p>	<p>42.1 The Contractor warrants that the Facilities or any part thereof shall be free from defects in the design, engineering, materials and workmanship of the Plant supplied and of the work executed.</p> <p>42.2 The Defect Liability Period shall be five hundred and forty (540) days from the date of Completion of the Facilities (or any part thereof) or one year from the date of Operational Acceptance of the Facilities (or any part thereof), whichever first occurs, unless specified otherwise in the PCC pursuant to GCC Sub-Clause 42.10.</p> <p>If during the Defect Liability Period any defect should be found in the design, engineering, materials and workmanship of the Plant supplied or of the work executed by the Contractor, the Contractor shall promptly, in consultation and agreement with the Employer regarding appropriate remedying of the defects, and at its cost, repair, replace or otherwise make good as the Contractor shall determine at its discretion, such defect as well as any damage to the Facilities caused by such defect. The Contractor shall not be responsible for the repair, replacement or making good of any defect or of any damage to the Facilities arising out of or resulting from any of the following causes:</p> <ul style="list-style-type: none"> (a) improper operation or maintenance of the Facilities by the Employer; (b) operation of the Facilities outside specifications provided in the Contract; or (c) Normal wear and tear. <p>42.3 The Contractor’s obligations under this GCC Clause 42 shall not</p>

	<p>apply to:</p> <ul style="list-style-type: none"> (a) any materials that are supplied by the Employer under GCC Sub-Clause 36.2, are normally consumed in operation, or have a normal life shorter than the Defect Liability Period stated herein; (b) any designs, specifications or other data designed, supplied or specified by or on behalf of the Employer or any matters for which the Contractor has disclaimed responsibility herein; or (c) Any other materials supplied or any other work executed by or on behalf of the Employer, except for the work executed by the Employer under GCC Sub-Clause 42.7.
	<p>42.4 The Employer shall give the Contractor a notice stating the nature of any such defect together with all available evidence thereof, promptly following the discovery thereof. The Employer shall afford all reasonable opportunity for the Contractor to inspect any such defect.</p>
	<p>42.5 The Employer shall afford the Contractor all necessary access to the Facilities and the Site to enable the Contractor to perform its obligations under this GCC Clause 42.</p> <p>The Contractor may, with the consent of the Employer, remove from the Site any Plant or any part of the Facilities that are defective if the nature of the defect, and/or any damage to the Facilities caused by the defect, is such that repairs cannot be expeditiously carried out at the Site.</p>
	<p>42.6 If the repair, replacement or making good is of such a character that it may affect the efficiency of the Facilities or any part thereof, the Employer may give to the Contractor a notice requiring that tests of the defective part of the Facilities shall be made by the Contractor immediately upon completion of such remedial work, whereupon the Contractor shall carry out such tests.</p> <p>If such part fails the tests, the Contractor shall carry out further repair, replacement or making good, as the case may be, until that part of the Facilities passes such tests. The tests shall be agreed upon by the Employer and the Contractor.</p>
	<p>42.7 If the Contractor fails to commence the work necessary to remedy such defect or any damage to the Facilities caused by such defect within a reasonable time (which shall in no event be considered to be less than fifteen (15) days), the Employer may, following notice to the Contractor, proceed to do such work, and the reasonable costs incurred by the Employer in connection therewith shall be paid to the Employer by the Contractor or may be deducted by the Employer from any monies due the Contractor or claimed under the Performance Security.</p>
	<p>42.8 If the Facilities or any part thereof cannot be used by reason of such defect and/or making good of such defect, the Defect Liability Period of the Facilities or such part, as the case may be, shall be extended by a period equal to the period during which the Facilities or such part cannot be used by the Employer because of any of the aforesaid reasons.</p>

	<p>42.9 Except as provided in GCC Clauses 42 and 49, the Contractor shall be under no liability whatsoever and howsoever arising, and whether under the Contract or at law, in respect of defects in the Facilities or any part thereof, the Plant, design or engineering or work executed that appear after Completion of the Facilities or any part thereof, except where such defects are the result of the gross negligence, fraud, or criminal or willful action of the Contractor.</p>
	<p>42.10 In addition, any such component of the Facilities, and during the period of time as may be specified in the PCC, shall be subject to an extended defect liability period. Such obligation of the Contractor shall be in addition to the defect liability period specified under GCC Sub-Clause 42.2.</p>
<p>43. Functional Guarantees</p>	<p>43.1 The Contractor guarantees that during the Guarantee Test, the Facilities and all parts thereof shall attain the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, subject to and upon the conditions therein specified.</p> <p>43.2 If, for reasons attributable to the Contractor, the minimum level of the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, are not met either in whole or in part, the Contractor shall at its cost and expense make such changes, modifications and/or additions to the Plant or any part thereof as may be necessary to meet at least the minimum level of such Guarantees. The Contractor shall notify the Employer upon completion of the necessary changes, modifications and/or additions, and shall request the Employer to repeat the Guarantee Test until the minimum level of the Guarantees has been met. If the Contractor eventually fails to meet the minimum level of Functional Guarantees, the Employer may consider termination of the Contract, pursuant to GCC Sub-Clause 64.2.2.</p> <p>43.3 If, for reasons attributable to the Contractor, the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, are not attained either in whole or in part, but the minimum level of the Functional Guarantees specified in the said Appendix to the Contract Agreement is met, the Contractor shall, at the Contractor's option, either</p> <ul style="list-style-type: none"> (a) make such changes, modifications and/or additions to the Facilities or any part thereof that are necessary to attain the Functional Guarantees at its cost and expense, and shall request the Employer to repeat the Guarantee Test or (b) pay liquidated damages to the Employer in respect of the failure to meet the Functional Guarantees in accordance with the provisions in the Appendix to the Contract Agreement titled Functional Guarantees. <p>43.4 The payment of liquidated damages under GCC Sub-Clause 43.3, up to the limitation of liability specified in the Appendix to the Contract Agreement titled Functional Guarantees, shall completely satisfy the Contractor's guarantees under GCC Sub-Clause 43.3, and the Contractor shall have no further liability whatsoever to the Employer in respect thereof. Upon the payment of such liquidated</p>

	<p>damages by the Contractor, the Project Manager shall issue the Operational Acceptance Certificate for the Facilities or any part thereof in respect of which the liquidated damages have been so paid.</p>
<p>44. Patent Indemnity</p>	<p>44.1 The Contractor shall, subject to the Employer's compliance with GCC Sub-Clause 44.2, indemnify and hold harmless the Employer and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Employer may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract by reason of: (a) the installation of the Facilities by the Contractor or the use of the Facilities in the country where the Site is located; and (b) the sale of the products produced by the Facilities in any country.</p> <p>Such indemnity shall not cover any use of the Facilities or any part thereof other than for the purpose indicated by or to be reasonably inferred from the Contract, any infringement resulting from the use of the Facilities or any part thereof, or any products produced thereby in association or combination with any other equipment, plant or materials not supplied by the Contractor, pursuant to the Contract Agreement.</p> <p>44.2 If any proceedings are brought or any claim is made against the Employer arising out of the matters referred to in GCC Sub-Clause 29.1, the Employer shall promptly give the Contractor a notice thereof, and the Contractor may at its own expense and in the Employer's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.</p> <p>If the Contractor fails to notify the Employer within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Employer shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Employer within the twenty-eight (28) day period, the Employer shall make no admission that may be prejudicial to the defense of any such proceedings or claim.</p> <p>The Employer shall, at the Contractor's request, afford all available assistance to the Contractor in conducting such proceedings or claim, and shall be reimbursed by the Contractor for all reasonable expenses incurred in so doing.</p> <p>44.3 The Employer shall indemnify and hold harmless the Contractor and its employees, officers and Subcontractors from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Contractor may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract arising out of or in connection with any design, data, drawing, specification, or other documents or materials</p>

	provided or designed by or on behalf of the Employer.
45. Limitation of Liability	<p>45.1 Except in cases of criminal negligence or willful misconduct,</p> <p>(a) neither Party shall be liable to the other Party, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, which may be suffered by the other Party in connection with the Contract, other than specifically provided as any obligation of the Party in the Contract, and</p> <p>(b) the aggregate liability of the Contractor to the Employer, whether under the Contract, in tort or otherwise, shall not exceed the amount resulting from the application of the multiplier specified in the PCC, to the Contract Price or, if a multiplier is not so specified, the total Contract Price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment, or to any obligation of the Contractor to indemnify the Employer with respect to patent infringement..</p>
E. Risk Distribution	
46. Transfer of Ownership	<p>46.1 Ownership of the Plant (including spare parts) to be imported into the country where the Site is located shall be transferred to the Employer upon loading on to the mode of transport to be used to convey the Plant from the country of origin to that country.</p> <p>46.2 Ownership of the Plant (including spare parts) procured in the country where the Site is located shall be transferred to the Employer when the Plant are brought on to the Site.</p> <p>46.3 Ownership of the Contractor's Equipment used by the Contractor and its Subcontractors in connection with the Contract shall remain with the Contractor or its Subcontractors.</p> <p>46.4 Ownership of any Plant in excess of the requirements for the Facilities shall revert to the Contractor upon Completion of the Facilities or at such earlier time when the Employer and the Contractor agree that the Plant in question are no longer required for the Facilities.</p> <p>46.5 Notwithstanding the transfer of ownership of the Plant, the responsibility for care and custody thereof together with the risk of loss or damage thereto shall remain with the Contractor pursuant to GCC Clause 32 (Care of Facilities) hereof until Completion of the Facilities or the part thereof in which such Plant are incorporated.</p>
47. Care of Facilities	<p>47.1 The Contractor shall be responsible for the care and custody of the Facilities or any part thereof until the date of Completion of the Facilities pursuant to GCC Clause 39 or, where the Contract provides for Completion of the Facilities in parts, until the date of Completion of the relevant part, and shall make good at its own cost any loss or damage that may occur to the Facilities or the relevant part thereof from any cause whatsoever during such period. The Contractor shall also be responsible for any loss or damage to the Facilities caused by the Contractor or its Subcontractors in the course of any work carried out, pursuant to GCC Clause 42. Notwithstanding the foregoing, the Contractor shall not be liable for any loss or damage to the Facilities or that part thereof caused by reason of any of the matters specified or</p>

	<p>referred to in paragraphs (a), (b) and (c) of GCC Sub-Clauses 48.2.</p> <p>47.2 If any loss or damage occurs to the Facilities or any part thereof or to the Contractor's temporary facilities by reason of</p> <p>(a) insofar as they relate to the country where the Site is located, nuclear reaction, nuclear radiation, radioactive contamination, pressure wave caused by aircraft or other aerial objects, or any other occurrences that an experienced contractor could not reasonably foresee, or if reasonably foreseeable could not reasonably make provision for or insure against, insofar as such risks are not normally insurable on the insurance market and are mentioned in the general exclusions of the policy of insurance, including War Risks and Political Risks, taken out under GCC Clause 34 hereof; or</p> <p>(b) any use or occupation by the Employer or any third Party other than a Subcontractor, authorized by the Employer of any part of the Facilities; or</p> <p>(c) any use of or reliance upon any design, data or specification provided or designated by or on behalf of the Employer, or any such matter for which the Contractor has disclaimed responsibility herein,</p> <p>47.3 the Employer shall pay to the Contractor all sums payable in respect of the Facilities executed, notwithstanding that the same be lost, destroyed or damaged, and will pay to the Contractor the replacement value of all temporary facilities and all parts thereof lost, destroyed or damaged. If the Employer requests the Contractor in writing to make good any loss or damage to the Facilities thereby occasioned, the Contractor shall make good the same at the cost of the Employer in accordance with GCC Clause 64. If the Employer does not request the Contractor in writing to make good any loss or damage to the Facilities thereby occasioned, the Employer shall either request a change in accordance with GCC Clause 64, excluding the performance of that part of the Facilities thereby lost, destroyed or damaged, or, where the loss or damage affects a substantial part of the Facilities, the Employer shall terminate the Contract pursuant to GCC Sub-Clause 66.1 hereof.</p> <p>47.4 The Contractor shall be liable for any loss of or damage to any Contractor's Equipment, or any other property of the Contractor used or intended to be used for purposes of the Facilities, except (i) as mentioned in GCC Sub-Clause 42.2 with respect to the Contractor's temporary facilities, and (ii) where such loss or damage arises by reason of any of the matters specified in GCC Sub-Clauses 47.2 (b) and (c).</p>
<p>48. Loss of or Damage to Property; Accident or Injury to Workers; Indemnification</p>	<p>48.1 Subject to GCC Sub-Clause 48.3, the Contractor shall indemnify and hold harmless the Employer and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, in respect of the death or injury of any person or loss of or damage to any property other than the Facilities whether accepted or not, arising in connection with the supply and</p>

	<p>installation of the Facilities and by reason of the negligence of the Contractor or its Subcontractors, or their employees, officers or agents, except any injury, death or property damage caused by the negligence of the Employer, its contractors, employees, officers or agents.</p> <p>48.2 If any proceedings are brought or any claim is made against the Employer that might subject the Contractor to liability under GCC Sub-Clause 48.1, the Employer shall promptly give the Contractor a notice thereof and the Contractor may at its own expense and in the Employer's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.</p> <p>48.3 If the Contractor fails to notify the Employer within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Employer shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Employer within the twenty-eight (28) day period, the Employer shall make no admission that may be prejudicial to the defense of any such proceedings or claim.</p> <p>The Employer shall, at the Contractor's request, afford all available assistance to the Contractor in conducting such proceedings or claim, and shall be reimbursed by the Contractor for all reasonable expenses incurred in so doing.</p> <p>48.4 The Employer shall indemnify and hold harmless the Contractor and its employees, officers and Subcontractors from any liability for loss of or damage to property of the Employer, other than the Facilities not yet taken over, that is caused by fire, explosion or any other perils, in excess of the amount recoverable from insurances procured under GCC Clause 49, provided that such fire, explosion or other perils were not caused by any act or failure of the Contractor.</p> <p>48.5 The Party entitled to the benefit of an indemnity under this GCC Clause 48 shall take all reasonable measures to mitigate any loss or damage which has occurred. If the Party fails to take such measures, the other Party's liabilities shall be correspondingly reduced.</p>
<p>49. Insurance</p>	<p>49.1 To the extent specified in the Appendix to the Contract Agreement titled Insurance Requirements, the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurances set forth below in the sums and with the deductibles and other conditions specified in the said Appendix. The identity of the insurers and the form of the policies shall be subject to the approval of the Employer, who should not unreasonably withhold such approval.</p> <p>(a) Cargo Insurance During Transport Covering loss or damage occurring while in transit from the Contractor's or Subcontractor's works or stores until arrival at the Site, to the Plant (including spare parts therefor) and to the Contractor's Equipment.</p>

	<p>(b) <u>Installation All Risks Insurance</u> Covering physical loss or damage to the Facilities at the Site, occurring prior to Completion of the Facilities, with extended maintenance coverage for the Contractor’s liability in respect of any loss or damage occurring during the Defect Liability Period while the Contractor is on the Site for the purpose of performing its obligations during the Defect Liability Period.</p> <p>(c) <u>Third Party Liability Insurance</u> Covering bodily injury or death suffered by third Parties including the Employer’s personnel, and loss of or damage to property occurring in connection with the supply and installation of the Facilities.</p> <p>(d) <u>Automobile Liability Insurance</u> Covering use of all vehicles used by the Contractor or its Subcontractors, whether or not owned by them, in connection with the execution of the Contract.</p> <p>(e) <u>Workers’ Compensation</u> In accordance with the statutory requirements applicable in any country where the Contract or any part thereof is executed.</p> <p>(f) <u>Employer’s Liability</u> In accordance with the statutory requirements applicable in any country where the Contract or any part thereof is executed.</p> <p>(g) <u>Other Insurances</u> Such other insurances as may be specifically agreed upon by the Parties hereto as listed in the Appendix to the Contract Agreement titled Insurance Requirements.</p> <p>49.2 The Employer shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 49.1, except for the Third Party Liability, Workers’ Compensation and Employer’s Liability Insurances, and the Contractor’s Subcontractors shall be named as co-insureds under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 49.1 except for the Cargo Insurance during Transportation, Workers’ Compensation and Employer’s Liability Insurances. All insurer’s rights of subrogation against such co-insureds for losses or claims arising out of the performance of the Contract shall be waived under such policies.</p> <p>49.3 The Contractor shall, in accordance with the provisions of the Appendix to the Contract Agreement titled Insurance Requirements, deliver to the Employer certificates of insurance or copies of the insurance policies as evidence that the required policies are in full force and effect. The certificates shall provide that no less than twenty-one (21) days’ notice shall be given to the Employer by insurers prior to cancellation or material modification of a policy.</p> <p>49.4 The Contractor shall ensure that, where applicable, its Subcontractor(s) shall take out and maintain in effect adequate insurance policies for their personnel and vehicles and for work executed by them under the Contract, unless such Subcontractors are covered by the policies taken out by the Contractor.</p>
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	<p>49.5 The Employer shall at its expense take out and maintain in effect during the performance of the Contract those insurances specified in the Appendix to the Contract Agreement titled Insurance Requirements, in the sums and with the deductibles and other conditions specified in the said Appendix. The Contractor and the Contractor's Subcontractors shall be named as co-insured under all such policies. All insurers' rights of subrogation against such co-insured for losses or claims arising out of the performance of the Contract shall be waived under such policies. The Employer shall deliver to the Contractor satisfactory evidence that the required insurances are in full force and effect. The policies shall provide that not less than twenty-one (21) days' notice shall be given to the Contractor by all insurers prior to any cancellation or material modification of the policies. If so requested by the Contractor, the Employer shall provide copies of the policies taken out by the Employer under this GCC Sub-Clause 49.5.</p> <p>49.6 If the Contractor fails to take out and/or maintain in effect the insurances referred to in GCC Sub-Clause 49.1, the Employer may take out and maintain in effect any such insurances and may from time to time deduct from any amount due to the Contractor under the Contract any premium that the Employer shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Contractor. If the Employer fails to take out and/or maintain in effect the insurances referred to in GCC 49.5, the Contractor may take out and maintain in effect any such insurances and may from time to time deduct from any amount due the Employer under the Contract any premium that the Contractor shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Employer. If the Contractor fails to or is unable to take out and maintain in effect any such insurances, the Contractor shall nevertheless have no liability or responsibility towards the Employer, and the Contractor shall have full recourse against the Employer for any and all liabilities of the Employer herein.</p> <p>49.7 Unless otherwise provided in the Contract, the Contractor shall prepare and conduct all and any claims made under the policies affected by it pursuant to this GCC Clause 49, and all monies payable by any insurers shall be paid to the Contractor. The Employer shall give to the Contractor all such reasonable assistance as may be required by the Contractor. With respect to insurance claims in which the Employer's interest is involved, the Contractor shall not give any release or make any compromise with the insurer without the prior written consent of the Employer. With respect to insurance claims in which the Contractor's interest is involved, the Employer shall not give any release or make any compromise with the insurer without the prior written consent of the Contractor.</p>
<p>50. Unforeseen Conditions</p>	<p>50.1 If, during the execution of the Contract, the Contractor shall encounter on the Site any physical conditions other than climatic conditions, or artificial obstructions that could not have been reasonably foreseen prior to the date of the Contract Agreement by an experienced contractor on the basis of reasonable</p>

	<p>examination of the data relating to the Facilities including any data as to boring tests, provided by the Employer, and on the basis of information that it could have obtained from a visual inspection of the Site if access thereto was available, or other data readily available to it relating to the Facilities, and if the Contractor determines that it will in consequence of such conditions or obstructions incur additional cost and expense or require additional time to perform its obligations under the Contract that would not have been required if such physical conditions or artificial obstructions had not been encountered, the Contractor shall promptly, and before performing additional work or using additional Plant or Contractor's Equipment, notify the Project Manager in writing beforehand:</p> <p>(a) the physical conditions or artificial obstructions on the Site that could not have been reasonably foreseen;</p> <p>(b) the additional work and/or Plant and/or Contractor's Equipment required, including the steps which the Contractor will or proposes to take to overcome such conditions or obstructions;</p> <p>(c) the extent of the anticipated delay; and</p> <p>(d) the additional cost and expense that the Contractor is likely to incur.)</p> <p>On receiving any notice from the Contractor under this GCC Sub-Clause 50.1, the Project Manager shall promptly consult with the Employer and Contractor and decide upon the actions to be taken to overcome the physical conditions or artificial obstructions encountered. Following such consultations, the Project Manager shall instruct the Contractor, with a copy to the Employer, of the actions to be taken.</p> <p>50.2 Any reasonable additional cost and expense incurred by the Contractor in following the instructions from the Project Manager to overcome such physical conditions or artificial obstructions referred to in GCC Sub-Clause 50.1 shall be paid by the Employer to the Contractor as an addition to the Contract Price.</p> <p>50.3 If the Contractor is delayed or impeded in the performance of the Contract because of any such physical conditions or artificial obstructions referred to in GCC Sub-Clause 50.1, the Time for Completion shall be extended in accordance with GCC Clause 60.</p>
<p>51. Change in Laws and Regulation</p>	<p>51.1 Unless otherwise specified in the Contract, if after the Contract, any law, regulation, ordinance, order or bylaw having the force of law is enacted, promulgated, abrogated, or changed in Bangladesh (which shall be deemed to include any change in interpretation or application by the competent authorities) that subsequently affects the Delivery Date and/or the Contract Price, then such Delivery Date and/or Contract Price shall be correspondingly increased or decreased, to the extent that the Supplier has thereby been affected in the performance of any of its obligations under the Contract.</p>

52. Force Majeure	<p>52.1 In this Clause, “Force Majeure” means an exceptional event or circumstance:</p> <ul style="list-style-type: none"> (a) which is beyond a Party’s control; (b) which such Party could not reasonably have provided against before entering into the Contract; (c) which, having arisen, such Party could not reasonably have avoided or overcome; and (d) which is not substantially attributable to the other Party.
	<p>52.2 Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:</p> <ul style="list-style-type: none"> (i) war, hostilities (whether war be declared or not), invasion, act of foreign enemies; (ii) rebellion, terrorism, sabotage by persons other than the Contractor’s Personnel, revolution, insurrection, military or usurped power, or civil war; (iii) riot, commotion, disorder, strike or lockout by persons other than the Contractor’s Personnel; (iv) munitions of war, explosive materials, ionising radiation or contamination by radio-activity, except as may be attributable to the Contractor’s use of such munitions, explosives, radiation or radio-activity, and (v) natural catastrophes such as cyclone, hurricane, typhoon, tsunami, storm surge, floods, earthquake, landslides, fires, epidemics, quarantine restrictions, or volcanic activity; (vi) freight embargoes; (vii) acts of the Government in its sovereign capacity.
53. Notice of Force Majeure	<p>53.1 If a Party is or will be prevented from performing its substantial obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure</p>
	<p>53.2 The Party shall, having given notice, be excused performance of its obligations for so long as such Force Majeure prevents it from performing them.</p>
	<p>53.3 Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.</p>
54. Duty to Minimize Delay	<p>54.1 Each Party shall at all times use all reasonable endeavors to minimize any delay in the performance of the Contract as a result of Force Majeure.</p>
	<p>54.2 A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.</p>

<p>55. Consequences of Force Majeure</p>	<p>55.1 The Contractor shall not be liable for forfeiture of its Performance Security, liquidated damages, or termination for default if and to the extent that it's delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure:</p> <p>55.2 The Employer may suspend the delivery or contract implementation, wholly or partly, by written order for a certain period of time, as it deems necessary due to force majeure as defined in the contract.</p> <p>55.3 Delivery made either upon the lifting or the expiration of the suspension order. However, if the Employer terminates the contract as stated under GCC clause 66, resumption of delivery cannot be done.</p> <p>55.4 The Employer determines the existence of a force majeure that will be the basis of the issuance of suspension of order.</p>
<p>F. Payment</p>	
<p>56. Contract Price</p>	<p>56.1 The Contract Price shall be paid as specified in the Contract Agreement Form PG5A- 8.</p> <p>56.2 Unless an adjustment clause is provided for in the PCC, the Contract Price shall be a firm lump sum not subject to any alteration, except in the event of a Change in the Facilities or as otherwise provided in the Contract.</p> <p>56.3 Subject to GCC Sub-Clauses 25.2, 26.1 and 50 hereof, the Contractor shall be deemed to have satisfied itself as to the correctness and sufficiency of the Contract Price, which shall, except as otherwise provided for in the Contract, cover all its obligations under the Contract.</p> <p>56.4 Prices shall be adjusted for fluctuations in the cost of inputs only if provided for in the PCC. If so provided, the amounts as certified in each payment certificate, before deducting for Advance Payment, shall be adjusted by applying the respective price adjustment factor to the payment amount. The generic formula indicated below in the form as specified in the PCC applies:</p> <p>$P = A + B (I_m/I_o)$</p> <p>where:</p> <p>P is the adjustment factor</p> <p>A and B are Coefficients specified in the PCC, representing the nonadjustable and adjustable portions, respectively, of the Contract; and</p> <p>I_m is the Index during the month the work has been executed and I_o is the Index prevailing twenty eight (28) days prior to the deadline for submission of Tender.</p> <p>The Indexes to be used is as published by the Bangladesh Bureau of Statistics (BBS) on a monthly basis. In case not available, then other countries or authorities of the sources mentioned in Appendix to the Tender may be used.</p> <p>56.5 If the value of the Index is changed after it has been used in a calculation, the calculation shall be corrected and an adjustment</p>

	made in the next or in the final payment certificate. The Index value shall be deemed to take account of all changes in price due to fluctuations.
57. Terms of Payment	<p>57.1 The Contract Price shall be paid as specified in the Contract Agreement and in the Appendix to the Contract Agreement titled Terms and Procedures of Payment, which also outlines the procedures to be followed in making application for and processing payments.</p> <p>57.2 No payment made by the Employer herein shall be deemed to constitute acceptance by the Employer of the Facilities or any part(s) thereof.</p> <p>57.3 In the event that the Employer fails to make any payment by its respective due date or within the period set forth in the Contract, the Employer shall pay to the Contractor interest on the amount of such delayed payment at the rate(s) shown in the Appendices to the Contract Agreement titled Terms and Procedures of Payment, for the period of delay until payment has been made in full, whether before or after judgment or arbitration award.</p> <p>57.4 The currency or currencies in which payments are made to the Contractor under this Contract shall be specified in the Appendices to the Contract Agreement titled Terms and Procedures of Payment, subject to the general principle that payments will be made in the currency or currencies in which the Contract Price has been stated in the Contractor's tender.</p>
58. Advance Payment Security	<p>58.1 The Contractor shall, within twenty-eight (28) days of the notification of contract award, provide a security in an amount equal to the advance payment calculated in accordance with the Appendix to the Contract Agreement titled Terms and Procedures of Payment, and in the same currency or currencies.</p> <p>58.2 The security shall be in the form provided in the tender documents or in another form acceptable to the Employer. The amount of the security shall be reduced in proportion to the value of the Facilities executed by and paid to the Contractor from time to time, and shall automatically become null and void when the full amount of the advance payment has been recovered by the Employer. The security shall be returned to the Contractor immediately after its expiration.</p>
59. Performance Security	<p>59.1 The Contractor shall, within twenty-eight (28) days of the notification of contract award, provide a security for the due performance of the Contract in the amount specified in the PCC.</p> <p>59.2 The performance security shall be denominated in the currency or currencies of the Contract, or in a freely convertible currency acceptable to the Employer, and shall be in the form provided in Section 5, Tender and Contract Forms, corresponding to the type of bank guarantee stipulated by the Employer in the PCC, or in another form acceptable to the Employer.</p> <p>59.3 Unless otherwise specified in the PCC, the security shall be reduced by half on the date of the Operational Acceptance. The Security shall become null and void, or shall be reduced pro rata to the Contract Price of a part of the Facilities for which a separate</p>

	<p>Time for Completion is provided, five hundred and forty (540) days after Completion of the Facilities or three hundred and sixty five (365) days after Operational Acceptance of the Facilities, whichever occurs first; provided, however, that if the Defects Liability Period has been extended on any part of the Facilities pursuant to GCC Sub-Clause 42.8 hereof, the Contractor shall issue an additional security in an amount proportionate to the Contract Price of that part. The security shall be returned to the Contractor immediately after its expiration, provided, however, that if the Contractor, pursuant to GCC Sub-Clause 42.10, is liable for an extended defect liability obligation, the performance security shall be extended for the period specified in the PCC pursuant to GCC Sub-Clause 42.10 and up to the amount specified in the PCC.</p> <p>59.4 The Employer shall not make a claim under the Performance Security, except for amounts to which the Employer is entitled under the Contract. The Employer shall indemnify and hold the Contractor harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from a claim under the Performance Security to the extent to which the Employer was not entitled to make the claim.</p>
<p>60. Taxes and Duties</p>	<p>60.1 The Contractor shall be entirely responsible for all kinds of taxes, duties, fees, levies, and such other charges assessed on the Contractor, its Subcontractors or their employees by all municipal, state or national government authorities in connection with the Facilities in and outside of the country where the Site is located.</p> <p>60.2 Notwithstanding GCC Sub-Clause 60.1 above, the Employer shall bear and promptly pay</p> <ul style="list-style-type: none"> (a) all customs and import duties for the Plant specified in Price Schedule No. 1; and (b) other domestic taxes such as, sales tax and value added tax (VAT) on the Plant specified in Price Schedules No. 1 and No. 2 and that is to be incorporated into the Facilities, and on the finished goods, imposed by the law of the country where the Site is located. <p>60.3 If any tax exemptions, reductions, allowances or privileges may be available to the Contractor in the country where the Site is located, the Employer shall use its best endeavours to enable the Contractor to benefit from any such tax savings to the maximum allowable extent.</p>
<p>61. Payments to Nominated Subcontractor(s)</p>	<p>61.1 The Contractor shall pay to the Nominated Subcontractor(s) the amounts shown on the Nominated Subcontractor's invoices approved by the Contractor in accordance with the subcontract included under the Contract.</p>
<p>62. Price Adjustment</p>	<p>62.1 Where the Contract Period (excluding the Defects Liability Period) exceeds eighteen (18) months, it is normal procedure that prices payable to the Contractor shall be subject to adjustment during the performance of the Contract to reflect changes occurring in the cost of labour and material components. In such cases the tender documents shall include in the Appendix 2, a formula of such price</p>

	<p>adjustment.</p> <p>62.2 Where Contracts are of a shorter duration than eighteen (18) months or in cases where there is to be no Price Adjustment, the following provision shall not be included. Instead, it shall be indicated under this Appendix 2 that the prices are to remain firm and fixed for the duration of the Contract.</p> <p>62.3 If the value of the Index is changed after it has been used in a calculation, the calculation shall be corrected and an adjustment made in the next or in the final payment certificate. The Index value shall be deemed to take account of all changes in price due to fluctuations.</p>
<p>63. Liquidated Damages</p>	<p>63.1 The Contractor shall be liable to pay Liquidated Damages or in other words the Delay Damages to the Employer at the rate per day as specified in the PCC for each day of delay from the Intended Completion Date, for the uncompleted delivery of goods/works/services or for any part thereof.</p> <p>63.2 The total amount of Liquidated Damages shall not exceed the amount defined in the PCC.</p> <p>63.3 Once the cumulative amount of Liquidated Damages reaches ten (10) percent of the Contract price, the Employer may rescind the Contract, without prejudice to other courses of action and remedies open to it.</p> <p>63.4 The amount of Liquidated Damages may be deducted from any money due or which may become due to the Contractor under the Contract and/or collect such amount of Liquidated Damages from the Retention Money (if any) or other securities posted by the Contractor whichever is convenient to the Employer. In an extreme situation that no such foregoing recourse is available, the contractor be asked to make good the damages from his own finances in writing failing which necessary action as per the provisions of this GCC or PCC be taken.</p> <p>63.5 Payment of Liquidated Damages by the Contractor shall not relieve the Contractor from its obligations.</p> <p>63.6 If the Intended Completion Date is extended after Liquidated Damages have been paid, the Engineer shall correct any overpayment of Liquidated Damages by the Contractor by adjusting the next payment certificate.</p>
<p>G. Change in Contract Elements</p>	
<p>64. Change in the Facilities</p>	<p>64.1 <u>Introducing a Change</u></p> <p>64.1.1 Subject to GCC Sub-Clauses 64.2.5 and 64.2.7, the Employer shall have the right to propose, and subsequently require, that the Project Manager order the Contractor from time to time during the performance of the Contract to make any change, modification, addition or deletion to, in or from the Facilities hereinafter called “Change”, provided that such Change falls within the general scope of the Facilities and does not constitute unrelated work and that it is technically practicable, taking into account both the state of advancement of the Facilities and the technical compatibility of the Change envisaged with the nature of</p>

	<p>the Facilities as specified in the Contract</p> <p>64.1.2 The Contractor may from time to time during its performance of the Contract propose to the Employer with a copy to the Project Manager, any Change that the Contractor considers necessary or desirable to improve the quality, efficiency or safety of the Facilities. The Employer may at its discretion approve or reject any Change proposed by the Contractor, provided that the Employer shall approve any Change proposed by the Contractor to ensure the safety of the Facilities.</p>
	<p>64.1.3 Notwithstanding GCC Sub-Clauses 64.1.1 and 64.1.2, no change made necessary because of any default of the Contractor in the performance of its obligations under the Contract shall be deemed to be a Change, and such change shall not result in any adjustment of the Contract Price or the Time for Completion.</p> <p>64.1.4 The procedure on how to proceed with and execute Changes is specified in GCC Sub-Clauses 64.2 and 64.3, and further details and forms are provided in the Employer's Requirements (Forms and Procedures).</p> <p>64.2 <u>Changes Originating from Employer</u></p> <p>64.2.1 If the Employer proposes a Change pursuant to GCC Sub-Clause 64.1.1, it shall send to the Contractor a "Request for Change Proposal," requiring the Contractor to prepare and furnish to the Project Manager as soon as reasonably practicable a "Change Proposal," which shall include the following:</p> <ul style="list-style-type: none"> (a) brief description of the Change (b) effect on the Time for Completion (c) estimated cost of the Change (d) effect on Functional Guarantees (if any) (e) effect on the Facilities (f) effect on any other provisions of the Contract. <p>64.2.2 Prior to preparing and submitting the "Change Proposal," the Contractor shall submit to the Project Manager an "Estimate for Change Proposal," which shall be an estimate of the cost of preparing and submitting the Change Proposal.</p> <p>Upon receipt of the Contractor's Estimate for Change Proposal, the Employer shall do one of the following:</p> <ul style="list-style-type: none"> (a) accept the Contractor's estimate with instructions to the Contractor to proceed with the preparation of the Change Proposal (b) advise the Contractor of any part of its Estimate for Change Proposal that is unacceptable and request the Contractor to review its estimate (c) advise the Contractor that the Employer does not intend to proceed with the Change. <p>64.2.3 Upon receipt of the Employer's instruction to proceed under</p>

	<p>GCC Sub-Clause 64.2.2 (a), the Contractor shall, with proper expedition, proceed with the preparation of the Change Proposal, in accordance with GCC Sub-Clause 64.2.1.</p>
	<p>64.2.4 The pricing of any Change shall, as far as practicable, be calculated in accordance with the rates and prices included in the Contract. If such rates and prices are inequitable, the Parties thereto shall agree on specific rates for the valuation of the Change</p>
	<p>.64.2.5 If before or during the preparation of the Change Proposal it becomes apparent that the aggregate effect of compliance therewith and with all other Change Orders that have already become binding upon the Contractor under this GCC Clause 64 would be to increase or decrease the Contract Price as originally set forth in Article 2 (Contract Price) of the Contract Agreement by more than fifteen percent (15%), the Contractor may give a written notice of objection thereto prior to furnishing the Change Proposal as aforesaid. If the Employer accepts the Contractor's objection, the Employer shall withdraw the proposed Change and shall notify the Contractor in writing thereof.</p> <p>The Contractor's failure to so object shall neither affect its right to object to any subsequent requested Changes or Change Orders herein, nor affect its right to take into account, when making such subsequent objection, the percentage increase or decrease in the Contract Price that any Change not objected to by the Contractor represents.</p>
	<p>64.2.6 Upon receipt of the Change Proposal, the Employer and the Contractor shall mutually agree upon all matters therein contained. Within fourteen (14) days after such agreement, the Employer shall, if it intends to proceed with the Change, issue the Contractor with a Change Order.</p> <p>If the Employer is unable to reach a decision within fourteen (14) days, it shall notify the Contractor with details of when the Contractor can expect a decision.</p> <p>If the Employer decides not to proceed with the Change for whatever reason, it shall, within the said period of fourteen (14) days, notify the Contractor accordingly. Under such circumstances, the Contractor shall be entitled to reimbursement of all costs reasonably incurred by it in the preparation of the Change Proposal, provided that these do not exceed the amount given by the Contractor in its Estimate for Change Proposal submitted in accordance with GCC Sub-Clause 64.2.2.</p> <p>64.2.7 If the Employer and the Contractor cannot reach agreement on the price for the Change, an equitable adjustment to the Time for Completion, or any other matters identified in the Change Proposal, the Employer may nevertheless instruct the Contractor to proceed with the Change by issue of a "Pending Agreement Change Order."</p>

	<p>Upon receipt of a Pending Agreement Change Order, the Contractor shall immediately proceed with effecting the Changes covered by such Order. The Parties shall thereafter attempt to reach agreement on the outstanding issues under the Change Proposal.</p>
	<p>64.3 Changes Originating from Contractor</p> <p>64.3.1 If the Contractor proposes a Change pursuant to GCC Sub-Clause 64.1.2, the Contractor shall submit to the Project Manager a written "Application for Change Proposal," giving reasons for the proposed Change and including the information specified in GCC Sub-Clause 64.2.1. Upon receipt of the Application for Change Proposal, the Parties shall follow the procedures outlined in GCC Sub-Clauses 64.2.6 and</p> <p>64.3.2. However, should the Employer choose not to proceed, the Contractor shall not be entitled to recover the costs of preparing the Application for Change Proposal.</p>
<p>65. Extension of Time for Completion</p>	<p>65.1 The Time(s) for Completion specified in the PCC pursuant to GCC Sub-Clause 8.2 shall be extended if the Contractor is delayed or impeded in the performance of any of its obligations under the Contract by reason of any of the following:</p> <ul style="list-style-type: none"> (a) any Change in the Facilities as provided in GCC Clause 64 (b) any occurrence of Force Majeure as provided in GCC Clause 52, unforeseen conditions as provided in GCC Clause 50, or other occurrence of any of the matters specified or referred to in paragraphs (a), (b) and (c) of GCC Sub-Clause 47.2 (c) any suspension order given by the Employer under GCC Clause 41 hereof or reduction in the rate of progress pursuant to GCC Sub-Clause 66.2 or (d) any changes in laws and regulations as provided in GCC Clause 51 or (e) any default or breach of the Contract by the Employer, Appendix to the Contract Agreement titled ,or any activity, act or omission of the Employer, or the Project Manager, or any other contractors employed by the Employer, or (f) any delay on the part of a sub-contractor, provided such delay is due to a cause for which the Contractor himself would have been entitled to an extension of time under this sub-clause, or (g) delays attributable to the Employer or caused by customs, or (h) any other matter specifically mentioned in the Contract <p>by such period as shall be fair and reasonable in all the circumstances and as shall fairly reflect the delay or impediment sustained by the Contractor.</p>

	<p>65.2 Except where otherwise specifically provided in the Contract, the Contractor shall submit to the Project Manager a notice of a claim for an extension of the Time for Completion, together with particulars of the event or circumstance justifying such extension as soon as reasonably practicable after the commencement of such event or circumstance. As soon as reasonably practicable after receipt of such notice and supporting particulars of the claim, the Employer and the Contractor shall agree upon the period of such extension. The Contractor shall at all times use its reasonable efforts to minimize any delay in the performance of its obligations under the Contract.</p> <p>In all cases where the Contractor has given a notice of a claim for an extension of time under GCC 65.2, the Contractor shall consult with the Project Manager in order to determine the steps (if any) which can be taken to overcome or minimize the actual or anticipated delay. The Contractor shall there after comply with all reasonable instructions which the Project Manager shall give in order to minimize such delay. If compliance with such instructions shall cause the Contractor to incur extra costs and the Contractor is entitled to an extension of time under GCC 65.1, the amount of such extra costs shall be added to the Contract Price.</p>
<p>66. Suspension</p>	<p>66.1 The Employer may request the Project Manager, by notice to the Contractor, to order the Contractor to suspend performance of any or all of its obligations under the Contract. Such notice shall specify the obligation of which performance is to be suspended, the effective date of the suspension and the reasons thereof. The Contractor shall thereupon suspend performance of such obligation, except those obligations necessary for the care or preservation of the Facilities, until ordered in writing to resume such performance by the Project Manager..</p> <p>If, by virtue of a suspension order given by the Project Manager, other than by reason of the Contractor's default or breach of the Contract, the Contractor's performance of any of its obligations is suspended for an aggregate period of more than ninety (90) days, then at any time thereafter and provided that at that time such performance is still suspended, the Contractor may give a notice to the Project Manager requiring that the Employer shall, within twenty-eight (28) days of receipt of the notice, order the resumption of such performance or request and subsequently order a change in accordance with GCC Clause 64, excluding the performance of the suspended obligations from the Contract.</p> <p>If the Employer fails to do so within such period, the Contractor may, by a further notice to the Project Manager, elect to treat the suspension, where it affects a part only of the Facilities, as a deletion of such part in accordance with GCC Clause 64 or, where it affects the whole of the Facilities, as termination of the Contract under GCC Sub-Clause 66.1.</p>

	<p>66.2 if</p> <p>(a) the Employer has failed to pay the Contractor any sum due under the Contract within the specified period, has failed to approve any invoice or supporting documents without just cause pursuant to the Appendix to the Contract Agreement titled Terms and Procedures of Payment, or commits a substantial breach of the Contract, the Contractor may give a notice to the Employer that requires payment of such sum, with interest thereon as stipulated in GCC Sub-Clause 57.3, requires approval of such invoice or supporting documents, or specifies the breach and requires the Employer to remedy the same, as the case may be. If the Employer fails to pay such sum together with such interest, fails to approve such invoice or supporting documents or give its reasons for withholding such approval, or fails to remedy the breach or take steps to remedy the breach within fourteen (14) days after receipt of the Contractor's notice or</p> <p>(b) the Contractor is unable to carry out any of its obligations under the Contract for any reason attributable to the Employer, including but not limited to the Employer's failure to provide possession of or access to the Site or other areas in accordance with GCC Sub-Clause 25.2, or failure to obtain any governmental permit necessary for the execution and/or completion of the Facilities,</p> <p>then the Contractor may by fourteen (14) days' notice to the Employer suspend performance of all or any of its obligations under the Contract, or reduce the rate of progress.</p> <p>66.3 If the Contractor's performance of its obligations is suspended or the rate of progress is reduced pursuant to this GCC Clause 66, then the Time for Completion shall be extended in accordance with GCC Sub-Clause 40.1, and any and all additional costs or expenses incurred by the Contractor as a result of such suspension or reduction shall be paid by the Employer to the Contractor in addition to the Contract Price, except in the case of suspension order or reduction in the rate of progress by reason of the Contractor's default or breach of the Contract.</p> <p>66.4 During the period of suspension, the Contractor shall not remove from the Site any Plant, any part of the Facilities or any Contractor's Equipment, without the prior written consent of the Employer.</p>
<p>H. Termination and Settlement of Disputes</p>	
<p>67. Termination</p>	<p>67.1 <u>Termination for Default</u></p> <p>(a) The Employer or the Contractor, without prejudice to any other remedy for breach of Contract, by giving twenty eight (28) days written notice of default to the other party, may terminate the Contract in whole or in part if the other party causes a fundamental breach of Contract.</p> <p>(b) Fundamental breaches of the Contract shall include, but shall</p>

	<p>not be limited to, the following:</p> <ul style="list-style-type: none"> (i) the Contractor stops work for twenty-eight (28) days when no stoppage of work is shown on the current Programme and the stoppage has not been authorized by the Engineer; (ii) the Engineer instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within twenty-eight (28) days; (iii) the Engineer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer; (iv) the Engineer gives Notice that the failure to achieve the progress in accordance with the updated Programme of Works by the Contractor is a non-fulfilment of contractual obligations and the Contractor fails to restore it within a reasonable period of time instructed by the Engineer; (v) the Contractor does not maintain a Security, which is required; (vi) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of Liquidated Damages can be paid, as specified in GCC Sub Clause 41.2; (vii) the Contractor has subcontracted the whole of the Works or has assigned the Contract without the required agreement and without the approval of the Engineer; (viii) the Contractor, in the judgment of the Employer has engaged in practices, as defined in GCC Sub Clause 39, in competing for or in executing the Contract. <p>(c) A payment certified by the Engineer is not paid by the Employer to the Contractor within twenty eight (28) days of the date of the Engineer's certificate.</p>
	<p>67.2 <u>Termination for Insolvency</u></p> <p>The Employer and the Contractor may at any time terminate the Contract by giving twenty eight (28) days written notice to the other party if either of the party becomes bankrupt or otherwise insolvent. In such event, termination will be without compensation to any party, provided that such termination will not prejudice or affect any right of action or remedy that has accrued or will accrue thereafter to the other party.</p> <p>67.3 <u>Termination for Convenience</u></p> <p>(a) The Employer, by giving twenty eight (28) days written notice sent to the Contractor, may terminate the Contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination is for the Employer's convenience, the extent to which performance of the Contractor under the Contract is terminated, and the date upon which such termination becomes effective. The termination shall take effect twenty eight (28) days after the later dates on which the Contractor receives</p>

	<p>this notice or the Employer returns the Performance Security.</p> <p>(b) The Employer shall not terminate the contract under GCC Sub Clause 67.1 (a) in order to execute the contract itself or to arrange for the Works to be executed by another contractor or to avoid a termination of the Contract by the Contractor as stated under GCC Sub Clause 67.1(a).</p> <p>67.4 In the event the Employer terminates the Contract in whole or in part, the Employer shall accept the portion of the Works that are complete and ready for handing over after the Contractor's receipt of notice of termination of the Contract. For the remaining portion of the Works, the Employer may elect:</p> <p>(a) to have any portion completed by the Contractor at the Contract terms and prices; and /or</p> <p>(b) to cancel the remainder and pay to the Contractor an agreed amount for partially completed Works and for materials and parts previously procured by the Contractor, or</p> <p>(c) except in the case of termination for convenience as stated under GCC Sub Clause 67, engage another Contractor to complete the Works, and in that case the Contractor shall be liable to the Employer for any cost that may be incurred in excess of the sum that would have been paid to the Contractor, if the work would have been executed and completed by him or her.</p> <p>67.5 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as is reasonably possible</p>
<p>68. Payment upon Termination</p>	<p>68.1 If the Contract is terminated because of a fundamental breach of Contract under GCC Sub Clause 67.1 by the Contractor, the Project Manager shall issue a certificate for the value of the Works done and Plant and Materials ordered less advance payments received up to the date of the issue of the certificate and less the amount from percentage to apply to the contract value of the works not completed, as indicated in the PCC. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.</p> <p>68.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Project Manager shall issue a payment certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's foreign personnel employed solely on the Works and recruited specifically for the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.</p> <p>68.3 If the Contract is terminated for reasons of Force Majeure, the The Project Manager shall determine the value of the work done and issue a Payment Certificate which shall include.</p> <p>(a) the amounts payable for any work carried out for which unit rates or prices are stated in the Contract;</p>

	<ul style="list-style-type: none"> (b) the cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Employer when paid for by the Employer, and the Contractor shall place the same at the Employer's disposal; (c) other costs or liabilities which in the circumstances were reasonably and necessarily incurred by the Contractor in the expectation of completing the Works; (d) the cost of removal of Temporary Works and Contractor's Equipment from the Site; and (e) the cost of repatriation of the Contractor's staff and labor employed wholly in connection with the Works at the date of termination.
69. Property	69.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer if the Contract is terminated because of the Contractor's default stated under GCC Sub Clause 67.1.
70. Frustration	70.1 If the Contract is frustrated by the occurrence of a situation of Force Majeure as defined in GCC Sub Clause 52, the Engineer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all works carried out before receiving it and for any work carried out afterwards to which a commitment was made.
I. Claims, Disputes and Arbitration	
71. Contractor's Claims	<p>71.1 If the Contractor considers himself to be entitled to any extension of the Completion Time and/or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall give notice to the Employer, describing the event or circumstance giving rise to the claim. The notice shall be given as soon as practicable, and not later than twenty eight (28) days after the Contractor became aware, or should have become aware, of the event or circumstance.</p> <p>71.2 If the Contractor fails to give notice of a claim within such period of twenty eight (28) days, the Intended Completion Date shall not be extended, the Contractor shall not be entitled to additional payment, and the Employer shall be discharged from all liability in connection with the claim.</p> <p>71.3 Within forty two (42) days after the Contractor became aware or should have become aware of the event or circumstance giving rise to the claim, or within such other period as may be proposed by the Contractor and approved by the Engineer, the Contractor shall send to the Engineer a fully detailed claim which includes full supporting particulars of the basis of the claim and of the extension of time and/or additional payment claimed, for settlement.</p>

<p>72. Settlement of Disputes</p>	<p><u>Amicable settlement</u></p> <p>72.1 The Employer and the Contractor shall make every effort to resolve amicably by direct informal negotiation any disagreement or dispute arising between them under or in connection with the Contract.</p> <p><u>Arbitration</u></p> <p>72.2 If, after twenty-eight (28) days, the parties have failed to resolve their dispute or difference by such mutual consultation as stated under GCC Clause 72.1, then either the Employer or the Contractor may give notice to the other party of its intention to commence arbitration in accordance with GCC Sub Clause 72.3, as to the matter in dispute, and no arbitration in respect of this matter may be commenced unless such notice is given. Any dispute or difference in respect of which a notice of intention to commence arbitration has been given in accordance with this Clause shall be finally settled by arbitration.</p> <p>72.3 Arbitration shall be commenced prior to or after execution of the Works under the Contract. Arbitration proceedings shall be conducted in accordance with the rules of procedure specified in the PCC.</p> <p>72.4 Notwithstanding any reference to arbitration hereinabove the parties shall continue to perform their respective responsibilities under the Contract unless agreed otherwise and, the Employer shall pay any monies due to the Contractor.</p>
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Section 4. Particular Conditions of Contract

<p><i>Instructions for completing the Particular Conditions of Contract are provided in italics in parenthesis for the relevant GCC Clauses.</i></p>	
GCC Clause	Amendments of, and Supplements to, Clauses in the General Conditions of Contract
GCC 1.1(j)	<p>The Contractor is <i>[Name, address, and name of authorized representative]</i></p>
GCC 1.1(II)	<p>The Employer is West Zone Power Distribution Co. Ltd. (WZPDCL) Represented by: <i>Project Director,</i> <i>Smart Pre-Payment Metering Project for West Zone Power Distribution Company Ltd. (WZPDCL) Area (Phase-II), WZPDCL</i> <i>Bidyut Bhaban, Boyra Main Road, Khulna-9000.</i></p>
GCC 1.1(oo)	<p>The site(s)/ point(s) of delivery and installation are: S&D-1,2, Kushtia, WZPDCL Kumarkhali ESU, WZPDCL Bheramara ESU, WZPDCL Meherpur ESU, WZPDCL</p>
GCC 3.1	<p>The Procuring Entity's address for the purpose of communications under this contract is : Attention: Engr. Md. Rakib Uddin, Project Director, Smart Pre-Payment Metering Project for West Zone Power Distribution Company Ltd. (WZPDCL) Area (Phase-II), WZPDCL. Phone: Address: Bidyut Bhaban, Boyra Main Road, Khulna-9000 Mobile: +8801766690830 Electronic mail address:sppmp2@gmail.com</p> <p>The Contractor's address for the purpose of communications under this contract is : Contact person: Address: Tel: Fax: e-mail address:</p>
GCC 6.1 (k)	<p>Other documents forming part of the Contract are; Acceptance of NOA, Performance Security, Tender/Proposal (Offer) of the Contractor, API annexed in part-2, Schedule of Key Personnel and All Correspondences between purchaser and Contractor prior to signing of the contract.</p>
GCC 9.2	<p>Materials, Equipment Plants and supplies shall not have their origin in the following countries: Countries having no diplomatic relation with the Government of Bangladesh.</p>

	Plant and services from a country which is not included in the specified countries mentioned in the respected GTP in Section 6: Guaranteed Technical Particulars is also not acceptable.
GCC 13.1	Possession of the Site or part(s) of the Site, to the Contractor shall be given on the following date(s): Within 14 days after LC Opening by the Employer
GCC 22.3	It's the contractor's responsibility to replace any faulty equipment/parts within the warranty period/defect liability period. Besides, the Contractor shall have to supply spare parts for a period of <i>at least 5 years after the ending of the warranty period/defect liability period.</i> <i>The Contractor shall carry sufficient inventories to ensure an ex-stock supply of consumable spares for the Plant/System. Requirement of spare parts should be estimated from the manufacturer's/supplier's previous supply experiences of the offered equipment. Other spare parts and components shall be supplied as promptly as possible, but at the most within six (6) months of placing the order and opening the letter of credit. In addition, in the event of termination of the production of spare parts, advance notification will be made to the Employer of the pending termination, with sufficient time to permit the Employer to procure the needed requirement. Following such termination, the Contractor will furnish to the extent possible and at no cost to the Employer the blueprints, drawings and specifications of the spare parts, if requested.</i>
GCC 23.1	Replace Clause as follows: The Contractor shall commence work on the Facilities within 14 (Fourteen) days from the Effective Date and proceed with Facilities in accordance with the Time schedule specified in the Appendix 4 (Time Schedule) of the Contract Agreement.
GCC 24.1	The time for completion (operational acceptance) of the whole of the facilities is within 365 days from the effective date as described in the contract agreement. However, support service shall continue for 03 (three) years from the date of issuance of Operational Acceptance Certificate(OAC).
GCC 32.1	A Subcontractor that is a national of, or registered in, the following countries are not eligible: <i>Not Applicable.</i>
GCC 33.1	Nominated Subcontractor(s) named below; <i>None</i>
GCC 38.2	Replace the clause as follows: a) Technical Orientation and Quality Test Witness: The Purchaser shall have the right to inspect/test the goods/materials to confirm their conformity to the specification. The purchaser shall be entitled at all reasonable time during manufacture to inspect, examine and test of goods/materials at the manufacturers' premises, workmanship and performance. The following test shall be carried out as per latest version of SANS/IEC standard unless otherwise mentioned at the manufacturer premises or other places where the test facilities are available. The Contractor shall, after consulting the purchaser, give the Purchaser reasonable notice in writing of the date and the place at which any material or equipment will be ready for

testing as provided in the contract and unless the purchaser shall attend at the place so named on date, which the contractor has stated in his notice, the contractor may proceed with the tests, which shall be deemed to have been made in the purchaser's presence, and shall forth with forward to the purchaser duly certified copies of test readings.

When the purchaser intends to attend the test he shall promptly inform the contractor accordingly in writing, so that he can take action. The purchaser shall give the contractor timely notice in writing of his intention to attend the test.

Where the contractor provides for tests on the premises of the contractor or of any manufacturer of the contractor, except where otherwise specified, shall provide free of charge such assistance, labor, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such test efficiently. These tests shall be performed as per relevant SANS/IEC standard and only routine tests as agreed upon, will be performed.

As and when the purchaser is satisfied that any materials/equipment shall have passes the tests referred to in this clause, purchaser shall notify the contractor in writing to that effect.

Should any inspected/tested goods fail to conform to the specification, the Purchaser shall have the right to reject any of the items or complete batch if necessary. In that case Contractor has to replace the Equipment and to make good of them without any financial involvement to the Purchaser. In case any of the Equipment found not conforming with the specification at the time of post landing Inspection, the contractor will in no way be relieved from the responsibility of replacing them or making them good at their own cost, despite the Equipment were found good at the time of Factory Acceptance Test. Nothing in this clause shall in any way release the contractor from any warranty or other obligations under the contract.

If the offered goods are manufactured outside the purchaser's country then Utility's Inspection Team shall have to conduct Technical Orientation and Quality Test Witness at the manufacturer's factory premises. The Purchaser's nominated "Engineering Team" consisting of at least 05 (Five) Engineers in each team shall take part in the witness of the QAT of the goods/ Technical Orientation on the manufacturer's premises for a period of 10 days (excluding journey time). All the cost regarding QAT witness by the Purchaser's 'Engineering Team' i.e. the cost of Air Ticket from Dhaka to the place of inspection/training & return, internal transportation, Phone, Fax, E-mail, Health insurance, Hotel accommodation, Food etc. and pocket money of 150 USD per day per person for the period of 10 days (excluding journey time) shall be borne by the Contractor and the cost shall be included with the equipment's quoted price.

No goods shall be packed, prepared for shipment / delivery unless it has been approved including Test reports and written instruction has been issued by the Purchaser.

The tenderer has to mention the place of Technical Orientation and Quality Test Witness in the following table:-

Sl. No.	Item	Period of Technical Orientation and Quality Test Witness	Place & Country of Technical Orientation and Quality Test Witness

During Technical Orientation & Quality Test Witness, the inspection team will select 03 (Three) Single phase meters, 01 (One) Three phase meter and 02 (Two) Data concentrator units at random basis for testing the selected meters in an independent testing lab for the following tests: i) Dry heat test; ii) Damp heat cycle test; iii) Electromagnetic compatibility (EMC) tests as per relevant IEC standards. The tenderer will arrange these tests in an internationally accredited Testing Laboratory during Quality Test Witness.

b) Post Landing Inspection:

The Contractor shall inform the purchaser immediately after arrival of the goods at the designated store of Utility (as per delivery schedule). An Inspection team of Utility shall perform the post-landing inspection in presence of contractor's representative. The Contractor shall arrange the program of post-landing inspection. Any defect or damage have been found at post-landing inspection, the defective or damaged materials/ goods to be replaced by the contractor at his own cost within the stipulated time.

The purchaser's right to inspect, test (where necessary) and reject the goods after delivery at the designated store of Utility shall in no way be limited or waived by reason of the goods having previously been inspected, tested and passed by the purchaser prior to the good's delivery. The cost incurred for this purpose shall be borne by the contractor.

GCC 40.1.2	<p>Replace the Clause as follows:</p> <p>Before commissioning the, Employer will provide operating and maintenance personnel under Contractor's supervision to get them (Employer's O&M personal) acquainted with and to witness the commissioning of the Plant & Equipment. All raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters required for Commissioning shall be supplied by the Contractor.</p>
GCC 40.2.2	<p>The Guarantee Test of the Facilities shall be successfully completed within 30 from the date of Completion.</p> <p>If for reasons not attributable to the Contractor, the Guarantee Test of the Facilities or the relevant part thereof cannot be successfully completed within the period 30 (thirty) days from the date of successfully completion of commissioning, Operational Acceptance Certificate (OAC) / PAC may be issued subjected to GCC Sub-Clause 40.3.1 hereof. But Contractor shall have to perform Guarantee Test as soon as Employer request for the same.</p>

<p>GCC40.3.1 (Missing Clause)</p>	<p>Add the Clause 40.3.1 (Operational Acceptance) as follows:</p> <p>Subjected to GCC Sub-Clause 40.4 below, Operational Acceptance shall occur in respect of Facilities or any part thereof when</p> <p>a) the Guarantee Test has been successfully completed and the Functional Guarantee are met; or</p> <p>b) the Guarantee Test has not been successfully completed or has not been carried out for reasons not attributable to the Contractor within the period from the date of Completion or any other agreed upon period as specified in GCC Sub-Clause 40.2.2 or</p> <p>c) the Contractor has paid the liquidated damages specified in GCC Sub- clause 43.3 for Functional Guarantee hereof; and</p> <p>d) any minor items mentioned in GCC Sub-Clause 39.9 hereof relevant to the</p> <p>Facilities or that part thereof have been completed; and successfully carry out the Technical Orientation and Quality Test Witness of Plant & Equipment and any part of the Facilities specified hereof;</p>
<p>GCC 41.3</p>	<p>No bonus will be given for earlier Completion of the Facilities or part thereof.</p>
<p>GCC42.2</p>	<p>Replace the first Paragraph of clause 42.2 with the following:</p> <p>The warranty /defect liability period hereunder shall begin from the date of issuance of Operational Acceptance Certificate (OAC)/ Provisional Acceptance Certificate (PAC) for a particular equipment/system by WZPDCL and shall end after 03 (three) years pursuant to GCC Sub-Clause 42.10.</p>
<p>GCC 42.10</p>	<p>During the Defect Liability Period, if any Plant & Equipment is damaged and replaced by the Contractor, Defect Liability Period shall be the remaining period of the original Defect Liability Period.</p>
<p>GCC 42.11 (Additional Clause)</p>	<p>Final Acceptance Certificate (FAC):</p> <p>The “Final Acceptance Certificate (FAC)” shall mean the official notification by Employer to the Contractor, issued at the end of all the Defect Liability Period (if different guarantee periods to different parts of the work, after the expiration of the latest of such periods) and the support service period which indicates that the Contractor has completed his obligation under the Contract.</p>
<p>GCC 45.1 (b)</p>	<p>The multiplier of the Contract Price is: One (1)</p>
<p>GCC 56.2</p>	<p>The Contract Price adjustment is not applicable.</p>
<p>GCC 57.5 (Additional Clause)</p>	<p>Payments due to the Contractor in each certificate shall be made into the following Bank Account nominated by the Contractor and in the currency as specified in the Payment Schedule:</p> <p>The particulars of the Bank Account nominated a r e as follows:</p> <p>Title of the Account: [insert title to whom the Contract awarded]</p> <p>Name of the Bank :[insert name with code, if any]</p> <p>Name of the Branch: [insert branch name with code ,if any]</p> <p>Account Number : [insert number]</p> <p>Address : [insert location with district]</p> <p>Tel: Fax:</p> <p>e-mail address:</p>

GCC 59.1	The Contractor shall, within twenty-eight (28) days of the notification of contract award, provide a security for the due performance of the Contract in the amount: At least Ten percent (10%) of the Contract amount.
GCC 59.2	The performance security shall be provided in the currency or currencies of the Contract as stated under ITT Sub Clauses 27.4 at the percentage as specified in GCC 59.1 and shall be in the form of an irrevocable Bank Guarantee issued by an internationally reputable Bank which has a correspondent Bank located in Bangladesh in the Format (<i>Form PG5A-9</i>) provided in Section 5, Tender and Contract Forms, acceptable to the Employer
GCC 59.3	Performance Security shall not be reduced. The performance security shall be valid until the completion of Defects Liability Period or the completion of support service period, whichever happens later plus 28 (twenty eight) days, provided, however, that if the Defects Liability Period has been extended on any part of the Facilities pursuant to GCC Sub-Clause 42.8 hereof, the Contractor shall issue an additional security in an amount proportionate to the Contract Price of that part.
GCC 60.1	This clause shall be added for clarification: The Contractor shall be entirely liable to pay Income Tax on Contract price for both foreign & local currency (Except CIP) according to the Income Tax ordinance 1984 & VAT Act. 1991 at the prevailing rate of the Govt. Treasury.
GCC 60.2 (a)	This clause shall be added for clarification: The contractor shall submit to the owner 5 (five) copies of non-negotiable shipping documents ahead of shipment for arranging payment of such taxes and clearing the materials in time. The WZPDCL shall not bear any expenditure on account of import of cement, if any, by the Contractor. Normally, equipment and materials that will be incorporated in the permanent works shall be transported by vessel. If the Contractor decides to air freight any items, the excess freight beyond freight of vessel or excess inland transportation or any other additional cost on account of air freight shall be borne by the Contractor. Manufacturer/supplier/ contractor shall be entirely responsible for clearing the material/equipment through their appointed clearing agent (including necessary payment to them), submission of tax assessment report from custom authority to the purchaser, ahead of time period to avoid any sorts of demurrage. On presentation of assessment report from custom authority, the purchaser will make arrangement for payment to custom authority. All charges related to tax assessment & Clearing shall be borne by the contractor if necessary The Contractor shall obtain all import permits or licenses required for any part of the work within the terms stated in the program or if not so stated, in reasonable time having regard to the time for delivery of the work and the time for completion.
GCC 63.1	The Contractor shall be liable to pay Liquidated Damages or in other words the Delay Damages to the Employer at the rate of zero point one percent (0.1%) of the contract amount per day for each day of delay from the Intended Completion Date, for the uncompleted delivery of goods/works/services or for any part thereof.
GCC 63.2	The maximum amount of Liquidated Damages is: Ten percent (10%) of the final Contract price.

<p>GCC 72.3</p>	<p>(i) In the case of a dispute between the Employer and the foreign Contractor, Any dispute, controversy or claim arising out of or relating to this Contract, or breach, termination or invalidity thereof, shall be settled by arbitration in accordance with the United Nations Commission on International Trade Law (UNCITRAL) Arbitration Rules of 1976 as at present in force.</p> <p>ii) In the case of a dispute between the Employer and the national Contractor, in particular, the arbitration shall be conducted in accordance with the Arbitration Act (Act No 1 of 2001) of Bangladesh <i>as at present in force and in the place President of the Institution of Engineers, Bangladesh.</i></p>												
<p>GCC 73.1 Shipping & Delivery Documents (Additional Clause)</p>	<p>Subject to GCC Clause 64, the Delivery of the Plants and Services shall be in accordance with the Delivery and Completion Schedule specified in the Section 6: Schedule of Requirements.</p> <p>No goods should be shipped or delivered without prior instruction (shipping advice) from the Employer/Consignee.</p> <p>Details of shipping and documents to be furnished by the Contractor/Supplier shall be:</p> <p>“For Schedule No. 1 - Plant and Equipment Supplied from Abroad / Goods supplied from broad as per INCOTERM CIP: Upon shipment, the Contractor/Supplier shall notify the Purchaser by telex or fax the full details of the shipment, including Contract number, description of Goods, quantity, the vessel, the bill of lading number and date, port of loading, date of shipment, port of discharge, etc. The Contractor/Supplier shall send the following documents to the Purchaser, with a copy to the Insurance Company:</p> <p>(a) 7 copies of the Supplier’s invoice showing the description of the Goods, quantity, unit price, and total amount; (b) original and 8 copies of the negotiable, clean, on-board bill of lading marked “freight prepaid” and 8 copies of non-negotiable bill of lading where applicable; (c) 8 copies of the packing list identifying contents of each package; (d) insurance certificate; (e) Manufacturer’s or Supplier’s warranty certificate; (f) Inspection certificate, issued by the nominated inspection team of the purchaser and the Supplier’s factory inspection report; and (g) Certificate of origin. (h) Shipping advice issued by the Consignee (i) Truck Challan:</p> <p>The Employer/Consignee shall receive the above documents at least one week before arrival of Goods at the port and, if not received, the Supplier will be responsible for any consequent expenses.</p> <p>The negotiable sets of documents shall be originals signed by the Supplier. The Commercial Invoice is to show material value plus freight as applicable. The Employer/Consignee shall receive the shipping documents at the latest one week before arrival of cargoes at the airport of Dhaka or any sea/land port of entry in Bangladesh. The shipping documents shall be supplied to as follows:</p> <table border="1"> <tr> <td>1</td> <td>Executive Director (Finance), WZPDCL, Khulna</td> <td>2 (Two) sets</td> </tr> <tr> <td>2</td> <td>Project Director Smart Pre-payment Metering Project for West Zone Power Distribution Company Ltd. (WZPDCL) Area (Phase-II) [SPPMP-2], WZPDCL, Khulna</td> <td>2 (Two) sets</td> </tr> <tr> <td>3</td> <td>Deputy General manager (Accounts), HQ, WZPDCL, Khulna</td> <td>2 (Two) sets</td> </tr> <tr> <td>4</td> <td>Manager (Accounts), SPPMP-2, WZPDCL, Khulna</td> <td>2 (Two) sets</td> </tr> </table>	1	Executive Director (Finance), WZPDCL, Khulna	2 (Two) sets	2	Project Director Smart Pre-payment Metering Project for West Zone Power Distribution Company Ltd. (WZPDCL) Area (Phase-II) [SPPMP-2], WZPDCL, Khulna	2 (Two) sets	3	Deputy General manager (Accounts), HQ, WZPDCL, Khulna	2 (Two) sets	4	Manager (Accounts), SPPMP-2, WZPDCL, Khulna	2 (Two) sets
1	Executive Director (Finance), WZPDCL, Khulna	2 (Two) sets											
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3	Deputy General manager (Accounts), HQ, WZPDCL, Khulna	2 (Two) sets											
4	Manager (Accounts), SPPMP-2, WZPDCL, Khulna	2 (Two) sets											

	<p>For Goods from within the Purchaser's country as per INCOTERM EXW: Upon delivery of the Goods to the transporter, the Supplier shall notify the Employer/Consignee and send the following documents to the Employer/Consignee:</p> <ul style="list-style-type: none">(a) 7 copies of the Supplier's invoice showing the description of the Goods, quantity, unit price, and total amount;(b) 7 copies delivery note, railway receipt, or truck receipt;(c) 3 copies Manufacturer's or Supplier's warranty certificate;(d) 7 copies inspection certificate issued by the nominated inspection team and the Supplier's factory inspection report; and(e) 7 copies certificate of origin. <p>The Employer/Consignee, shall receive the above documents before the arrival of the Goods and, if not received, the Supplier will be responsible for any consequent expenses.</p>
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Appendix to the Tender

[In Tables below, the Procuring Entity shall indicate the source and base values with dates of Indexes, unless otherwise instructed to be quoted by the Tenderer, for the different Cost Components and mention its Weightings or Coefficients]

Table 1.1: Price Adjustment Data- *Not Applicable.*

[ITT Sub Clause 26.9: To be provided by the Procuring Entity]

Index Descriptions	Base Value	Sources of Index

Note:

1. The sources of Indexes and its values with dates shall be Bangladesh Bureau of Statistics (BBS) unless otherwise mentioned by the Procuring Entity or instructed to be quoted by the Tenderer.
2. The Procuring Entity may require the Tenderer to justify its proposed Indexes, if quoted by the Tenderer.
3. The Base Value of the Indexes shall be those prevailing twenty eight (28) days prior to the deadline for submission of the Tenders.

Table 1.2: Price Adjustment Data -*Not Applicable.*

[GCC Sub Clause 56.4: To be provided by the Procuring Entity]

Item Group	Bill No. if applicable	Index Descriptions	Coefficients or Weightings for non-adjustable Cost Component	Coefficients or Weightings for adjustable Cost Components										Total			
				a	b	c	d	e	f	g	h	i	j				
																	1
																	1
																	1
																	1
																	1
																	1

Note:

The Weightings or Coefficients of the Cost Components shall be mentioned by the Procuring Entity based on the proportion of components involved in the items caused to be impacted by rise and fall in its prices.

APPENDICES [This appendixes shall be the part of the contract]

- Appendix 1 - Terms and Procedures of Payment
- Appendix 2 - Price Adjustment
- Appendix 3 - Insurance Requirements
- Appendix 4 - Time Schedule
- Appendix 5 - List of Major Items of Plant and services and List of Approved Subcontractors
- Appendix 6 - Scope of Works and Supply by the Employer
- Appendix 7 - List of Documents for Approval or Review
- Appendix 8 - Functional Guarantees
- Appendix 9 - Article(s)

Appendix 1. Terms and Procedures of Payment

In accordance with the provisions of GCC Clause 57 (Terms of Payment), the Employer shall pay the Contractor in the following manner and at the following times, on the basis of the Price Breakdown given in the section on Price Schedules. Payments will be made in the currencies quoted by the Tenderer unless otherwise agreed between the parties. Applications for payment in respect of part deliveries may be made by the Contractor as work proceeds.

(A) Terms of Payment

Schedule No. 1 - Plant and Equipment Supplied from Abroad

In respect of plant and equipment supplied from abroad, the following payments shall be made:

a) Payment of foreign currency portion shall be made through Letter of Credit (L/C) opened in favor of the Supplier in a schedule Bank of Bangladesh. LC Charges within Bangladesh shall be paid by the Purchaser and those outside Bangladesh paid by the supplier. The payment for goods supplied from aboard to be made as follows:

(i) **Advance Payment:** Ten percent (10%) of the total CIP amount shall be paid as an advance payment against submission of irrevocable and unconditional Bank Guarantee by the contractor of equal amount issued from a reputed schedule bank of Bangladesh and after signing of the contract. The Contractor shall furnish the said Bank Guarantee within 28 (twenty-eight) days of the notification of contract award, in an amount equal to the advance payment. The advance payment security may be reduced in proportion to the value of the plant and equipment delivered, as evidenced by PLI report. The advance payment security will be released after completion of post landing inspection of all the items.

(ii) **On PLI Report:** Seventy percent (70%) of the total or pro rata CIP amount upon Incoterm "CIP", shall be paid through a letter of credit upon submission of a claim supported by the satisfactory post landing inspection (PLI) report. This shall be accompanied by shipping documents [specified in PCC clause 73.1], and R&I report along with the invoice to be certified by the engineer and passed for payment by the purchaser's representative. The Project Director will certify the invoice, and the payment advice will be issued by the purchaser's representative (Accounts Department).

(iii) **On Operational Acceptance Certificate /PAC:** Ten percent (10%) of the total or pro rata CIP amount shall be paid upon issuance of the Operational Acceptance Certificate(OAC)/Provisional Acceptance Certificate (PAC) [as specified in GCC 40.3] and submission of a claim bill duly verified & certified by the concerned officer and approved by the Project Director.

(iv) **On Final Acceptance Certificate (FAC) :** Ten percent (10%) of the total or pro rata CIP amount shall be paid through letter of credit on submission of Final Acceptance Certificate (FAC) and invoice duly certified by engineer and passed for payment by the purchaser. Project Director/Engineer will certify the invoice and the payment advice will be issued by the purchaser's representative (Accounts Department).

Schedule No. 2 - Plant and Equipment Supplied from within the Employer's Country

In respect of plant and equipment supplied from within the Employer's country, the following payments shall be made:

- i) **Advance Payment:** Ten percent (10%) of the total EXW amount as an advance payment against receipt of invoice, and an irrevocable unconditional advance payment security for the equivalent amount made out in favor of the Employer. The advance payment security may be reduced in proportion to the value of plant and equipment delivered to the site, as evidenced by shipping and delivery documents. The advance payment security will be released after completion of post landing inspection of all items.
- ii) **On Delivery and PLI Report:** Eighty percent (80%) of the total or pro rata EXW amount upon Incoterm "Ex-Works," upon delivery to the designated site and after issuance of "PLI Report" for each consignment delivered at site and submission of documents specified in PCC clause 73.1 with a claim bill duly verified & certified by the concerned officer of the Project Office, and approved by the Project Director along VAT payment Certificate/Challan.
- iii) **On Operational Acceptance Certificate /PAC:** Five percent (5%) of the total or pro rata EXW amount upon issue of the Operational Acceptance Certificate (OAC) as specified in GCC 40.3 and a claim bill duly verified & certified by the concerned officer of the Project Office, and approved by the Project Director.
- iv) **On Final Acceptance Certificate (FAC):** Five percent (5%) of the total or pro rata EXW amount upon issue of the Final Acceptance Certificate (FAC) as specified in PCC Sub-clause GCC42.11 and a claim bill duly verified & certified by the concerned officer of the Project Office, and approved by the Project Director.

Schedule No. 5 - Installation and other Services

a) In respect of installation services for both the foreign and local currency portions, the following payments shall be made:

- i) **Advance Payment:** Ten percent (10%) of the total Installation and other Services amount as an advance payment against receipt an irrevocable unconditional advance payment security from any schedule Bank of Bangladesh for the equivalent amount made out in favour of the Employer. The advance payment security may be reduced in proportion to the value of the Installation and other Services performed at the site, as evidenced by Progress Report. The advance payment security will be released after issuance of Operational Acceptance Certificate (OAC).
- ii) **On monthly Progress Report:** Seventy percent (70%) of the measured value of Installation and Services performed satisfactorily by the Contractor, as identified in the said Program of Performance or in Contractors' breakdown estimate, during the preceding month, will be made monthly after receipt of invoice/claim bill duly verified & certified by the concerned officer of the Project Office, and approved by the Project Director.
- iii) **On Operational Acceptance Certificate /PAC:** Ten percent (10%) of the total or pro rata value of installation services performed by the Contractor as identified in the said Program of Performance or in Contractors' breakdown estimate, during the preceding month, upon issue of the Operational Acceptance Certificate (OAC) as specified in GCC40.3, will be made after receipt of invoice/claim bill duly verified &

certified by the concerned officer of the Project Office, and approved by the Project Director.

- iv) **On Final Acceptance Certificate (FAC):** Ten percent (10%) of the total or pro rata value of installation services performed by the Contractor as identified in the said Program of Performance or in Contractors' breakdown estimate, during the preceding month, upon issue of the Final Acceptance Certificate (FAC) as specified in PCC Sub-clause GCC42.11, will be made after receipt of invoice/claim bill duly verified & certified by the concerned officer of the Project Office, and approved by the Project Director.
- b) In respect of training services for both the foreign and local currency portions, the following payments shall be made:
- i) **Advance Payment:** Ten percent (10%) of the total training Services value as an advance payment against receipt an irrevocable unconditional advance payment security from any schedule Bank of Bangladesh for the equivalent amount made out in favour of the Employer. The advance payment security will be released after issuance of Completion Certificate for the training programs.
- ii) **On Completion:** Eighty percent (80%) of the total or pro rata value of training Services shall be paid upon presentation of claim supported by a certificate from the Purchaser declaring that the training programmes have been conducted satisfactorily and that all the training related contractual obligations have been met.
- iii) **On Final Acceptance Certificate (FAC):** Ten percent (10%) of the total or pro rata value of training Services performed by the Contractor upon issue of the Final Acceptance Certificate (FAC) as specified in PCC Sub-clause GCC 42.11, shall be paid after receipt of invoice/claim bill duly verified & certified by the concerned officer of the Project Office, and approved by the Project Director.

Note: The purchaser shall make earnest effort to make the payment in shortest possible time. However, no interest will be applicable for delayed payment.

(B) Payment Procedures

The procedures to be followed in applying for certification and making payments shall be as follows:

Payments under this Contract shall be done in the currency of the Tender for Foreign Currency and in Taka for local currency.

1. Local Currency [BDT]

Payment of Local currency portion (where applicable) shall be made direct through transfer of fund to Contractor's account or through cheque or EFT Payment shall be made direct through Consignee.

2. Foreign Currency

Payment of foreign currency portion shall be made through Letter of Credit (L/C) opened in favor of the contractor/supplier in a scheduled Bank of Bangladesh.

BANKING CHARGES:

- Letter of Credit opening and other charges including amendment charges within Bangladesh shall be borne by WZPDCL and those outside Bangladesh shall be borne by the contractor/supplier.
- The supplier shall have to bear all such charges both inside and outside Bangladesh in case of extension of L/C if done at the request of the contractor/ supplier.

3. Invoices

The Contractor shall submit invoices (original) in triplicate to the Project Director whenever an invoice is required to be submitted as per provision of this Contract. Invoices should be duly certified by Project Director.

4. Documentation Required for Payment

Submission of delivery documents as stated under Clause GCC 73.1

(C) Payment Procedure for monthly Progress Report against Civil, Installation & Services work

On or about the first day of each month the Contractor will prepare a bill in prescribed form of the value (As per Breakdown estimate submitted by Contractor) for the Installation & Services work done up-to such date. The estimated cost of Installation & Services work which, do not conform to the specifications will be deducted from the billed amount. Payment will be made to the Contractor as stipulated above. Such intermediate payment shall be regarded as payment by way of advance against the final payment for work actually done and shall not preclude the requiring of bad, unsound and imperfect work to be removed and reconstructed. Such payments shall not be considered as admission that the Contract performance has been completed nor shall it indicate the accruing or any claim, or shall it conclude, determine or affect in any way the powers of WZPDCL under this Contract to final settlement and adjustment of the account or in any other way vary or affect the Contract.

Contractor's Breakdown Estimate

The Contractor shall prepare and submit to the Consignee for approval a breakdown estimates for and covering each lump-sum price stated in the Contract. The breakdown estimate, showing the value of each kind of service shall be certified by Consignee and approved by the Engineer before any partial payment estimate is prepared. Such items as bond premium, temporary facilities and plant may be listed separately in the breakdown estimate, provided that their cost can be substantiated.

The sum of the items listed in any breakdown estimate shall equal the Contract lump- sum price or prices, overhead and profit shall not be listed as separate items. Documentation for progress payments shall be supported by the following documents:

- (a) One counterpart of a Work Progress Certificate signed by the Contractor and jointly countersigned by the Owner's Engineer and the Project Director.
- (b) The Contractor shall submit all Work Progress Certificates to both the Owner's Engineer and the Project Director simultaneously by registered air mail. The Owner's Engineer and the Project Director will either countersign or reject a Work Progress Certificate within a maximum period of thirty (30) days from the date of receipt of such Certificate by him. If the Owner's Engineer and the Project Director or either shall fail either to countersign or to reject a Work progress Certificate within the said thirty (30) days period, the Contractor

shall notify the Project Director by cable of the delay in the approval from the Site; and the Project Director will either countersign the Work Progress Certificate in question or assign his reasons for not doing so within a maximum period of sixty (60) days from the date of receipt of the Contractor's said cable notice to him.

- (c) The Contractor shall furnish to the Project Director and the Owner's Engineer or either whenever called upon to do so any additional information or documents that may be required in connection with verification of progress claims and or any other payments made.

Appendix 2. Price Adjustment (Not Applicable)

Prices payable to the Contractor, in accordance with the Contract, shall be subject to adjustment during performance of the Contract to reflect changes in the cost of labor and material components, in accordance with the following formula:

The Contract is subject to price adjustment applying the following formulae and the weightings or coefficients :

[Price Adjustment Formulae to be applicable if stated under ITT Sub Clause 26.9 shall be specified here]

Example:

$$P = A + a (Lm/Lo) + b (Blm/BlO) + c (CEm/CEo) + d (RSm/RSO) + e (STm/STo) + f (BRm/BRo) + g (MIm/MIo) + h (FUm/FUo) + \text{etc}$$

where;

L= Labor, Bl=Bitumen, CE=Cement, RS=Reinforcing Steel, ST=Stone, BR=Bricks, MI=Miscellaneous, FU= Fuel]

Weighting or Coefficient A equals between 0.10 and 0.15 and, B (a+b+c+d+e+f+g+h+etc) equals between 0.90 and 0.85.

[insert figure] non-adjustable component (**coefficient A**)

[insert figure] adjustable component (**coefficient B**)

[The sum of A+B shall equal ONE (1). It is usual to have value of A between 0.10 and 0.15 and that of B between 0.90 and 0.85. Breakdown of B shall be provided in Appendix to the Tender.]

[delete as appropriate]

The date of adjustment shall be the mid-point of the period of manufacture or installation of component or Plant.

The following conditions shall apply:

- (a) No price increase will be allowed beyond the original delivery date unless covered by an extension of time awarded by the Employer under the terms of the Contract. No price increase will be allowed for periods of delay for which the Contractor is responsible. The Employer will, however, be entitled to any price decrease occurring during such periods of delay.
- (c) No price adjustment shall be payable on the portion of the Contract price paid to the Contractor as an advance payment.

For complex plant supply and installation involving several sources of supply and/or a substantial amount of installation works, a family of formulas may be necessary, with provision for the usage of Contractor's equipment in the works formula.

Appendix 3. Insurance Requirements

Insurances To Be Taken Out By The Contractor

In accordance with the provisions of GCC Clause 49, the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurances set forth below in the sums and with the deductibles and other conditions specified. The identity of the insurers and the form of the policies shall be subject to the approval of the Employer, such approval not to be unreasonably withheld.

The minimum insurance cover shall be 110% (Hundred Ten). The insurance policy would be furnished from Bangladesh Sadharan Bima Corporation. The Contractor/Supplier shall secure and maintain throughout the duration of the contract insurance of such types and in such amounts as may be necessary to protect himself and the interest of Purchaser against hazards of risk or loss at Supplier's cost. Failure of the Supplier to maintain such coverage shall not relieve him of any contractual responsibility or obligations for transportation and ocean cargo insurance from port of loading to port of unloading and from warehouse to warehouse in Bangladesh.

As Marine/Cargo insurance as well as Local Insurance shall be from Sadharan Bima Corporation, 139, Motijheel Commercial Area, Dhaka, Bangladesh and the cost shall be paid by Supplier/Contractor. Shipment of goods in any chartered vessel over 15(fifteen) years of age and shipment of goods in the Deck are prohibited.

(a) Cargo Insurance

Covering loss or damage occurring, while in transit from the supplier's or manufacturer's works or stores until arrival at the Site, to the Facilities (including spare parts therefore) and to the construction equipment to be provided by the Contractor or its Subcontractors.

Amount [in currency(ies)]	Deductible limits [in currency(ies)]	Parties insured [names]	From [place]	To [place]
Hundred ten percent (110%) of the Contract Price	-----	WZPDCL	Supplier's or manufacturer's works or stores	Contractor's store in Bangladesh

(b) Installation All Risks Insurance

Covering physical loss or damage to the Facilities at the Site, occurring prior to completion of the Facilities, with an extended maintenance coverage for the Contractor's liability in respect of any loss or damage occurring during the defect liability period while the Contractor is on the Site for the purpose of performing its obligations during the defect liability period.

Amount [in currency(ies)]	Deductible limits [in currency(ies)]	Parties insured [names]	From [place]	To [place]
Hundred ten percent (110%) of the Contract Price	-----	WZPDCL		

(c) Third Party Liability Insurance

Covering bodily injury or death suffered by third parties (including the Employer’s personnel) and loss of or damage to property (including the Employer’s property and any parts of the Facilities that have been accepted by the Employer) occurring in connection with the supply and installation of the Facilities.

(d) Automobile Liability Insurance

Covering use of all vehicles used by the Contractor or its Subcontractors (whether or not owned by them) in connection with the supply and installation of the Facilities. Comprehensive insurance in accordance with statutory requirements.

(e) Workers’ Compensation

In accordance with the statutory requirements applicable in any country where the Facilities or any part thereof is executed.

(f) Employer’s Liability

In accordance with the statutory requirements applicable in any country where the Facilities or any part thereof is executed.

(g) Other Insurances

The Contractor is also required to take out and maintain at its own cost the following insurances:

Details:

Amount [in currency(ies)]	Deductible limits [in currency(ies)]	Parties insured [names]	From [place]	To [place]
<i>Nil</i>	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>

The Employer shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 49.1, except for the Third Party Liability, Workers’ Compensation and Employer’s Liability Insurances, and the Contractor’s Subcontractors shall be named as co-insureds under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 49.1, except for the Cargo, Workers’ Compensation and Employer’s Liability Insurances. All insurer’s rights of subrogation against such co-insureds for losses or claims arising out of the performance of the Contract shall be waived under such policies.

Insurances to be Taken Out By The Employer

The Employer shall at its expense take out and maintain in effect during the performance of the Contract the following insurances.

Details:

Amount [in currency(ies)]	Deductible limits [in currency(ies)]	Parties insured [names]	From [place]	To [place]
<i>Nil</i>	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>

Appendix 4. Time Schedule

Time(s) for Completion as stated in the PCC24.1.

Except under exceptional circumstances, the Time Schedule should indicate periods of time (e.g., weeks or months) and not specify calendar dates. All periods should be shown from the Effective Date of the Contract.

The Tenderer shall be required to submit with its tender a detailed program, normally in the form of a bar chart & CPM, showing how and the order in which it intends to perform the Contract and showing the key events requiring action or decision by the Employer. In preparing this Program, the Tenderer shall adhere to the Time(s) for Completion given in the Tender Data Sheet or give its reasons for not adhering thereto. The Time Schedule submitted by the selected Tenderer and amended as necessary prior to award of Contract shall be included as Appendix to the Contract Agreement before the Contract is signed.

If Tenderers, pursuant to the provisions of the Instructions to Tenderers, are to be permitted to offer an Alternative T e n d e r based on a different Time Schedule, details of this and any resulting reduction in Price from their conforming tender based on the Time Schedule included in the bidding documents shall be submitted as an Attachment to their bid.

Appendix 5. List of Major Items of Plant and Services and List of Approved Subcontractors

[Subcontracting is not applicable]

Prior to issuing the Tender Document, the Employer has established a list of major item of plant and services for which approval of the Employer is required. Prior to award of Contract, the details of approved subcontractor, including manufacturers shall be completed, indicating those subcontractors proposed by the Tenderer in the corresponding Attachment to its tender that are approved by the Employer for engagement by the Contractor during the performance of the Contract.

A list of major items of plant and services is provided below.

The following Subcontractors and/or manufacturers are approved for carrying out the item of the facilities indicated. Where more than one Subcontractor is listed, the Contractor is free to choose between them, but it must notify the Employer of its choice in good time prior to appointing any selected Subcontractor. In accordance with GCC Sub-Clause 32.1, the Contractor is free to submit proposals for Subcontractors for additional items from time to time. No Subcontracts shall be placed with any such Subcontractors for additional items until the Subcontractors have been approved in writing by the Employer and their names have been added to this list of Approved Subcontractors.

Major Items of Plant and Services	Approved Manufacturers	Nationality

Appendix 6. Scope of Works and Supply by the Employer

The following personnel, facilities, works and supplies shall apply as appropriate.

All personnel, facilities, works and supplies will be provided by the Employer in good time so as not to delay the performance of the Contractor, in accordance with the approved Time Schedule and Program of Performance pursuant to GCC Sub-Clause 31.2.

Unless otherwise indicated, all personnel, facilities, works and supplies will be provided free of charge to the Contractor.

Personnel	Charge to Contractor (if any)
The Employer will provide operating and maintenance personnel under the Contractor's supervision to get them (employer's personnel) acquainted with and to witness the commissioning of the facilities.	Not Applicable

Facilities	Charge to Contractor (if any)
The Employer will provide access to its distribution network and required facilities for installation and integration of the equipment required for the execution of the contract. Besides, the employer will also provide the existing data such as consumer & meter data in its database, if deemed necessary by the employer, for the purpose of meter replacement by the contractor.	Not Applicable

Works	Charge to Contractor (if any)
Nil	Not Applicable

Supplies	Charge to Contractor (if any)
Nil	Not Applicable

Appendix 7. List of Documents for Approval or Review

Pursuant to GCC Sub-Clause 35.3.1, the Contractor shall prepare, or cause its Subcontractor to prepare, and present to the Project Manager in accordance with the requirements of GCC Sub-Clause 31.2 (Program of Performance), the following documents for

(A) Approval

1. Program/Schedule of Performance.
2. Form for Consumer & Meter Data Collection (CMO).

[A form having required details of the consumer and the meters (both- the replaced old meter and the installed new smart pre-payment meter) shall have to be developed by the contractor and placed before the employer for approval before starting the meter installation process. The approved form shall be properly filled in and duly signed by the contractor/contractor's authorized representative, employers' representative and the concerned consumer during installation of the new meters. The contractor shall prepare /update the consumer database at the employer's server to record this event properly.]

3. All technical particulars, GTP, specifications, design and drawings of the equipment listed in the Price schedule, BoQ and Section-6.2.2.
4. Short Codes & OBIS Codes for energy meters.
5. As built drawing (where applicable).

(B) Review

1. Listing of additional equipment requirements to match design.

Appendix 8. Functional Guarantees

1. General

This Appendix sets out

- (a) the functional guarantees referred to in GCC Clause 43 (Functional Guarantees)
- (b) the preconditions to the validity of the functional guarantees, either in production and/or consumption, set forth below
- (c) the minimum level of the functional guarantees
- (d) the formula for calculation of liquidated damages for failure to attain the functional guarantees.

2. Preconditions

The Contractor gives the functional guarantees (specified herein) for the facilities, subject to the following preconditions being fully satisfied:

The contractor gives notice to the purchaser on completion of the facility/facilities for commissioning and operational acceptance.

3. Functional Guarantees

Performance of Individual equipment and Performance of Complete system/facilities as per Section 6: Schedule of Employer's Requirements & Section 7 will be checked during Guarantee test.

The Guarantee Test run/Performance Test run of each project site (facility) shall be carried out for 03 (Three) days thereof without any trouble.

Necessary testing arrangement to carry out the Commissioning, final inspection, Guarantee Test / performance test shall be done by the Contractor within the contract price.

If any Test is not possible at site than related document during FAT/Routine Test Report can be used.

Employer may take over completed portions of the facility on the basis of Operational Acceptance after at least three (3) weeks of observation to the outcome of the work, prior to completion of the Contract, by written notice to the Contractor.

Appendix 9: Article(s)

<p>Article 1 Contract Documents</p>	<p>Definitions (Reference GCC Clause 1) Capitalized words and phrases used herein shall have the same meanings as are ascribed to them in the General Condition.</p>
<p>Article 2 Contract Price and Terms of Payment</p>	<p>2.1 Contract Price (Reference GCC Clause 56.1) The Employer hereby agrees to pay to the Contractor the Contract Price in consideration of the performance by the Contractor of its obligations hereunder. The Contract Price shall be the aggregate of: [amounts of foreign currency in words, amounts in figures.] and [amounts of local currency in words, amounts in figures.], as specified in Price Schedule No. 6 (Grand Summary), or such other sums as may be determined in accordance with the terms and conditions of the Contract.</p> <p>2.2 Terms of Payment (Reference GCC Clause 57) The terms and procedures of payment according to which the Employer will reimburse the Contractor are given in the Appendix (Terms and Procedures of Payment) hereto. In the event that the amount payable u n d e r Schedule No .1 is adjusted in accordance with GCC 56.2 or with any of the other terms of the Contract, the Employer shall arrange for the documentary credit to be amended accordingly.</p>
<p>Article 3 Effective Date</p>	<p>3.1 Effective Date (Reference GCC Clause 1) The Effective Date upon which the period until the Time for Completion of the Facilities shall be counted from is the date when all of the following conditions have been fulfilled: (a) This Contract Agreement has been duly executed for and on behalf of the Employer and the Contractor; (b) The Contractor has submitted to the Employer the performance security and the advance payment guarantee; (c) The Employer has paid the Contractor the advance payment (d) The Contractor has been advised that the documentary credit referred to in Article 2.2 above, if applicable, has been issued in its favor. Each party shall use its best efforts to fulfill the above conditions for which it is responsible as soon as practicable.</p> <p>3.2 If the conditions listed under 3.1 are not fulfilled within two (2) months from the date of this Contract notification because of reasons not attributable to the Contractor, the parties shall discuss and agree on an equitable adjustment to the Contract Price and/or the Time for Completion and/or other relevant conditions of the Contract.</p>
<p>Article 4 Communications</p>	<p>4.1 The address of the Employer for notice purposes, pursuant GCC 3.1 is: [Employer's address].</p> <p>4.2 The address of the Contractor for notice purposes, pursuant to GCC 3.1 is: [Contractor's address].</p>
<p>Article 5. Appendices & Annexures (4-1 ~4-4)</p>	<p>5.1 The Appendices & Annexures listed in the attached List of Appendices and List of Annexures shall be deemed to form an integral part of this Contract Agreement.</p> <p>5.2 Reference in the Contract to any Appendix or Annexures shall mean the Appendices or Annexures attached hereto, and the Contract shall be read and construed accordingly.</p>

List of ANNEXURE [These annexures shall be the part of the technical proposal as well as the contract]

- Annexure: 4-1[a]** Tenderer's Completed Contracts.
- Annexure: 4-1[b]** Manufacturer's Completed Contracts
- Annexure: 4-2[a]** Tenderer's Ongoing Contract(s)
- Annexure: 4-2[a]** Manufacturers Ongoing Contract(s)
- Annexure: 4-3** Assessment for Manufacturer's Compliance to Production Capacity
- Annexure: 4-4** Assessment for Tenderer's Compliance to Financial Resources Availability

Annexure: 4-1 [a]

Tenderer's Completed Contracts:

Sl. No.	Name, Address, Phone No., Fax No. & domain E-mail of the Employer	Contract No. & Date	Description of Supply with quantity	Contract Value	Date of completion of Supply
1.					
2.					
3.					
4.					

I/We hereby declare that, above mentioned information* is correct and there are no more completed similar contracts in Government entities under power sector of Bangladesh other than those mentioned in the above table.

Signatory Name:
Designation:

Seal & Signature
of the Tenderer

****Note: This information shall have to be mentioned in the Letterhead pad of the Tenderer duly seal & signed along with supporting document.***

Annexure: 4-1 [b]

Manufacturer's Completed Contracts:

Year wise supply record of the manufacturer for the electric pre-payment meter are to be submitted with supported by authentic documents in the following format:

Sl. No.	Name, Address, Phone No., e-mail ID (company domain) & Fax No. of the Purchaser	Contract no. & Date	Contract Value	Supplied Prepaid meter & DCU (mentioning type, model, 1-pase/3-phase, keypad/smart, split/non-split)	Quantity	Date of Completion of Supply
1.						
2.						
...	

I/We hereby declare that, above mentioned information* is correct and there are no more completed similar contracts in Government entities under power sector of Bangladesh other than those mentioned in the above table.

Signatory Name:
Designation:

Seal & Signature
of the Tenderer

***Note:**

- 1. Information of Minimum 30% of the Tendered quantity (As stated in TDS) in a single contract within last 5(five) calendar years are to be supplied by the manufacturer.]**
- 2. This information shall have to be mentioned in the Letterhead pad of the Manufacturer duly seal & signed *along with supporting document.***

Annexure: 4-2 [a]

Tenderer's Ongoing Contract(s):

Sl. No.	Name, Address, Phone No., Fax No. & domain E-mail of the Employer	Contract /NOA No. & Date	Description of Supply as per Contract			Already supplied (if any)		Remaining items to be Supplied		Date of completion of Supply	
			Name of the Item	Quantity	Value	Quantity	Value	Quantity	Value	As per Contract	Target
(1)	(2)	(3)	(4)			(5)		6 = (4-5)		(7)	
Similar contract(s)											
1.											
2.											
3.											
4.											
Other contract(s) (if applicable)											
1.											
2.											
3.											
4.											

I/We hereby declare that, above mentioned information* is correct and there are no more ongoing contracts in any electricity utility other than those mentioned in the above table.

Signatory Name:
Designation:

Seal & Signature
of the Tenderer

***Note: This information shall have to be mentioned in the Letterhead pad of the Tenderer duly seal & signed along with supporting document.**

Annexure: 4-2 [b]

Manufacturer's Ongoing Contract(s):

Sl. No.	Name, Address, Phone No., Fax No. & domain E-mail of the Employer	Contract /NOA No. & Date	Description as per Contract			Already manufactured/ supplied (if any)		Remaining items to be manufactured /Supplied		Date of completion of Manufacture/ Supply	
			Name of the Item	Quantity	Value	Quantity	Value	Quantity	Value	As per Contract	Target
(1)	(2)	(3)	(4)			(5)		6 = (4-5)		(7)	
1.											
2.											
3.											
4.											

I/We hereby declare that, above mentioned information* is correct and there are no more ongoing contracts in any electricity utility other than those mentioned in the above table.

Signatory Name:
Designation:

Seal & Signature of
the Manufacturer

***Note: This information shall have to be mentioned in the Letterhead pad of the Manufacturer duly seal & signed *along with supporting document*.**

Annexure: 4-3

Assessment for Manufacturer’s Compliance to Production Capacity:

Ongoing Similar Contracts Commitments (Table-4-3-A)					
Sl. No.	Name, Address, Phone No., Fax No. & domain E-mail of the Employer	Contract /NOA No. & Date	Outstanding production quantity (X) ^a	Remaining Contract Period in months (Y) ^b	Monthly Production Requirement (X / Y)
1.					
2.					
3.					
4.					
Total Monthly Production Requirement for Ongoing Similar Contract(s) Commitments					

^a Remaining outstanding supply quantity for ongoing similar contract(s) will be forwarded from **Annexure:4-2[b]** and calculated from 28 days prior to the Tender submission deadline of this Tender.

^b Remaining contract period to be calculated from 28 days prior to the Tender submission deadline of this Tender.

Assessment of Production Capacity (Table-4-3-B)				
Production capacity of Goods per month as per Tenderer Information (A)	Total Monthly Production Requirement for Ongoing Similar Contracts Commitments from Table- 4-3-A (B)	Remaining Net Production Capacity per month C= (A-B)	Requirement of the minimum production capacity of Goods per month for this Tender (D)	Results: [C must be greater than or equal to D] (E*)
			The minimum monthly production capacity of the offered goods (smart prepayment meters & DCU) must be 1/3rd of the tendered quantity.	

Note:* "E" Must be satisfied to qualify the Tenderer.

Annexure: 4-4

Assessment for Tenderer’s Compliance to Financial Resources Availability:

Ongoing Contracts Commitments (Table-4-4-A)					
Sl. No.	Name, Address, Phone No., Fax No. & domain E- mail of the Employer	Contract /NOA No. & Date	Outstanding Contract Value (X) ^a	Remaining Contract Period in month (Y) ^b	Monthly Financial Resources Requirement (X / Y)
1.					
2.					
3.					
4.					
Total Monthly Financial Requirement for Ongoing Contract(s) Commitments					

^a Remaining outstanding supply value for ongoing contract(s) will be forwarded from **Annexure 4-2[a]** and calculated from 28 days prior to the Tender submission deadline of this Tender.

^b Remaining contract period to be calculated from 28 days prior to the Tender submission deadline of this Tender.

Assessment of Financial Resources Availability (Table-4-4-B)					
Available Financial Resources as per Tenderer Information (A)	Monthly Financial Resources Requirement for Ongoing Contracts Commitments from Table- 4-4-A (B)	Financial Requirement of Ongoing Contracts Commitments for 2(two) months C= (2*B)	Net amount Available Financial Resources D= (A-C)	Financial Requirement for this Tender (E)	Result s: [D must be greater than or equal to E] (F*)
				As mentioned in TDS [ITT 15.1(b)]	

Note: * "F" Must be satisfied to qualify the Tenderer.

Section 5. Tender and Contract Forms

Form	Title
Tender Forms	
PG5A – 1a	Tender Submission Letter for Technical Proposal
PG5A – 1b	Tender Submission Letter for Financial (Price) Proposal
PG5A – 2a	Tenderer Information Sheet
PG5A – 2b	JVCA Partner Information
PG5A – 2c	Subcontractor Information
PG5A – 3	Price Schedule for Plant and Services
PG5A – 4	Technical Proposal
PG5A – 4a	Specification submission & compliance sheet.
PG5A– 5	Manufacturer’s Authorisation Letter
PG5A – 6	Bank Guarantee for Tender Security
PG5A – 6a	Letter of Commitment for Bank’s undertaking for Line of Credit (Form PG5A-6a)
Contract Forms	
PG5A – 7	Notification of Award
PG5A – 8	Contract Agreement
PG5A – 9	Bank Guarantee for Performance Security
PG5A– 10	Bank Guarantee for Advance Payment
PG5A– 11	Bank Guarantee for Retention Money Security (Form PG5A-11)
Additional Tender Forms	
PG5A– 12	Warranty Certificate (Form PG5A - 12)
PG5A– 13	Deviation List (Form PG5A - 13)

Forms PG5A-1a, PG5A-1b to PG5A-6, PG5A-6a comprises part of the Tender and should be completed as stated in ITT Clause 24.

Forms PG5A-7 to PG5A-11 and the appendices of the tender comprises part of the Contract as stated in GCC Clause 6.

Forms PG5A– 12 and PG5A– 13 comprises part of the tender (should be completed as stated in ITT Clause 24) as well as part of the Contract as stated in GCC Clause 6.

Tender Submission Letter for Technical offer (Form PG5A-1a)

[This letter should be completed and signed by the Authorised Signatory preferably on the Letter-Head Pad of the Tenderer and be appended in the technical proposal envelope]

To:

[Contact Person]

[Name of Procuring Entity]

[Address of Procuring Entity]

Date:

Invitation for Tender No:

[indicate IFT No]

Tender Package No:

[indicate Package No]

This Package is divided into the following Number of Lots

[indicate number of Lot(s)]

We, the undersigned, offer to design, manufacture, test, deliver, install, pre-commission and commission in conformity with the Tender Document, the following Plant and Services, viz:

In signing this letter, and in submitting our Tender, we also confirm that:

- (a) our Tender shall be valid for the period stated in the Tender Data Sheet (ITT Sub Clause 30.1) and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (b) a Tender Security is attached in the form of a *[state pay order, bank draft, bank guarantee]* in the amount stated in the Tender Data Sheet (ITT Sub Clause 32) and valid for a period of twenty-eight (28) days beyond the Tender validity date;
- (c) we have examined and have no reservations to the Tender Document, issued by you on *[insert date]*; including Addendum to Tender Document No(s) *[state numbers]*, issued in accordance with the Instructions to Tenderers (ITT Clause 11). *[insert the number and issuing date of each addendum; or delete this sentence if no Addendum has been issued]*;
- (d) we, including as applicable, any JVCA partner or Subcontractor for any part of the contract resulting from this Tender process, have nationalities from eligible countries, in accordance with ITT Sub Clause 5.1;
- (e) we are submitting this Tender as a sole Tenderer in accordance with ITT Sub Clause 38.3

or

we are submitting this Tender as the partners of a JVCA, comprising the following other partners in accordance with ITT Sub Clause 18.1;

	Name of Partner	Address of Partner
1		
2		
3		
4		

- (f) *we are not a Government owned entity as defined in ITT Sub Clause 5.3 or*

we are a Government owned entity, and we meet the requirements of ITT Sub Clause 5.3;

(delete one of the above as appropriate)

- (g) we, including as applicable any JVCA partner, declare that we are not associated, nor have been associated in the past, directly or indirectly, with a consultant or any other entity that has prepared the design, specifications and other documents in accordance with ITT Sub Clause 5.5;
- (h) we, including as applicable any JVCA partner or Subcontractor for any part of the contract resulting from this Tender process, have not been declared ineligible by the Government of Bangladesh on charges of engaging in corrupt, fraudulent, collusive or coercive practices in accordance with ITT Sub Clause 5.6;
- (i) furthermore, we are aware of ITT Clause 4 concerning such practices and pledge not to indulge in such practices in competing for or in executing the Contract;
- (j) we intend to subcontract an activity or part of the Works, in accordance with ITT Sub Clause 19.1, to the following Subcontractor(s);

Activity or part of the Plant and Services	Name of Subcontractor with Address

- (k) we, including as applicable any JVCA partner, confirm that we do not have a record of poor performance, such as abandoning the works, not properly completing contracts, inordinate delays, or financial failure as stated in ITT Clause 5.7, and that we do not have, or have had, any litigation against us, other than that stated in the Tenderer Information (**Form PG5A-2b**);
- (l) we are not participating as Tenderers in more than one Tender in this Tendering process. We understand that your written Notification of Award shall constitute the acceptance of our Tender and shall become a binding Contract between us, until a formal Contract is prepared and executed;
- (m) we, including as applicable any JVCA partner, confirm that we do not have a record of insolvency, receivership, bankrupt or being wound up, our business activities were not been suspended, and it was not been the subject of legal proceedings in accordance with ITT Sub Clause 5.8;
- (n) we, including as applicable any JVCA partner, confirm that we have fulfilled our obligations to pay taxes and social security contributions applicable under the relevant national laws and regulations of Bangladesh in accordance with ITT Sub Clause 5.9;
- (o) we understand that you reserve the right to reject all the Tenders or annul the Tender proceedings, without incurring any liability to Tenderers, in accordance with ITT Clause 59.

Signature:	<i>[insert signature of authorised representative of the Tenderer]</i>
Name:	<i>[insert full name of signatory with National ID Number, if applicable]</i>
In the capacity of:	<i>[insert capacity of signatory]</i>
Duly authorised to sign the Tender for and on behalf of the Tenderer	

*[If there is more than one (1) signatory, or in the case of a JVCA, add other boxes and sign accordingly].***Attachment 1:**

[ITT Sub Clause 38.3]

Written confirmation authorising the above signatory(ies) to commit the Tenderer

[and, if applicable]

Attachment 2:

[ITT Sub Clause 29.2(b)]

Copy of the JVCA Agreement / Letter of Intent to form JVCA with draft proposed Agreement

Tender Submission Letter for Financial offer (Form PG5A-1b)

[This letter should be completed and signed by the Authorised Signatory preferably on the Letter-Head Pad of the Tenderer and be appended in the financial proposal envelope]

To:

[Contact Person]

[Name of Procuring Entity]

[Address of Procuring Entity]

Date:

Invitation for Tender No:

[indicate IFT No]

Tender Package No:

[indicate Package No]

This Package is divided into the following Number of Lots

[indicate number of Lot(s)]

We, the undersigned, offer to design, manufacture, test, deliver, install, precommission and commission in conformity with the Tender Document, the following Plant and Services, viz:

In accordance with ITT Clauses 26 and 27, the following prices and discounts apply to our Tender:

The Tender Price is: (ITT Sub-Clause 26.1)	<i>[state amount in figures] and [state amount in words]</i>
Plant (including Mandatory Spare Parts) Supplied from abroad	<i>[state amount in figures] and [state amount in words]</i>
Plant (including Mandatory Spare Parts) supplied from within the Employer's Country	<i>Taka [state amount in figures] And Taka [state amount in words]</i>
Design Services	<i>[state amount in figures] and [state amount in words]</i>
Installation and Other Services	<i>[state amount in figures] and [state amount in words]</i>
Recommended Spare parts Price (If economic Factor is applicable)	<i>[state amount in figures] and [state amount in words]</i>
The Unconditional discount is (ITT Sub-Clause 23.11)	<i>[state amount in figures] and [state amount in words]</i>
The methodology for Application of the discount is:	<i>[state the methodology]</i>

and we shall accordingly submit an Advance Payment Guarantee in the format shown in Form PG5A- 10.

In signing this letter, and in submitting our Tender, we also confirm that:

- a) our Tender shall be valid for the period stated in the Tender Data Sheet (ITT Sub Clause 30.1) and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- b) a Tender Security is attached in the form of a [state pay order, bank draft, bank guarantee] in the amount stated in the Tender Data Sheet (ITT Sub Clause 32) and valid for a period of twenty eight (28) days beyond the Tender validity date;
- c) if our Tender is accepted, we commit to furnishing a Performance Security within the time stated under ITT Sub Clause 65.1) and in the form specified in the Tender Data Sheet (ITT Sub Clause 66.1) valid for a period of twenty eight (28) days beyond the date of issue of the Completion Certificate of the Plants and Services;
- d) we have examined and have no reservations to the Tender Document, issued by you on [insert date]; including Addendum to Tender Document No(s) [state numbers] , issued in accordance with the Instructions to Tenderers (ITT Clause 11). [insert the number and issuing date of each addendum; or delete this sentence if no Addendum has been issued];
- e) we, including as applicable, any JVCA partner or Subcontractor for any part of the contract resulting from this Tender process, have nationalities from eligible countries, in accordance with ITT Sub Clause 5.1;
- f) we are submitting this Tender as a sole Tenderer in accordance with ITT Sub Clause 38.3 or
we are submitting this Tender as the partners of a JVCA, comprising the following other partners in accordance with ITT Sub Clause 18.1;

	Name of Partner	Address of Partner
1		
2		
3		
4		

- g) we are not a Government owned entity as defined in ITT Sub Clause 5.3 or
we are a Government owned entity, and we meet the requirements of ITT Sub Clause 5.3;
(delete one of the above as appropriate)
- h) we, including as applicable any JVCA partner, declare that we are not associated, nor have been associated in the past, directly or indirectly, with a consultant or any other entity that has prepared the design, specifications and other documents in accordance with ITT Sub Clause 5.5;
- i) we, including as applicable any JVCA partner or Subcontractor for any part of the contract resulting from this Tender process, have not been declared ineligible by the Government of Bangladesh on charges of engaging in corrupt, fraudulent, collusive or coercive practices in accordance with ITT Sub Clause 5.6;
- j) furthermore, we are aware of ITT Clause 4 concerning such practices and pledge not to indulge in such practices in competing for or in executing the Contract;
- k) we intend to subcontract an activity or part of the Works, in accordance with ITT Sub Clause 19.1, to the following Subcontractor(s);

Activity or part of the Plant and Services	Name of Subcontractor with Address

- l) we, including as applicable any JVCA partner, confirm that we do not have a record of poor performance, such as abandoning the works, not properly completing contracts, inordinate delays, or financial failure as stated in ITT Clause 5.7, and that we do not have, or have had, any litigation against us, other than that stated in the Tenderer Information (**Form PG5A-2b**);
- m) we are not participating as Tenderers in more than one Tender in this Tendering process. We understand that your written Notification of Award shall constitute the acceptance of our Tender and shall become a binding Contract between us, until a formal Contract is prepared and executed;
- n) we, including as applicable any JVCA partner, confirm that we do not have a record of insolvency, receivership, bankrupt or being wound up, our business activities were not been suspended, and it was not been the subject of legal proceedings in accordance with ITT Sub Clause 5.8;
- o) we, including as applicable any JVCA partner, confirm that we have fulfilled our obligations to pay taxes and social security contributions applicable under the relevant national laws and regulations of Bangladesh in accordance with ITT Sub Clause 5.9;
- p) we understand that you reserve the right to reject all the Tenders or annul the Tender proceedings, without incurring any liability to Tenderers, in accordance with ITT Clause 61

Signature:	<i>[insert signature of authorised representative of the Tenderer]</i>
Name:	<i>[insert full name of signatory with National ID Number]</i>
In the capacity of:	<i>[insert capacity of signatory]</i>
Duly authorised to sign the Tender for and on behalf of the Tenderer	

[If there is more than one (1) signatory, or in the case of a JVCA, add other boxes and sign accordingly]. **Attachment 1:**

[ITT Sub Clause 38.3]

Written confirmation authorising the above signatory(ies) to commit the Tenderer

[and, if applicable]

Attachment 2:

[ITT Sub Clause 29.2(b)]

Copy of the JVCA Agreement / Letter of Intent to form JVCA with draft proposed Agreement

Tenderer Information (Form PG5A-2a)

[This Form should be completed only by the Tenderer, preferably on its Letter-Head Pad]

Invitation for Tender No: *[indicate IFT No]*
 Tender Package No: *[indicate Package No]*
 This Package is divided into the following Number of Lots: *[indicate number of Lot(s)]*

1. Eligibility Information of the Tenderer [ITT –Clauses 5 & 29]			
1.1	Nationality of individual or country of registration		
1.2	Tenderer's legal title		
1.3	Tenderer's registered address		
1.4	Tenderer's legal status <i>[complete the relevant box]</i>		
	Proprietorship		
	Partnership		
	Limited Liability Concern		
	Government-owned Enterprise		
	Others <i>[please describe, if applicable]</i>		
1.5	Tenderer's year of registration		
1.6	Tenderer's authorised representative details		
	Name		
	National ID number		
	Address		
	Telephone / Fax numbers		
	e-mail address		
1.7	Litigation [ITT Cause 13]		
	If there is no history of litigation or no pending litigation then state opposite "None". If there is a history of litigation, or a number of awards, against the Tenderer provide details below		
	<u>A. Arbitration Awards made against</u>		
	ar	Matter in dispute	Value of Award
			Value of Claim

B. Arbitration Awards pending					
	Year	Matter in dispute			Value of Claim
1.8	Tenderer to attach photocopies of the original documents mentioned aside			[All documents required under ITT Clauses 5 and 29]	
The following two information are applicable for National Tenderers					
1.9	Tenderer's Value Added Tax Registration (VAT) Number				
1.10	Tenderer's Tax Identification Number(TIN)				
[The foreign Tenderers, in accordance with ITT Sub Clause 5.1, shall provide evidence by a written declaration to that effect to demonstrate that it meets the criterion]					
6. Qualification Information of the Tenderer [ITT Clause 29]					
2.1 General Experience in Plant and Services of Tenderer					
	Start Month Year	End Month Year	Years	Contract No and Name of Contract Name and Address of Procuring Entity Brief description of Plant and Services	Role of Tenderer [Contractor/Subcontractor /Management Contractor]
2.2 Specific Experience in Key Activities					
	Contract No Name of Contract		[insert reference no] of [insert year] [insert name]		
	Role in Contract <i>[tick relevant box].</i>		Contractor	Subcontractor	Management Contractor
	Award date Completion date Total Contract Value		[insert date] [insert date] [insert amount]		
	Procuring Entity's Name Address Tel / Fax <u>e-mail</u> Brief description with justifications of the similarity compared to the Procuring Entity's		[state justification in support of its similarity compared to the proposed works]		

	requirements	
2.3	Average annual turnover [ITT Sub Clause 15.1(a)] <i>[amount invoiced to Procuring Entity(s) for each year of works in progress or completed, using rate of exchange at the end of the period reported]</i>	
	Year	Amount & Currency <i>amount in figures</i>
2.4	Financial Resources available to meet the cash flow [ITT Sub Clause 15.1(b)]	
	No	Source of Financing Amount Available
In order to confirm the above statements the Tenderer shall submit , as applicable, the documents mentioned in ITT Sub Clause 14.1(a), (b) and 15.1 (a), (b) & (c)		
2.5	Contact Details	
	Name, address, and other contact details of Tenderer Bankers and other Procuring Entity(s) that may provide references, if contacted by this Procuring Entity	
2.6	Qualifications and experience of key technical and administrative personnel proposed for Contract administration and management [ITT Sub Clause 16.1]	
	Position Name Years of General Experience	Years of Specific Experience
<i>[Tenderer to complete details of as many personnel as are applicable. Each personnel listed above should complete the Personnel Information (Form PG5A-5)]</i>		
2.7	Major Equipment proposed to carry out the Contract [ITT Sub Clause 17.1]	
	Item of Equipment	Condition (new, good, average, poor) Owned, leased or to be purchased (state owner, less or seller)

<i>[Tenderer to list details of each item of major equipment, as applicable]</i>			

Name:	<i>[insert full name of signatory]</i>	<i>Signature with Date and Seal</i>
In the capacity of:	<i>[insert designation of signatory]</i>	<i>[Sign]</i>
Duly authorised to sign the Tender for and on behalf of the Tenderer		

JVCA Partner Information (Form PG5A-2b)

[This Form should be completed by each JVCA partner].

Invitation for Tender No:	<i>[indicate IFT No]</i>
Tender Package No	<i>[indicate Package No]</i>
This Package is divided into the following Number of Lots	<i>[indicate number of Lot(s)]</i>

1. Eligibility Information of the JVCA Partner [ITT –Clauses 5 & 29]			
1.1	Nationality of Individual or country of Registration		
1.2	JVCA Partner's legal title		
1.3	JVCA Partner's registered address		
1.4	JVCA Partner's legal status <i>[complete the relevant box]</i>		
	Proprietorship		
	Partnership		
	Limited Liability Concern		
	Government-owned Enterprise		
	Other (please describe, if applicable)		
1.5	JVCA Partner's year of registration		
1.6	JVCA Partner's authorised representative details		
	Name		
	National ID number		
	Address		
	Telephone / Fax numbers		
	e-mail address		
1.7	Litigation [ITT Sub Cause 13]		
	If there is no history of litigation or no pending litigation then state "None". If there is a history of litigation, or a number of awards, against the JVCA Partner provide details below:		
	<u>A. Arbitration Awards made against</u>		
	Year	Matter in dispute	Value of Award of Claim
	<u>B. Arbitration Awards pending</u>		
	Year	Matter in dispute	Value of Claim

1.8	JVCA Partner to attach copies of the original documents mentioned aside		[All documents required under ITT Clauses 5 and 29]		
The following two information are applicable for national JVCA Partners only					
1.9	JVCA Partner's Value Added Tax Registration (VAT) Number				
1.10	JVCA Partner's Tax Identification Number (TIN)				
[The foreign JVCA Partners, in accordance with ITT Sub Clause 5.1, shall provide evidence by a written declaration to that effect to demonstrate that it meets the criterion]					
2. Key Activity(ies) for which it is intended to be joint ventured [ITT Sub Clause 18.2 & 18.3]					
	Elements of Activity		Brief description of Activity		
3. Qualification Information of the JVCA Partner [ITT Clause 18]					
3.1	General Experience in Plant and Services of JVCA Partner				
	Start Month Year	End Month Year	Years	Contract No and & Name of Contract Name and Address of Procuring Entity Brief description of Works	Role of JVCA Partner [Contractor/Subcontractor/Management Contractor]
3.2	Specific Experience in Key Activities				
	Contract No Name of Contract		[insert reference no] of [insert year] [insert name]		
	Role in Contract [tick relevant box]		Contractor	Sub contractor	Management Contractor
	Award date Completion date Total Contract Amount		[insert date] [insert date] [insert amount]		
	Procuring Entity's Name Address Tel / Fax		[state justification in support of its similarity compared to the proposed plants and service]		

	<u>e-mail</u>	Brief description with justifications of the similarity compared to the Procuring Entity's requirements	
3.3	Average annual construction turnover [ITT Sub Clause 15.1 (a)] <i>[amount invoiced to Procuring Entity(s) for each year of work in progress or completed, using rate of exchange at the end of the period reported]</i>		
	Year	Amount & Currency	Amount in Figures
3.4	Financial Resources available to meet the cash flow [ITT Sub-Clause 15.1(b)]		
		Source of financing	Amount available
	In order to confirm the above statements the JVCA Partner shall submit , as applicable, the documents mentioned in ITT Sub Clause 14.1 (a) & (b)15.1 (a), (b), (c) & (d)		
3.5	Contact Details		
	Name, address, and contact details of Tenderer's Bankers and other Procuring Entity(s) that may provide references if contacted by this Procuring Entity		
3.6	Qualifications and experience of key technical and administrative personnel proposed for Contract administration and management [ITT Sub Clause 16.1]		
	Position Name Years of General Experience	Years of Specific Experience	
	<i>[Tenderer to complete details of as many personnel as are applicable. Each personnel listed above should complete the Personnel Information (Form PG5A-5)]</i>		
3.7	Major items of Construction Equipment proposed for carrying out the works [ITT Sub-Clause 17.1]		
	Item of Equipment	Condition (new, good, average, poor)	Owned, leased or to be purchased (state owner, leaser or seller)
	<i>[Tenderer to list details of each item of Major equipment, as applicable]</i>		

Name:	<i>[insert full name of signatory]</i>	<i>Signature with Date and Seal</i>
In the capacity of:	<i>[insert designation of signatory]</i>	<i>[Sign]</i>
Duly authorised to sign the Tender for and on behalf of the Tenderer		

Subcontractor Information (Form PG5A-2c)

[This Form should be completed by each Subcontractor, preferably on its Letter-Head Pad]

Invitation for Tender No: *[indicate IFT No]*
 Tender Package No *[indicate Package No]*
 This Package is divided into the following Number of Lots *[indicate number of Lot(s)]*

1. Eligibility Information of the Subcontractor <i>[ITT –Clauses 5 & 29]</i>		
1.1	Nationality of Individual or country of Registration	
1.2	Subcontractor's legal title	
1.3	Subcontractor's registered address	
1.4	Subcontractor's legal status <i>[complete the relevant box]</i>	
	Proprietorship	
	Partnership	
	Limited Liability Concern	
	Government-owned Enterprise	
	Other (please describe)	
.1.5	Subcontractor's year of registration	
1.6	Subcontractor's authorised representative details	
	Name	
	Address	
	Telephone / Fax numbers	
	e-mail address	
1.7	Subcontractor to attach copies of the following original documents	All documents to the extent relevant to ITT Clause 5 and 29 in support of its qualifications
The following two information are applicable for national Subcontractors		
1.8	Subcontractor's Value Added Tax Registration (VAT) Number	
1.9	Subcontractor's Tax Identification Number(TIN)	
<i>[The foreign Subcontractors , in accordance with ITT sub Clause 5.1, shall provide evidence by a written declaration to that effect to demonstrate that it meets the criterion]</i>		
2. Key Activity(ies) for which it is intended to be Subcontracted <i>[ITT Sub Clause 19.1]</i>		

2.1	Elements of Activity	Brief description of Activity
2.2	List of Similar Contracts in which the proposed Subcontractor had been engaged	
	Name of Contract and Year of Execution	
	Value of Contract	
	Name of Procuring Entity	
	Contact Person and contact details	
	Type of Assignment performed	
Name:	<i>[insert full name of signatory]</i>	<i>Signature with Date and Seal</i>
In the capacity of:	<i>[insert designation of signatory]</i>	<i>[Sign]</i>
Duly authorised to sign the Tender for and on behalf of the Tenderer		

Price Schedule for Plant and Service (Form PG5A-3)

(This form should be completed and submitted by the tenderer and appended in the financial proposal envelope)

Invitation for Tender No:	<i>[indicate IFT No]</i>
Tender Package No	<i>[indicate Package No]</i>
This Package is divided into the following Number of Lots	<i>[indicate number of Lot(s)]</i>

General

1. The Price Schedules are divided into separate Schedules as follows:
 - Schedule No. 1: Plant (including Mandatory Spare Parts) Supplied from Abroad
 - Schedule No. 2: Plant (including Mandatory Spare Parts) Supplied from within the Employer's Country
 - Schedule No. 3: Design Services *[Not Applicable]*
 - Schedule No. 4: Civil Works *[Not Applicable]*
 - Schedule No. 5: Installation and Other Services
 - Schedule No. 6: Grand Summary
 - Schedule No.7: Recommended Spare Parts
2. The Schedules do not generally give a full description of the plant to be supplied and the services to be performed under each item. Tenderers shall be deemed to have read the Employer's Requirements and other sections of the Tender Document and reviewed the Drawings to ascertain the full scope of the requirements included in each item prior to filling in the rates and prices. The entered rates and prices shall be deemed to cover the full scope as aforesaid, including overheads and profit.
3. If tenderers are unclear or uncertain as to the scope of any item, they shall seek clarification in accordance with ITT 9.1 prior to submitting their tender.

Pricing

4. Prices shall be filled in indelible ink, and any alterations necessary due to errors, etc., shall be initialed by the Tenderer.

As specified in the Tender Data Sheet and Special Conditions of Contract, prices shall be fixed and firm for the duration of the Contract, or prices shall be subject to adjustment in accordance with the corresponding Appendix (Price Adjustment) to the Contract Agreement.
5. Tender prices shall be quoted in the manner indicated and in the currencies specified in the Instructions to Tenderers in the Tender Document.

For each item, tenderers shall complete each appropriate column in the respective Schedules, giving the price breakdown as indicated in the Schedules.

Prices given in the Schedules against each item shall be for the scope covered by that item as detailed in Section 6 (Employer's Requirements) or elsewhere in the Tender Document.
6. Payments will be made to the Contractor in the currency or currencies indicated under each respective item.
7. When requested by the Employer for the purposes of making payments or partial payments, valuing variations or evaluating claims, or for such other purposes as the Employer may reasonably require, the Contractor shall provide the Employer with a breakdown of any composite or lump sum items included in the Schedules.

Schedules of Rates and Prices

Schedule No. 1 - Plant and Mandatory Spare Parts Supplied from Abroad

Line Item No	Description of Item	Country of Origin	Quantity	Unit Price CIP [insert of place destination] [USD]	CIP price per Line Item [USD]	Taxes and Duties In Local Currency (Taka)
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6 = 4 x 5</u>	<u>7</u>
1.0	Meters & Accessories					
1.1	Supply of Keypad base Single phase Smart Pre-payment meters with Broadband PLC Communication module		50913 Nos.			
1.2	Supply of Keypad base Three phase Oline Smart Pre-payment Meters with Broadband PLC Communication module		888 Nos.			
1.3	Supply of External GPRS communication module for offered Single Phase Meter (Plug and Play), 4G, (which will also support all other available bands in Bangladesh)		2546 Nos.			
1.4	Supply of External GPRS communication module for offered Three Phase Meter (Plug and Play), 4G, (which will also support all other available bands in Bangladesh)		44 Nos.			
1.5	Supply of DCU (Data Concentrator Unit) with SIM card, CT, Enclosure Box, Cables & other required materials		384 Nos.			
1.6	Supply of HandHeld Unit with Optical communication cable (for downloading data from meter to PC) [4 Nos. cable with each HHU]		7 Nos.			
2.0	Supply, Installation, testing & Commissioning of Hardware & Software for 02 Nos. of Utility Vending Station cum Customer Care Center (VS-CCC) [this quoted price shall include the cost of supply as well as Installation, testing & Commissioning i.e., no additional payment shall be applicable separately for Installation, testing & Commissioning of these items]					
2.1	Workstation with Required Software (both System and application)		4 Nos.			
2.2	GRPS/EDGE/EVDO Modem with Required Software (both System and application)		4 Nos.			
2.3	SIM Card with Required Software (both System and application)		4 Nos.			
2.4	Laser Printer with Required Software (both System and application)		2 Nos.			
2.5	Slip Printer with Required Software (both System and application)		4 Nos.			
2.6	Laptop with Required Software (both System and application)		2 Nos.			
2.7	Router and Switch with Required Software (both System and application)		2 Nos.			

Line Item No	Description of Item	Country of Origin	Quantity	Unit Price CIP place destination] [insert of USD]	CIP price per Line Item [USD]	Taxes and Duties In Local Currency (Taka)
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6 = 4 x 5</u>	<u>7</u>
2.8	Split Type square AC 2 ton		2 Nos.			
Column 6 to be carried forward to Schedule No. 6. Grand Summary						

Note: 1. The Employer may also use other INCOTERMS, if deemed necessary, In such case Form PG5A-6, will require to be customized by the Employer
2. Specify currencies in accordance with ITT 27. Create and use as many columns for Unit Price and Total Price as there are currencies.

Country of Origin Declaration Form

Item	Description	Country of Origin
Name:	[insert full name of signatory]	Signature with Date and Seal
In the capacity of:	[insert designation of signatory]	[Sign]
Duly authorized to sign the Tender for and on behalf of the Tenderer		

Schedule No. 2 - Plant and Mandatory Spare Parts Supplied from within the Employer's Country

Line Item No.	Description of Item	Quantity	Unit Price EXW (Foreign Currency or Taka)	Total EXW Price (Foreign Currency or Taka)	Sales Tax (Foreign Currency or Taka)	Total Price (Foreign Currency or Taka)
1	2	3	4	5 = 3x 4	6	7 = 5 + 6
1.0	Meters & Accessories					
1.1	Supply of Keypad base Single phase Smart Pre-payment meters with Broadband PLC Communication module	50913 Nos.				
1.2	Supply of Keypad base Three phase Oline Smart Pre-payment Meters with Broadband PLC Communication module	888 Nos.				
1.3	Supply of External GPRS communication module for offered Single Phase Meter (Plug and Play), 4G, (which will also support all other available bands in Bangladesh)	2546 Nos.				
1.4	Supply of External GPRS communication module for offered Three Phase Meter (Plug and Play), 4G, (which will also support all other available bands in Bangladesh)	44 Nos.				
1.5	Supply of DCU (Data Concentrator Unit) with SIM card, CT, Enclosure Box, Cables & other required materials	384 Nos.				
1.6	Supply of Hand Held Unit with Optical communication cable (for downloading data from meter to PC) [4 Nos. cable with each HHU]	7 Nos.				
2.0	Supply, Installation, testing & Commissioning of Hardware & Software for 02 Nos. of Utility Vending Station cum Customer Care Center (VS-CCC) [this quoted price shall include the cost of supply as well as Installation, testing & Commissioning i.e., no additional payment shall be applicable separately for Installation, testing & Commissioning of these items]					
2.1	Workstation with Required Software (both System and application)	4 Nos.				
2.2	GRPS/EDGE/EVDO Modem with Required Software (both System and application)	4 Nos.				
2.3	SIM Card with Required Software (both System and application)	4 Nos.				
2.4	Laser Printer with Required Software (both System and application)	2 Nos.				

Line Item No.	Description of Item	Quantity	Unit Price EXW (Foreign Currency or Taka)	Total EXW Price (Foreign Currency or Taka)	Sales Tax (Foreign Currency or Taka)	Total Price (Foreign Currency or Taka)
1	2	3	4	5 = 3x 4	6	7 = 5 + 6
2.5	Slip Printer with Required Software (both System and application)	4 Nos.				
2.6	Laptop with Required Software (both System and application)	2 Nos.				
2.7	Router and Switch with Required Software (both System and application)	2 Nos.				
2.8	Split Type square AC 2 ton	2 Nos.				
TOTAL Column 5 to be carried forward to Schedule No. 6. Grand Summary						

Note: 1. *Specify currencies in accordance with ITT 27. Create and use as many columns for Unit Price and Total Price as there are currencies*

Name:	<i>[insert full name of signatory]</i>	<i>Signature with Date and Seal</i>
In the capacity of:	<i>[insert designation of signatory]</i>	<i>[Sign]</i>
Duly authorised to sign the Tender for and on behalf of the Tenderer		

Schedule No. 3 - Design Services (Not Applicable).

Item	Description of Item	Quantity	Unit Price		Total Price	
			Local Currency Portion	Foreign Currency Portion	Local Currency Portion	Foreign Currency Portion
(1)	(2)	(3)	(4)	(5)	(6) = (3 x 4)	(7) = (3 x 5)
TOTAL Columns 6 and 7 to be carried forward to Schedule No. 6. Grand Summary						

¹Note: 1. Specify currencies in accordance with ITT 27. Create and use as many columns for Unit Price and Total Price as there are currencies

Name:	<i>[insert full name of signatory]</i>	<i>Signature with Date and Seal</i>
In the capacity of:	<i>[insert designation of signatory]</i>	<i>[Sign]</i>
Duly authorised to sign the Tender for and on behalf of the Tenderer		

Schedule No. 4 – Civil works part *(Not Applicable)*.

Item	Description of items	Unit	Quantity	Rate	Amount
1	2	3	4	5	6 = 4*5
TOTAL Columns 6 to be carried forward to Schedule No. 6. Grand Summary					

Note: 1. Specify currencies in accordance with ITT 27. Create and use as many columns for Unit Price and Total Price as there are currencies

Name:	<i>[insert full name of signatory]</i>	<i>Signature with Date and Seal</i>
In the capacity of:	<i>[insert designation of signatory]</i>	<i>[Sign]</i>
Duly authorised to sign the Tender for and on behalf of the Tenderer		

Schedule No. 5- Installation and Other Services

Item	Description	Quantity	Unit Price		Total Price	
			Local Currency Portion	Foreign Currency Portion	Local Currency Portion	Foreign Currency Portion
1	2	3	4	5	6 = 3 x 4	7 = 3 x 5
3.0	Installation, testing & commissioning of Meters & Accessories					
3.1	Installation, testing & commissioning of Keypad base Single phase Smart Pre-payment meters (Dismantling of existing postpaid/prepaid meters with carrying and handover included)	50913 Nos.				
3.2	Installation, testing & commissioning of Keypad base Three phase Online Smart Pre Payment meters (Dismantling of existing postpaid/prepaid meters with carrying and handover included)	888 Nos.				
3.3	Installation, testing & commissioning of DCU (Data Concentrator Unit), DCU Enclosure Box and CT with required materials such as cables/ clamps/ screw/ nut-bolts/ connector etc. when/where required to install DCU.	384 Nos.				
4.0	Supply, Installation, testing, commissioning of Network					
4.1	Network 1: The Master Information Center (MIC) to the DC/DCU (wireless connection) and DC/DCU to the related Meters. (Installation & Monthly Communication charge shall be paid by the contractor until the project handover)	384 Nos.				
4.2	Network 2: The Master Information Center (MIC) to the Utility Vending Station cum Customer Care Center (VS-CCC) Networks: This network includes both physical connection via fibre optical line and wireless connection through GPRS. (Installation & Monthly Communication charge of this network for the 02 Nos. of VS-CCC to be installed under this contract as well as for 03 Nos. of existing VS-CCC in the project area shall be paid by the contractor until the end of the support service period. There is/will be 02 Nos. of such connections for each of the VS-CCC).	10 Nos				
5.0	Training Services					
5.1	Manpower Training (Local) [10 Nos. Trainees, 10 Days]	3.33 Man-				

Item	Description	Quantity	Unit Price		Total Price	
			Local Currency Portion	Foreign Currency Portion	Local Currency Portion	Foreign Currency Portion
1	2	3	4	5	6 = 3 x 4	7 = 3 x 5
		Month				
5.2	Manpower Training (Foreign) [6 Nos. Trainees, 7 Days]	1.4 Man-Month				
TOTAL Columns 6 and 7 to be carried forward to Schedule No. 6. Grand Summary						

Note: 1. Specify currencies in accordance with ITT 27. Create and use as many columns for Unit Price and Total Price as there are currencies

Name:	<i>[insert full name of signatory]</i>	<i>Signature with Date and Seal</i>
In the capacity of:	<i>[insert designation of signatory]</i>	<i>[Sign]</i>
Duly authorized to sign the Tender for and on behalf of the Tenderer		

Schedule No. 6 - Grand Summary

Schedule No.	Title	Total Price	
		Foreign Currency	Local Currency
1	Plant and Mandatory Spare Parts Supplied from Abroad		
2	Plant and Mandatory Spare Parts Supplied from Within the Employer's Country		
3	Design Services (Not Applicable)		
4	Civil works part (Not Applicable)		
5	Installation and Other Services		
GRAND TOTAL to be carried forward to Form PG5A-1b			

Note: 1. Specify currencies in accordance with ITT 27. Create and use as many columns for Unit Price and Total Price as there are currencies
 2. Create additional columns for up to a maximum of 3 Foreign Currencies if so required

Name:	<i>[insert full name of signatory]</i>	<i>Signature with Date and Seal</i>
In the capacity of:	<i>[insert designation of signatory]</i>	<i>[Sign]</i>
Duly authorized to sign the Tender for and on behalf of the Tenderer		

Schedule No. 7 - Recommended Spare Parts

Item	Description	Qty	Unit Price		Total Price	
			EXW Local Parts Local Currency	CIP Imported Parts Foreign Currency	Local Currency Portion	Foreign Currency Portion
1	2	3	4	5	6 = 3 x 4	7 = 3 x 5
TOTAL						

Note: 1. Specify currencies in accordance with ITT 27. Create and use as many columns for Unit Price and Total Price as there are currencies

Name:	<i>[insert full name of signatory]</i>	<i>Signature with Date and Seal</i>
In the capacity of:	<i>[insert designation of signatory]</i>	<i>[Sign]</i>
Duly authorized to sign the Tender for and on behalf of the Tenderer		

Technical Proposal (Form PG5A-4)

[The Revised Technical Proposal, if any, shall follow the same format and structure]

Site Organization

Method Statement

Mobilization Structure

Construction Structure

Plant

Safety Plan

Personnel

Equipment

Proposed subcontractors for Major Items of Plant and Services

Time Schedule

Site Organization

[insert technical proposal for site organization]

[The Tenderer shall include in the tender an appropriate organization chart. This shall include head office as well as site components and clearly demonstrate that the Tenderer possesses the staff and organizational resources to complete the Supply and Installation of Plant & Equipment.]

Method Statement

[insert technical proposal for Method Statement]

[The Tenderer shall furnish an overall description covering all activities and processes from inception to site works and commissioning.

In particular methods of minimizing the impact on the environment in accordance with the relevant laws and regulations during the construction phase shall be described.]

Mobilization Schedule

[insert technical proposal for Mobilization Schedule]

[This shall be included in the overall time schedule to be provided by the Tenderer as per “Time Schedule” in Section 5. Tendering Forms]

Construction Schedule

[insert technical proposal for Construction Schedule]

[This shall be included in the overall time schedule to be provided by the Tenderer as per “Time Schedule” in Section 5. Tendering Forms]

Plant

*[insert technical proposal for **Plant**]*

[The Tenderer shall provide the plant and equipment it intends to use in the construction process to demonstrate that it has the capability to complete the Supply and Installation of Plant & Equipment.]

Safety Plan

*[insert technical proposal for **Safety Plan**]*

[The Tenderer shall demonstrate that it has a comprehensive safety system that will be used during the construction and installation phase. This system shall meet all safety requirements in accordance with all relevant laws, rules and regulations.]

Personnel Information

[This Form should be completed for each person proposed by the Tenderer on Form PG5A-2a& PG5A-2b, where applicable]

Invitation for Tender No:	<i>[indicate IFT No]</i>
Tender Package No	<i>[indicate Package No]</i>
This Package is divided into the following Number of Lots	<i>[indicate number of Lot(s)]</i>

A. Proposed Position (tick the relevant box)			
B. Personal Data			
Name			
Date of Birth			
Years overall experience			
Years of specific experience			
National ID Number			
Years of employment with the Tenderer			
B. Professional Qualifications:			
1.			
2.			
C. Present Employment <i>[to be completed only if not employed by the Tenderer]</i>			
Name of Procuring Entity:			
Address of Procuring Entity:			
Present Job Title:			
Years with present Procuring Entity:			
Tel No:	Fax No:	e-mail address:	
Contact <i>[manager/personnel officer]</i> :			
D. Professional Experience			
Summarise professional experience over the last twenty years, in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.			
	From	To	Company / Project / Position / Relevant technical and management experience.
1			
2			
3			

Name:	<i>[insert full name of signatory]</i>	<i>Signature with Date and Seal</i>
In the capacity of:	<i>[insert designation of signatory]</i>	<i>[Sign]</i>
Duly authorised to sign the Tender for and on behalf of the Tenderer		

Equipment Information

[The Tenderer shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in TDS . A Separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Tenderer]

Invitation for Tender No:	<i>[indicate IFT No]</i>
Tender Package No	<i>[indicate Package No]</i>
This Package is divided into the following Number of Lots	<i>[indicate number of Lot(s)]</i>

Item of equipment		
Equipment information	Name of manufacturer	Model and power rating
	Capacity	Year of manufacture
Current status	Current location	
	Details of current commitments	
Source	Indicate source of the equipment <input type="checkbox"/> Owned <input type="checkbox"/> Rented <input type="checkbox"/> Leased <input type="checkbox"/> Specially manufactured	

Omit the following information for equipment owned by the Tenderer.

Owner	Name of owner	
	Address of owner	
	Telephone	Contact name and title
	Fax	Telex
Agreements	Details of rental / lease / manufacture agreements specific to the project	

Name:	<i>[insert full name of signatory]</i>	<i>Signature with Date and Seal</i>
In the capacity of:	<i>[insert designation of signatory]</i>	<i>[Sign]</i>
Duly authorized to sign the Tender for and on behalf of the Tenderer		

Proposed Subcontractors for Major Items of Plant and Installation Services

A list of major items of Plant and Installation Services is provided below.

The following Subcontractors and/or manufacturers are proposed for carrying out the item of the facilities indicated. Tenderers are free to propose more than one for each item

Major Items of Plant and Installation Services	Proposed Subcontractors/Manufacturers	Nationality

Form Functional Guarantee

The Tenderer shall copy in the left column of the table below, the identification of each functional guarantee required in the Specification and stated by the Employer in ITT 24(n) and in the right column, provide the corresponding value for each functional guarantee of the proposed plant and equipment.

Invitation for Tender No:	<i>[indicate IFT No]</i>
Tender Package No	<i>[indicate Package No]</i>
This Package is divided into the following Number of Lots	<i>[indicate number of lot(s)]</i>

Required Functional Guarantee	Value of Functional Guarantee of the Proposed Plant and Equipment
1.	
2.	
3.	
4.	
5.	
6.	

Specifications Submission and Compliance Sheet (Form PG5A-4a)

Invitation for Tender No:

Date:

Tender Package No:

Package Description: *[enter description as specified in Section 6]*

Tender Lot No:

Lot Description: *[enter description as specified in Section 6]*

Item No.	Name of Goods or Related Service	Country of Origin	Make and Model (<i>when applicable</i>)	Full Technical Specifications and Standards
1	2	3	4	5
	FOR GOODS			Note 1
	FOR RELATED SERVICES			

[The Tenderer should complete all the columns as required]

Signature:	<i>[insert signature of authorised representative of the Tenderer]</i>
Name:	<i>[insert full name of signatory with National ID]</i>
In the capacity of:	<i>[insert designation of signatory]</i>
Duly authorised to sign the Tender for and on behalf of the Tenderer	

Manufacturer's Authorisation Letter (Form PG5A - 5)

[The Tenderer shall require the Manufacturer to fill in this Form in accordance with the instructions indicated. This letter of authorization should be on the letterhead of the Manufacturer and should be signed by a person with the proper authority to sign documents that are binding on the Manufacturer. The Tenderer shall include it in its tender, if so indicated in the TDS as stated under ITT Sub-Clause 29.1(b)]

Invitation for Tender No:	Date:
Tender Package No:	
Tender Lot No:	
To: Name and address of Employer]	

WHEREAS

We *[insert complete name of Manufacturer]*,

who are official manufacturers of *[insert type of goods manufactured]*, having factories at *[insert full address of Manufacturer's factories]*, do hereby

authorize *[insert complete name of Tenderer]* to supply the following Plant and Equipment, manufactured by us *[insert name and or brief description of the Goods]*.

We hereby extend our full guarantee and warranty as stated under GCC Clause 42 of the General Conditions of Contract, with respect to the Goods offered by the above Tenderer.

Signed: *[insert signature(s) of authorized representative(s) of the Manufacturer]*

Name: *[insert complete name(s) of authorized representative(s) of the Manufacturer]*

Address: *[insert full address including Fax and e-mail]*

Title: *[insert title]*

Date: *[insert date of signing]*

Bank Guarantee for Tender Security (Form PG5A– 6)

[this is the format for the Tender Security to be issued by a scheduled bank of Bangladesh as stated under ITT Clauses 32 and 33]

Invitation for Tender No:

Date:

Tender Package No:

Tender Lot No:

To:

[Name and address of Employer]

TENDER GUARANTEE No:

We have been informed that *[insert name of Tenderer]* (hereinafter called “the Tenderer”) intends to submit to you its Tender dated *[insert date of Tender]* (hereinafter called “the Tender”) for the supply and installation of *[description of plant and services]* under the above Invitation for Tenders (hereinafter called “the IFT”).

Furthermore, we understand that, according to your conditions, Tenders must be supported by a Bank Guarantee for Tender Security .

At the request of the Tenderer, we *[insert name of bank]* hereby irrevocably and unconditionally undertake to pay you, without cavil or argument, any sum or sums not exceeding in total an amount of Tk.*[insert amount in figures and in words]* upon receipt by us of your first written demand accompanied by a written statement that the Tenderer is in breach of its obligation(s) under the Tender conditions, because the Tenderer:

- a. has withdrawn its Tender after opening of Tenders but within the validity of the Tender Security ; or
- b. refused to accept the Notification of Award (NOA) within the period as stated under Instructions to Tenderers (ITT) ; or
- c. failed to furnish Performance Security within the period as stipulated in the NOA; or
- d. refused to sign the Contract Agreement by the time specified in the NOA; or
- e. did not accept the correction of the Tender price following the correction of the arithmetic errors in accordance with the ITT; or

This guarantee will expire:

- (a) if the Tenderer is the successful Tenderer, upon our receipt of a copies of the contract signed by the Tenderer and the Performance Security issued to you in accordance with the ITT; or
- (b) if the Tenderer is not the successful Tenderer, twenty eight (28) days after the expiration of the Tenderer’s Tender validity period, being *[date of expiration of the Tender validity plus twenty eight(28) days]*

Consequently, we must receive at the above-mentioned office any demand for payment under this guarantee on or before that date.

Letter of Commitment for Bank's undertaking for Line of Credit (Form PG5A-6a)

[This is the format for the Credit Line to be issued by any scheduled Bank of Bangladesh in accordance with ITT Clause 15.1(b)]

Invitation for Tender No:

Date:

Tender Package No:

Lot No (when applicable)

To:

[Name and address of the Procuring Entity]

CREDIT COMMITMENT No: [insert number]

We have been informed that [name of Tenderer] (hereinafter called "the Tenderer") intends to submit to you its Tender (hereinafter called "the Tender") for the execution of the Supply and Installation of Plant & Equipment of [description of works] under the above Invitation for Tenders (hereinafter called "the IFT").

Furthermore, we understand that, according to your conditions, the Tenderer's Financial Capacity i.e. Liquid Asset must be substantiated by a Letter of Commitment of Bank's Undertaking for Line of Credit.

At the request of, and arrangement with, the Tenderer, we [name and address of the Bank] do hereby agree and undertake that [name and address of the Tenderer] will be provided by us with a revolving line of credit, in case awarded the Contract, for execution of the Works viz. [insert name of works], for an amount not less than BDT [in figure](in words) for the sole purpose of the execution of the above Contract. This Revolving Line of Credit will be maintained by us until issuance of "Taking-Over Certificate" by the Procuring Entity.

In witness whereof, authorised representative of the Bank has hereunto signed and sealed this Letter of Commitment.

Signature

Signature

Note: The amount in BDT can be converted to an equivalent amount in USD. In doing so, you have to take currency exchange rate on the date of issuance of Line of credit. In case the issuing bank is located outside Bangladesh, it shall have correspondent bank located in Bangladesh.

Notification of Award (Form PG5A - 7)

Contract No:
To:

Date:

[Name of Contractor]

This is to notify you that your Tender dated *[insert date]* for the supply and installation of plant and Services for *[name of contract]* for the Contract Price of *[state amount in figures and in words]* as corrected and modified in accordance with the Instructions to Tenderers, has been approved by *[name of Employer]*.

You are thus requested to take following actions:

- i. accept in writing the Notification of Award within seven (7) working days of its issuance pursuant to ITT Sub-Clause 64.1
- ii. furnish a Performance Security in the specified format and in the amount of Tk.*[state amount in figures and words]* ,within Twenty-eight (28) days from issue of this Notification of Award but not later than *(specify date)*, in accordance with ITT Clause 64.3
- iii. sign the Contract within twenty eight (28) days of issuance of this Notification of Award but not later than *(specify date)*, in accordance with ITT Clause 69.2

You may proceed with the execution of the supply of Plant and Services only upon completion of the above tasks. You may also please note that this Notification of Award shall constitute the formation of this Contract, which shall become binding upon you.

We attach the draft Contract and all other documents for your perusal and signature.

Signed

Duly authorised to sign for and on behalf of *[name of Employer]*

Date:

Contract Agreement (Form PG5A - 8)

THIS AGREEMENT made the [day] day of [month][year] between [name and address of Employer] (hereinafter called "the Employer") of the one part and [name and address of Contractor] (hereinafter called "the Contractor") of the other part:

WHEREAS the Employer invited Tenders for certain plant and services, viz, [brief description of plant and services] and has accepted a Tender by the Contractor for the supply of those plant and services in the sum of Taka [Contract Price in figures and in words] (hereinafter called "the Contract Price").

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the General Conditions of Contract hereafter referred to.
2. The following documents forming the Contract shall be in the following order of precedence, namely :
 - (a) the signed Form of Contract Agreement;
 - (b) the Notification of Award
 - (c) The Tender and the appendices to the Tender
 - (d) Particular Conditions of Contract;
 - (e) General Conditions of Contract;
 - (f) Technical Specifications;
 - (g) Drawings;
 - (h) Price Schedules of Plant and Equipment and;
 - (i) other document including correspondences listed in the PCC forming part of the Contract
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to provide the plants and related services and to remedy any defects therein in conformity in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor in consideration of the provision of the plant and services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.
5. The Appendices listed in the attached List of Appendices shall be deemed to form an integral part of this Contract Agreement. Reference in the Contract to any Appendix shall mean the Appendices attached hereto, and the Contract shall be read and construed accordingly.

IN WITNESS whereof the Employer and the Contractor have caused this Agreement to be duly executed by their duly authorized representatives in accordance with the laws of Bangladesh on the day, month and year first written above.

Signed by, for and on behalf of the Employer

For the Employer:

For the Contractor:

Signature

Print Name

Title

In the presence
of Name
Address

Bank Guarantee for Performance Security (Form PG5A – 9)

[This is the format for the Performance Security to be issued by an internationally reputable bank and it shall have correspondent bank located in Bangladesh, to make it enforceable in accordance with ITT Sub-Clause 67.1 pursuant to Rule 27(4) of the Public Procurement Rules, 2008.]

Contract No:

Date:

To:

[Name and address of Employer]

PERFORMANCE GUARANTEE No: *[insert Performance Guarantee number]*

We have been informed that *[name of Contractor]* (hereinafter called “the Contractor”) has undertaken, pursuant to Contract No *[reference number of Contract]* dated *[date of Contract]* (hereinafter called “the Contract”) for the supply and installation of *[description of plant and services]* under the Contract.

Furthermore, we understand that, according to your conditions, Contracts must be supported by a performance guarantee.

At the request of the Contractor, we *[name of bank]* hereby irrevocably and unconditionally undertake to pay you, without cavil or argument, any sum or sums not exceeding in total an amount of Tk.*[insert amount in figures and in words]* upon receipt by us of your first written demand accompanied by a written statement that the Supplier is in breach of its obligation(s) under the Contract conditions, without you needing to prove or show grounds or reasons for your demand of the sum specified therein.

This guarantee is valid until *[date of validity of guarantee]*, consequently, we must receive at the above-mentioned office any demand for payment under this guarantee on or before that date.

[Signatures of authorized representatives of the bank]

Signature

Seal

Bank Guarantee for Advance Payment (Form PG5A – 10)

[this is the format for the Advance Payment Security to be issued by an internationally reputable bank and it shall have correspondent bank located in Bangladesh, to make it enforceable in accordance with GCC Clause 57.1]

Contract No:

Date:

To:

[Name and address of Employer]

ADVANCE PAYMENT GUARANTEE No.:

We have been informed that *[name of Contractor]* (hereinafter called “the Contractor”) has undertaken, pursuant to Contract No *[reference number of Contract]* dated *[date of Contract]* (hereinafter called “the Contract”) for the supply and installation of *[description of plant and services]* under the Contract.

Furthermore, we understand that, according to your Particular Conditions of Contract Clause 26.1, Advance Payment(s) on Contracts must be supported by a bank guarantee.

At the request of the Contractor, we *[name of bank]* hereby irrevocably unconditionally undertake to pay you, without cavil or argument, any sum or sums not exceeding in total an amount of Tk.*[insert amount in figures and in words]* upon receipt by us of your first written demand accompanied by a written statement that the Contractor is in breach of its obligation(s) under the Contract conditions, without you needing to prove or show grounds or reasons for your demand of the sum specified therein.

We further agree that no change, addition or other modification of the terms of the Contract to be performed, or of any of the Contract documents which may be made between the Employer and the Contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee is valid until *[date of validity of guarantee]*, consequently, we must receive at the above-mentioned office any demand for payment under this guarantee on or before that date.

[Signatures of authorized representatives of the bank]

Signature

Seal

Bank Guarantee for Retention Money Security (Form PG5A-11)

[This is the format for the Retention Money Guarantee to be issued by any scheduled Bank of Bangladesh in accordance with GCC Clause 57]

Demand Guarantee

[Bank's Name, and Address of Issuing Branch or Office]

Beneficiary: [insert Name and Address of the Procuring Entity]

Date: [insert date]

RETENTION MONEY GUARANTEE No.: [insert number]

We have been informed that [insert name of Contractor] (hereinafter called "the Contractor") has entered into Contract Number [insert reference number of the Contract] dated [insert date] with you, for the execution of [insert name of Contract and brief description of Works] (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, when the Taking-Over Certificate has been issued for the Works and the first half of the Retention Money has been certified for payment, payment of Tk. [insert the amount of the second half of the Retention Money] which becomes due after the Defects Liability Period has passed and certified in the form of Defects Correction Certificate, is to be made against a Retention Money Guarantee.

At the request of the Contractor, we [insert name of Bank] hereby irrevocably unconditionally undertake to pay you any sum or sums not exceeding in total an amount of Tk. [insert amount in figures] (Taka [insert amount in words]) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor failed to properly correct the defects duly notified in respect of the Supply and Installation of Plant & Equipment.

It is a condition for any claim and payment under this guarantee to be made that the payment of the second half of the Retention Money referred to above must have been received by the Contractor on its account number [insert A/C no] at [name and address of Bank].

This guarantee is valid until [insert the date of validity of Guarantee that being twenty-eight (28) days beyond the Defects Liability Period]. Consequently, we must receive at the above-mentioned office any demand for payment under this guarantee on or before that date.

Warranty Certificate (Form PG5A - 12)

[The Tenderer shall require to fill in this Form in accordance with the instructions indicated. This Certificate should be on the official pad of the Tenderer and should be signed by a person with the proper authority to sign documents.]
*[The Tenderer shall include it in its Tender, if so, indicated in the TDS as stated under **ITT Sub Clause 24.2 (r)**]*

Invitation for Tender No:	Date:
Tender Package No:	
Tender Lot No (when applicable):	
To: [Name and address of Procuring Entity]	

WHEREAS

We [insert complete name of Tenderer],

who are authorized Supplier of [insert type of goods to be Supplied], having registered office at [insert full address of Tenderer's registered office] do hereby warrants that all the Plant & Equipment [insert name and brief description of the Goods, Plant & Equipment] will be supplied by us and extend our full guarantee and warranty as stated under GCC Clause 42 of the General Conditions of Contract with respect to the Goods offered by us under this contract.

Signed: [insert signature(s) of authorized representative(s) of the Tenderer]

Name: [insert complete name(s) of authorized representative(s) of the Tenderer]

Address: [insert full address including Fax and e-mail]

Title: [insert title]

Date: [insert date of signing]

Deviation List (Form PG5A - 13)

[If Tenderer has any reservation on terms and conditions, Tenderer has to mention his reservations in Deviation list]

Sl. No.	Reference Clause No.	No./	Proposed Deviation	Remarks

[Add rows if necessary]

Signature: [insert signature of authorized representative of the Tenderer]

Name: [insert full name of signatory]

In the capacity of: [insert designation of signatory]

Duly authorized to sign the Tender for and on behalf of the Tenderer

Section 6. Employer's Requirements

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6.1 Scope of Supply of Plant and Installation Services by the Contractor

6.1.1 General Scope

Design, Manufacture, Supply, Installation, Testing & Commissioning of Smart Pre-Payment Meters, Data Concentrator Unit (DCU), Network, Utility Vending Station cum Customer Care Center (VS-CCC) and other related equipment with related services on Turn-key Basis. The scope of plant and services include design, manufacture, quality assurance, inspection & testing, packing for export, insurance & shipment to site, transportation, setting to work site and testing & commissioning of all the equipment necessary for operation of the smart prepayment metering system to be installed. Moreover, the existing meters dismantled from the existing consumer premises shall be handed over and deposited to WZPDCL Store / Project Store without any damage as per directions of Project Director or Engineer in Charge of this project.

The site(s)/ point(s) of delivery and installation are:

S&D-1,2, Kushtia, WZPDCL

Kumarkhali ESU, WZPDCL

Bheramara ESU, WZPDCL

Meherpur ESU, WZPDCL or as directed by the Project Director within WZPDCL area.

The meters & DCU's to be supplied by the contractor shall have to be successfully integrated and interfaced with the Existing Smart Pre-payment Metering System (Unified system as well as HES/MDM system) of WZPDCL as per Technical Specification of Tender requirements. The detail requirement is listed in section-6, the technical specification and Guaranteed Technical Particulars (GTP) in the tender document.

The scope also includes imparting training both foreign and local to WZPDCL's Engineers on offered system and operational support service for 3 (Three) years from the date of commissioning and handover of the system

The contractor is responsible for ensuring that all and any items of work required for the safe, efficient and satisfactory completion and functioning of the works are included in the Bid price whether it will be described in the specification or not. In case of implementation of the turnkey contract, if there is no need to supply/ install/ work on any item of the price schedule in terms of reality, the bill for that item will not be paid by the employer or if partial supply/install/ work has to be done, it will be paid proportionately or price breakdown with discussion /negotiation.

6.1.2 The major scopes:

Major scopes are described below:

Sl. No.	Description of Items	Unit of Measurement	Quantity
1	Design, Manufacture, Supply, Installation, Testing & Commissioning of Smart Pre- paid metering Networks	Lot	1
2	Design, Manufacture, Supply, Installation, Testing & Commissioning of Utility Vending Station cum Customer Care Center (VS-CCC)	Nos.	2
3	Design, Manufacture, Supply, Installation, Testing & Commissioning of single phase & three phase Smart pre-paid energy meters with BPLC communication modules [with replacement of existing meters.]	Nos.	51801
4	Supply of External GPRS communication module for offered Single Phase & Three Phase Meter (Plug and Play), 4G, (which will also support all other	Nos.	2590

Sl. No.	Description of Items	Unit of Measurement	Quantity
	available bands in Bangladesh)		
5	Design, Manufacture, Supply, Installation, Testing & Commissioning of DCU (Data Concentrator Unit) with Enclosure Box, CT, SIM Cards cables & other materials	Nos.	384
6	Design, Manufacture, Supply, Testing & Commissioning of Hand-Held Unit	Nos.	7
7	Optical communication cable (for downloading data from meter to PC).	Nos.	20
8	Supply, Installation, testing, commissioning of Network (Network 1+ Network 2)	Nos.	394
9	Interfacing of offered meters with the existing smart pre-payment Metering system software of the purchaser	Nos.	51801
10	Manpower Training (Local & Foreign)	Man-Month	4.73
11	Infrastructure Development for 02 Nos. VS-CCC (miscellaneous, as when/Where required)	L.S	L.S
12	Supply of related miscellaneous IT hardware (Storage/Fiber cable etc.) and Software (when and where required)	L.S	L.S
13	Three (3) years operation & maintenance support for system	Lot	1

6.1.3 Network requirements

Details of Network requirements are as follows:

The MIC, and the DRC will be assigned with real IP address.

Sl. No.	Description of Items	Description of the Network	Unit of Measurement	Quantity
01	Network 1: MIC to DCU (wireless connection) and DCU to the related Meters (PLC connection).	<ul style="list-style-type: none"> • GPRS/EDGE/EVDO or other. • Different Locations (in WZPDCL area). • Chosen Data Service Network Provider so every other operated on-air mobile operator will be available for necessary communication amongst them and that has to be ensured. • A secured & separate APN. • A fixed static IP scheme. • Bi-directional (Full Duplex). • PLC Communication (BPLC) 	Nos.	384
02	Network 2: MIC to VS-CCC Network. This network includes both physical connection via fibre optical line and wireless connection through GPRS.	<ul style="list-style-type: none"> • Dedicate leased fibre line (like DDN) • @minimum 2mbps • A secured & separate APN • Alive network for 24x7 round the clock • A fixed static IP scheme • Bi-directional (Full Duplex) • @minimum 1Gbps twisted pair (RJ45) • Different Locations (in WZPDCL area). • Chosen Data Service Network Provider so every other operated on-air mobile operator will be available for necessary communication amongst them and that has to be ensured. • GPRS 4G (which will also support all other available bands in Bangladesh) 	Nos	10

6.1.4 Utility Vending Station cum Customer Care Center (VS-CCC) :

The contractor shall supply, install, test and commission 02 Nos. Utility Vending Station cum Customer Care Center (VS-CCC) at designated (by project director) places with the following Hardware items:

SI. No.	Description of Items	Unit of Measurement	Quantity
1	Workstation with Required Software	Nos.	4
2	GRPS/EDGE/EVDO Modem	Nos.	4
3	SIM Card with Required Software	Nos.	4
4	Laser Printer with Required Software	Nos.	2
5	Slip Printer with Required Software	Nos.	4
6	Laptop with Required Software	Nos.	2
7	Router and Switch with Required Software (both System and application)	Nos.	2
8	Split type square ac 2 ton with related material and services (including installation)	Nos.	2
9	Civil Works: Development of existing infra-structure for the (VS-CCC) [Includes minor civil works (if necessary) and supply of furniture to make the VS-CCC hardware to be installed operable.]	Lump-sum	1

6.1.5 Training Services

Details of Manpower Training (Local) are as follows:

Sl. No.	Description of Manpower/ Qualification criteria	Quantity	Training Location	Description of training contents/ materials
1	Software Engineer, Network & Hardware Engineer, Electrical Engineer	2.66 Man-Month	To be mentioned by Tenderer	<ol style="list-style-type: none"> Linux operating System, API, DLL, PL/SQL/JAVA, VPN, In depth operations and source code analysis of Unified System, HES, MDM and AMI system with related areas. Every piece of Software supported Hardware that is involved in the system and on interfacing with conventional network and Meters focusing at major on PLC, DCU/ECG, GPRS, VPN with related AMI server. On the electrical parts of the system as well as the customization of the meter.
2	Operator and End user	0.67 Man-Month	To be mentioned by Tenderer	POST operate the vending station, Meter Customization and the related areas as required

Details of Manpower Training (Foreign) are as follows:

Sl. No.	Description of Manpower/ Qualification criteria	Quantity	Training Location	Description of training contents/ materials
1	Software Engineer, Network & Hardware Engineer, Electrical Engineer	1.4 Man-Month	To be mentioned by Tenderer	<ol style="list-style-type: none"> Linux operating System, API Details, DLL, PL/SQL/JAVA, VPN, In depth operations and source code analysis of HES and AMI system. Every piece of Software supported Hardware that is involved in the system and on interfacing with conventional network and Meters focusing at major on PLC, DCU/ECG, GPRS, VPN with related AMI server. On the electrical parts of the system as well as the customization of the meter.

The tenderer will provide required local training as well as foreign training in the manufacturers/ suppliers country(s). So that the trainees can operate and maintain the system smoothly after handover of the turn key project. The training programs will cover Software Engineer, Network & Hardware Engineer, Electrical Engineer and operators.

6.1.6 Three (03) years of operation & maintenance support for system:

<p>RESPNSIBILITY UNDER OPERATIONAL SUPPORT</p> <p>In addition to the requirements of the technical specifications, the following shall be the responsibilities of the Operational Support for the duration of the 3 (three) years Operational Support.</p>
<p>Source Code</p> <p>The Source codes of the system shall be the property of the employer.</p>
<p>Software Use</p> <p>The tenderer shall comply with the requirements for interfacing of offered meter with the employers' softwares.</p>
<p>System Management</p> <p>The registration of customer details on the MIC & CDC management of any changes to customer details, the Operational Support shall perform editing of customer records and management of customer arrears. The Operational Support shall effect up to 5 tariff changes as required by Utility during the contract period. Data shall be uploaded/downloaded to the MIC/CDC from the UVS, POS, Meter & UCCs from the respectives to the MIC & CDCS every 24 x7 round the clock. The Operational Support shall provide customer reports detailing the number of prepayment customers at the start of each month to Utility. The Operational Support shall visit each consumer to perform a system audit at least once every 6 months.</p> <p>The Operational Support shall process all applications for new pre-paid customers within the Operational Support's operational area directly. New installations shall be completed by the operator and notified to Utility.</p>
<p>Technical Manual</p> <p>Tenderer should provide technical manual and operational manual of the system within 15 (fifteen) days from before commercial operation start.</p>
<ul style="list-style-type: none"> • The maintenance services shall be valid for 03 (three) years from the date of commissioning under warranty period.
<ul style="list-style-type: none"> • To keep the supplied Software in good working condition under warranty period.
<ul style="list-style-type: none"> • Maintenance service includes preventive maintenance services on Monthly basis, based on the specific needs of individual equipment or as determined by Tenderer/Employer and on-call remedial maintenance under warranty period. Maintenance work should be at utility offices. Incase it is not possible the maintenance work at utility premises, then tenderer will provide the maintenance work by their own arrangement.
<ul style="list-style-type: none"> • Maintenance Services includes the replacement of non-working parts of hardware without incurring any cost to the employer under warranty period.
<ul style="list-style-type: none"> • To provide all necessary labor and technical know-how, and replacement of mechanical, electrical or electronic parts, as required for the maintenance work of equipment under warranty period.
<ul style="list-style-type: none"> • To maintain necessary stock of spare parts which may have the chances of damage for immediate support/ replacement under warranty period.
<ul style="list-style-type: none"> • The maintenance, servicing & replacement works as necessary must start within 02 (Two) hours sharp after lodging complaints under warranty period.

<ul style="list-style-type: none"> • The tenderer shall have to report time to time like 2 times in a month and shall have to report the progress.
<ul style="list-style-type: none"> • Defect or any sort of damage in hardware shall have to be identified, repaired/replaced and put into normal working condition within 08 (eight) hours after lodging complaint with the tenderer. The Tenderer will be responsible for repair, correction, and replacement of the defective goods or parts without incurring any cost to the employer under warranty period.
<ul style="list-style-type: none"> • Utility shall impose penalty @Taka 500 per hour of delay after 16 hours of lodging complaint with the tenderer under warranty period.
<ul style="list-style-type: none"> • Pre-Paid Meter Maintenance: Faulty devices and peripherals shall be repaired on exchange basis whether warranty or otherwise at the cost of the operational support. All sorts of repairing and maintenance tasks for software, hardware, meter and network has to be performed by the contractor.
<ul style="list-style-type: none"> • On a monthly basis meter data collection, auditing and related all sorts of reports shall be prepared by the operational support contractor and copied to respective utility.
<ul style="list-style-type: none"> • If it is not possible to resolve the problem within 16 (sixteen) hours, the tenderer may provide required support/equipments/item/parts on temporary basis without incurring any cost to the employer so that Server, Computer, Line Matrix Printer & UPS shall work properly. But this type of arrangement must not exceed more than two weeks. In that case, penalty will not be imposed for this maximum two weeks under warranty period.
<ul style="list-style-type: none"> • For any further up gradation, if utility procures any part/ product /devices, then the tenderer should install, commission the parts/ products /devices without incurring any service charge to the employer under warranty period.
<ul style="list-style-type: none"> • For 3 years operation & maintenance support the tenderer shall employ the following personnel: <ul style="list-style-type: none"> a) Coordinator (min. Bachelor Degree with 15 years Working experience)- 1 no. b) System Administrator- 1 no. c) Network Engineer - 1 no. d) Hardware Engineer - 1 no. e) Programmer - 1 no. f) Database Administrator - 1 no. g) Electrical Supervisor-11 nos. having experience in meter installation h) UCC/ UVS operator- 11 nos. having experience in vending and UCC work. They will provide full time support to utility vending operator/ utility people for vending/ UCC related work.

6.2 SPECIFICATION

6.2.1 General Specification

6.2.1.1 The Principle

For a stable and efficient electricity distribution system and an effective and trust worthy revenue collection system a country wide Smart Pre-Paid Metering System is evident. As the technology advancement reaches at its peak for peace to help the utility companies to manage a well-organized electricity distribution system, the utility companies no need to rely on conventional metering system. An adaptation of Smart Pre-Paid Metering System can change the needs and the requirements of better solution for the utility companies that make the whole distribution system more dynamic and digitally enhanced. By introducing the features and advantages of the Smart Pre-Paid Metering System that will not only provide freedom of the consumers but also generate a pace in collection strategy of the utility companies in comfort eliminating all kinds of confusion and havoc of corruption.

Digital Metering System brings a quantum leap in energy calculation in accuracy. But eventually most of the energy meters are analog devices. Conventionally mostly installed the analog meters are not only a less-in-accuracy but also it creates and follows to maintain a human hauled operational system that is a bit costly and rather slow. On the contrary the digital metering systems are quick and free from all the demerits of the running aged old electricity distribution system.

Let's have a quick through of National Unified Smart Pre-Paid Metering System. In prepaid model, an electricity consumer has to buy credit (Unit/Currency) from the utility company and to enjoy the limited bought electricity credit into the meter before he can use the electricity. This amount is slowly credited as the consumer uses electricity. One can refill one's necessary credit at any nearest Point of Sale for electricity. As it is clear that the consumer is solely responsible for the pre-buying energy credit and accommodating the purchased energy for optimal use, the utility company requires no resources and personal for billing purposes and that surely will help to improve customer care services. In a sense it is a direct and practical procedure to help the consumers to be optimal in one's uses to reduce down the system loss and averaging the incremental collection of the revenue. By the National Unified Smart Pre-Paid Meter System. The Load Demand will be aligned as the consumer can meet the facility of monitoring one's installed credit initials.

But this model also introduces a chance of fraud if there is a complete lack of meter usage supervision. This is easily corrected by introducing data exchange mechanism within the energy meters that are able to report usage statistics, load profile, power failures, tamper data and other relevant information. Building this data exchange mechanism within a keycode meter will require additional hardware like power line communication or mobile communication chips. But as more and more manufactures enter the market it will become difficult to maintain the success of the model if they do not follow a single standard. It will be difficult for the utilities to run a successful business if they cannot replace an existing meter from a particular manufacture with another meter from another manufactures. So it is undoubtedly a present time demand to have standardized single uniform platform of distribution system for a nation.

This is only possible when all manufactures follow a single guideline and standards. These standards include meter data and history, data exchange format and software specification for all related software. This document proposes such a system which not only includes practical lessons learned from the field but also introduces new features and components that are necessary for utility companies to manage new generation of prepaid meters with tariff management. A complete breakdown of the overall system is specified first with diagram, then it is described in detail, network architecture is explained next and the hardware and software specification defined. A complete and exhaustive specification like this can only ensure the success of all future meter requirements of Bangladesh but can also act as a model for other countries to follow.

There are already existing single-phase meters deployed and used in the field. Some of the mode of media of these works with a smartcard and others with keypad. The proposed solution builds on the existing model by providing standardized data exchange mechanism. The data exchange media will be the smartcard or keycode tokens. This will carry both tariff and recharge amount data from utility to meter and carry usage data from meter to utility (i.e. bidirectional data transfer). And for the keypad process a standard key mechanism also been introduced and adopted. A standardized data format for the smartcard has been adopted. Since many manufactures use different encoding and security within their meter, the data exchange mechanism also has provision for manufacturer encoded data that can be only decoded by the meter. The manufacturer will provide API to create this encoded data from raw data to the utility.

In Bangladesh, the electricity is being running on traiff beneficiary approach. So the revenue collection must have been counted and calculated at the meter side for a real time calculation and have to generate a real customer data pattern that will definately enhance the data exchange to reveal the energy generation as well as the load management.

All the Smart Pre-Paid meter that shall be procured shall be followed the discribed system software architecture (attached in part-2 of this STD).

The overall network system of the Smart Pre-Paid metering system:

6.2.1.2 The Technical Specification on the Network and the Software of the Smart Pre-Paid Metering System has mainly two parts.

- **TheMaster Information Center (MIC):** All the servers, the routers, the switches, the billing software located centrally in the utility premises are defined together as The **Master Information Center**.
- **The Data Network Service Provider (Mobile Network Companies):** The Data Network Service Provider companies are responsible for providing both SIM/ RIM card data circuit for data network service having a stable bandwidth capacity. Short Message Service (PUSH-PULL SMS) also is available and defined for the short text messaging system activated in the mobile network companies.

6.2.1.3 The System

The system as shown in the diagram are containing several continuous areas each performing different particular roles.

6.2.1.3.1 Master Information Center (MIC):

The core area of the system is the Master Information Center (MIC). This is where all the running communication processes and the running business processes are installed and located residing in the utility company premises.

The Master Information Center (MIC)is comprised of

- **The Database Servers (RDBMS):** The Multiple database servers provide reliable data storage and delivery.
- **The Routers and the Firewalls:** The Routers are connected through the system master station to The Data Network Service Provider round the clock. All the network connections have gone through the firewall for maximum security reasons.
- **The Application Server:** This is a request processing side. There should be at least two application servers at this end as to make the system a little flexible. These servers lonely will be responsible for processes of all the requests from the Point of Sales (POS) terminals and vending stations.

The functions of these servers are:

- ✓ To provide a real time and relentless connectivity in between the database and POS/Utility Vending Station,
 - ✓ To provide secure authentication service to POS/ Utility Vending Station,
 - ✓ To process unit charge/bill pay request from POS/ Utility Vending Station,
 - ✓ To ensure required encrypt data quickly,
 - ✓ To transfer results and status of the data to POS/Utility Vending Station for hardcopy receipt to a consumer,
- **The Short Message Server (PUSH-PULL SMS):** This server will process PUSH-PULL SMS requests arriving from the various consumers through The Data Network Service Provider.
 - **The Accounting and Billing Server:** This server will keep and produce the various billing and transaction reports for all the vendors, mobile operators and consumers.

6.2.1.3.2 The Data Network Service Provider (Mobile Operators): The Data Network Service Provider actually it refers to the mobile operators will provide the following services:

- Provide data network service through GPRS/EDGE/EVDO/HSPA network,
- Provide PUSH-PULL SMS service to utility companies and their consumers through mobile phones.

Every Data Network Service Provider will be connected to each utility only one Master Information Centre through a dedicate fiber or leased fiber line.

6.2.1.3.3 Utility Vending Station cum Customer Care Center (VS-CCC) 24x7:

Mostly located at utility premises, this will be managed by the utility companies itself round the clock. It will be established for multi purposes as well. The utility consumers will come here most of the time to recharge their credits. The Consumers will deliver their meter information and pay the operator his preferred and demanded amount. Each VS-CCC will be equipped with a set of laptop or desktop, smartcard reader/writer, laser printer, slip printer, network modem and the VS-CCC software. The operator will enter these consumer details into the software and issue a request to process the transaction. The software will use the data network service to connect to the application server at Master Information Center and initiate a fund transfer request. Before getting the fund transfer, he should have a fund collection from the respective vending station of the respective utilities. The process will first check whether there are enough funds available in the operator's account for this transaction. If 'No' then a message is sent back to the VS-CCC informing regarding the insufficiency fund status. If there is enough fund, then the application server initiates a transfer fund request from the operators account. If the transfer is successful, then the server checks the database to find the type of meter installed at the consumer premises. If it is a keypad meter then the server will generate the 'n' digit keypad number necessary to recharge the meter. This number or the encrypted message along with a success recharge message is sent back to the VS-CCC software (as it is a two-way communication system). The VS-CCC software then prints the keypad code. The software will print a receipt containing the amount paid instantly. The VS-CCC software will keep the till next vended amount in accordance with it's purchased amount as well as the system master station will also follow the log of transaction for future use.

In case of the three phase meters, the SMS server will send back the success message to the VS-CCC software and the software will print the acknowledgement receipt for the consumer.

The consumer will get necessary services regarding the meters during stipulated office hours and the complains will be attended from here. So, a customization center must integrate here to give the consumer a prompt, better and reliable service to shorten down the power cut. This center will also integrate with the system master station to create new consumer, assign/change meter of consumer and perform all administrative tasks to maintain consumer data integrity in the Master Information Center.. The POS vendors will come here to collect the required energy during the official time table. The vending stations will deposit the collected amount to the Bank. Again, for the consumers the late hour collected amount will be kept and deposited to the bank after certain time maintaining the friendly hours.

Since it will be managed by the utility company. A 'n' digit code can be generated or smart card written directly taking cash from the consumer. The vending stations along with the customization center will be connected to The Master Information Center though a secured dedicated leased line or where possibly through the mobile data network where leased line is not available or not feasible.

6.2.1.3.4 Utility Consumers: Consumers can check their assigned load status and other information by sending PUSH-PULL SMS by a predefined format using their mobile phones. Each utility company will have its own short-code (example: BPAY or 2729) which will be valid for all mobile operators. When a PUSH-PULL SMS is sent, the data network service provider will send it directly to the Master Information Center's PUSH-PULL SMS server through the connected network. The PUSH-PULL SMS server will process the PUSH-PULL SMS request, generate the appropriate response and send the response back to the requesting mobile phone containing the requested information. This will work as PUSH-PULL SMS service.

6.2.1.3.5 *On-Line Prepayment meters*: Both the Single Phase and Three phase meters will have on-line vending facility. Each meter will support GSM (GPRS 4G which will also support all other available bands in Bangladesh) module though which the information can directly be communicated to and from the meter as well as the meters should communicate with server through BROADBAND PLC/RF using DC/DCU.

6.2.1.3.6 Data Service Network: The backbone of the proposed Smart Pre-Paid Metering System will be established on already erected and developed network by a recognized data service network provider. The only one system master station of each utility company will be connected with their network through a firewall. The data service network provider actually the mobile operators will be connected through this data service network. Similarly, the vending stations of the utility organizations may also be connected through the same data service network as required.

6.2.1.4 The Network Specification of the Smart Pre-Paid Metering System

The Pre-Paid Metering System will require the following basic network connections to work seamlessly that will online 24x7. These networks are defined below:

Network 1: Network 1: MIC to DCU (wireless connection) and DCU to the related Meters (PLC connection):

Network features:

- GPRS/EDGE/EVDO or other.
- Different Locations (in WZPDCL area).
- Chosen Data Service Network Provider so every other operated on-air mobile operator will be available for necessary communication amongst them and that has to be ensured.

- A secured & separate APN.
- A fixed static IP scheme.
- Bi-directional (Full Duplex).
- PLC Communication (BPLC)

Network 2: MIC to VS-CCC Network:

This network includes both physical connection via fibre optical line and wireless connection through GPRS. Prominent features are:

- Dedicate leased fibre line (like DDN)
- @minimum 2mbps
- A secured & separate APN
- Alive network for 24x7 round the clock
- A fixed static IP scheme
- Bi-directional (Full Duplex)
- @minimum 1Gbps twisted pair (RJ45)
- Different Locations (in WZPDCL area).
- Chosen Data Service Network Provider so every other operated on-air mobile operator will be available for necessary communication amongst them and that has to be ensured.
- GPRS 4G (which will also support all other available bands in Bangladesh)

6.2.1.5 System Integration, Installation, Operation and Maintenance

The Tenderer will be responsible for design, manufacture, supply, installation, testing & commissioning smart pre-paid meters & metering system with related service on turn key basis, which will include to the operation of the system and interfacing of offered meters with purchasers existing software. Already developed software API is enclosed in part-2 of the STD. The whole system will be integrated so that all parts run smoothly. These responsibilities include but are not limited to:

- Work with utility to test and finalize all input and output.
- Deploy software at each required locations.
- Ensure interoperability of each software module.
- Install a secure software installation method.

- Arrange for SMS message short codes from mobile operators.
- Work with the data service network provider (mobile operators) and with the purchasers' to setup the required network communication for both wireless and physical connections.
- Work with the data service network provider (mobile operators) representation to setup SMS message server and communication.
- Work with utility, pos vendors and all concerned to test software for bugs and if required fix bugs or incorporate improvements and suggestions.
- Work to provide vending service to the smart prepaid metering consumer of the respective utilities through Mobile SMS, mobile Apps, POS, ATM/Bank booth, web service etc.
- Work with meter manufactures to make sure all software and hardware meters communicate properly.
- Work with utility to make sure that all software follows the defined standards, agree on change with all partners if required.
- Interfacing: The system software has been developed and irrected. The prescribed interfacing protocol has been developed in JAVA which is attached in Part -2 of the tender document. The tenderer's meters will follow that protocol and will complete their interfacing API on or before demonstration date. No tender will be technically responsive until and unless the interfacings API works and comply with requirements and also fully satisfy the Engineers authorized by the Employer. Otherwise the tender shall be rejected and will not be considered for further evaluation.
- The offered meter will be manufactured in such a way so that its API can follow the already developed system software's API. The rights & the cCopy rights of the system software and the pattern of the system will be the sole owner of the people's republic of Bangladesh.
- The offered meters shall have to be integrated and interfaced with the WZPDCL's existing HES/MDM and existing BPLC DCUs.

etc. and more as required.

The software parts are described below:

- The online single phase and 3phase meter must be connected directly with the MIC server using the built in GPRS/EDGE/EDVO/HSPA modem.
- The communication data format is XML.
- The XML data exchange format is defined in the XML schema files.

- The communication channel of the 3phase online meter must be encrypted by 256bit SHA and seeded by a true random number generator.
- Each online pre paid meter will have contained a unique key installed
- Each online 3phase meter will have contained a unique key installed.
- Utility must be able to program the following data into the meter before they are used:
 - Meter ID
 - Data Communication Port (default 2100, custom port)
 - Server IP Address
 - Server Port
 - Encryption Key
- The meter will get a fixed IP address from the installed SIM card.
- The meter will always listen to the “Data Communication Port” for incoming data and will always send data to “Server IP Address: Server Port”.
- For incoming request, the reply data will go through the same connection similar to HTTPS.
- Incoming request from server to IP address and port 2100 of meter.
- Server posts encoded XML data.
- Server sends two carriage return to denote that it has send the entire request.
- The meter decodes the data, process the request and generates appropriate response and send it back to server.
- Bidirectional data transfer will use the same connection like HTTPS.
- The contractor shall have to supply at least 12 Nos. PCSoft with all types of access and lifetime licenses.

etc. and more as required.

6.2.1.6 Vending Software:

This software should have proper installer to install and this software should have a hardware constrained with a unique hardware electronic ID like MAC address or chasis ID or Processor ID or vendor service tag no. ID or etc.

- Sales Module
 - ✓ This module will sale credit or energy as per consumer requirement
 - ✓ To Define type of Pre Payment meter.
 - ✓ To Collect consumer and meter related information from related MIC database like tariff and Slab, holiday, friendly hour, Emergency credit, connection load, and Alert level etc. and related information through established network.
 - ✓ To Send defined information through Smart card or generating token or through SMS/GPRS for remote Meter.
 - ✓ To Collect Meter historical data that will be collected from the meter and operational data from Smart card and update those to MIC database.

etc. and more as required.

- Data Exchange module
 - ✓ This module will collect updated information from MIC and send & insert it to relevant databases.
 - ✓ To Collect information from temporary local database and send all those processed data to MIC through P2P connection by established LAN or Dial Up or through Data network Service.
 - ✓ All exchangeable data need to prepare using encryption methodology.

etc. and more as required.

- Report Module:

There will be a several types of reports to be generated. It has to be met the on demand process of the each utility division. here some of it's type are noted below:

- ✓ Daily Sales report,
- ✓ Individual consumer purchase report,
- ✓ Operator related report,
- ✓ Generate log for Data Exchange module,

etc. and more as required.

6.2.1.7 POS Application

This application work **will be operative for 24x7 round the clock online system.**

Sales Module

6.2.1.7.1 For Smart card base Meter

- ✓ To Collect consumer and meter historical Information from Smart card and get Credit demand by key input.
- ✓ Send those information's to the MIC through short Message service (SMS) or by GPRS/EDGE Service through established data network service.
- ✓ To Collect necessary information From the MIC as per request and update smart card by those information's.
- ✓ To Print module for slip print.
- ✓ To Send acknowledgment to the MIC after completion of Operation.
- ✓ To Generate log file for all operations.

etc. and more as required.

6.2.1.7.2 For Keypad base meter

- ✓ To Insert consumers' identification number and credit demand to POS interface and POS will send those to the MIC through short Message service (SMS) or by GPRS/EDGE Service through established data network service.
- ✓ To Collect Token Number for the above request from the MIC and print it to thermal paper.
- ✓ To Send acknowledgment to the MIC after completion of Operation.
- ✓ To Generate log file for all operation.

etc. and more as required.

6.2.1.7.3 For Online single phase and three phase Meter

- ✓ To Insert consumer identification number and credit demand to POS interface and the POS will send those through short Message service (SMS) or by GPRS/EDGE Service through established data network service.
- ✓ To Collect acknowledgement from the MIC after sending information to Meter by the MIC itself through short Message service.

- ✓ then at POS an acknowledgement will be received and print a slip for consumer.
- ✓ To Send acknowledgment to the MIC after completion of Operation.
- ✓ To Generate log file for all operation.

etc. and more as required.

6.2.1.8 The MIC Software

MIC Application

This application will be **the core** of the total Smart Pre-Paid metering system. Any type data modification will be allowed **and accomplished** only by this application. It will have different management Module for processing different type tasks.

6.2.1.8.1 Consumer Information Management

- **Information modification**

- By this module **only** authorized user can modify any kind of data related to consumer.
- Consumer personal information.
- Consumer tariff Class.
- Connection load.
- Issued meter related information.

etc. and more as required.

- **Report module**

- Consumer personal information
- Sales report
- Consumption report
- Historical report

etc. and more as required.

- **Tariff Management**

- Management module
 - Insertion of new tariff
 - Modification of existing tariff
 - Tariff Slab insertion and modification
 - Activation Date issue

etc. and more as required.

- **Report module**

- Individual tariff details
- All active tariff details
- Tariff history log

etc. and more as required.

6.2.1.8.2 Customized Information Management

This Module will use for include/exclude/Modification of common feature for individual or common Consumer.

- Holiday Information
- Friendly Hour
- Weekend
- Emergency Credit Limit
- Credit Alert Information

etc. and more as required.

6.2.1.9 Utility Vending Station Management

- **Management module**

- Issue new vending Station
- Update vending Station information.
- Deposit Information Update
- Vending Authentication information
- Vending sales Limit

etc. and more as required.

- **Report Module**

- Individual Vending related information
- Vending sales pattern
- Vending Station Deposit Status.

etc. and more as required.

6.2.1.10 POS Management

- **Management module**

- Issue new POS
- Update POS information.
- Deposit Information Update
- POS Authentication information
- Issued GSM/GPRS SIM related information.
- Commission related information
- POS sales Limit

etc. and more as required.

- **Report Module**

- a. Individual POS related information
- b. POS sales pattern
- c. POS Deposit Status.
- d. POS Sale Commission and related report

etc. and more as required.

6.2.1.11 Load Control:

This feature is a unique and essential part of the system to regulate the Load Management. This will be included into the meter and obviously the software. The Load control module will work on both for the offline & online meters. This module will be reside in the application software. In the meter the request will follow the trigger of load control. so the there will be a micro-controller programmed load control feature.

6.2.1.12 DATA Exchange Management Service

This is a self running and automatic service that has the vital role for the total system. It will be the way by which all vending Station and POS can communicate and exchange information with the MIC.

- To Prepare update or modified data from MIC database Server.
- To Collect and insert new Data from every Vending Station and POS to MIC Database Server.
- To Synchronize all updated data from database Server, Vending Station and POS.
- To Generate log for every task for synchronization.

etc. and more as required.

6.2.1.12.1 Content management Application

- **Short Message Service(SMS) module**

- **POS management**

- ✓ To Collect request SMS/GPRS from POS.
 - ✓ To Process and generate information from MIC database as per request.
 - ✓ To Send replied SMS/GPRS for the particular request to the particular request.
 - ✓ To Send Common information to POS.

etc. and more as required.

- **Consumer management**

- ✓ To Send Meter operational information to online 3 phase Meter as per requirement for instant urgent basis.
 - ✓ To Collect Meter related information from remote meter through SMS.

etc. and more as required.

Token Management

- To Collect requested information from database.
- To Generate Token for individual request.
- To Generate token for common information.

etc. and more as required.

Meter Management

Meter Customization

- To Issue new meter for individual consumer.
- To Update meter related information to database.
- To Collect meter related information from database and send those to Meter.
- To Generate report for related task like day wise meter customization.

etc. and more as required.

Meter/Smart Card Change Application

- To Change new issued meter or card related information to database
- To Send meter related information to new issued Meter.
- To Send changing information with common information to Smartcard as it can be accessible by the particular Meter.

etc. and more as required.

Meter Status Access module

- This module will used for accessing meter Current information Collected from Meter through Common Meter Status Card or RF/IR communicator or through RS485 Serial interface.

etc. and more as required.

6.2.1.12.2 Instant Service Management

It is a portable application by which utility can mentor and monitor meters installed at Field. This application must have been hardware constrained.

- To Interface to collect information from meter through Meter through Common Meter Status Card or RF/IR communication or through RS485 Serial interface.
- To Update information to Meter as per MIC requirement.
- To Interface to Collect information from MIC database as per requirement to update information to meter and stored it to temporary database at the portable device for the time being.
- To Interface to Update MIC database with collected information from occurred situation.

etc. and more as required.

6.2.1.12.3 Authorization Management

- As everyone cannot get permission to access every management module, this module will use for giving permission to individual for accessing specific management module.
- It will also manage permission for user of vending Station and POS by providing user name and password.

etc. and more as required.

6.2.1.12.4 Backup Module

This module is to take backup of the MIC related database.

etc. and more as required.

6.2.1.13 Report Management Console

Sales reports

- Account wise sales reports.
- Daily sales reports.
- Monthly sales reports.
- Tariff wise sales reports.
- POS wise sales reports.

etc. and more as required.

Consumption reports

- Account wises.
- Tariff wises.
- Feeder wises.
- Month wises.

etc. and more as required.

VAT reports

- Date wises
- Month wises
- Year wises

etc. and more as required.

Customer reports

- Account wise
- Meter no wise
- Phase wise
- Tariff wise
- All customer

etc. and more as required.

- **Exception reports**

- Sanction load violation report on No of [n]% violated
- Low/No consumption report

etc. and more as required.

6.2.1.14 Account log info report

- Account wise
- All
- Others
- Holiday report
- Tariff report
- Vending station/POS report
- Credit given report
- Vending station information report
- Sales pattern
- Deposit status
- Vending statistics report

etc. and more as required.

It is notable that the software that will be involved and installed in the CDC, MIC, UVS, UCC & POS will be followed on the basis of a desided convension of the Data Exchange Format that will be resposible for The meter that must be able to read and to write data to the smartcard in specific desided format if it is a smartcard based meter or decode information from desided encoded keys typed through the keypad if it is a keypad based meter.

At the POS or the Utility Vending Station the Token will be generated for the Keypad base meters so the software should have followed the keypad numbering scheme as described below. Here it is should be

mentioned that the scheme is perception only it could be changed or modified with respect to the manufacturer that varies.

6.2.1.15 Keypad Numbering Scheme

While the manufacturer is free to use any number scheme they see fit, the number scheme must be secure and use minimum number of digits and must always contain the following fields in encrypted form:

Meter ID

Recharged amount

Sanctioned Load

Sequence Number

The meter must check the validity of these fields before recharging the credit. The sequence number is an auto generated number starting from 1 for each recharge or keypad numbers. A keypad number will only be accepted if the previous number has been keyed in. For example if a consumer goes to POS to recharge 300Tk and gets keycode xxxyyzzz (which contains sequence number n). The next month he goes again to recharge 250Tk and gets keycode pppqqrrr (which contains sequence number n+1). Keycode pppqqrrr will only be accepted if xxxyyzzz has been keyed in previously i.e. meter will only accept a keycode containing sequence number 'n' if at some point keycode containing sequence number 'n-1' has been keyed in. This is to ensure that keycodes are not discarded by a consumer intentionally.

Periodically it may be necessary to generate a keycode that contains more data. The keycode scheme must be able to accommodate the following data if and when required:

Meter ID

Recharged amount

Sanctioned Load

Sequence Number

Load Change

- Sanctioned Load
- Start Time
- Load Control

Rate

- Start Unit
- Peak Rate
- Offpeak Rate
- Activation Date

Holiday

- Month
- Day

It is assumed that the keypad number with only the meter id, amount, load and sequence number will be a lot shorter than the key code containing all the rate information.

At the POS or the Utility Vending Station the data transfer will be occurred for the smartcard base meters so the software should have follow the Smart Card Data Format scheme as described below. Here it is should be mentioned that the scheme is a perception only it could be changed or modified with respect to the manufacturer that varies.

6.2.1.16 Smart Card Data Format

SLE4428 or 100% compatible 1K Byte EEPROM Memory Card must be used in the card based meter. The memory card will have encrypted and no encrypted memory parts. The encrypted bytes must be generated by the meter SDK/API as supplied by the manufacturer. The manufacturer is free to use any encoding scheme to secure the data but must contain all the data as mentioned in the following table:

<u>Data</u>	<u>Bytes</u>	<u>Memory Address (Bytes)</u>
Non Encrypted Data		
Binary Pattern (1010110011110000)	2	1-2
Version	1	3
Meter ID	10	4-13
Consumer ID	10	14-23
Utility ID	2	24-25
Sanctioned Load (kW)	6	26-31
Meter Type	1	32
Sanctioned Load Exceeded	1	33
Last Recharge Amount	2	34-35
Last Recharged Date (DMY)	3	36-38
Last Transaction ID	10	39-48
Unused/Future Provision	55	49-100
Encrypted Data as Generated by the Meter Manufacturer SDK/API		
The following Data must exist within the encrypted Data: <u>Data To Meter:</u> Meter ID, Consumer ID, Utility ID, Sanctioned Load, Recharge Amount, Weekend, Emergency Account, Friendly Hour (start/end), Peak Hour (start/end), Buzzer Volume, Rates, Rate starts at unit, Rate at Peak, Rate at Off peak, Activation Date, Holidays, Month, Day, Load Change, Load Control, Start Time (hour/minute), Sanctioned Load, Etc. and more as required. <u>Data From Meter:</u> Tamper Status, RTC Status, LR Status, Usage Data for the last 6 months individually, Month, Year, KWh, Taka Recharged, Taka Used, Average Power, Reactive Power, Maximum Power, Volt Ampere, KWh in Peak, KWh in Off peak, KVarh in Peak, KVarh in Off peak, Total charge in Peak, Total charge in Off peak, Number of power failures, Number of time sanctioned load exceeded, Load Control, Tamper, Number of times tampered, Date/ Time of Tamper, Etc. and more as required.	923	101-1024

6.2.1.17 Encrypted Data Generation SDK/API

It is notable that the software that will be involved and installed in the CDC, MIC, UVS, UCC & POS will be followed on Encrypted Data Generation SDK/API of the related respective meter supplied by the meter manufacturer responsible for The meter that must be able to read and to write data to the smartcard in specific decided format if it is a smartcard based meter or decode information from decided encoded keys typed through the keypad if it is a keypad based meter through the involved Encrypted Data Generation SDK/API.

At the POS or the Utility Vending Station the data transfer will be occurred for the smartcard base meters or the Token will be generated for the Keypad base meters so the software should have follow and use Encrypted Data Generation SDK/ API as described in Part B of the Tender Document. Here it is should be mentioned that the Encrypted Data Generation SDK/API is a perception only it could be changed or modified with respect to the manufacturer that varies.

The meter manufacturer must provide SDK/ API to generate encrypted that suitable for the meter to process and understand the API interface that has been developed in JAVA and operating system is on Linux.

The manufacturer must provide:

- Library compiled in GCC Linux that can be integrated in Java Program.
- Sample project and source code illustrating usage of provided java program
- Documentation of each function, input and output.

Work with utility to make sure that all software follows the defined standards, agree on change with all partners if required. Standards are summarized below:

6.2.1.18 POS-SMS Communication Format

The POS will communicate directly with the MIC using a separate & private Data Service Network (mobile network or other secure network where applicable). The data exchange will occur through an encrypted XML data exchange. The communication channel will use a 512bit or 1024bit SSL which the vendor must acquire. A private key will reside on the server and a public key will be available. The XML request and response formats are defined in the attached XML scheme files. Furthermore, the following additional information are required:

Server Address:

Port: 443, standard SSL port

URL: https://server_address/pos_process/

1. Accounting Server-SMS Communication Format
2. Meter Manufacturer API/SDK Format

The Tenderer must collect, integrate and test proper functionality of these SDK from the meter manufacturers:

- Library compiled in GCC Linux that can be integrated in any Linux C program.
- Windows DLL or C library with all required header files.
- .NET managed DLL.
- Sample project illustrating usage provided library/ DLL.
- Documentation.
- Installer.

Function Lists: The following functions and parameters must be implemented:

Function meter_encode:

Related Parameters

Parameter	Data Type
Recharge_amount	Integer
Sanctioned_load	Float
Sequence Number	Integer
Rate	Array
Holiday	Array
Loss	Array
Load Change	Array
Meter_id	String
Expected_output	Unsigned char (1=keycode, 2=binary data)
Meter_id	String
Sanctioned Load,Weekend,Emergency Account,Friendly Hour (start/end),Peak Hour (start/end),Buzzer Volume,Rate, Holiday, Loss, Load Change includes:Rates,Rate starts at unit,Rate at Peak,Rate at Offpeak,Activation Date,Holidays,Month,Day,Load Change,Load Control, Start Time (hour/minute),Sanctioned Load, Etc. and more as required.	Array

Related Response

Parameter	Data Type
Status	Boolean
Amount	Float
Encoded_Data	Byte array
Keycode	String
Meter_id	String
Etc. and more as required.	

Function meter_decode:

Parameter	Data Type
Meter_id	String
Encoded_Data	Byte array

Etc. and more as required.	
Related Response	
Parameter	Data Type
Status	Boolean
Tamper Status, RTC Status, LR Status, Usage Data for the last 6 months individually, Month, Year, KWh, Taka Recharged, Taka Used, Average Power, Reactive Power, Maximum Power, Volt Ampere, KWh in Peak, KWh in Off peak, KVarh in Peak, KVarh in Off peak, Total charge in Peak, Total charge in Off peak, Number of power failures, Number of time sanctioned load exceeded, Load control, Tamper, Number of times tampered Date/ Time of Tamper	Array
Etc. and more as required.	

6.2.1.19 Meter Number Scheme

The meter number scheme will be the unique and be followed by a conversion of the utility. The number scheme will not be the scheme described but the description will be the basic of the conversion of the meter number scheme which will be supplied after signing of the contract.

A 11 digit meter number is envisioned. The first digit will be the utility ID. The second and third digit will correspond to meter manufacturer name. The fourth digit will correspond to meter type. The next 7 digits will be a sequence number used to identify each meter and will consist of numbers (0-9).

6.2.1.20 3φ Meter-SMS Data Exchange and Authentication Scheme

The XML data exchange format is defined in the attached XML files. Furthermore, the communication channel must be encrypted by 256bit SHA and seeded by a true random number generator. Each meter should also have a unique key installed.

Server Address:

Port: 2100, custom port

Protocol: Text/Encrypted XML

6.2.1.21 Smart Card Data Format

SLE4428 or 100% compatible 1K Byte EEPROM Memory Card must be used in the card based meter. The memory card will have encrypted and no encrypted memory parts. The encrypted bytes must be generated by the meter SDK/API as supplied by the manufacturer. The manufacturer is free to use any encoding scheme to secure the data but must contain all the data as mentioned in the following table:

Data	Bytes	Memory address (Bytes)
Non Encrypted Data		
Binary Pattern (1010110011110000)	2	1-2
Version	1	3
Meter ID	10	4-13

Data	Bytes	Memory address (Bytes)
Non Encrypted Data		
Consumer ID	10	14-23
Utility ID	2	24-25
Sanctioned Load (kW)	6	26-31
Meter Type	1	32
Sanctioned Load Exceeded	1	33
Last Recharge Amount	2	34-35
Last Recharged Date (DMY)	3	36-38
Last Transaction ID	10	39-48
Unused/Future Provision	55	49-100
Encrypted Data as Generated by the Meter Manufacturer SDK/API		
<p>The following Data must exist within the encrypted Data:</p> <p><u>Data To Meter:</u> Meter ID, Consumer ID, Utility ID, Sanctioned Load, Load Control, Recharge Amount, Weekend, Emergency Account, Friendly Hour (start/end), Peak Hour (start/end) Buzzer Volume, Rates, Rate starts at unit, Rate at Peak, Rate at Offpeak, Activation Date, Holidays, Month, Day, Load Change, Start Time (hour/minute), Sanctioned Load, Etc. and more as required.</p> <p><u>Data From Meter:</u> Tamper Status, RTC Status, LR Status, Usage Data for the last 6 months individually, Month, Year, KWh, Taka Recharged, Taka Used, Average Power, Reactive Power, Maximum Power, Volt Ampere, KWh in Peak, KWh in Offpeak, KVarh in Peak, KVarh in Offpeak, Total charge in Peak, Total charge in Offpeak, Number of power failures, Number of time sanctioned load exceeded, Load control, Tamper, Number of times tampered, Date/Time of Tamper, Etc. and more as required.</p>	923	101-1024

The tenderer developed POS software must be able to reach and write these values to and from the smartcard as well as acquire encode values from manufacturer provided SDK.

6.2.1.22 Meter Connection Procedure

The following procedure is envisioned: Configure the meter with server IP, port and any authentication key required. Bring the meter online and send a query_test command from the server. The meter should respond with firmware version which will verify connectivity. The send the “conf” command to meter from server.

6.2.1.23 Establishment of Network

The tenderer who will implement will be responsible for establishment of the network for the entire system. These include but are not limited to:

- Network connecting POS to MIC
- Network connecting UVS & UCC and utility POS to MIC if/when required
- Network connecting Data Network Service Provider (mobile operators) to MIC
- Arrange contract with Data Network Service Provider (mobile operators) for a secure private data network and provide data network SIM/RIM to POS operators.
- Ensure security of the network. Setup APN where required
- Ensure uptime of network
- Manage network, test performance, throughput and bottleneck of network
- Maintain automated network failure detection and failover. Develop a failure notification service model
- Follow network address scheme as defined below:

Each utility company will be assigned a unique number starting with 1 (max: 119, total: 119). Each mobile operator will be assigned a unique number starting with 230 (max 254, total: 25). Each financial institution will be assigned a unique number starting with 120 (max 229, total: 110). For our example, we will assume the following numbers to illustrate an example.

Utility company x: 1

Utility company y: 2

Mobile Operator m: 230

Mobile Operator n: 231

Financial Institution p: 120

Financial Institution q: 121

All utility servers will reside in a unique subnet of the 172.16.x.x network.

Example:

Utility company x application server address: 172.16.1.1

Utility company y application server address: 172.16.2.1

Mobile company m application server address: 172.16.230.1

Mobile company n application server address: 172.16.231.1

Financial Institute p payment server address: 172.16.120.1

Financial Institute q payment server address: 172.16.121.1

Other 253 IPs are available for other network servers for later or additional use

6.2.1.24 Tariff Management

6.2.1.24.1 Tariff Definition

The System Manager shall be able to define tariff objects. Each tariff has a unique tariff ID associated with it. The following information is required to define a tariff.

Tariff ID	A unique tariff identifier
Effective Date	The date on which the tariff will be effective.

Step Structure	Step	Rate
	0 - kWh ₁	R ₁
	kWh ₁ - kWh ₂	R ₂
	kWh ₂ - kWh ₃	R ₃
	kWh ₃ - kWh ₄	R ₄
	kWh ₄ - kWh ₅	R ₅
	kWh ₅ - kWh ₆	R ₆
	kWh ₆ -	R ₇

Subject	Tariff Category	PFC Calculation
Power Factor Correction (PFC) Charges	'A', 'B', 'C1', 'C2', 'D1', 'D2', 'D3', 'E', & 'T' Category, 3 phase, 400V, 20KW & above	For PF<0.95, PFC= 0.75%*Energy Charge*(0.95-PF); Maximum PFC= = 0.75%*Energy Charge*(0.95-0.75); Where, PF= Power Factor Obtained from meter.

Subject	Tariff Category	Time
Time of Use	'C1' & 'E' Category,	Peak – 17:00 to 23:00 Off Peak-23:00 to 17:00
	'D3' Category	Peak – 17:00 to 23:00 Off Peak-23:00 to 05:00 and 09:00 to 17:00 Super Offpeak-05:00 to 09:00

Service Charges	Fixed charges are levied per month. These charges are different for single phase and three phase meters in a particular tariff category.
Minimum Charges	There will be no minimum charges for Pre-Paid System.
Sanctioned Demand Charges (Fixed Charge)	A fixed charge per kW of the sanctioned demand is levied per month.
Maximum Demand Charges	Integrated over ½ hourly periods Maximum Demand in KW.
VAT	Value added tax is levied on electricity charges and must be catered for in the system.
Rebate	Consumers shall avail rebate which will be 0.5% of Net Bill exclusive of VAT.

- a) The tariff code, effective date, kWh_x (in units of kWh), R_x together with a fixed monthly service charge Service Charges and a fixed monthly sanctioned demand shall be used to define all prepaid tariffs used in the system.
- b) The MIC shall make provision for up to 500 tariff definitions.
- c) The MIC must verify the tariff data entered and shall not allow discontinuities in the energy levels or negative rates for energy and fixed charges.
- d) There shall be a facility to copy tariffs to new tariff codes for editing purposes. The edit facility shall include a mechanism to increase the values of any of the variables R_x, SC and DC by a fixed percentage.
- e) Tables of Supply Group Codes and tariffs shall be securely stored at the MIC.
- f) No penalty Charges for Power Factor equal to or above 0.95 to 1.0. Power Factor Correction Charge is computed as above and average power factor is measured by meter based on only reactive energy. The monthly average power factor from meter is used for the factor and applied on the energy charge.

Please refer to WZPDCL's tariff document for details of the tariffs provided by Bangladesh Govt (SRO no. 43 Law/2024, Dated: 29 February, 2024).

Meter must have the provision to store the PFC charge data and display the PFC charge data.
Meter must have the provision to update the PFC charge calculation procedure through online.

6.2.1.24.2 Tariff Algorithm

The prepayment system could be implemented stepped tariffs. The tariffs will be implemented at the vending equipment/meter. The algorithm must ensure that:

- a) The Stepped tariffs are implemented in meter as accurately as is the case for conventionally billed customers.
- b) Customers are not restricted to the amount and frequency of electricity token purchases provided purchases do not exceed 12 times the calculated monthly average consumption without penalty.
- c) If any tariff changes, tariff update with effective date sent to meters through smart card at the time of purchase for smart card meters. The updated tariff will be sent using special numbers for keypad meters. For both meters, after utility decides the tariff update, all purchase of credit (with keypad number or smart card) will carry and tariff change flag. So that the meter will not accept any credit addition until it gets the tariff update.
- d) Customers will purchase only credit following credit transfer principles.
- e) Before any new purchase in a particular month the fixed charges are deducted for the first time and the rest of the money paid by customer will be sent to meter through card or number as credit.
- f) For consecutive purchase in the same month, credit values without any fixed charge will be sent to the meter.
- g) Slab reset service charges; power factor penalty (PFC) should be monthly basis.
- h) The meter should have functionality to re - calculate the consumed amount; that is if any tariff changes or updated, even if the user does not switch to the new tariff immediately, the utility can deduct this part of the undercharged electricity bill through the meter to avoid loss of revenue. For this purpose Tenderes shall have to maintain
 1. A register which will store at least 30 days daily consumption (kWh) date wise.

2. Monthly consumption register (minimum 12 months)
3. Old and current tariff register

Calculating the difference between old and current tariff, adjustment has to be done in the meter balance and this process should be programmable.

- i) The tender shall provide a detailed description of the algorithm including:
 1. All assumptions made.
 2. An explanation of how the averaging algorithm operates.
 3. Examples of how the algorithm works.
 4. Examples of how to explain the algorithm to customers.
 5. Examples of how to deal with customers queries.
 6. Description of how the algorithm manages tariff rate and tariff structure change.
 7. Description of mechanisms to apply corrections.
 8. Description of how to deal with the situation where a customer buys at two different locations between data transfers.
 9. Online data transfer is required so that customers can buy token from any vending system and different locations.

**Specification for
Single Phase
Smart Pre-payment Energy Meters**

6.2.1.25 Scope

This specification covers the design, manufacture, testing and supply of static single-phase direct connected pre-payment energy meters of accuracy Class 1.

6.2.1.26 Scope of Supply

The tenderer shall be responsible for supply, installation, testing & commissioning with related services packing, loading, shipment, custom clearance if necessary, and transportation, insurance and unloading at site. The supplied meters will be operated by existing purchasers' software (API attached in part-2 of this STD). Interfacing of the offered meter is the responsibility of the tenderer.

Item No.	Name of Goods or Related Services	Description	Unit of Measurement	Quantity
1.	Supply and installation of Smart Pre-payment Energy Meter including necessary accessories packing, loading, shipment, custom clearance if necessary, and transportation, insurance and unloading at site	Single phase, 230 Voltage (phase to neutral), 5(60)A	Each	1,36,434

Single phase prepayment meters shall be installed and commissioned according to the minimum guidelines as set out in technical specification. Prior to installation of meters customers shall be forewarned by delivery of a notice explaining what will happen. Public relations will be responsibility of the utility companies.

The installation team shall have a work order sheet instructing them what to do. The following information shall be printed on the works order from:

Customer Name	:	Supplied by the Utility and verified by Survey
Customer address	:	Supplied by the Utility and verified by Survey
Old Account Number	:	Supplied by the Utility
Old Meter Number & Reading	:	Supplied by the Utility
Tariff Code	:	The specific tariff to be allocated to the customer must be identified by the tariff code
Old Meter Reading	:	Old Meter Reading must be recorded at the time of pre-paid meter installation and verified by the concern customer.
Commissioning date	:	Date of pre-paid meter commissioning shall be noted.

There are different categories of installations that will be required:

1. Removal of induction & conventional digital meter and direct installation of prepayment meter with additional wiring or service line work required.
2. Removal of induction & conventional digital meter, re-routing of wiring with replacement of service connection and installation of pre-payment meter. Potential joints shall not be allowed in service drop cable.
3. Removal of service line (if required) and meter. Replacement of service connection and installation of meter.
4. New customer installation including service connection and installation of pre-payment meter.

The following guide lines must be followed by the supplier during installation of the meters:

1. The meters shall be sealed with Ferrule Type/Twist type seals compatible with the meters that uniquely identify the utility person who sealed the meters.
2. Meters shall be tested and commissioned by the installation supervisor using the data from the works order form to program the tariff details.
3. At the time of meter installation the customer's induction & conventional digital meter reading shall be captured on the order by the installation supervisor and the data returned to the SMS. The date of commissioning is also entered onto the work order form. If new service cable is re-installeed, the amount of new re-installed service cable shall be recorded and concern customer's signature must be taken on workorder sheet.
4. Customers shall be registered at the SMS using the returned work order form within 24 hours of commissioning.
5. The service connections shall not be replaced unless the survey indicates service line with joints or inadequately rated service lines or bad in selected line.
6. All meters shall be installed indoors at a location convenient to the customer as well as service personnel away from sources of heat and moisture.
7. The installation shall be symmetrical, vertical and parallel to respective walls and floors. From the points where the service enters customers building, it shall be enclosed in a 25 mm (dia) PVC pipe until it enters the metering house.
8. The piping shall be clamped or saddled at a maximum of 250 mm intervals.
9. At the time of installation on site training and instruction shall be given to the customer.
10. All other necessary accessories will be supplied by the Contractor.
11. At the time of meter installation picture of old and new meter with reading will be taken and shall be provided to the utility.
12. At time of installation, summary sheet of the customer (including both old meter and new meter information) will be prepared as utility prescribed format and will be submitted to the utility.

6.2.1.27 General Technical Requirements

6.2.1.27.1 Service conditions

The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

SI.No.	Condition	Specification
1	Maximum ambient temperature (°C)	55
2	Minimum ambient temperature (°C)	5
3	Maximum daily average temperature (°C)	35
4	Maximum annual average temperature (°C)	30

SI.No.	Condition	Specification
5	Mean annual rainfall (mm)	2500
6	Minimum annual rainfall (mm)	1461
7	Maximum annual rainfall (mm)	4127
8	Maximum relative humidity (%)	95
9	Average relative humidity (%)	80
10	Maximum wind velocity (km/h)	180
11	Maximum altitude above mean sea level (meters)	200

6.2.1.27.2 Environmental Requirements

The meter shall conform to the environmental capability requirements as documented in IEC 62052-11, 62053-21 and 62053-23. In addition to that, the following minimum requirements shall be met.

- i) The meter shall be protected against malfunction due to the ingress of vermin, by conformal coating of the printed circuit boards in the meter.
- ii) Any openings shall be as small as practically possible to prevent the ingress of dirt and vermin and to limit the potential for vandalism or tamper following IP 51 and IP 54.

6.2.1.27.3 Standards and codes of practice

All material and equipment supplied and all works carried out shall comply in every respect with the technical codes of the International Organization for Standardization (ISO) and with the recommendations of the International Electrotechnical Commission (IEC), which apply to the electrical equipment.

Goods and special guarantees beyond the scope of ISO and IEC shall conform at least to one of the following standards and codes in the following priority:

1. VDE and DIN standards
2. BS or ASTM
3. Other internationally accepted standards which ensure a quality equal to or higher than the standards mentioned above, but only if these are submitted in the English language edition.

The following documents shall be read in conjunction with this specification. In case of conflict, however, this document shall take precedence. Nothing in this specification shall lessen the contractors' obligations detailed in any other documents forming part of the contract.

IEC 514	Acceptance inspection of Class 1 alternating current watt-hour meters.
IEC 735	Testing equipment for electrical energy meters.
IEC 62052-11	Electricity metering equipment (AC)- General requirements, tests and test Conditions- Part 11: Metering equipment
IEC 62055	Part 21: Framework for standardization Part 31: Particular requirements- Static payment meters for active energy (classes 1).

IEC 62053-21, 62053-23	Alternating current static watt-hour meters (classes 1)
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts
IEC 1038	Time switches for tariff and load control
IEC 1107	Data exchange for meter reading, tariff and load control and direct local data exchange
IEC 58	Shock and vibration, humidity, solar radiation and salt mist etc
ISO 9001	Code of practice for quality systems part 1: Model for quality assurance in design/development, production, installation and servicing.
IEC 62054	Real Time Clock (RTC)
Others	All other relevant IEC specifications for metering equipment

6.2.1.28 Specific Technical Requirements

The meters to be supplied against this specification shall meet the requirements specified in this clause.

6.2.1.28.1 Electrical requirements

Meter supplied shall meet the following electrical requirements.

Sl.No	Description	Specification
1	Connection	1-phase, 2-wire, direct connected (unidirectional)
2	Number of elements	01 (one) minimum
3	Rated voltage	230 V phase to neutral
4	Variation in voltage	-50% to +30%
5	Continuous over voltage	Should withstand 400 volts for 48 hours without causing any damage or degrading of its operating life, or causing changes of more than 0.01 kWh in its credit registers (excluding the possible decrement of credit due to power being consumed).
6	Base current, I_b	≤ 5 A
7	Maximum continuous current, I_{max}	≥ 60 A
8	Starting current	20 mA (0.4% I_b)
9	Rated frequency	50 Hz
10	Variation in frequency	$\pm 4\%$
11	Power factor	0.5 lag – unity – 0.8 lead
12	Class index	1.0
13	Clock	Built-in real time clock with battery backup
14	Display	LCD; Visibility should be sufficient to read the meter mounted at height of 0.5 to 2.0 m.

Sl.No	Description	Specification
		Pin type; trans-reflective HTN or STN type industrial grade; temperature range -20°C to $+70^{\circ}\text{C}$
15	Period of display	Continuous
16	Digits	WxH: 6 mm x 10 mm (minimum)
17	Maximum viewing angle	160 degrees
18	Number of display digits	6+2
19	Display parameters	<ul style="list-style-type: none"> i) kWh for the current billing period ii) Total kWh used since installation iii) Current electricity rate iv) Credit level v) Date and time vi) Instantaneous load vii) Instantaneous voltage, current & p.f. viii) Maximum Demand for current month (in kW)
20	Power consumption in the voltage circuit	≤ 2 Watts and 5 VA
21	Harmonic energy	Meter shall record total energy including harmonic energy
22	Memory	Non volatile memory that retain information up to 10 years in the absence of power
23	Power limiting	Meter shall disconnect the load when a pre-programmed threshold power is reached. The threshold shall be programmable in steps of 500W or less.
24	Limit of Current	Shall be Programmable within the range of 0.02A >60 A
25	Tamper detection	Sensor to detect that terminal cover have been opened
26	Load disconnection	Latching relay
27	Audible alarm	Buzzer
28	Lightning Protection	In accordance to IEC 62053-21
29	Sealing Condition	The meter body will be hermetically sealed/ ultrasonically welded to avoid unauthorized opening of meter cover.
30	Communication	RS485, GPRS(4G which will also support all other available bands in Bangladesh)/ NB-IoT and BROADBAND PLC and RF (Plug and Play)
31	Communication Protocol	DLMS/COSEM
32	Vending	Vending facility through online, Mobile SMS, Mobile Apps, POS, ATM/Bank booth etc.
34	Load Control Switch (Latching Relay)	a. Smart meter shall be equipped with integrated load control switches (latching relay) at both phase and neutral to control flow of electricity to the load data the instance of connect/ disconnect commands as per functional need of the system.

Sl.No	Description	Specification
		<p>b. Both Load switches (latching relay) shall operate simultaneously for connect/disconnect purpose and shall be mounted inside the meter with suitable arrangement.</p> <p>c. The rating of switches used shall be in line with meter rating.</p>

6.2.1.28.2 Mechanical requirements

The enclosure shall be tamper resistant and shall be suitable for indoor mounting. The meter shall be such that the internal components in the active part of the meter shall be protected against unintentional damage or tamper during handling and installation.

Furthermore, Meter supplied shall meet the following mechanical requirements.

Sl. No.	Description	Specification
1	Meter Case	<p>The meter shall be constructed by employing flame retardant and high impact strength material. The base, body and frame including terminal block shall be of heat resistive; shock proof and rust proof good quality hard material e.g. unbreakable engineering or stamped metal or molded phenol resin which shall be capable of withstanding of 145° C. The base will be provided with 3 (three) screw mounting holes, 1 (one) slotted meter support bracket at the top and 1 (one) round hole on each side in the bottom half of the base for securely mounting the meter to the meter board.</p> <p>The meter cover shall be of molded black phenol resin or alternatively stamped metal or toughened glass or Poly-Carbonate. The meter cover shall be provided with a window of Poly-Carbonate or toughened glass. For display of LCD display.</p> <p>The meter shall be effectively sealed to prevent entrance of moisture, rain and dust into its internal parts.</p>
2	Terminal	<p>Side/bottom entry connection type; minimum 4 terminals to accommodate 10 mm² duplex; terminal cover shall be extended type;</p> <p>Terminal block shall be polycarbonate grade 500R or equivalent bakelite; brass or copper current terminals; two flat-head brass screws at each terminal; terminal bore diameter 6 mm;</p>
3	Minimum free space between bottom of terminal and terminal cover	60 mm
4	Connections diagrams, short codes and terminal marking	Every meter shall be indelibly marked with a diagram of connection, and short codes. Meter terminals shall be marked, this marking shall appear on the diagram. The short codes shall be assigned during final design-drawing approval by WZPDCL.
5	Insulation level	Shall withstand a power frequency test of 4kV and impulse withstand test of 6 kV
6	Protection against penetration of dust and water	Conform to the degree of protection of IP51 or better
7	Top cover sealing	Hermetically sealed or ultrasonically welded.
8	Pulse output	Flashing LED visible from the front.

Sl. No.	Description	Specification
9	Maximum pulse frequency	Shall not exceed 2.5 kHz
10	Protection against magnetic field	Accuracy shall not be affected by AC/DC magnetic field on all the sides of meter. Meter working shall not be affected by permanent magnet of 0.5 mT.
11	Temperature range	Limit range of operation: -25°C to 55°C Limit range of storage and transport: -25°C to 70°C
12	Name plate	Every meter shall have clearly visible, indelibly and distinctly marked name plate containing the following information: i) Manufacturer's name ii) Meter type iii) Number of phases and number of wire iv) Meter serial number and year of manufacture v) Rated voltage of the system vi) Basic current and maximum current vii) Reference frequency in hertz viii) Meter constant in imp/kWh ix) Class index of the meter x) Over-current breaking capacity (in kA) xi) UTILITY logo xii) Contract No. xiii) Reference Standard
13.	Optical Port	Meter should have standard optical port for local read and configuration. Meter should have two wired active RS485 port for remote communication.

6.2.1.28.3 Latching relay specifications

The specification for the single phase latching relay is as follows:

Sl. no	Description	Requirements
1	Manufacturers Name & Address	Gruner, Germany/ Schneider Electric, USA/ Johnson Electric, Germany/ KG, USA
2	No. of coils	2 (two)
3	Rated coil voltage	12 VDC
4	Rated coil power	6 W
5	Pulse to set	30 ms
6	Contact Material	Silver alloy
7	Maximum Switching Power	15000 VA
8	Maximum Switching Voltage	250 V AC
9	Maximum Switching Current (rms)	80A
10	Contact resistance	≤ 2 mΩ

Sl. no	Description	Requirements
11	Electrical Cycle	1x10 ⁴
12	Mechanical Cycle	1x10 ⁵
13	Insulation resistance	≥ 1000 MΩ
15	Dielectric Strength between contacts	≥ 2000 VAC
16	Dielectric Strength between contact and coil (50 Hz)	≥ 3000 VAC
17	Dielectric Strength between contacts assembly	≥ 4000 VAC
18	Ambient temperature	-40 °C ~ +55 °C
19	Operating humidity	40 to 95%
20	Temperature rise at rated current (assuming 30°C room temp.)	60°C

6.2.1.28.4 Meter sealing

- a) Provision shall be for sealing the meter at least two Ferrule steel seals
- b) The stainless steel seals shall be applied in such a way that it will not be possible to undo/loosen the mounting screws used to secure the meter without breaking these seals.
- c) The stainless steel seals shall be applied in such a way that they will be easily visible when viewing an installed meter from the front.
- d) The terminals shall also be have Ferrule/TT sealing arrangement.

6.2.1.28.5 Tamper detection

A tamper sensor shall be provided to detect that terminal cover has been opened both in power supply and without power supply.

6.2.1.28.6 Optical Interface

The meter shall have an IEC 62056-21 compliant optical communication port. This should allow the utility to access via front for variety of customer information stored inside the meter and to upload it into a hand held unit (HHU).

6.2.1.28.7 Remote Communication

The meter shall have remote communication option (equipped with GPRS/EDGE/EVDO/HSPA modem) which will be able to interface with RS485 for data communication with the central server from meters.

and

The meter shall have communication function with BROADBAND PLC and RF through DC which will be able to communicate with the central server using GPRS (4G which will also support all other available bands in Bangladesh) modem.

The meter shall have both GPRS (4G which will also support all other available bands in Bangladesh)/NB-IoT and BROADBAND PLC and RF communication compatibility (Plug and Play).

The PC Software must have provision to communicate with the Meter (both single Phase and three phase) through online.

6.2.1.29 Electromagnetic compatibility

(a) Immunity to electromagnetic disturbance

The meter shall be designed in such a way that conducted or radiated electromagnetic disturbances as well as electrostatic discharge do not damage or substantially influence the meter. The disturbances to be considered are:

- i. Electrostatic discharges
- ii. Electromagnetic HF field
- iii. Fast transient burst

(b) Radio interference suppression

The meters shall not generate conducted or radiated noise which could interfere with other equipment.

6.2.1.30 Accuracy requirements

(a) Limits of error due to variation of the current

The percentage errors shall not exceed the limits for the relevant accuracy class stipulated in IEC standard.

(b) Limits of error due to other influence quantities

The additional percentage error due to the change of influence quantities shall not exceed the limit for the reference accuracy class stipulated in IEC standard.

(c) Limits of error due to ambient temperature variation

The limits of error shall not exceed the limits stipulated in IEC standard.

(d) Starting and running with no-load

Initial start-up of the meter: The meter shall be fully functional within 5 seconds after the voltage is applied to the meter terminals.

Running with no load: When the voltage is applied with no current flowing in the current circuit the test output of the meter shall not produce more than one pulse.

Starting: The meter shall start and continue to register at $0.4I_b\%$ at power factor of 1.

(e) Meter constant

The relation between the test output and the indication in the display shall comply with the marking on the name-plate.

6.2.1.31 Functional Requirement

6.2.1.31.1 Security

All credit and meter management tokens shall be meter specifically encrypted to guarantee security of the system. Encrypted tokens shall not be reusable. Tokens to display status and test the meter may be un-encrypted and reusable.

6.2.1.31.2 Token validation

If a token not meant for the meter is applied, the meter should display a message to that effect. Similarly, if a valid token is re-entered into the meter then the meter must display an appropriate message.

6.2.1.31.3 Meter personalization

In addition to factory personalization and personalization via encrypted tokens, it shall be possible to personalize the meter from a hand held unit (HHU) provided the HHU is authorized/ programmed to communicate with the meter.

6.2.1.31.4 Meter modes

The meter shall be required to support at least two modes of operation, namely the prepayment mode and the meter test mode.

6.2.1.31.5 Prepayment mode

The basis of this mode is that credit is transferred to the meter, and provided the meter remains in credit, the meter provides supply. The credit register is decremented against current consumption with the countdown total being displayed on the meter display.

6.2.1.31.6 Meter test mode

The meter should support a test mode that is activated either from a dedicated test token, or using the HHU. This test should be automated in the meter and should include a full diagnostic test, testing of the all the active and inactive functionality, metering accuracy test (1 minute load test), and connection validation tests. Meter test mode shall also display following information:

- i) Meters software version
- ii) Current limit
- iii) Switch open and close count
- iv) Token acceptance & rejection count

6.2.1.31.7 Load disconnection

- a) The load shall be disconnected by a latching relay under the following conditions:
 - i) The credit in the meter has expired and grace facilities also expired.
 - ii) The load power threshold has been exceeded.
 - iii) The meter is in a tampered state.
 - iv) Neutral missing at source side.
- b) The meter shall indicate whether the load is connected or not and shall display the reason for disconnection.

- c) The customer shall not have the option to switch the contactor manually. Under over – current conditions the mechanism to automatically reconnect the load must ensure that the number of switching cycles is limited. The meter shall attempt to reconnect the load up to 5 times at 30-second intervals. If the over-current condition still exists the meter shall wait a period of 30 minutes before attempting to reconnect the load.

6.2.1.31.8 Load control

Meters shall have the options to control loads with the following features:

Sl. No.	Requirement	Description
1	Allowed loads for given time periods	There shall be provision in the meter to define the allowable loads for given time periods within a day
2	Activation date of load allocation	There shall be provision in the meter to accommodate the date of activation of the defined load allocation
3	Load Limit step	Load limit shall be defined in step of 500 W.

6.2.1.31.9 Tamper detection

Tamper shall be detected with and without power supply.

When the meter detects a tamper condition, it should enter a shutdown state, with an appropriate message. The customer should be disconnected immediately. The tamper status shall be reset by using a uniquely coded tamper reset token that may only be used once.

Meter should detect reverse flow of power and measure correctly by forward registration.

Meter should measure current in phase and neutral both so that current bypass tamper taken care off.

Meter should provide tamper log data with date and time and same should be sent to main system through two way token or through meter reading port.

Removal of battery shall be considered as a temper.

6.2.1.31.10 Energy accounting

6.2.1.31.11 Credit register

i) The credit register is the “operating account” of the meter being decremented by the metering process. The specific requirements of this register are:

- a) This register must be decremented for the equivalent of every credit unit consumed.
- b) When the available credit has been consumed, the meter must open the contactor and isolate supply from the customer (unless the Friendly hours or Emergency Credit option is invoked).
- c) This register can become negative from use of emergency credit.
- d) The balance of this register should be written to the token.

ii) Before accumulating the new recharge credit or tariff conversion information, the meter shall perform a Freeze Operation on the current remaining energy credit and store it to a separate register to ensure the accuracy and consistency of the data. After the credit freeze & storing is completed, the meter shall update the remaining energy credit or tariff settings according to the Token information.

6.2.1.31.12 Friendly hours, weekend, holidays

The meter shall accommodate the “Friendly hours”, “Weekend” and “Holidays” features. These are time periods during which the meter shall not cut-off power to consumer if the credit becomes negative. Details of the features are described in the following table.

Sl. No.	Requirement	Description
1	Friendly hours	There shall be provision to define 'Friendly hours' in the meter. The utility shall be able to define the 'Friendly hours' and shall be communicated to the meter through token.
2	Weekend	There shall be provision to define 'Weekend' in the meter. The utility shall be able to define the weekend and shall be communicated to the meter through token.
3	Holidays	There shall be provision to define 'Holidays' in the meter. At the end of a year the utility shall be able to define new holiday dates and these shall be communicated to meter through token.

6.2.1.31.13 Emergency credit

Provision shall be made in the meter for an Emergency Credit facility that allows the customer to draw on an emergency credit should the credit in the register be consumed.

The specific requirements of this facility are:

- a) When the credit register value reaches a programmable Emergency Credit Threshold the meter should sound an audible alarm, and prompt the user to accept the use of the Emergency Credit facility (card insertion or button depression). The meter should not supply energy against emergency credit unless acknowledged by the customer.
- b) If all the available credit in the credit register is expired and power disconnected, the facility to activate the Emergency Credit should remain an option to the user.
- c) The meter should remain in service until the Emergency Credit Limit has been reached, after which the supply should be disconnected.
- d) If the Emergency credit limit is set to zero, the Emergency Credit Threshold shall function as a low credit warning and provide the user with a visual and audible alarm that credit is low. The user shall have the option to silence the alarm by inserting a card or pressing a button to accept the alarm.
- e) If emergency credit has been previously consumed, then the value of emergency credit used shall be deducted from the next token inserted into the meter.
- f) Once emergency credit has been exhausted, no further credit facilities shall be available until the full emergency credit allocation has been paid for.

6.2.1.31.14 Consumption during current billing period

- a) This register records the cumulative energy consumption for the current billing period.
- b) The registers shall be updated at least every 10 Wh.
- c) The value of this register shall be written to the token (if applicable).

6.2.1.31.15 Historic consumption

For this option there are six energy registers that store the total energy consumed for the previous six months.

- a) These registers are cycled at during the month-end process, with the oldest data being deleted.
- b) The value of these registers written to the token (if applicable).

6.2.1.31.16 Cumulative energy consumption

- a) This register records the cumulative consumption since the meter was commissioned.
- b) The units of storage are kWh, rounded to two decimal points (10 Wh).
- c) The value of this register shall be written to the token (if applicable).

6.2.1.31.17 Tariff

All tariff calculation must be done within the meter.

The meter is required to support stepped tariffs structures as well as time-of-use and maximum demand.

The tariff structure consists of the following records:

- i) Each tariff must be uniquely identified using the tariff code
- ii) Each tariff shall have an activation date, being the date on which the tariff becomes effective.
- iii) Each tariff has up to seven steps (in kWh) for different levels of energy pricing.
- iv) The rate describes the cost per kWh for energy consumption in that step.

6.2.1.31.18 Tariff management in the meter

- a) Tariffs shall be entered into the meter via the two-way token or HHU. The meter should not allow tariffs to be manually entered using the push buttons.
 - When the meter is active, the current cannot be overwritten.
 - The meter must time and date stamp when the tariff is loaded into meter.
- b) In general, when a tariff has expired in the meter, the tariff is automatically deleted by the meter.

6.2.1.31.19 Tariff security and verification

The meter shall write the active tariff code to the token on each insertion.

6.2.1.31.20 Tariff switchover

When the meter detects that a new tariff is applicable (using the tariff activation date), the meter should execute the following steps:

- i) The meter shall begin the billing against the new tariff.
- ii) The current tariff code shall be updated to reflect the new tariff code.
- iii) The old (expired) tariff should be deleted.
- iv) New tariffs will only be activated at 00:00 on the first day of a month.

6.2.1.31.21 Billing

Billing operates on a monthly basis. Energy consumption charge is deducted within the meter for at least every 10 Wh. All other charges including service charge, minimum charge, vat and taxes are deducted at the POS.

6.2.1.31.22 Month-end calculation

At the end of each month, the meter should perform a month-end calculation that consists of the following minimum steps:

- a) The cumulative monthly energy registers must be reset, and the historic registers must be updated.
- b) The meter must determine whether a new tariff will become active, and if so, must delete the old tariff.

6.2.1.31.23 Date and time management

The meter shall be equipped with a real time clock supporting the date and time as per IEC standard. Pseudo-clock using mains crossing detection is not acceptable. The maximum drift of the clock shall be less than 30 seconds per month. The battery and/or auxiliary power source shall operate maintenance free for a period of at least 10 years and meter shall have battery replacement facility.

The meter must be equipped with a battery monitoring system that monitors the battery's condition and initiates a "Change Battery Alarm" to the point of sale when the battery approaches the end of its operating life. If the battery is not replaced, the failure of the battery is deemed to constitute a meter failure, and the meter should be shut down.

Date and time may be changed using special token carrier. Date and time changes shall be flagged, written to the token carrier and transferred to the POS at the next purchase.

6.2.1.31.24 Human machine interface displays

6.2.1.32 General requirements

- a) The design philosophy of the meter display subsystem should be that a suitable message or indication must be displayed or annunciated for every meter event and alarm without exception.
- b) The meter should make provision for the customer or utility personnel to scroll through the displays.
- c) The meter should have a default display that displays the following minimum information:
 - i) The Remaining Credit
 - ii) The Total Consumption, kWhr to date
 - iii) The power limit
 - iv) The current Tariff

6.2.1.33 Liquid crystal display

- a) A liquid crystal display is required to display status alarm and event information.
- b) An illuminated display with a minimum lifetime of ten years is required.

- c) The size (number of rows and characters per row) should be appropriate for the display and interpretation of the messages and meter information, and should be legible from a distance of at least 500 cm with a viewing angle of no less than 30°.

6.2.1.34 Fault and status display

The meter should provide a visible indication of the status of the incoming supply. Meter should integrate the incoming neutral and phase wire swapping detection function to automatically detect and confirm the wiring status of the Neutral and Phase. The meter should process in real time to ensure continuous monitoring of the correct wiring status of the neutral and phase wires. The meter should provide a clear fault indication through the user interface, such as a flashing indicator light or an error code on the display screen, to notify the user of the wiring problem. If required meter shall open the relay in case of phase and neutral swapping and this function should be programmable.

6.2.1.35 Rate LED

The meter should include a consumption rate indicator LED that emits visible red light.

6.2.1.36 Status/alarm/event displays

In addition to the displays required above the meter must display the following minimum information in an intuitive way such that an inexperienced user can understand and interpret the information intelligibly. Laminated instruction cards are to be provided for each unit.

- i) Meter ID.
- ii) Out of Credit message
- iii) Invalid token entered
- iv) Duplicate token entered
- v) Meter tamper state
- vi) Meter failure and/or fault code

The Tenderer must submit a detailed specification of the way in which the display are structured and laid out.

6.2.1.37 Meter identification cards

- a) In case of keypad meters, each meter shall be supplied with a meter identification card, which complies with NRS 009-4: 1995.
- b) The printed details and graphic design of the cards shall be submitted to the utility prior to producing the cards.

6.2.1.38 Testing and approval

- a) It will be the responsibility of the tenderer to submit to the Employers representative for approval a complete Acceptance Test Procedure (ATP) for system verification.
- b) Once the Employer's representatives approve the ATP, the testing and performance validation tests on 2% (random samples) of the supplied meters will commence. The Employer's representative at the utility's premises will witness these tests.

6.2.1.39 Quality assurance

Tenderers shall comply with and be certified to the following ISO levels:

ISO 9001 Quality systems

Model for quality assurance in design development production installation and servicing

Model for quality assurance in final inspection and test

Tenderers shall submit copies of certification with their proposal to this effect.

6.2.1.40 SOFTWARE REQUIREMENT

6.2.1.40.1 Data Exchange Format

The meter must be able read and write data to the smartcard in specific format if it is a smartcard-based meter or decode information from encoded keys typed through the keypad if it is a keypad-based meter.

6.2.1.40.1 Keypad Numbering Scheme

The meter number scheme will be the unique and be followed by a conversion of all the utilities. The number scheme will not be the scheme described but the description will be the basic of the conversion of the meter number scheme which will be supplied after signing of the contract

While the manufacturer is free to use any number scheme they see fit, the number scheme must be secure and use minimum number of digits and must always contain the following fields in encrypted form:

Meter ID

Recharged amount

Sanctioned Load

Sequence Number

The meter must check the validity of these fields before recharging the credit. The sequence number is an auto generated number starting from 1 for each recharge or keypad numbers. A keypad number will only be accepted if the previous number has been keyed in. For example if a consumer goes to POS to recharge 300Tk and gets keycode xxxyyzzz (which contains sequence number n). The next month he goes again to recharge 250Tk and gets keycode pppqqrrr (which contains sequence number n+1). Keycode pppqqrrr will only be accepted if xxxyyzzz has been keyed in previously i.e. meter will only accept a keycode containing sequence number 'n' if at some point keycode containing sequence number 'n-1' has been keyed in. This is to ensure that keycodes are not discarded by a consumer intentionally.

Periodically it may be necessary to generate a keycode that contains more data. The keycode scheme must be able to accommodate the following data if and when required:

Meter ID

Recharged amount

Sanctioned Load

Sequence Number

Load Change

- Sanctioned Load
- Start Time

Rate

- Start Unit
- Peak Rate
- Off peak Rate
- Activation Date

Holiday

- Month
- Day

It is assumed that the keypad number with only the meter id, amount, load and sequence number will be a lot shorter than the keycode containing all the rate information.

6.2.1.40.2 Smart Card Data Format

SLE4428 or 100% compatible 1K Byte EEPROM Memory Card must be used in the card based meter. The memory card will have encrypted and no encrypted memory parts. The encrypted bytes must be generated by the meter SDK/API as supplied by the manufacturer. The manufacturer is free to use any encoding scheme to secure the data but must contain all the data as mentioned in the following table:

<u>Data</u>	<u>Bytes</u>	<u>Memory Address (Bytes)</u>
Non Encrypted Data		
Binary Pattern (1010110011110000)	2	1-2
Version	1	3
Meter ID	10	4-13
Consumer ID	10	14-23
Utility ID	2	24-25
Sanctioned Load (kW)	6	26-31
Meter Type	1	32
Sanctioned Load Exceeded	1	33
Last Recharge Amount	2	34-35
Last Recharged Date (DMY)	3	36-38
Last Transaction ID	10	39-48
Unused/Future Provision	55	49-100
Encrypted Data as Generated by the Meter Manufacturer SDK/API		
The following Data must exist within the encrypted Data: <u>Data To Meter:</u> Meter ID Consumer ID Utility ID Sanctioned Load Recharge Amount Weekend Emergency Account Friendly Hour (start/end) Peak Hour (start/end) Buzzer Volume Rates <ul style="list-style-type: none"> • Rate starts at unit • Rate at Peak • Rate at Offpeak • Activation Date Holidays <ul style="list-style-type: none"> • Month 	923	101-1024

<u>Data</u>	<u>Bytes</u>	<u>Memory Address (Bytes)</u>
<ul style="list-style-type: none"> • Day Load Change <ul style="list-style-type: none"> • Start Time (hour/minute) • Sanctioned Load <u>Data From Meter:</u> Tamper Status RTC Status LR Status Usage Data for the last 12 months individually <ul style="list-style-type: none"> • Month • Year • KWh • Taka Recharged • Taka Used • Average Power • Reactive Power • Maximum Power • Volt Ampere • KWh in Peak • KWh in Offpeak • KVarh in Peak • KVarh in Offpeak • Total charge in Peak • Total charge in Offpeak • Number of power failures • Number of time sanctioned load exceeded Tamper <ul style="list-style-type: none"> • Number of times tampered • Date/Time of Tamper 		

6.2.1.40.3 Encrypted Data Generation SDK

Encrypted Data Generation SDK/API as described in Part B of the Tender Document. Here it should be mentioned that the Encrypted Data Generation SDK/API is a perception only it could be changed or modified with respect to the manufacturer that varies.

The meter manufacturer must provide SDK/API to generate encrypted that suitable for the meter to process and understand the API interface that has been developed in JAVA and operating system is on Linux.

The manufacturer must provide:

- Library compiled in GCC Linux that can be integrated in Java Program.
- Sample project and source code illustrating usage of provided java program
- Documentation of each function, input and output.

Work with utility to make sure that all software follows the defined standards, agree on change with all partners if required.

The following functions and parameters must be implemented:

Function Lists:

Function meter_encode:

Command

meter_encode

Parameters

Parameter	Data Type
Recharge_amount	Integer
Sanctioned_load	Float
Sequence Number	Inteter
Rate	Array
Holiday	Array
Loss	Array
Load Change	Array
Meter_id	String
Expected_output	Unsigned char (1=keyode, 2=binary data)
Meter_id	String
Sanctioned Load Weekend Emergency Account Friendly Hour (start/end) Peak Hour (start/end) Buzzer Volume Rate, Holiday, Loss, Load Change includes: Rates <ul style="list-style-type: none"> • Rate starts at unit • Rate at Peak • Rate at Offpeak • Activation Date Holidays <ul style="list-style-type: none"> • Month • Day Loss <ul style="list-style-type: none"> • Loss Type • Loss Rate Load Change <ul style="list-style-type: none"> • Start Time (hour/minute) • Sanctioned Load 	Array

Response

Parameter	Data Type
Status	Boolean
Amount	Float
Encoded_Data	Byte array

Keycode	String
Meter_id	String

Function meter_decode:

Command

meter_decode

Parameters

Parameter	Data Type
Meter_id	String
Encoded_Data	Byte array

Response

Parameter	Data Type
Status	Boolean
Tamper Status RTC Status LR Status Usage Data for the last 6 months individually <ul style="list-style-type: none"> • Month • Year • KWh • Taka Recharged • Taka Used • Average Power • Reactive Power • Maximum Power • Volt Ampere • KWh in Peak • KWh in Offpeak • KVarh in Peak • KVarh in Offpeak • Total charge in Peak • Total charge in Offpeak • Number of power failures • Number of time sanctioned load exceeded • Loss Charge <ul style="list-style-type: none"> ○ Type of Loss ○ Loss charge in Peak ○ Loss charge Offpeak Tamper <ul style="list-style-type: none"> • Number of times tampered • Date/Time of Tamper 	Array

6.2.1.40.4 Meter Numbering

The meter number scheme will be the unique and be followed by a conversion of all the utilities. The number scheme will not be the scheme described but the description will be the basic of the conversion of the meter number scheme which will be supplied after signing of the contract

It must be possible to program the meter with an 11 digit meter number. The first two digits will be utility ID. The second digit will correspond to meter_type. 1=Smart Card based, 2=Keypad type, 3=online. The next 8 digits will be a sequence number used to identify each meter and will consist of numbers (0-9).

6.2.1.41 Tariff Management

6.2.1.41.1 Tariff Definition

The System Manager shall be able to define tariff objects. Each tariff has a unique tariff ID associated with it. The following information is required to define a tariff.

Tariff ID	A unique tariff identifier
Effective Date	The date on which the tariff will be effective.

Step Structure	Step	Rate
	0 - kWh ₁	R ₁
	kWh ₁ - kWh ₂	R ₂
	kWh ₂ - kWh ₃	R ₃
	kWh ₃ - kWh ₄	R ₄
	kWh ₄ - kWh ₅	R ₅
	kWh ₅ - kWh ₆	R ₆
	kWh ₆ -	R ₇

Subject	Tariff Category	PFC Calculation
Power Factor Correction (PFC) Charges	'A', 'B', 'C1', 'C2', 'D1', 'D2', 'D3', 'E', & 'T' Category, 3 phase, 400V, 20KW & above	For PF<0.95, PFC= 0.75%*Energy Charge*(0.95-PF); Maximum PFC= = 0.75%*Energy Charge*(0.95-0.75); Where, PF= Power Factor Obtained from meter.

Subject	Tariff Category	Time
Time of Use	'C1' & 'E' Category,	Peak – 17:00 to 23:00 Off Peak-23:00 to 17:00
	'D3' Category	Peak – 17:00 to 23:00 Off Peak-23:00 to 05:00 and 09:00 to 17:00 Super Offpeak-05:00 to 09:00

Service Charges	Fixed charges are levied per month. These charges are different for single phase and three phase meters in a particular tariff category.
Minimum Charges	There will be no minimum charges for Pre-Paid System.

Sanctioned Demand Charges (Fixed Charge)	A fixed charge per kW of the sanctioned demand is levied per month.
Maximum Demand Charges	Integrated over ½ hourly periods Maximum Demand in KW.
VAT	Value added tax is levied on electricity charges and must be catered for in the system.
Rebate	Consumers shall avail rebate which will be 0.5% of Net Bill exclusive of VAT.

- g) The tariff code, effective date, kWh_x (in units of kWh), R_x together with a fixed monthly service charge Service Charges and a fixed monthly sanctioned demand shall be used to define all prepaid tariffs used in the system.
- h) The MIC shall make provision for up to 500 tariff definitions.
- i) The MIC must verify the tariff data entered and shall not allow discontinuities in the energy levels or negative rates for energy and fixed charges.
- j) There shall be a facility to copy tariffs to new tariff codes for editing purposes. The edit facility shall include a mechanism to increase the values of any of the variables R_x, SC and DC by a fixed percentage.
- k) Tables of Supply Group Codes and tariffs shall be securely stored at the MIC.
- l) No penalty Charges for Power Factor equal to or above 0.95 to 1.0. Power Factor Correction Charge is computed as above and average power factor is measured by meter based on only reactive energy. The monthly average power factor from meter is used for the factor and applied on the energy charge.

Please refer to WZPDCL's tariff document for details of the tariffs provided by Bangladesh Govt (SRO no. 43 Law/2024, Dated: 29 February, 2024).

Meter must have the provision to store the PFC charge data and display the PFC charge data.
Meter must have the provision to update the PFC charge calculation procedure through online.

6.2.1.41.2 Tariff Algorithm

The prepayment system could be implemented stepped tariffs. The tariffs will be implemented at the vending equipment/meter. The algorithm must ensure that:

- a) The Stepped tariffs are implemented in meter as accurately as is the case for conventionally billed customers.
- b) Customers are not restricted to the amount and frequency of electricity token purchases provided purchases do not exceed 12 times the calculated monthly average consumption without penalty.
- c) If any tariff changes, tariff update with effective date sent to meters through smart card at the time of purchase for smart card meters. The updated tariff will be sent using special numbers for keypad meters. For both meters, after utility decides the tariff update, all purchase of credit (with keypad number of smart card) will carry and tariff change flag. So that the meter will not accept any credit addition until it gets the tariff update.
- d) Customers will purchase only credit following credit transfer principles.
- e) Before any new purchase in a particular month the fixed charges are deducted for the first time and the rest of the money paid by customer will be sent to meter through card or number as credit.

- f) For consecutive purchase in the same month, credit values without any fixed charge will be sent to the meter.
- g) Slab reset service charges, power factor penalty (PFC) should be monthly basis.
- h) The meter should have functionality to re - calculate the consumed amount; that is if any tariff changes or updated, even if the user does not switch to the new tariff immediately, the utility can deduct this part of the undercharged electricity bill through the meter to avoid loss of revenue. For this puposeTenderes shall have to maintain
 - 1. A register which will store at least 30 days daily consumption (kWh) date wise.
 - 2. Monthly consumption register (minimum 12 months)
 - 3. Old and current tariff register
 Calculating the difference between old and current tariff, adjustment has to be done in the meter balance and this process should be programmable.
- i) The tender shall provide a detailed description of the algorithm including:
 - 1. All assumptions made.
 - 2. An explanation of how the averaging algorithm operates.
 - 3. Examples of how the algorithm works.
 - 4. Examples of how to explain the algorithm to customers.
 - 5. Examples of how to deal with customers queries.
 - 6. Description of how the algorithm manages tariff rate and tariff structure change.
 - 7. Description of mechanisms to apply corrections
 - 8. Description of how to deal with the situation where a customer buys at two different locations between data transfers.
 - 9. Online data transfer is required so that customers can buy token from any vending system and different locations.

**Specification
for
Three Phase Online Smart Pre-payment Energy
Meters**

6.2.1.42 Scope

This specification covers the design, manufacture, testing and supply of static three phase direct connected pre-payment energy meters of accuracy Class 1.

The tenderer shall be responsible for supply, installation, testing & commissioning with related services (including supply necessary accessories except cable) packing, loading, shipment, custom clearance if necessary, and transportation, insurance and unloading at site. The supplied meters will be operated by existing purchasers' software (API attached in part-2 of this STD). Inerfacing of the offered meter is the responsibility of the tenderer.

Item No.	Name of Goods or Related Services	Description	Unit Measurement	Quantity
1.	Supply and installation of Smart Pre-payment Energy Meter including necessary accessories packing, loading, shipment, custom clearance if necessary, and transportation, insurance and unloading at site	Three phase, 400 Voltage (phase to phase), 10(100)A	Each	2377

Three phase prepayment meters shall be installed and commissioned according to the minimum guidelines as set out in technical specification. Prior to installation of meters customers shall be forewarned by delivery of a notice explaining what will happen. Public relations will be responsibility of the utility companies.

The installation team shall have a work order sheet instructing them what to do. The following information shall be printed on the works order from:

Customer Name	:	Supplied by the Utility and verified by Survey
Customer address	:	Supplied by the Utility and verified by Survey
Old Account Number	:	Supplied by the Utility
Old Meter Number & Reading	:	Supplied by the Utility
Tariff Code	:	The specific tariff to be allocated to the customer must be identified by the tariff code
Old Meter Reading	:	Old Meter Reading must be recorded at the time of pre-paid meter installation and verified by the concern customer.
Commissioning date	:	Date of pre-paid meter commissioning shall be noted.

There are different categories of installations that will be required:

1. Removal of induction and conventional meter and direct installation of smart pre-paid meter with additional wiring or service line work required.
2. Removal of induction and conventional meter re-routing of wiring with replacement of service connection and installation of smart pre-paid meter. Potential joints shall not be allowed in service drop cable.
3. Removal of service line (if required) and meter. Replacement of service connection and installation of meter.
4. New customer installation including service connection and installation of pre-payment meter.

The following guide lines must be followed by the supplier during installation of the meters:

1. The meters shall be sealed with Ferrule Type/Twist type seals compatible with the meters that uniquely shall identify by the utility person who sealed the meters.
2. Meters shall be tested and commissioned by the installation supervisor using the data from the works order form to program the tariff details.
3. At the time of meter installation the customer's induction and conventional post-paid meter reading shall be captured/ noted on the order by the installation supervisor and the data returned to the MIC. The date of commissioning is also entered onto the work order form. If new service cable is re-installeed, the amount of new re-installed service cable shall be recorded and concern customer's signature must be taken on workorder sheet.
4. Customers shall be registered at the MIC using the returned work order form within 24 hours of commissioning.
5. The service connections shall not be replaced unless the survey indicates service line with joints or inadequately rated service lines or bad in selected line.
6. All meters shall be installed indoors at a suitable location convenient to the eye-level of customer as well as service personnel away from sources of heat and moisture.
7. The installation shall be symmetrical, vertical and parallel to respective walls and floors. From the points where the service enters customers building, it shall be enclosed in a minimum 30 mm (dia) PVC pipe until it enters the metering house.
8. The piping shall be clamped or saddled at a maximum of 250 mm intervals.
9. At the time of installation on site training and instruction shall be given to the customer.
10. All other necessary accessories will be supplied by the Contractor.
11. At the time of meter installation picture of old and new meter with reading will be taken and shall be provided to the utility.
12. At time of installation, summary sheet of the customer (including both old meter and new meter information) will be prepared as utility prescribed format and will be submitted to the utility.

6.2.1.44 GENERAL TECHNICAL REQUIREMENTS

6.2.1.44.1 Service conditions

The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Sl. No.	Condition	Specification
1	Maximum ambient temperature (°C)	55
2	Minimum ambient temperature (°C)	5
3	Maximum daily average temperature (°C)	35
4	Maximum annual average temperature (°C)	30
5	Mean annual rainfall (mm)	2500
6	Minimum annual rainfall (mm)	1461

Sl. No.	Condition	Specification
7	Maximum annual rainfall (mm)	4127
8	Maximum relative humidity (%)	95
9	Average relative humidity (%)	80
10	Maximum wind velocity (km/h)	180
11	Maximum altitude above mean sea level (meters)	200

6.2.1.44.2 Environmental Requirements

The meter shall conform to the environmental capability requirements as documented in IEC 62052-11, 62053-21 and 62053-23. In addition to that, the following minimum requirements shall be met.

- i) The meter shall be protected against malfunction due to the ingress of vermin, by conformal coating of the printed circuit boards in the meter.
- ii) Any openings shall be as small as practically possible to prevent the ingress of dirt and vermin and to limit the potential for vandalism or tamper following IP 51 and IP 54.

6.2.1.44.3 Standards and codes of practice

All material and equipment supplied and all works carried out shall comply in every respect with the technical codes of the International Organization for Standardization (ISO) and with the recommendations of the International Electrotechnical Commission (IEC), which apply to the electrical equipment.

Goods and special guarantees beyond the scope of ISO and IEC shall conform at least to one of the following standards and codes in the following priority:

1. VDE and DIN standards
2. BS or ASTM
3. Other internationally accepted standards which ensure a quality equal to or higher than the standards mentioned above, but only if these are submitted in the English language edition.

The following documents shall be read in conjunction with this specification. In case of conflict, however, this document shall take precedence. Nothing in this specification shall lessen the contractors obligations detailed in any other documents forming part of the contract.

IEC 514	Acceptance inspection of Class 1 alternating current watt-hour meters.
IEC 735	Testing equipment for electrical energy meters.
IEC 62052-11	Electricity metering equipment (AC)- General requirements, tests and test Conditions- Part 11: Metering equipment
IEC 62055	Part 21: Framework for standardization Part 31: Particular requirements- Static payment meters for active energy
IEC 62053-21, 62053-23	Alternating current static watt-hour meters (classes 1)
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts

IEC 1107	Data exchange for meter reading, tariff and load control and direct local data exchange
IEC 58	Shock and vibration, humidity, solar radiation and salt mist etc
ISO 9001	Code of practice for quality systems part 1: Model for quality assurance in design/development, production, installation and servicing.
IEC 62054	Real Time Clock (RTC)
Others	All other relevant IEC specifications for metering equipment

6.2.1.45 SPECIFIC TECHNICAL REQUIREMENTS

The meters to be supplied against this specification shall meet the requirements specified in this clause.

6.2.1.45.1 Electrical requirements

Meter supplied shall meet the following electrical requirements.

Sl. No	Description	Specification
1	Connection	3-phase, 4-wire, direct connected (Bi-directional)
2	Number of element	3 (Three)
3	Rated voltage	400 V phase to phase
4	Variation in voltage	+30% to -50%;
5	Continuous over voltage	Should withstand 500 volts for 48 hours without causing any damage or degrading of its operating life, or causing changes of more than 0.01 kWh in its credit registers (excluding the possible decrement of credit due to power being consumed).
6	Base current, I_b	≤ 10 A
7	Maximum continuous current, I_{max}	≥ 100 A
8	Starting current	40 mA (0.4% I_b)
9	Rated frequency	50 Hz
10	Variation in frequency	$\pm 4\%$
11	Power factor	0.5 lag – unity – 0.8 lead
12	Class index	1.0
13	Clock	Built-in real time clock with battery backup
14	Display	LCD; Visibility should be sufficient to read the meter mounted at height of 0.5 to 2.0 m. Pin type; trans-reflective HTN or STN type industrial grade; temperature range -20°C to $+70^{\circ}\text{C}$
15	Period of display	Continuous
16	Digits	WxH: 6 mm x 10 mm (minimum)
17	Maximum viewing angle	160 degrees

Sl. No	Description	Specification
18	Number of display digits	6+2
19	Display parameters	<ul style="list-style-type: none"> i) kWh for the current billing period (Forward, Reverse, Net) ii) Total kWh used since installation (Forward, Reverse, Net) iii) Current electricity rate iv) Credit level v) Date and time vi) Instantaneous load vii) Instantaneous phase voltage viii) Instantaneous phase current ix) Instantaneous pf x) Off Peak-Peak-Super Off peak Reading xi) Maximum demand of current month [Forward, Reverse]
20	Power consumption in the voltage circuit	≤ 5 Watts and 10 VA
21	Harmonic energy	Meter shall record total energy including harmonic energy
22	Memory	Non volatile memory that retain information up to 10 years in the absence of power
23	Power limiting	Meter shall disconnect the load when a pre-programmed threshold power is reached. The threshold shall be programmable in steps of 500W or less.
24	Limit of Current	Shall be Programmable within the range of $0.04A \geq 100 A$
25	Tamper detection	Sensor to detect that terminal cover have been opened
26	Load disconnection	Latching relay
27	Audible alarm	Buzzer
28	Lightning Protection	In accordance to IEC 62053-21
29	Sealing Condition	The meter body will be hermetically sealed/ ultrasonically welded to avoid unauthorized opening of meter cover.
30	Communication compatibility (plug and play)	Both GPRS (4G which will also support all other available bands in Bangladesh)/NB-IoT and BROADBAND PLC and RF
31	Communication Protocol	DLMS/COSEM
32	Vending	Vending facility through online, Mobile SMS, Mobile Apps, POS, ATM/Bank booth etc.
33	Register	<p>Solid state LCD Display type register. The display shall be programmable, automatic and include:</p> <ul style="list-style-type: none"> -Tampering indication in the register -Cumulative kWh [Forward, Reverse, Net] with Peak, Off-peak & Super Off-peak

Sl. No	Description	Specification
		<p>-Cumulative total KVarh [Forward (Q1+Q4), Reverse (Q2+Q3), Net] with (Peak, Off-peak & Super Off-peak) for both Lead and Lag</p> <p>-Maximum Demand (KW) [Forward & Reverse] with time & date</p> <p>-Number of MD reset (automatically & manually)</p> <p>-cumulative Maximum Demand (KW)[Forward & Reverse] for billing month</p> <p>-Settlement register as per Net Metering Guideline 2018 (Revised).</p> <p>- Peak – 17:00 to 23:00, Off Peak-23:00 to 17:00, Super Off- peak-05:00 to 09:00 (programmable) Bangladesh Standard Time. The software for Time of Use (TOU) shall be so developed to accommodate future tariff and can be customized, if the purchaser changes the tariff. The software shall be compatible with windows operating system.</p> <p>-Maximum Demand (MD) in KW shall be registered using the technique of cumulating on integration period controlled by built-in process and the MD shall be continuously recorded and the highest shall be indicated. The highest MD shall be added to the cumulative store, which shall be automatically initiated after an interval of one month/ one billing period by means of built-in timing device.</p> <p>-Integration period shall be 30(thirty) minutes.</p>
34	Load Control Switch (Latching Relay)	<p>a. Smart meter shall be equipped with integrated load control switches (latching relay) at all three phases and neutral to control flow of electricity to the load at the instance of connect/ disconnect commands as per functional need of the system.</p> <p>b. All Load switches (latching relay) shall operate simultaneously for connect/disconnect purpose and shall be mounted inside the the meter with suitable arrangement.</p> <p>c. The rating of switches used shall be in line with meter rating.</p>

6.2.1.45.2 Mechanical requirements

The enclosure shall be tamper resistant and shall be suitable for indoor mounting. The meter shall be such that the internal components in the active part of the meter shall be protected against unintentional damage or tamper during handling and installation.

Furthermore, Meter supplied shall meet the following mechanical requirements.

Sl. No.	Description	Specification
1	Meter Case	<p>The meter shall be constructed by employing flame retardant and high impact strength material. The base, body and frame including terminal block shall be of heat resistive; shock proof and rust proof good quality hard material e.g. unbreakable engineering or stamped metal or molded phenol resin which shall be capable of withstanding of 145° C. The base will be provided with 3 (three) screw mounting holes, 1 (one) slotted meter support bracket at the top and 1 (one) round hole on each side in the bottom half of the base for securely mounting the meter to the meter board.</p> <p>The meter cover shall be of molded black phenol resin or alternatively stamped metal or toughened glass or Poly-Carbonate. The meter cover shall be provided with a window of Poly-Carbonate or toughened glass. For display of LCD display.</p>
		The meter shall be effectively sealed to prevent entrance of moisture, rain and dust into its internal parts.
2	Terminal	<p>Side/bottom entry connection type; minimum 8 terminals to accommodate 16 mm² duplex; terminal cover shall be extended type;</p> <p>Terminal block shall be polycarbonate grade 500R or equivalent bakelite; brass or copper current terminals; two flat-head brass screws at each terminal; terminal bore diameter 8.5 mm;</p>
3	Minimum free space between bottom of terminal and terminal cover	60 mm
4	Connections diagrams, short codes and terminal marking	Every meter shall be indelibly marked with a diagram of connection, and short codes. Meter terminals shall be marked, this marking shall appear on the diagram. The short codes shall be assigned during final design-drawing approval by WZPDCL.
5	Insulation level	Shall withstand a power frequency test of 4kV and impulse withstand test of 6 kV
6	Protection against penetration of dust and water	Conform to the degree of protection of IP51 or better
7	Top cover sealing	Hermitically sealed or ultrasonic welded
8	Pulse output	Flashing LED visible from the front.
9	Maximum pulse frequency	Shall not exceed 2.5 kHz
10	Protection against magnetic field	Accuracy shall not be affected by AC/DC magnetic field on all the sides of meter. Meter working shall not be affected by permanent magnet of 0.5mT.
11	Temperature range	<p>Limit range of operation: -25°C to 55°C</p> <p>Limit range of storage and transport: -25°C to 70°C</p>

Sl. No.	Description	Specification
12	Name plate	Every meter shall have clearly visible, indelibly and distinctly marked name plate containing the following information: i) Manufacturer's name ii) Meter type iii) Number of phases and number of wire iv) Meter serial number and year of manufacture v) Rated voltage of the system vi) Basic current and maximum current vii) Reference frequency in hertz viii) Meter constant in imp/kWh ix) Class index of the meter x) Over-current breaking capacity (in kA) xi) UTILITY logo
13	Optical Port	Meter should have standard optical port for local read and configuration. Meter should have active RS485 port for remote communication.

6.2.1.45.3 Latching relay specifications

The specification for the three-phase latching relay is as follows:

Sl. No	Description	Requirements
1	Manufacturers Name & Address	Gruner, Germany/ Schneider Electric, USA/ Johnson Electric, Germany/ KG, USA
2	No. of coils	2 (two)
3	Rated coil voltage	12 VDC
4	Rated coil power	9 W
5	Pulse to set	30 ms
6	Contact Material	Silver alloy
7	Maximum Switching Power	25,000 VA
8	Maximum Switching Voltage	250 V AC
9	Maximum Switching Current (rms)	120A
10	Contact resistance	$\leq 2 \text{ m}\Omega$
11	Electrical Cycle	5×10^3
12	Mechanical Cycle	1×10^5
13	Insulation resistance	$\geq 1,000 \text{ M}\Omega$
14	Dielectric Strength between open contacts	$\geq 2,000 \text{ VAC}$
15	Dielectric Strength between contact and coil (50 Hz)	$\geq 3,000 \text{ VAC}$
16	Dielectric Strength between contacts assembly	$\geq 4,000 \text{ VAC}$
17	Ambient temperature	$-40 \text{ }^\circ\text{C} \sim +55 \text{ }^\circ\text{C}$
18	Operating humidity	40 to 95%
19	Temperature rise at rated current (assuming 30°C room temp.)	60°C

6.2.1.45.3 Meter sealing

- a) Provision shall be for sealing the meter at least two Ferrule steel seals
- b) The stainless steel seals shall be applied in such a way that it will not be possible to undo/loosen the mounting screws used to secure the meter without breaking these seals.
- c) The stainless steel seals shall be applied in such a way that they will be easily visible when viewing an installed meter from the front.
- d) The terminals shall also be have Ferrule/TT sealing arrangement.

6.2.1.45.4 Tamper detection

A tamper sensor shall be provided to detect that terminal cover has been opened both in power supply and without power supply.

6.2.1.45.5 Optical Interface

The meter shall have an IEC 62056-21 compliant optical communication port. This should allow the utility to access via front for variety of customer information stored inside the meter and to upload it into a hand held unit (HHU).

6.2.1.45.6 Electromagnetic compatibility

(a) Immunity to electromagnetic disturbance

The meter shall be designed in such a way that conducted or radiated electromagnetic disturbances as well as electrostatic discharge do not damage or substantially influence the meter. The disturbances to be considered are:

- i. Electrostatic discharges
- ii. Electromagnetic HF field
- iii. Fast transient burst

(b) Radio interference suppression

The meters shall not generate conducted or radiated noise which could interfere with other equipment.

6.2.1.45.7 Accuracy requirements

(a) Limits of error due to variation of the current

The percentage errors shall not exceed the limits for the relevant accuracy class stipulated in IEC standard.

(b) Limits of error due to other influence quantities

The additional percentage error due to the change of influence quantities shall not exceed the limit for the reference accuracy class stipulated in IEC standard.

(c) Limits of error due to ambient temperature variation

The limits of error shall not exceed the limits stipulated in IEC standard.

(d) Starting and running with no-load

Initial start-up of the meter: The meter shall be fully functional within 5 seconds after the voltage is applied to the meter terminals.

Running with no load: When the voltage is applied with no current flowing in the current circuit the test output of the meter shall not produce more than one pulse.

Starting: The meter shall start and continue to register at 0.4% I_b at power factor of 1.

(e) Meter constant

The relation between the test output and the indication in the display shall comply with the marking on the name-plate.

6.2.1.45.8 Remote Communication

The meter shall have remote communication option (equipped with GPRS/EDGE/EVDO/HSPA modem) which will be able to interface with RS485 for data communication with the central server from meters. and,

The meter shall have communication function with BROADBAND PLC/ RF through DC which will be able to communicate with the central server using GPRS(4G which will also support all other available bands in Bangladesh)modem.

The meter shall have RS485 communication port.

The meter shall have both GPRS(4G which will also support all other available bands in Bangladesh)/ NB-IoTand BROADBAND PLC and RF communication compatibility (Plug and Play).

The PC Software must have provision to communicate with the Meter (both single Phase and three phase) through online.

6.2.1.46 FUNCTIONAL REQUIREMENT

6.2.1.46.1 Security

All credit and meter management tokens shall be meter specifically encrypted to guarantee security of the system. Encrypted tokens shall not be reusable. Tokens to display status and test the meter may be un-encrypted and reusable.

6.2.1.46.2 Token validation

If a token not meant for the meter is applied the meter should display a message to that effect. Similarly, if a valid token is re-entered into the meter then the meter must display an appropriate message.

6.2.1.46.3 Meter personalization

In addition to factory personalization and personalization via encrypted tokens, it shall be possible to personalize the meter from a hand held unit (HHU) provided the HHU is authorized/programmed to communicate with the meter.

6.2.1.46.4 Meter modes

The meter shall be required to support at least two modes of operation, namely the prepayment mode and the meter test mode.

6.2.1.46.5 Prepayment mode

The basis of this mode is that credit is transferred to the meter, and provided the meter remains in credit, the meter provides supply. The credit register is decremented against current consumption with the countdown total being displayed on the meter display.

6.2.1.46.6 Meter test mode

The meter should support a test mode that is activated either from a dedicated test token, or using the HHU. This test should be automated in the meter and should include a full diagnostic test, testing of the all the active and inactive functionality, metering accuracy test (1 minute load test), and connection validation tests. Meter test mode shall also display following information:

- i) Meters software version
- ii) Current limit

- iii) Switch open and close count
- iv) Token acceptance & rejection count

6.2.1.46.7 Load disconnection

- a) The load shall be disconnected by a latching relay under the following conditions:
 - i) The credit in the meter has expired and grace period also expired.
 - ii) The load power threshold has been exceeded.
 - iii) The meter is in a tampered state.
 - iv) Neutral missing at source side.
- b) The meter shall indicate whether the load is connected or not and shall display the reason for disconnection.
- c) The customer shall not have the option to switch the contactor manually. Under over – current conditions the mechanism to automatically reconnect the load must ensure that the number of switching cycles is limited. The meter shall attempt to reconnect the load up to 5 times at 30-second intervals. If the over-current condition still exists the meter shall wait a period of 30 minutes before attempting to reconnect the load.

6.2.1.46.8 Load control

Meters shall have the options to control loads with the following features:

Sl. No.	Requirement	Description
1	Allowed loads for given time periods	There shall be provision in the meter to define the allowable loads for given time periods within a day
2	Activation date of load allocation	There shall be provision in the meter to accommodate the date of activation of the defined load allocation
3	Load Limit step	Load limit shall be defined in step of 500 W.

6.2.1.46.9 Tamper detection

Tamper shall be detected with and without power supply.

When the meter detects a tamper condition, it should enter a shutdown state, with an appropriate message. The customer should be disconnected immediately. The tamper status shall be reset by using a uniquely coded tamper reset token that may only be used once.

Meter should detect reverse flow of power and measure correctly by forward registration.

Meter should measure current in phase and neutral both so that current bypass tamper taken care off.

Meter should provide tamper log data with date and time and same should be sent to main system through two way token or through meter reading port.

Removal of battery shall be considered as a temper.

The meter shall operate normally under the following conditions:

Phase Sequence Reversal: The meter should work accurately irrespective of phase sequence of the supply.

Shorting / By Passing: The meter shall have capability to record bypassing / shorting and opening of current coil(s) of one or any two phases with date, time.

Missing Potential: The meter shall be capable of detecting and recording occurrences and restorations of missing potential (1 phase or 2 phases) which can happen due to intentional/ accidental disconnection of potential leads with date and time along with total no. of such occurrences for all phases during the above period.

6.2.1.46.10 Energy Accounting

6.2.1.46.11 Credit register

i) The credit register is the “operating account” of the meter being decremented by the metering process. The specific requirements of this register are:

- a) This register must be decremented for the equivalent of every credit unit consumed.
- b) When the available credit has been consumed, the meter must open the contactor and isolate supply from the customer (unless the Friendly hours or Emergency Credit option is invoked).
- c) This register can become negative from use of emergency credit.
- d) The balance of this register should be written to the token.

ii) Before accumulating the new recharge credit or tariff conversion information, the meter shall perform a Freeze Operation on the current remaining energy credit and store it to a separate register to ensure the accuracy and consistency of the data. After the credit freeze & storing is completed, the meter shall update the remaining energy credit or tariff settings according to the Token information.

6.2.1.46.12 Friendly hours, weekend, holidays

The meter shall accommodate the “Friendly hours”, “Weekend” and “Holidays” features. These are time periods during which the meter shall not cut-off power to consumer if the credit becomes negative. Details of the features are described in the following table.

Sl.No.	Requirement	Description
1	Friendly hours	There shall be provision to define ‘Friendly hours’ in the meter. The utility shall be able to define the ‘Friendly hours’ and shall be communicated to the meter through token.
2	Weekend	There shall be provision to define ‘Weekend’ in the meter. The utility shall be able to define the weekend and shall be communicated to the meter through token.
3	Holidays	There shall be provision to define ‘Holidays’ in the meter. At the end of a year the utility shall be able to define new holiday dates and these shall be communicated to meter through token.

6.2.1.46.13 Emergency credit

Provision shall be made in the meter for an Emergency Credit facility that allows the customer to draw on an emergency credit should the credit in the register be consumed.

The specific requirements of this facility are:

- a) When the credit register value reaches a programmable Emergency Credit Threshold the meter should sound an audible alarm, and prompt the user to accept the use of the Emergency Credit

facility (card insertion or button depression). The meter should not supply energy against emergency credit unless acknowledged by the customer.

- b) If all the available credit in the credit register is expired and power disconnected, the facility to activate the Emergency Credit should remain an option to the user.
- c) The meter should remain in service until the Emergency Credit Limit has been reached, after which the supply should be disconnected.
- d) If the Emergency credit limit is set to zero, the Emergency Credit Threshold shall function as a low credit warning and provide the user with a visual and audible alarm that credit is low. The user shall have the option to silence the alarm by inserting a card or pressing a button to accept the alarm.
- e) If emergency credit has been previously consumed, then the value of emergency credit used shall be deducted from the next token inserted into the meter.
- f) Once emergency credit has been exhausted, no further credit facilities shall be available until the full emergency credit allocation has been paid for.

6.2.1.46.14 Consumption during current billing period

- a) This register records the cumulative energy consumption for the current billing period.
- b) The registers shall be updated at least every 10 Wh.
- c) The value of this register shall be written to the token (if applicable).

6.2.1.46.15 Historic consumption

For this option there are six energy registers that store the total energy consumed for the previous six months.

- a) These registers are cycled at during the month-end process, with the oldest data being deleted.
- b) The value of these registers written to the token (if applicable).

6.2.1.46.16 Cumulative energy consumption

- a) This register records the cumulative consumption since the meter was commissioned.
- b) The units of storage are kWh, rounded to two decimal points (10 Wh).
- c) The value of this register shall be written to the token (if applicable).

6.2.1.47 Tariff

All tariff calculation must be done within the meter.

The meter is required to support stepped tariffs structures as well as time-of-use and maximum demand.

The tariff structure consists of the following records:

- i) Each tariff must be uniquely identified using the tariff code
- ii) Each tariff shall have an activation date, being the date on which the tariff becomes effective.
- iii) Each tariff has up to seven steps (in kWh) for different levels of energy pricing.
- iv) The rate describes the cost per kWh for energy consumption in that step.

6.2.1.47.1 Tariff management in the meter

- a) Tariffs shall be entered into the meter via the two-way token or HHU. The meter should not allow tariffs to be manually entered using the push buttons.
 - When the meter is active, the current cannot be overwritten.
 - The meter must time and date stamp when the tariff is loaded into meter.
- b) In general, when a tariff has expired in the meter, the tariff is automatically deleted by the meter.

6.2.1.47.2 Tariff security and verification

The meter shall write the active tariff code to the token on each insertion.

6.2.1.47.3 Tariff switchover

When the meter detects that a new tariff is applicable (using the tariff activation date), the meter should execute the following steps:

- i) The meter shall begin the billing against the new tariff.
- ii) The current tariff code shall be updated to reflect the new tariff code.
- iii) The old (expired) tariff should be deleted.
- iv) New tariffs will only be activated at 00:00 on the first day of a month.

6.2.1.47.4 Billing

Billing operates on a monthly basis. Energy consumption charge is deducted within the meter for at least every 10 Wh. All other charges including service charge, minimum charge, vat and taxes are deducted at the POS.

6.2.1.47.5 Month-end calculation

At the end of each month, the meter should perform a month-end calculation that consists of the following minimum steps:

- a) The cumulative monthly energy registers must be reset, and the historic registers must be updated.
- b) The meter must determine whether a new tariff will become active, and if so, must delete the old tariff.

6.2.1.47.6 Date and time management

The meter shall be equipped with a real time clock supporting the date and time as per IEC Standard. Pseudo-clock using mains crossing detection is not acceptable. The maximum drift of the clock shall be less than 30 seconds per month. The battery and/or auxiliary power source shall operate maintenance free for a period of at least 10 years and meter shall have battery replacement facility.

The meter must be equipped with a battery monitoring system that monitors the battery's condition and initiates a "Change Battery Alarm" to the point of sale when the battery approaches the end of its operating life. If the battery is not replaced, the failure of the battery is deemed to constitute a meter failure, and the meter should be shut down.

Date and time may be changed using special token carrier. Date and time changes shall be flagged, written to the token carrier and transferred to the POS at the next purchase.

6.2.1.48 Human machine interface displays

6.2.1.48.1 General requirements

- a) The design philosophy of the meter display subsystem should be that a suitable message or indication must be displayed or annunciated for every meter event and alarm without exception.
- b) The meter should make provision for the customer or utility personnel to scroll through the displays.
- c) The meter should have a default display that displays the following minimum information:
 - i) The Remaining Credit
 - ii) The Total Consumption, kWh to date
 - iii) The power limit
 - iv) The current Tariff

6.2.1.48.2 Liquid crystal display

- a) A liquid crystal display is required to display status alarm and event information.
- b) An illuminated display with a minimum lifetime of ten years is required.
- c) The size (number of rows and characters per row) should be appropriate for the display and interpretation of the messages and meter information, and should be legible from a distance of at least 500 cm with a viewing angle of no less than 30°.

6.2.1.48.3 Fault and status display

The meter should provide a visible indication of the status of the incoming supply. Meter should integrate the incoming neutral and phase wire swapping detection function to automatically detect and confirm the wiring status of the Neutral and Phase. The meter should process in real time to ensure continuous monitoring of the correct wiring status of the neutral and phase wires. The meter should provide a clear fault indication through the user interface, such as a flashing indicator light or an error code on the display screen, to notify the user of the wiring problem. If required meter shall open the relay in case of phase and neutral swapping and this function should be programmable.

6.2.1.48.4 Rate LED

The meter should include a consumption rate indicator LED that emits visible red light.

6.2.1.48.5 Status/alarm/event displays

In addition to the displays required above the meter must display the following minimum information in an intuitive way such that an inexperienced user can understand and interpret the information intelligibly. Laminated instruction cards are to be provided for each unit.

- i) Meter ID.
- ii) Out of Credit message
- iii) Invalid token entered
- iv) Duplicate token entered
- v) Meter tamper state
- vi) Meter failure and/or fault code

The tenderer must submit a detailed specification of the way in which the display are structured and laid out.

6.2.1.48.6 Meter identification cards

- a) In case of keypad meters, each meter shall be supplied with a meter identification card, which complies with NRS 009-4: 1995.
- b) The printed details and graphic design of the cards shall be submitted to the utility prior to producing the cards.

6.2.1.48.7 Testing and approval

- a) It will be the responsibility of the tenderer to submit to the Employers representative for approval a complete Acceptance Test Procedure (ATP) for system verification.
- b) Once the Employer's representatives approve the ATP, the testing and performance validation tests on 2% (random samples) of the supplied meters will commence. The Employer's representative at the utility's premises will witness these tests.

6.2.1.48.8 Quality assurance

Tenderers shall comply with and be certified to the following ISO levels:

ISO 9001 Quality systems

Model for quality assurance in design development production installation and servicing

Model for quality assurance in final inspection and test

Tenderers shall submit copies of certification with their proposal to this effect.

6.2.1.49 SOFTWARE REQUIREMENT

Data Exchange Format

The meter must be able to communicate directly with the Master Information Center server using the built in GPRS/EDGE modem. The communication data format is XML. Furthermore the communication channel must be encrypted by 256bit SHA and seeded by a true random number generator. Each meter should also have a unique key installed. Utility must be able to program the following data into the meter before they are used:

Meter ID

Data Communication Port (default 2100, custom port)

Server IP Address

Server Port

Encryption Key (if necessary the more data could have been needed)

The meter will get a fixed IP address from the installed SIM card. The meter will always listen to the "Data Communication Port" for incoming data and will always send data to "Server IP Address: Server Port". For incoming request, the reply data will go through the same connection similar to HTTP.

Example: if the server needs to communicate with the meter, it will originate a connection request to the IP address of the meter in port 2100 (default). It will be a simple text connection similar to telnet. If connection is established, the server will send the encoded XML request through this channel, after which the server will send two carriage returns. The meter will process the request, generate appropriate XML response and return it to the server by using this existing connection.

1. Incoming request from server to IP address and port 2100 of meter.
2. Server posts encoded XML data.

3. Server sends two carriage returns to denote that it has sent the entire request.
4. The meter decodes the data, processes the request and generates appropriate response and sends it back to server.
5. Bidirectional data transfer will use the same connection like HTTP.

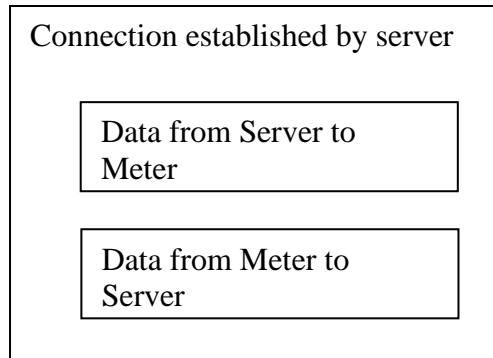


Fig: Data Exchange/Connection format for 3 Phase Meter

Meter Connection Procedure

Configure the meter with server IP, port and any authentication key required. Bring the meter online and send a query_test command from the server. The meter should respond with firmware version which will verify connectivity. (The send the “conf” command to meter from server.)

Meter Numbering

It must be possible to program the meter with an 11 digit meter number. The first two digits will be utility ID. The second digit will correspond to meter_type. 1=Smart Card based, 2=Keypad type, 3=online. The next 8 digits will be a sequence number used to identify each meter and will consist of numbers (0-9).

The source code of the software should be delivered to the employer. The proper documentation of the software should be proper and delivered to the employer before 15 (fifteen)days of the commercial operation of the the system.

The rights & the copy rights of the system and the pattern of the system will be the sole owner of the people’s republic of Bangladesh.

Tariff Management

Tariff Definition

The System Manager shall be able to define tariff objects. Each tariff has a unique tariff ID associated with it. The following information is required to define a tariff.

Tariff ID	A unique tariff identifier	
Effective Date	The date on which the tariff will be effective.	
Step Structure	Step	Rate
	0 - kWh ₁	R ₁
	kWh ₁ - kWh ₂	R ₂
	kWh ₂ - kWh ₃	R ₃
	kWh ₃ - kWh ₄	R ₄
	kWh ₄ - kWh ₅	R ₅
	kWh ₅ - kWh ₆	R ₆
	kWh ₆ -	R ₇

Subject	Tariff Category	PFC Calculation
Power Factor Correction (PFC) Charges	`A' , `B', `C1', `C2', `D1', `D2', `D3', `E', & `T' Category, 3 phase, 400V, 20KW & above	For PF<0.95, PFC= 0.75%*Energy Charge*(0.95-PF); Maximum PFC= = 0.75%*Energy Charge*(0.95-0.75); Where, PF= Power Factor Obtained from meter.

Subject	Tariff Category	Time
Time of Use	`C1' & `E' Category,	Peak – 17:00 to 23:00 Off Peak-23:00 to 17:00
	`D3' Category	Peak – 17:00 to 23:00 Off Peak-23:00 to 05:00 and 09:00 to 17:00 Super Offpeak-05:00 to 09:00

Service Charges	Fixed charges are levied per month. These charges are different for single phase and three phase meters in a particular tariff category.
Minimum Charges	There will be no minimum charges for Pre-Paid System.
Sanctioned Demand Charges (Fixed Charge)	A fixed charge per kW of the sanctioned demand is levied per month.
Maximum Demand Charges	Integrated over ½ hourly periods Maximum Demand in KW.
VAT	Value added tax is levied on electricity charges and must be catered for in the system.
Rebate	Consumers shall avail rebate which will be 0.5% of Net Bill exclusive of VAT.

- a) The tariff code, effective date, kWh_x (in units of kWh), R_x together with a fixed monthly service charge Service Charges and a fixed monthly sanctioned demand shall be used to define all prepaid tariffs used in the system.
- b) The MIC shall make provision for up to 500 tariff definitions.
- c) The MIC must verify the tariff data entered and shall not allow discontinuities in the energy levels or negative rates for energy and fixed charges.
- d) There shall be a facility to copy tariffs to new tariff codes for editing purposes. The edit facility shall include a mechanism to increase the values of any of the variables R_x, SC and DC by a fixed percentage.
- e) Tables of Supply Group Codes and tariffs shall be securely stored at the MIC.
- f) No penalty Charges for Power Factor equal to or above 0.95 to 1.0. Power Factor Correction Charge is computed as above and average power factor is measured by meter based on only reactive energy. The monthly average power factor from meter is used for the factor and applied on the energy charge.

Please refer to WZPDCL's tariff document for details of the tariffs provided by Bangladesh Govt (SRO no. 43 Law/2024, Dated: 29 February, 2024).

Meter must have the provision to store the PFC charge data and display the PFC charge data.
Meter must have the provision to update the PFC charge calculation procedure through online.

Tariff Algorithm

The prepayment system could be implemented stepped tariffs. The tariffs will be implemented at the vending equipment/meter. The algorithm must ensure that:

- a) The Stepped tariff is implemented in meter as accurately as is the case for conventionally billed customers.
- b) Customers are not restricted to the amount and frequency of electricity token purchases provided purchases do not exceed 12 times the calculated monthly average consumption without penalty.
- c) If any tariff changes, tariff update with effective date sent to meters through smart card at the time of purchase for smart card meters. The updated tariff will be sent using special numbers for keypad meters. For both meters, after utility decides the tariff update, all purchase of credit (with keypad number of smart card) will carry and tariff change flag. So that the meter will not accept any credit addition until it gets the tariff update.
- d) Customers will purchase only credit following credit transfer principles.
- e) Before any new purchase in a particular month the fixed charges are deducted for the first time and the rest of the money paid by customer will be sent to meter through card or number as credit.
- f) For consecutive purchase in the same month, credit values without any fixed charge will be sent to the meter.
- g) Slab reset service charges; power factor penalty (PFC) should be monthly basis.
- h) The meter should have functionality to re - calculate the consumed amount; that is if any tariff changes or updated, even if the user does not switch to the new tariff immediately, the utility can deduct this part of the undercharged electricity bill through the meter to avoid loss of revenue.
- i) The tender shall provide a detailed description of the algorithm including:
 1. All assumptions made.
 2. An explanation of how the averaging algorithm operates.
 3. Examples of how the algorithm works.
 4. Examples of how to explain the algorithm to customers.
 5. Examples of how to deal with customers queries.
 6. Description of how the algorithm manages tariff rate and tariff structure change.
 7. Description of mechanisms to apply corrections
 8. Description of how to deal with the situation where a customer buys at two different locations between data transfers.
 9. Online data transfer is required so that customers can by token from any vending system and different locations.

6.2.1.50 Technical Orientation and Quality Test Witness:

The Purchaser shall have the right to inspect/test the goods/materials to confirm their conformity to the specification. The purchaser shall be entitled at all reasonable time during manufacture to inspect, examine and test of goods/materials at the manufacturers' premises, workmanship and performance.

The following test shall be carried out as per latest version of SANS/IEC standard unless otherwise mentioned at the manufacturer premises or other places where the test facilities are available.

The Supplier shall, after consulting the purchaser, give the Purchaser reasonable notice in writing of the date and the place at which any material or equipment will be ready for testing as provided in the contract and unless the purchaser shall attend at the place so named on date, which the supplier has stated in his notice, the supplier may proceed with the tests, which shall be deemed to have been made in the purchaser's presence, and shall forth with forward to the purchaser duly certified copies of test readings.

When the purchaser intends to attend the test he shall promptly inform the supplier accordingly in writing, so that he can take action. The purchaser shall give the supplier timely notice in writing of his intention to attend the test.

Where the supplier provides for tests on the premises of the supplier or of any manufacturer of the supplier, except where otherwise specified, shall provide free of charge such assistance, labor, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such test efficiently. These tests shall be performed as per relevant SANS/IEC standard and only routine tests as agreed upon, will be performed.

As and when the purchaser is satisfied that any materials/equipment shall have passes the tests referred to in this clause, purchaser shall notify the contractor in writing to that effect.

Should any inspected/tested goods fail to conform to the specification, the Purchaser shall have the right to reject any of the items or complete batch if necessary. In that case Supplier has to replace the Equipment and to make good of them without any financial involvement to the Purchaser. In case any of the Equipment found not conforming with the specification at the time of post landing Inspection, the supplier will in no way be relieved from the responsibility of replacing them or making them good at their own cost, despite the Equipment were found good at the time of Factory Acceptance Test. Nothing in this clause shall in any way release the supplier from any warranty or other obligations under the contract.

If the offered goods are manufactured outside the purchaser's country then Utility's Inspection Team shall have to conduct Technical Orientation and Quality Test Witness at the manufacturer's factory premises. The Purchaser's nominated "Engineering Team" consisting of at least 05 (Five) Engineers in each team shall take part in the witness of the QAT of the goods/ Technical Orientation on the manufacturer's premises for a period of 10 days (excluding journey time). All the cost regarding QAT witness by the Purchaser's 'Engineering Team' i.e. the cost of Air Ticket from Dhaka to the place of inspection/training & return, internal transportation, Phone, Fax, E-mail, Health insurance, Hotel accommodation, Food etc. and pocket money of 150 USD per day per person for the period of 10 days (excluding journey time) shall be borne by the Supplier and the cost shall be included with the equipment's quoted price.

No goods shall be packed, prepared for shipment / delivery unless it has been approved including Test reports and written instruction has been issued by the Purchaser.

The tenderer has to mention the place of Technical Orientation and Quality Test Witness in the following table:-

Sl. No.	Item	Period of Technical Orientation and Quality Test Witness	Place & Country of Technical Orientation and Quality Test Witness

During Technical Orientation & Quality Test Witness, the inspection team will select 03 (Three) Single phase meters, 01 (One) Three phase meter and 02 (Two) Data concentrator units at random basis for testing the selected meters in an independent testing lab for the following tests: i) Dry heat test; ii) Damp heat cycle test; iii) Electromagnetic compatibility (EMC) tests as per relevant IEC standards. The tenderer will arrange these tests in an internationally accredited Testing Laboratory during Quality Test Witness.

6.2.1.51 Post Landing Inspection:

The Supplier shall inform the purchaser immediately after arrival of the goods at the designated store of Utility (as per delivery schedule). An Inspection team of Utility shall perform the post-landing inspection in presence of supplier's representative. The Supplier shall arrange the program of post-landing inspection. Any defect or damage have been found at post-landing inspection, the defective or damaged materials/ goods to be replaced by the supplier at his own cost within the stipulated time.

The purchaser's right to inspect, test (where necessary) and reject the goods after delivery at the designated store of Utility shall in no way be limited or waived by reason of the goods having previously been inspected, tested and passed by the purchaser prior to the good's delivery. The cost incurred for this purpose shall be borne by the supplier.

6.2.1.52 Packing:

Meters must be export packed and properly protected for shipment, rough transportation and storage. Specific care shall be taken for protection in store and reference is made to the climatic condition prevailing in Bangladesh.

Each unit shall be sealed in waterproof polyethylene bag having a silica gel packet placed inside the unit and then packed in polystyrene foam gasket closed by self adhesive tape rating of the meter shall be marked by marker pen or label on the form for easy identification.

Maximum 10 (ten) nos. of complete metering units are allowed to pack into a wooden packaging box lined with heavy gauge polyethylene. Between metering units a suitable packing material for protection and preventing their movement should be used. Silica gel should be provided inside each polyethylene

wrapper. The packing case should be able to withstand accidental direct exposure to weather for reasonable period.

The supplier shall be responsible for damages due to inadequate packing. A packing list showing the contents of each packing shall be enclosed in a waterproof envelope secured outside of the packing case. A copy of the packing list shall also be enclosed inside the package.

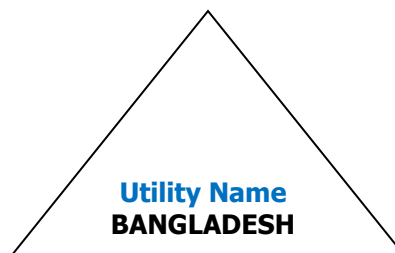
All packages imported are liable to be opened for customs examination at the port of landing and packing shall therefore be designed to facilitate opening and repackaging thereafter.

A red band (20 cm wide) shall be painted all around each package. Each package shall have the following information printed on it bold letters.

- Name of supplier.
- Port of loading.
- Port of destination.
- Name of consignee.
- Contract number.
- Brief description of stores.
- Number of packages. (total quantity)
- Gross and net weight.
- Dimension.

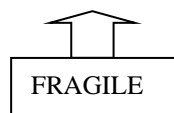
In addition each package shall be clearly marked or stenciled in red on two sides, the shipping mark Utility Name, BANGLADESH inscribed within a triangle marked shown below:

The shipping mark



On the other two sides, arrow marking with words "THIS SIDE UP" and "FRAGILE" shall be clearly marked or stenciled to indicate the face of the package to keep upward.

THIS SIDE UP



6.2.1.53 Hand Over of Project Site

The tenderer will supply, install, intergrate and interface eith WZPDCL's existing HES/MDM and existing BPLC DCUs, test, commission, the prepayment meter, train all utilities personals on installation testing, commissioning, operating troubleshooting, maintain and managing the prepayment meter and handover the feeder to respective utility. To hand over the project the tenderer must submit the following:

1. Summary Sheet of Old meter reading (with image) and New meter Reading according to customer proforma (which include customer's name, address, account no., Old meter no. Old meter reading, New meter no., etc.).

2. Customer summary data shall be submitted in a well organized format (provided by Utility) using a software.
3. Tenderer shall submit all the source code at the start of the project work and the last updated source code of the whole system at the time of project handover.
4. Tenderer shall provide the PC software for meter and DCU with minimum 12 nos. User ID and Password.

6.2.1.54 Responsibility under operational support

<p>RESPNSIBILITY UNDER OPERATIONAL SUPPORT</p> <p>In addition to the requirements of the technical specifications, the following shall be the responsibilities of the Operational Support for the duration of the 3 (three) years Operational Support.</p>
<p>Source Code</p> <p>The Source codes of the system shall be the property of the employer.</p>
<p>Software Use</p> <p>The tenderer shall comply with the requirements for interfacing of offered meter with the employers' softwares.</p>
<p>System Management</p> <p>The registration of customer details on the MIC & CDC management of any changes to customer details, the Operational Support shall perform editing of customer records and management of customer arrears. The Operational Support shall effect up to 5 tariff changes as required by Utility during the contract period. Data shall be uploaded/downloaded to the MIC/CDC from the UVS, POS, Meter & UCCs from the respectives to the MIC & CDCS every 24 x7 round the clock. The Operational Support shall provide customer reports detailing the number of prepayment customers at the start of each month to Utility. The Operational Support shall visit each consumer to perform a system audit at least once every 6 months.</p> <p>The Operational Support shall process all applications for new pre-paid customers within the Operational Support's operational area directly. New installations shall be completed by the operator and notified to Utility.</p>
<p>Technical Manual</p> <p>Tenderer should provide technical manual and operational manual of the system within 15 (fifteen) days from before commercial operation start.</p>
<ul style="list-style-type: none"> • The maintenance services shall be valid for 03 (three) years from the date of commissioning under warranty period.
<ul style="list-style-type: none"> • To keep the supplied Software in good working condition under warranty period.
<ul style="list-style-type: none"> • Maintenance service includes preventive maintenance services on Monthly basis, based on the specific needs of individual equipment or as determined by Tenderer/Employer and on-call remedial maintenance under warranty period. Maintenance work should be at utility offices. In case it is not possible the maintenance work at utility premises, then tenderer will provide the maintenance work by their own arrangement.

<ul style="list-style-type: none"> • Maintenance Services includes the replacement of non-working parts of hardware without incurring any cost to the employer under warranty period.
<ul style="list-style-type: none"> • To provide all necessary labor and technical know-how, and replacement of mechanical, electrical or electronic parts, as required for the maintenance work of equipment under warranty period.
<ul style="list-style-type: none"> • To maintain necessary stock of spare parts which may have the chances of damage for immediate support/ replacement under warranty period.
<ul style="list-style-type: none"> • The maintenance, servicing & replacement works as necessary must start within 02 (Two) hours sharp after lodging complaints under warranty period.
<ul style="list-style-type: none"> • The tenderer shall has to report time to time like 2 times in a month and shall has to report the progress.
<ul style="list-style-type: none"> • Defect or any sort of damage in hardware shall have to be identified, repaired/replaced and put into normal working condition within 08 (eight) hours after lodging complaint with the tenderer. The Tenderer will be responsible for repair, correction, and replacement of the defective goods or parts without incurring any cost to the employer under warranty period.
<ul style="list-style-type: none"> • Utility shall impose penalty @Taka 500 per hour of delay after 16 hours of lodging complaint with the tenderer under warranty period.
<ul style="list-style-type: none"> • Pre-Paid Meter Maintenance: Faulty devices and peripherals shall be repaired on exchange basis whether warranty or otherwise at the cost of the operational support. All sorts of repairing and maintenance tasks for software, hardware, meter and network has to be performed by the contractor.
<ul style="list-style-type: none"> • On a monthly basis meter data collection, auditing and related all sorts of reports shall be prepared by the operational support contractor and copied to respective utility.
<ul style="list-style-type: none"> • If it is not possible to resolve the problem within 16 (sixteen) hours, the tenderer may provide required support/equipments/item/parts on temporary basis without incurring any cost to the employer so that Server, Computer, Line Matrix Printer & UPS shall work properly. But this type of arrangement must not exceed more than two weeks. In that case, penalty will not be imposed for this maximum two weeks under warranty period.
<ul style="list-style-type: none"> • For any further up gradation, if utility procures any part/ product /devices, then the tenderer should install, commission the parts/ products /devices without incurring any service charge to the employer under warranty period.

- For 3 years operation & maintenance support the tenderer shall employ the following personnel:
 - a) Coordinator (min. Bachelor Degree with 15 years Working experience)- 1 no.
 - b) System Administrator- 1 no.
 - c) Network Engineer - 1 no.
 - d) Hardware Engineer - 1 no.
 - e) Programmer - 1 no.
 - f) Database Administrator - 1 no.
 - g) Electrical Supervisor-11 nos. having experience in meter installation
 - h) UCC/ UVS operator- 11 nos. having experience in vending and UCC work. They will provide full time support to utility vending operator/ utility people for vending/ UCC related work.

[N.B. Smart card mentioned in any section of the tender document will be considered as null and void.]

6.2.2 Guaranteed Technical Particulars (GTP)

6.2.2.1 Specifications of 230 VOLT 5(60)A Single Phase Online SMART PREPAYMENT ELECTRIC ENERGY METER

(To be filled up and signed by the Tenderer & Manufacturer, otherwise the offer will not be acceptable)

Sl. No.	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
1.	Reference Standard	-	IEC	
2.	Country of Origin		To be mentioned	
3.	Manufacturer's Name & address		To be mentioned	
4.	Place of Manufacturer		To be mentioned	
5.	Starting Year of Manufacture & Testing		To be mentioned	
6.	Model of Meter	-	To be mentioned	
7.	Generation of the offered Meter		To be mentioned	
8.	Type	-	Indoor	
9.	Installation		At easy approachable place in the consumer's premises.	
10.	Connection	-	1- phase, 2-wire (unidirectional)	
11.	Rated voltage	Volt	230	
12.	Maximum voltage	Volt	280	
13.	Basic Current	Amp	<=5	
14.	Maximum Current	Amp	>=60	
15.	Frequency	Hz	50	
16.	Number of Terminal	No.	4	
17.	Diameter of Terminal; Bore	mm	6mm to accommodate 10 mm ² cable	
18.	No. of Element (minimum)	No.	2 (One in Phase & other in Neutral)	
19.	Voltage circuit loss at rated voltage	VA & W	5VA, 2 Watt	
20.	Current circuit loss at rated current	VA	2.5	
21.	Variation of Power factor		0.5 lag to 0.8 lead	
22.	Variation of voltage		+30% to -50%	
23.	Performance Curve		To be submitted	
24.	Impulse withstand voltage	KV	6	
25.	Starting current (minimum)	mA	0.4% of basic current	
26.	KWh register type	-	LCD Display	
27.	Meter constant	Impulse/ kWhr	To be mentioned	
28.	Accuracy class	Class	1.0	
29.	Type of Battery		Lithium Battery	
30.	Country of Origin of the Battery		USA/EU/UK/JAPAN	

Sl. No.	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
31.	Built in clock		Real Time Clock (RTC) as per IEC 62054-21 or updated version. RTC must have separate battery (Country of origin: USA/EU/UK/JAPAN) back-up or Super Capacitor (with at least 06 hrs back up). If the main battery is removed, the time shall not be reset.	
32.	No. of Digits for Credit Storage		6+2	
33.	Credit Transfer System		Yes	
34.	Tariff Structure		Utility's tariff structure	
35.	KWhr dispensing register		Solid state LCD Display	
36.	Front Page Indications		<ul style="list-style-type: none"> - Credit Status, - Accept/Reject - Low credit warning - Consumption Rate - Tamper Indication 	
37.	Disconnection Facility		<ul style="list-style-type: none"> - On credit expiry, - Decommissioning state - Exceeded Power threshold - When tampered 	
38.	Provision for emergency Friendly Credit		Yes	
39.	Provision for Fixed charge/ Minimum charge		Customizable	
40.	Time interval of re-calibration (minimum)	Year	10	
41.	Service life (minimum)	Year	10	
42.	Weight of meter	Kg	To be mentioned	
43.	Overall dimensions (height, width, depth)	mm	To be mentioned	
44.	Load Control		Yes	
45.	Warranty	Years	3 Years	
46.	List of Recommended Spares		To be mentioned	
47.	Any other facility if any		To be mentioned	
48.	Meter body sealing condition		Hermatically Sealed/ Ultrasonic welded to avoid unauthorized opening of meter cover	
49.	Latching relay		As per specification mentioned in Section-6.2.1.28.3	
50.	Communication compatibility		RS485, GPRS(4G which will also support all other available bands in Bangladesh) and Broadband PLC and RF (plug and play)	
51.	Communication Protocol		DLMS/COSEM	
52.	Vending		Vending facility through online, Mobile SMS, Mobile Apps, POS, ATM/Bank booth etc.	

[The Tenderer should complete all the columns as required]

Signature:	Signature
Name & Designation of tenderer	Name and Designation of Manufacturer
Duly authorised to sign the Tender for and on behalf of the Tenderer	

6.2.2.2 Specifications of 400 VOLT 10(100) A Three Phase Online SMART PREPAYMENT ELECTRIC ENERGY METER

(To be filled up and signed by the Manufacturer & Tenderer, otherwise the offer will not be acceptable)

Sl. No.	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
1.	Reference Standard	-	IEC	
2.	Country of Origin		To be mentioned	
3.	Manufacturer's Name & address		To be mentioned	
4.	Place of Manufacturer		To be mentioned	
5.	Year of Manufacture & Testing		To be mentioned	
6.	Model of Meter	-	To be mentioned	
7.	Generation of the offered Meter		To be mentioned	
8.	Type	-	Indoor	
9.	Installation		At easy approachable place in the consumer's premises.	
10.	Connection	-	3- phase, 4-wire, Bidirectional (Programmable)	
11.	Rated voltage	Volt	400	
12.	Maximum voltage	Volt	500	
13.	Basic Current	Amp	<=10	
14.	Maximum Current	Amp	>=100	
15.	Frequency		50HZ	
16.	Number of Terminal	No.	8	
17.	Diameter of Terminal; Bore	mm	8.5mm to accommodate 25 mm ² cable	
18.	No. of Element	No.	3	
19.	Voltage circuit loss at rated voltage	VA & W	<=5 W and 10 VA	
20.	Current circuit loss at rated current	VA	2.5	
21.	Variation of Power factor		0.5 lag to 0.8 lead	
22.	Variation of voltage		+30% to -50%	
23.	Performance Curve		To be submitted	
24.	Impulse withstand voltage	KV	6	
25.	Starting current (minimum)	mA	0.4% of basic current	
26.	KWh register type	-	LCD Display	
27.	Meter constant	Impulse/ kWhr	To be mentioned	
28.	Accuracy class	Class	1.0	
29.	Type of Battery		Lithium Battery	
30.	Country of Origin of the Battery		USA/EU/UK/JAPAN	

Sl. No.	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
31.	Built in clock		Real Time Clock (RTC) as per IEC 62054-21 or updated version. RTC must have separate battery (Country of origin: USA/EU/UK/JAPAN) back-up or Super Capacitor (with at least 06 hrs back up). If the main battery is removed, the time shall not be reset.	
32.	No. of Digits for Credit Storage		6+2	
33.	Credit Transfer System		Yes	
34.	Tariff Structure		Utility's tariff structure	
35.	KWhr dispensing register		Solid state LCD Display	
36.	Front Page Indications		<ul style="list-style-type: none"> - Credit Status - Accept/Reject - Low credit warning - Consumption Rate - Tamper Indication 	
37.	Disconnection Facility		<ul style="list-style-type: none"> - On credit expiry - Decommissioning state - Exceeded Power threshold - When Tampered 	
38.	Provision for emergency Friendly Credit		Yes	
39.	Provision for Fixed charge/ Minimum charge		Customizable	
40.	Time interval of re-calibration (minimum)	Year	10	
41.	Service life (minimum)	Year	10	
42.	Weight of meter	Kg	To be mentioned	
43.	Overall dimensions (height, width, depth)	mm	To be mentioned	
44.	Load Control		Yes	
45.	Warranty	Years	3 Years	
46.	List of Recommended Spares		To be mentioned	
47.	Any other facility if any		To be mentioned	
48.	Meter body sealing condition		Hermetically Sealed/ Ultrasonic welded to avoid unauthorized opening of meter cover	
49.	Latching relay		As per specification mentioned in Section- 6.2.1.45.3	
50.	Communication compatibility (plug and play)		RS485, GPRS(4G which will also support all other available bands in Bangladesh) and	

Sl. No.	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
			Broadband PLC and RF (plug and play). Communication modules must be interchangeable with the modules used for Single Phase Smart Pre-payment Meters. Three Phase BPLC modules must communicate in three phases but the size and shape of the module should be compatible with single phase meters so that modules can interchangeably fit in.	
51.	Communication Protocol		DLMS/COSEM	
52.	Vending		Vending facility through online, Mobile SMS, Mobile Apps, POS, ATM/Bank booth etc.	

[The Tenderer should complete all the columns as required]

Signature:

Name & Designation of tenderer

Duly authorised to sign the Tender for and on behalf of the Tenderer

Signature

Name and Designation of Manufacturer

6.2.2.3 Specifications of Optical Communication Cable

(To be filled up and signed by the Manufacturer & Tenderer)

SI No.	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
1.	Brand		Any International reputed brand operating in the recognized continental markets for decades.	
2.	Model		To be mentioned by the supplier/tenderer.	
3.	Country of Origin		To be mentioned by the supplier/tenderer.	
4.	Mode		Multimode and single mode as required	
5.	Length		5M	
6.	Compatibility		Compatible with selected storage system and HBAs	
7.	Warranty Period	Calendar Year	Full 03(Three) years replacement and instant service warranty. Replacement time maximum 07(Seven) days.	

[The Tenderer should complete all the columns as required]

Signature:

Name & Designation of tenderer

Duly authorised to sign the Tender for and on behalf of the Tenderer

Signature

Name and Designation of Manufacturer

6.2.2.4 Specifications of Router (8-port switch integrated) for UVS & UCC

(To be filled up and signed by the Manufacturer & Tenderer, otherwise the offer will not be acceptable)

SI No	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
1	Brand		Any International Reputed Brand: To be mentioned by Tenderer	
2	Model		To be mentioned by Tenderer	
3	Country of origin		USA /EU/Japan	
4	Country of Assemble		To be mentioned by Tenderer	
5	Interfaces		WAN : 1 x Ethernet 1000Base-T - RJ-45 LAN : 8 x Ethernet 1000Base-T - RJ-45 Management : 1 x Console - RJ-45, Peripheral : Min. 1 x USB	
6	Capacity		IPSec VPN tunnels : 50	
7	Remote Management Protocol		HTTPS, Telnet, SNMP 3, HTTP, SSH	
	Encryption Algorithm		256-bit AES, 192-bit AES, PKI, PEAP, 128-bit AES, TKIP, DES, Triple DES, SSL, LEAP	
	Features		DHCP server, DNS proxy, Traffic shaping, Bidirectional Forwarding Detection (BFD), IPv6 support, Content filtering, VLAN support, URL filtering, Intrusion Prevention System (IPS), High Availability, Stateful Failover, Dynamic Multipoint VPN (DMVPN), Weighted Fair Queuing (WFQ), Class-Based Weighted Fair Queuing (CBWFQ), Link Fragmentation and Interleaving (LFI), DiffServ support, IGMP snooping, Stateful Packet Inspection (SPI), NAT support, WAN failover, VPN support, Virtual Route Forwarding-Lite (VRF-Lite), Access Control List (ACL) support, Spanning Tree Protocol (STP) support, Quality of Service (QoS), Load balancing, Auto-uplink (auto MDI/MDI-X), MAC address filtering	
	RAM		512 MB (installed) / 768 MB (max)	
8	Flash Memory		256 MB (installed) / 256 MB (max)	
9	Connectivity Technology		Wired	
10	Network / Transport Protocol		L2TPv3, DHCPDNS, IPSec, FTP, L2TP, DDNS	
11	Routing Protocol		EIGRP, BGP, RIP-1, RIP-2, VRRP, NHRP, GRE, HSRP, PIM-SM, OSPF	
12	Power Supply / Device		Power adapter External	
13	Voltage Required		AC 120/230 V	
14	Data Link Protocol		Fast Ethernet, Ethernet	
15	Enclosure Type		Desktop	
16	Warranty		Full 03 (Three) years replacement and instant service warranty from the date of commissioning.	

[The Tenderer should complete all the columns as required]

Signature:

Name & Designation of tenderer

Duly authorised to sign the Tender for and on behalf of the Tenderer

Signature

Name and Designation of Manufacturer

6.2.2.5 Specifications of Work Station

(To be filled up and signed by the Manufacturer & Tenderer)

SI No.	Name of Item	Unit	Required Specification	Full Technical Specification & Standard (to be mentioned)
1	Brand		Any International reputed brand operating in the recognized continental markets for decades.	
	Model		To be mentioned by the supplier/tenderer.	
2	Country Of Origin		North America / EU / Japan	
3	Country of Manufacture		To be mentioned by the supplier/tenderer.	
4	Processor		Intel core i7-12C-13 th generation or higher	
5	Clock Speed	GHz	To be mentioned	
	Cache Memory	MB	Minimum 25 MB	
6	Chipset		Intel 600 series or higher	
7	Bus Speed	Mhz	Minimum 3200 MHz	
8	RAM	GB	Minimum 16 GB	
9	HDD	GB	2000 GB (1024 RPM)	
10	Mouse		Same Brand USB Scroll Optical (V-Track) Mouse	
11	Keyboard		Same brand USB Multimedia Keyboard	
12	Graphics		Integrated UHD or Higher	
13	Monitor	inch	Same brand LED 18.5" Monitor	
14	DVD ROM Drive		DVD RW Drive	
15	Hard disk controller	gbps	Serial ATA 3.0 Gbps or Latest	
16	Audio		Integrated sound card	
17	I/O Ports		8 USB 3.0 (2 front, 6 rear, 1 internal) , Serial, Parallel, RJ-45 Etc. + Display port 1.2, Mic.in & Headphone out (front)	
18	NIC		Integrated/Built in Gigabit LAN or higher	
	Wireless NIC		Integrated/Built in wireless Wi-Fi + Bluetooth V4.0 or higher	
19	Slots		At least 3. 2 PCI, 1 PCIe x1	
20	OS Support		Any version of Windows, Linux, etc.	
21	OS		License with recovery kit	
22	Software		Licensed Anti-Virus Software	
23	Brochure and CDs		All brochure, instructions, manual and driver CDs to be supplied with the product	
24	Connection Cables		All necessary power and data connection cables to be supplied along with the product , power cables (3 pin flat)	
25	Warranty Period	Calendar Year	Full 03(Three) years replacement and instant service warranty. Replacement time maximum 07(Seven) days.	

[The Tenderer should complete all the columns as required]

Signature:

Name & Designation of tenderer

Duly authorised to sign the Tender for and on behalf of the Tenderer

Signature

Name and Designation of Manufacturer

6.2.2.6 Specifications of Laptop

(To be filled up and signed by the Manufacturer & Tenderer)

SI No	Name of Item	Unit	Required Specification	Full Technical Specification & Standard (to be mentioned)
1	Brand		Any International reputed brand operating in the recognized continental markets for decades.	
2	Model		To be Mentioned by the supplier/tenderer.	
3	Country of Origin		North America / EU/ Japan	
4	Country of Manufacturer		To be Mentioned by the supplier/tenderer.	
5	Processor	GHz	Intel core i7-10C-13th generation or higher	
	Clock speed		To be mentioned	
	Cache Memory	MB	Minimum 12 MB	
6	RAM	GB, MHz	Minimum 16 GB 3200 MHz DDR4 or higher	
7	Hard Disk Drive	GB, TB	Minimum 512GB M.2 PCIe NVMe internal SSD with 2 TB External portable HDD	
9	Combo Drive		To be mentioned (if any)	
10	Graphics		Integrated UHD or higher	
11	Monitor	inch	To be mentioned	
	Display Technology		FHD, LED Display	
12	Port & Connector		Min 2 USB 3.0 port, 1 X RJ 45 port for LAN, 1 X RJ, External Micro phone, Head Phone + Media Card Reader, Audio Jacks	
	NIC		Integrated/Built in Gigabit LAN or higher	
13	Keyboard		Integrated standard Keyboard	
14	Pointing Device		Both Touch Pad and one additional USB mouse	
15	Webcam		HD Webcam	
16	Speaker		Integrated Internal Speaker	
17	Wireless Technology		Wireless LAN and Bluetooth	
18	Battery		6 cell lithium ion battery	
19	Battery Backup		4 hours or higher with A/C Adapter	
20	Weight & Colour	kg	To be mentioned	
21	Operating System		Windows 10 with Original License and recover CD.	
22	Carrying Case		Original Standard Carrying Case, Same brand.	
23	Software		License Anti-Virus Software (Kesperesky/Norton/Semantic)	
24	Bangla software		Licensed Software with CD (Preferably Lekhoni)	
25	Certification		FCC class B, ISO 9001: 2000	
26	Warranty Period	Calendar Year	Full 03(Three) years replacement and instant service warranty. Replacement time maximum 07(Seven) days.	

[The Tenderer should complete all the columns as required]

Signature:
Name & Designation of tenderer

Signature
Name and Designation of Manufacturer

Duly authorised to sign the Tender for and on behalf of the Tenderer

6.2.2.7 Specifications of Network Laser Duplex Printer

(To be filled up and signed by the Manufacturer & Tenderer)

SI No.	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
1	Brand		Any International reputed brandoperating in the recognized continental markets for decades.	
2	Model		To be mentioned by the supplier/tenderer.	
3	Country of Origin		North America / EU / Japan	
4	Country of Manufacturer		To be mentioned by the supplier/tenderer.	
5	Toner type		Pre-installed original laser jet toner cartridge, No starter toner.	
6	Fuser Unit		Instant on fuser technology with ceramic heating elements.	
7	Resolution	dpi	1200 × 1200 dpi (Minimum)	
8	Processor	MHz	Minimum 1200 MHz	
9	Printing Speed	ppm	62-Page-per Minute (Letter), 35 PPM (A4) (min.)	
10	First Page Print Out	second	As fast as 8 seconds	
11	Duplex Printing		Automatic	
12	Mobile Printing		Yes	
13	Memory	MB	256 MB (Minimum) Expandable to 1 GB	
14	Memory Slots		2 DIMM Slots Minimum	
15	Interface		USB, LAN, Wi-Fi	
16	Languages		PCL 6, PCL 5e, POST Script 3 emulation	
17	Duty Cycle	page	2, 75,000 Pages per Month	
18	Trays		100 sheet multi-purpose input tray, 2 x 500 sheet input tray 50-sheet face up output tray, 250-sheet face down output tray	
19	Media Sizes		Letter, Legal, A4, A5, B5 and custom sizes	
20	Media Types		Paper (Plain, Preprinted, Letterhead, Bond, Color, Recycled, Rough), Transparencies, Labels	
21	Power Requirements		220-240 V / 50Hz ±	
22	Client Operating System Supported		Any version of Windows, Linux etc.,	
23	Network Operating System Supported		Via HP Jetdirect print server: Me, NT 4.0, 2000, XP, XP 64-bit, Server 2003, Red Hat Linux 6 and later.	
24	Network Protocols Supported		TCP/IP, UDP, HTTP etc.	
25	Weight and color		To be mentioned	
26	Warranty Period	Calendar Year	Full 03(Three) years replacement and instant service warranty. Replacement time maximum 07 (Seven) days.	

[The Tenderer should complete all the columns as required]

Signature:

Name & Designation of tenderer

Duly authorised to sign the Tender for and on behalf of the Tenderer

Signature

Name and Designation of Manufacturer

6.2.2.8 Specifications of Air-conditioner (AC)

(To be filled up and signed by the Manufacturer & Tenderer)

SI No.	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
1	Brand		Any International reputed brand operating in the recognized continental markets for decades like General, Hitachi, LG, Sharp etc.	
2	Model		To be mentioned by the supplier/tenderer.	
3	Country of Origin		To be mentioned by the supplier	
4	Country of Manufacturer		To be mentioned by the supplier/tenderer.	
5	Type		Split	
6	Capacity	Tonnage	2	
7	Compressor Type		To be mentioned by the supplier/tenderer.	
8	Cooling Capacity	Watts	To be mentioned by the supplier/tenderer.	
9	Noise Level Indoor (High/medium/Low)	Db	To be mentioned by the supplier/tenderer.	
10	Moisture Removal	(Ltrs/Hr)	To be mentioned by the supplier/tenderer.	
11	Star Rating		3/4/5	
12	Energy Efficiency Rating (EER)	W/W	>= 3.10	
13	Power Input	Watts	To be mentioned by the supplier/tenderer.	
14	Running Current	Amps	To be mentioned by the supplier/tenderer.	
15	Voltage/ Frequency	Volt/ Hz	230V/ 50/60 Hz±0.5%	
16	Timer		Yes/ No (Shall be mentioned)	
17	Sleep		Yes/ No (Shall be mentioned)	
18	Indicator		Yes/ No (Shall be mentioned)	
19	Auto Restart:		Yes/ No (Shall be mentioned)	
20	Remote Control Type		To be mentioned by the supplier/tenderer.	
21	Air Direction (Up/Down):		Yes/ No (Shall be mentioned)	
22	Anti-Bacteria Filter		Yes/ No (Shall be mentioned)	
23	Dimensions (Indoor unit/ Outdoor unit)	mm	To be mentioned by the supplier/tenderer.	
24	Weight (Indoor unit/ Outdoor unit)	Kg	To be mentioned by the supplier/tenderer.	
25	Warranty Period	Calendar Year	Full 03(Three) years replacement and instant service warranty. Replacement time maximum 03 (Three) days.	

[The Tenderer should complete all the columns as required]

Signature:

Name & Designation of tenderer

Duly authorised to sign the Tender for and on behalf of the Tenderer

Signature

Name and Designation of Manufacturer

6.2.2.9 Specifications of 5KVA UPS

(To be filled up and signed by the Manufacturer & Tenderer, otherwise the offer will not be acceptable)

SI No.	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
1	Brand		Any reputed brand	
2	Model		To be mentioned by the supplier/tenderer.	
3	Country of Origin		To be mentioned by the supplier/tenderer.	
4	Country of Manufacture		To be mentioned by the supplier/tenderer.	
5	Technology		On Line	
6	Capacity	VA	5000 VA.	
7	Back-up time	hrs	2 hrs minimum at full load.	
8	Wave Shape		Simulated Sine Wave.	
9	Input Voltage	VAC	160-270 VAC.	
10	Input Frequency	Hz	50/60Hz.	
11	Output Voltage	VAC	220±5% VAC.	
12	Output Frequency	AC	50/60 Hz±0.5% (AC Input) Auto Tracing.	
13	Computer Interface		Support RS 232 for UPS monitoring Software.	
14	Battery		Sealed Maintenance free Lead Acid.	
15	Battery Recharging	hrs	3-7 Hours up to 90% Capacity.	
16	Protection		Lightning, Spike, Surge, Flicker, Over & under Voltage, Over Load, Short Circuit, Battery low (Deep Discharge) & Noise (EMI/RFI) followed by International Safety Standard.	
17	Operating Temperature	°C	0-45°C.	
18	Operating Humidity		10%-95% (Non-Condensation).	
19	Brochure and CDs		All brochure, instruction manual and driver CDs to be supplied with the product.	
20	Connection Cables		All necessary power and data connection cables to be supplied along with the product.	
21	Warranty Period	Calendar Year	Full 03(three) years replacement and instant service warranty. Replacement time maximum 07(Seven) days.	

[The Tenderer should complete all the columns as required]

Signature:

Name & Designation of tenderer

Duly authorised to sign the Tender for and on behalf of the Tenderer

Signature

Name and Designation of Manufacturer

6.2.2.10 Specifications of GPRS/EDGE/EVDO/CDMA Modem

(To be filled up and signed by the Manufacturer & Tenderer)

SI No.	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
1	Brand		Any International reputed brandoperating in the recognized continental markets for decades.	
2	Model		To be mentioned by the supplier/tenderer.	
3	Country of Origin		To be mentioned by supplier/tenderer.	
4	Country of Manufacture		To be mentioned by the supplier/tenderer.	
5	Band		UMTS 850/1900/2100/900 MHz. EGPRS/GSM 850/900/1800/1900 MHz	
6	SIM		Internal SIM interface, Push-push SIM holder.	
7	Data		EDGE Circuit Switched data.	
8	APN		Support for multiple APNs.	
9	Interface		Data interface: USB specification 2.0 compliant full-speed.	
10	Display		LED display, simple integration via plug & play.	
11	Power		USB bus-powered, requires no external power supply.	
12	Size		Highly compact, light and powerful.	
13	OS Support		Any version of windows	
14	Upload/Download Speed	Mbps	50/150 Mbps	
15	SIM Support		Must support EDGE Network and SIM.	
16	Warranty Period	Calendar Year	Full 03(three) years replacement and instant service warranty. Replacement time maximum 07(Seven) days.	

[The Tenderer should complete all the columns as required]

Signature:

Name & Designation of tenderer

Duly authorised to sign the Tender for and on behalf of the Tenderer

Signature

Name and Designation of Manufacturer

6.2.2.11 Specifications of Slip Printer

(To be filled up and signed by the Manufacturer & Tenderer)

SINo	Name of Item	Unit	Required specifications	Full Technical Specification & Standard (to be mentioned)
01	Brand		Any International reputed brandoperating in the recognized continental markets for decades.	
02	Model		To be mentioned by supplier/tenderer.	
03	Country of Origin		To be mentioned by supplier/tenderer.	
04	Country of Manufacturer		To be mentioned by supplier/tenderer.	
05	Print Method		Thermal line printing	
06	Print Speed		To be mentioned	
07	Data Buffer	KB	4KB.	
08	Inked Ribbon		To be mentioned by supplier/tenderer.	
09	Interface		USB Interface (Mandatory)	
			Serial, Parallel, LAN, Wi-fi etc. (Optional)	
10	Power Supply (Adapter)	Volt	AC 120 ~240V DC 24V, 1.5A.	
11	Auto Cutter		Yes.	
12	Paper		Roll Paper.	
13	Driver/Manual	nos.	All Manual, Driver CD/DVD, Power Cable (3 Pin Flat), USB Cable have to be provided.	
14	OS Supported		Any version of Windows, Linux etc.	
	Warranty Period	Calendar Year	Full 03(three) years replacement and instant service warranty. Replacement time maximum 07(Seven) days.	

[The Tenderer should complete all the columns as required]

Signature:

Name & Designation of tenderer

Duly authorised to sign the Tender for and on behalf of the Tenderer

Signature

Name and Designation of Manufacturer

6.2.2.12 Specifications for Hand Held Units

(To be filled up and signed by the Manufacturer & Tenderer, otherwise the offer will not be acceptable)

Item No	Name of Item	Required specifications	Full Technical Specification & Standard (to be mentioned)
01.	Manufacturer Name	To be mentioned	
02.	Manufacturer Address	To be mentioned	
03.	Operating System	Android (Updated version)	
04.	Model no.	To be mentioned	
05.	Country of Origin	To be mentioned	
06.	Type	To be mentioned	
07.	Transaction capacity	500	
08.	Rechargeable Battery	Minimum 8 hours	
09	Communications Interface	IEC 1107	
10	Feature	<p>Energy: Current values of energy. Billing Data: Monthly and daily frozen energy and credit data. Instantaneous Values: Instantaneous values of meters, such as voltage, current, frequency, active power, and so on. Event: There are three types of events in total. Select each type to read the relevant events. Prepayment: prepay information. Parameter: meter basic parameters that can only be read out.</p> <p>Billing parameters, Basic parameters, Display configuration, Friend holiday, Power quality, GPRS parameters, Function watch, Token, RTC</p>	

[The Tenderer should complete all the columns as required]

Signature:

Name & Designation of tenderer

Duly authorised to sign the Tender for and on behalf of the Tenderer

Signature

Name and Designation of Manufacturer

6.2.2.13 Specifications of DCU (Data Concentrator Unit) for prepaid meters

(To be filled up and signed by the Manufacturer & Tenderer)

SI No	Name of Item	Required specifications	Full Technical Specification & Standard (to be mentioned)
1	Brand	Any International Reputed Brand: To be mentioned by Tenderer	
2	Model	To be mentioned by Tenderer	
3	Country of origin	To be mentioned by Tenderer	
4	Country of Assemble	To be mentioned by Tenderer	
5	Metering Accuracy	Active energy: Class 0.5 Reactive energy: Class 2	
6	Data collection	Provide collection of real-time data, historical data, event data, and status data. The data collection process complies with IEC 62056 (DLMS/COSEM). DC shall have provision of energy measurement of transformer and conduct scheduled meter reading function.	
7	Data storage	Provide cyclic storage for minor and major events and historical data, including the load curve, hour frozen data, daily frozen data, and monthly frozen data.	
8	Network communication	Provide connect to downstream smart meters through BROADBAND PLC, RS485 & RF. For BROADBAND PLC & RF Communication, provide connect to upstream front-end processors through 4G (which will also support all other available bands in Bangladesh) Network Communication module (BPLC and RF) shall be plug and play type.	
9	Maximum Power	≤30W	
10	Power Supply	AC:90~290V power supply, support three-phase four-wire and single-phase power supply	
11	Dimensions (HxWxD)	To be mentioned GPRS: BPLC: RF:	
12	Operating Temperature	-25°C to +65°C	
13	Ingress Protection Level	IP54 or better	
14	Security	Support AES256 and ECC192 Encryption Support SSL Protocol	

SI No	Name of Item	Required specifications	Full Technical Specification & Standard (to be mentioned)
15	Industrial Environment	Provide IP54 or better protection level Work at the temperature of -40°C to +60°C	
16	Remote upgrade	Support upgrade software package stored locally, and dispatch the package to all connected meters by multicast. Support OTA (Over the Air) technology	
17	RAM	128 MB/256 MB	
18	Feeding phase monitor	The concentrator should be able to identify the feeding phase of each meter (for single-phase meters) via PLC communication. The concentrator should be able to detect changing of feeding phase of meter (for single-phase meters) via PLC communication.	
19	Last gasp	When power off, the concentrator will send the alarm to Master Station.	
20	Transformer Monitoring and Protection	Overload detection and alarm. Low power factor detection and alarm.	
21	Type of External CT	Split Core Clamp type CT Minimum accuracy class: 0.5 Current Measurement Capacity: Min. 400 A Secondary Current output: Compatible with DCU	
22	Other features	-Plug and play communication module -Easy and friendly UI -Automatically detect meter -Remote and local firmware upgrade -On demand read/write -Remote configuration -Scheduled Reading -Concentrator Firmware upgrade -Meter firmware upgrade -Alarm -Meter Data Management -Network Clock Management -Web service Management	

[The Tenderer should complete all the columns as required]

Signature:

Name & Designation of Tenderer

Duly authorized to sign the Tender for and on behalf of the Tenderer

Signature

Name and Designation of Manufacturer

6.3 Form of Completion Certificate

Contract No:
To:

Date:

[Name of Contractor]

Pursuant to GCC Clause 39 (Completion of the Facilities) of the General Conditions of the Contract entered into between yourselves and the Employer dated *[insert date]*, for the supply and installation of plant and Services for *[name of contract]*, we hereby notify you that the following part(s) of the Facilities was (were) complete on the date specified below, and that, in accordance with the terms of the Contract, the Employer hereby takes over the said part(s) of the Facilities, together with the responsibility for care and custody and the risk of loss thereof on the date mentioned below.

1. Description of the Facilities or part thereof: _____
2. Date of Completion: _____

However, you are required to complete the outstanding items listed in the attachment hereto as soon as practicable.

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defect Liability Period.

Very truly yours,

for and on behalf of the Employer

[**Signature**]

[**Title of the Project Manager**]

6.4 Form of Operational Acceptance Certificate

Contract No:
To:

Date:

[Name of Contractor]

Pursuant to GCC Clause 40.3 (Operational Acceptance) of the General Conditions of the Contract entered into between yourselves and the Employer dated *[insert date]*, for the supply and installation of plant and Services for *[name of contract]*, we hereby notify you that the Functional Guarantees of the following part(s) of the Facilities were satisfactorily attained on the date specified below.

1. Description of the Facilities or part thereof: _____
2. Date of Operational Acceptance: _____

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defect Liability Period.

Very truly yours,

for and on behalf of the Employer

[**Signature**]

[**Title of the Project Manager**]

6.5 Form of Change Order Procedure and Forms

Contract No:
To:

Date:

[Name of Contractor]

CONTENTS

1. General
2. Change Order Log
3. References for Changes

ANNEXES

- Annex 1 Request for Change Proposal
- Annex 2 Estimate for Change Proposal
- Annex 3 Acceptance of Estimate
- Annex 4 Change Proposal
- Annex 5 Change Order
- Annex 6 Pending Agreement Change Order
- Annex 7 Application for Change Proposal

Change Order Procedure

1. General

This section provides samples of procedures and forms for implementing changes in the Facilities during the performance of the Contract in accordance with GCC Clause 64 (Change in the Facilities) of the General Conditions.

2. Change Order Log

The Contractor shall keep an up-to-date Change Order Log to show the current status of Requests for Change and Changes authorized or pending, as Annex 8. Entries of the Changes in the Change Order Log shall be made to ensure that the log is up-to-date. The Contractor shall attach a copy of the current Change Order Log in the monthly progress report to be submitted to the Employer.

3. References for Changes

- (1) Request for Change as referred to in GCC Clause 64 shall be serially numbered CR-X-nnn.
- (2) Estimate for Change Proposal as referred to in GCC Clause 64 shall be serially numbered CN-X-nnn.
- (3) Acceptance of Estimate as referred to in GCC Clause 64 shall be serially numbered CA-X-nnn.
- (4) Change Proposal as referred to in GCC Clause 64 shall be serially numbered CP-X-nnn.
- (5) Change Order as referred to in GCC Clause 64 shall be serially numbered CO-X-nnn.

Note: (a) Requests for Change issued from the Employer's Home Office and the Site representatives of the Employer shall have the following respective references:

Home Office	CR-H-nnn
Site	CR-S-nnn

- (b) The above number "nnn" is the same for Request for Change, Estimate for Change Proposal, Acceptance of Estimate, Change Proposal and Change Order.

Annex 1. Request for Change Proposal

(Employer's Letterhead)

To:

Date:

Attention:

Contract Name:

Contract Number:

With reference to the captioned Contract, you are requested to prepare and submit a Change Proposal for the Change noted below in accordance with the following instructions within _____ days of the date of this letter _____.

1. Title of Change: _____
2. Change Request No. _____
3. Originator of Change: Employer: _____
Contractor (by Application for Change Proposal No. _____):
4. Brief Description of Change:

5. Facilities and/or Item No. of equipment related to the requested Change:

6. Reference drawings and/or technical documents for the request of Change:

<u>Drawing No./Document No.</u>	<u>Description</u>
7. Detailed conditions or special requirements on the requested Change:

8. General Terms and Conditions:
 - (a) Please submit your estimate to us showing what effect the requested Change will have on the Contract Price.
 - (b) Your estimate shall include your claim for the additional time, if any, for completion of the requested Change.
 - (c) If you have any opinion negative to the adoption of the requested Change in connection with the conformability to the other provisions of the Contract or the safety of the Plant or Facilities, please inform us of your opinion in your proposal of revised provisions.
 - (d) Any increase or decrease in the work of the Contractor relating to the services of its personnel shall be calculated.

- (e) You shall not proceed with the execution of the work for the requested Change until we have accepted and confirmed the amount and nature in writing.

Signature:	<i>[insert signature of authorised representative of the Employer]</i>
Name:	<i>[insert full name of signatory with National ID Number]</i>
Title of the Signatory:	<i>[insert title of the Signatory]</i>
Name of the Employer:	<i>[insert name of the Employer]</i>

Annex 2. Estimate for Change Proposal

(Contractor's Letterhead)

To:

Date:

Attention:

Contract Name:

Contract Number:

With reference to your Request for Change Proposal, we are pleased to notify you of the approximate cost of preparing the below-referenced Change Proposal in accordance with GCC Sub-Clause 64.2.1 of the General Conditions. We acknowledge that your agreement to the cost of preparing the Change Proposal, in accordance with GCC Sub-Clause 64.2.2, is required before estimating the cost for change work.

1. Title of Change: _____
2. Change Request No./Rev.: _____
3. Brief Description of Change: _____
4. Scheduled Impact of Change: _____
5. Cost for Preparation of Change Proposal: _____²

(a) Engineering (Amount)

- (i) Engineer _____ hrs x _____ rate/hr =
(ii) Draftsperson _____ hrs x _____ rate/hr =
Sub-total _____ hrs

Total Engineering Cost

(b) Other Cost

Total Cost (a) + (b)

Signature:	<i>[insert signature of authorised representative of the Employer]</i>
Name:	<i>[insert full name of signatory with National ID Number]</i>
Title of the Signatory:	<i>[insert title of the Signatory]</i>
Name of the Employer:	<i>[insert name of the Employer]</i>

² Costs shall be in the currencies of the Contract.

Annex 3. Acceptance of Estimate

(Employer's Letterhead)

To:

Date:

Attention:

Contract Name:

Contract Number:

We hereby accept your Estimate for Change Proposal and agree that you should proceed with the preparation of the Change Proposal.

1. Title of Change: _____
2. Change Request No./Rev.: _____
3. Estimate for Change Proposal No./Rev.: _____
4. Acceptance of Estimate No./Rev.: _____
5. Brief Description of Change: _____
6. Other Terms and Conditions: In the event that we decide not to order the Change accepted, you shall be entitled to compensation for the cost of preparation of Change Proposal described in your Estimate for Change Proposal mentioned in para. 3 above in accordance with GCC Clause64 of the General Conditions.

Signature:	<i>[insert signature of authorised representative of the Employer]</i>
Name:	<i>[insert full name of signatory with National ID Number]</i>
Title of the Signatory:	<i>[insert title of the Signatory]</i>
Name of the Employer:	<i>[insert name of the Employer]</i>

Annex 4. Change Proposal

(Contractor's Letterhead)

To:

Date:

Attention:

Contract Name:

Contract Number:

In response to your Request for Change Proposal No. _____,
we hereby submit our proposal as follows:

1. Title of Change: _____
2. Change Proposal No./Rev.: _____
3. Originator of Change: Employer: [_____
Contractor: _____
4. Brief Description of Change: _____
5. Reasons for Change: _____
6. Facilities and/or Item No. of Equipment related to the requested Change:

7. Reference drawings and/or technical documents for the requested Change:

<u>Drawing/Document No.</u>	<u>Description</u>
-----------------------------	--------------------
8. Estimate of increase/decrease to the Contract Price resulting from Change Proposal:³

(Amount)

- (a) Direct material
- (b) Major construction equipment
- (c) Direct field labor (Total _____ hrs)
- (d) Subcontracts
- (e) Indirect material and labor
- (f) Site supervision
- (g) Head office technical staff salaries

³ Costs shall be in the currencies of the Contract.

Process engineer	_____hrs @ _____ rate/hr
Project engineer	_____hrs @ _____ rate/hr
Equipment engineer	_____hrs @ _____ rate/hr
Procurement	_____hrs @ _____ rate/hr
Draftsperson	_____hrs @ _____ rate/hr
Total	_____hrs

- (h) Extraordinary costs (computer, travel, etc.)
- (i) Fee for general administration, _____ % of Items
- (j) Taxes and customs duties

Total lump sum cost of Change Proposal
(Sum of items (a) to (j))

Cost to prepare Estimate for Change Proposal
(Amount payable if Change is not accepted)

- 9. Additional time for Completion required due to Change Proposal
- 10. Effect on the Functional Guarantees
- 11. Effect on the other terms and conditions of the Contract
- 12. Validity of this Proposal: within *[Number]* days after receipt of this Proposal by the Employer
- 13. Other terms and conditions of this Change Proposal:
 - (a) You are requested to notify us of your acceptance, comments or rejection of this detailed Change Proposal within _____ days from your receipt of this Proposal.
 - (b) The amount of any increase and/or decrease shall be taken into account in the adjustment of the Contract Price.
 - (c) Contractor's cost for preparation of this Change Proposal:²

Signature:	<i>[insert signature of authorised representative of the Contractor]</i>
Name:	<i>[insert full name of signatory with National ID Number]</i>
Title of the Signatory:	<i>[insert title of the Signatory]</i>
Name of the Contractor:	<i>[insert name of the Contractor]</i>

² Specify where necessary.

Annex 5. Change Order

(Employer's Letterhead)

To:

Date:

Attention:

Contract Name:

Contract Number:

We approve the Change Order for the work specified in the Change Proposal (No. _____), and agree to adjust the Contract Price, Time for Completion and/or other conditions of the Contract in accordance with GCC Clause 64 of the General Conditions.

1. Title of Change: _____

2. Change Request No./Rev.: _____

3. Change Order No./Rev.: _____

4. Originator of Change: Employer: _____
Contractor: _____

5. Authorized Price:

Ref. No.: _____ Date: _____

Foreign currency portion _____ plus Local currency portion _____

6. Adjustment of Time for Completion

None Increase _____ days Decrease _____
days

7. Other effects, if any

Authorized by: _____
(Employer)

Date:

Accepted by: _____
(Contractor)

Date:

Annex 6. Pending Agreement Change Order

(Employer's Letterhead)

To:

Date:

Attention:

Contract Name:

Contract Number:

We instruct you to carry out the work in the Change Order detailed below in accordance with GCC Clause 64 of the General Conditions.

1. Title of Change: _____
2. Employer's Request for Change Proposal No./Rev.:
_____ dated: _____
3. Contractor's Change Proposal No./Rev.: _____ dated:

4. Brief Description of Change: _____
5. Facilities and/or Item No. of equipment related to the requested Change:

6. Reference Drawings and/or technical documents for the requested Change:

<u>Drawing/Document No.</u>	<u>Description</u>
-----------------------------	--------------------
7. Adjustment of Time for Completion:
8. Other change in the Contract terms:
9. Other terms and conditions:

Signature:	<i>[insert signature of authorised representative of the Employer]</i>
Name:	<i>[insert full name of signatory with National ID Number]</i>
Title of the Signatory:	<i>[insert title of the Signatory]</i>
Name of the Employer:	<i>[insert name of the Employer]</i>

Annex 7. Application for Change Proposal

(Contractor's Letterhead)

To:

Date:

Attention:

Contract Name:

Contract Number:

We hereby propose that the below-mentioned work be treated as a Change in the Facilities.

1. Title of Change: _____
2. Application for Change Proposal No./Rev.: _____
_____ dated:

3. Brief Description of Change: _____
4. Reasons for Change:
5. Order of Magnitude Estimation (in the currencies of the Contract):
6. Scheduled Impact of Change:
7. Effect on Functional Guarantees, if any:
8. Appendix:

Signature:	<i>[insert signature of authorised representative of the Contractor]</i>
Name:	<i>[insert full name of signatory with National ID Number]</i>
Title of the Signatory:	<i>[insert title of the Signatory]</i>
Name of the Contractor:	<i>[insert name of the Contractor]</i>

Signature

Seal

6.6 Supplementary Information

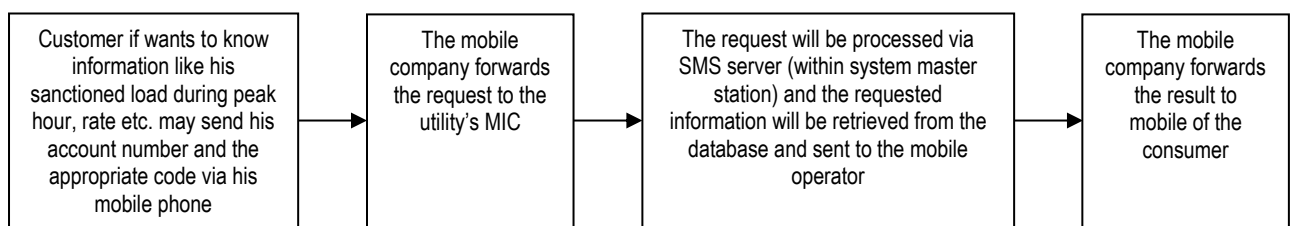
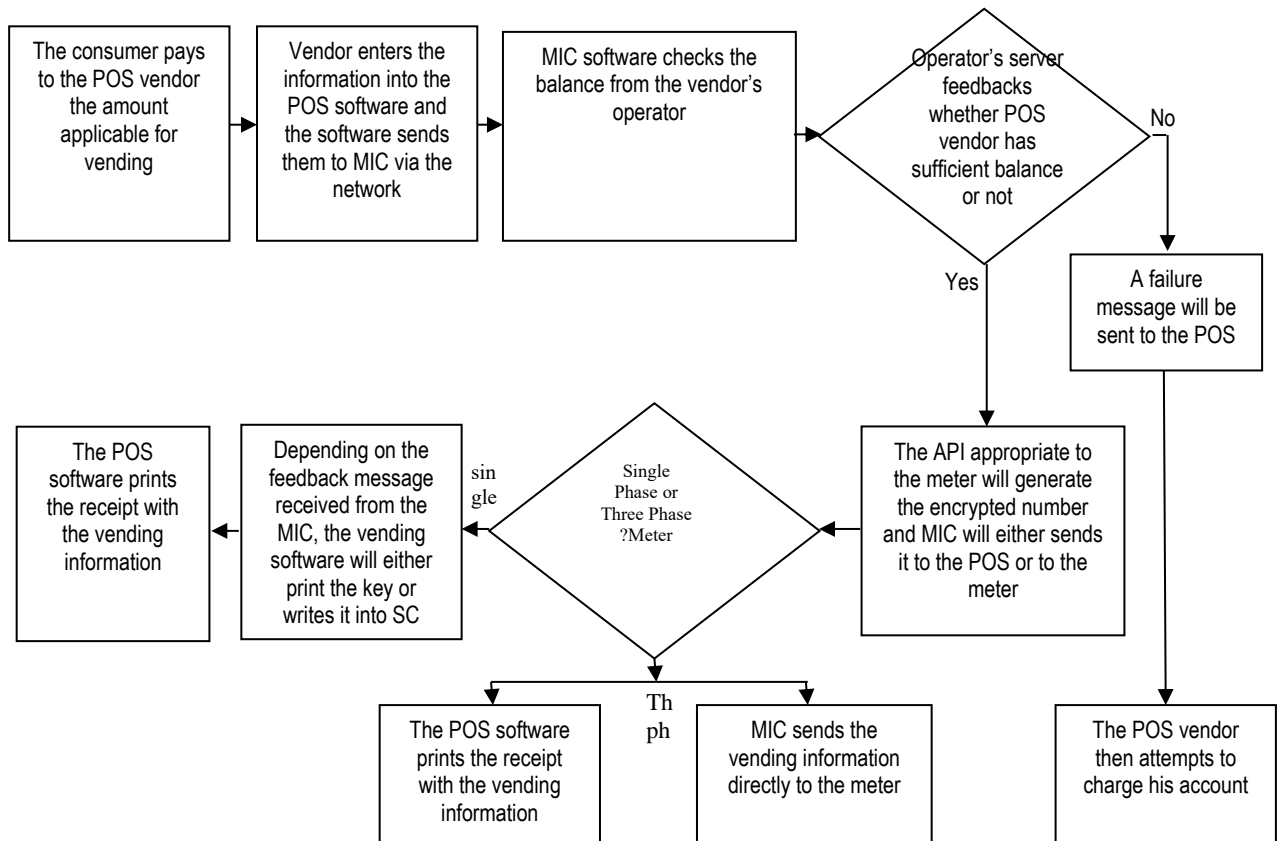
[The Tenderer shall furnish additional description/information covering all activities, if any]

**Section 7. Drawings
(to be submitted)**

Flow charts of the processes involved between different entities in the prepaid smart-metering system

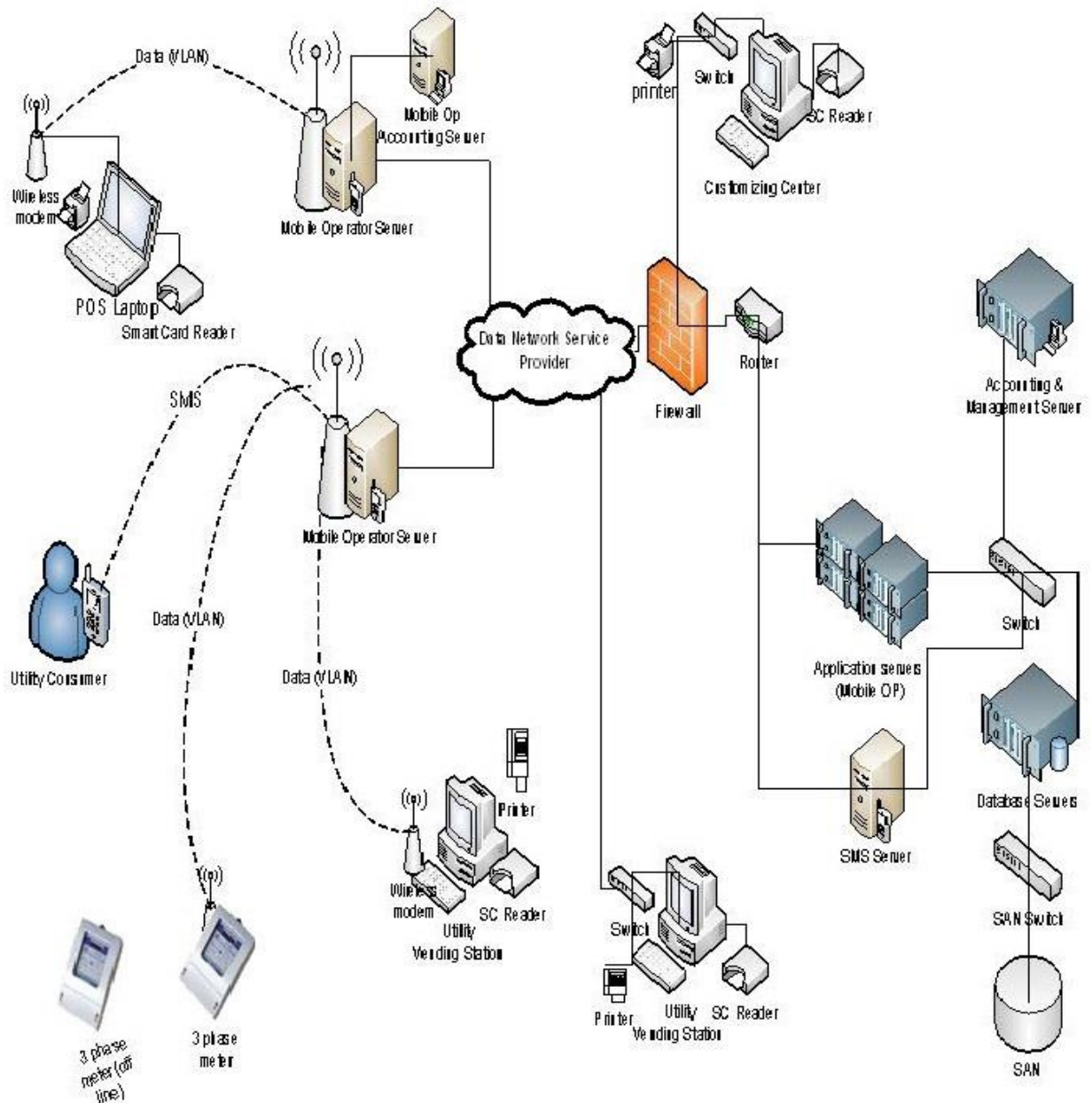
Overall Process Outline

Main requirement: A receipt is essential as a proof of vending. Otherwise, in case of problem of actual vending into the meters, resolution of the dispute will be difficult. Therefore, a consumer for vending purpose must come either to a POS or to a Vending Station for recharging his/her meters (either single phase or three phases). Since the friendly hour and emergency credit facilities will be active within the meter so the failure of vending beyond the office hour will not harm the consumer.



Processes initiated at POS

1. Processes involved at the Utility's Vending Station
2. Same as the POS initiated processes except the checking monetary transactions because only cash transactions will be made at the vending stations.
3. Processes involved at Short Message Services from consumers' mobile

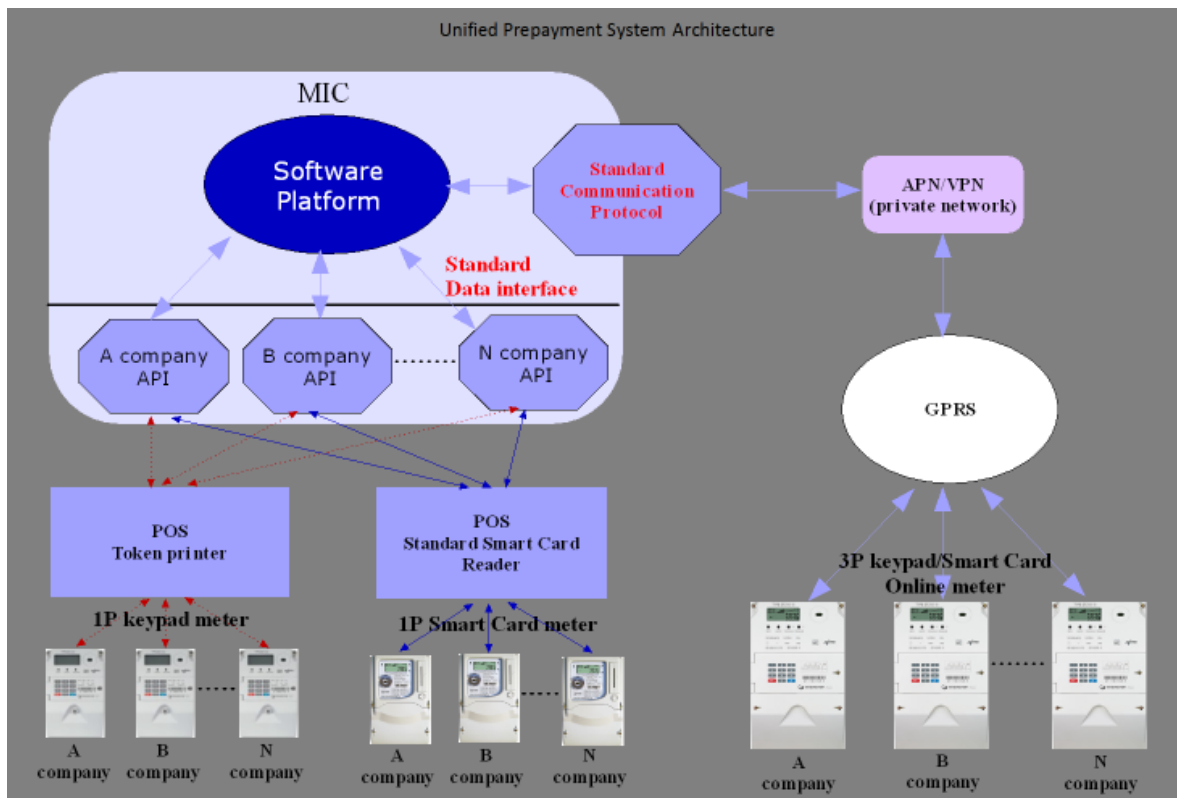


PART-2

(Unified Prepayment System API)

1 Multi-factories Access Platform

1.1 Access Platform Architecture Design



Each manufacturer provides its own encryption / decryption API, integrated into the system software.

When dealing with business based on different meters from each manufacturer, the system automatically calls the corresponding manufacturers' encryption/ decryption API.

The system defines uniformly data exchange interface corresponding to different business, such as input and output parameters.

When dealing with business, for the keypad meter, the system will call the encryption/ decryption API, generate the corresponding Token, and print; for smart card meter, the system will call the encryption/ decryption API, write the corresponding Token to encrypted data area of the smart card.

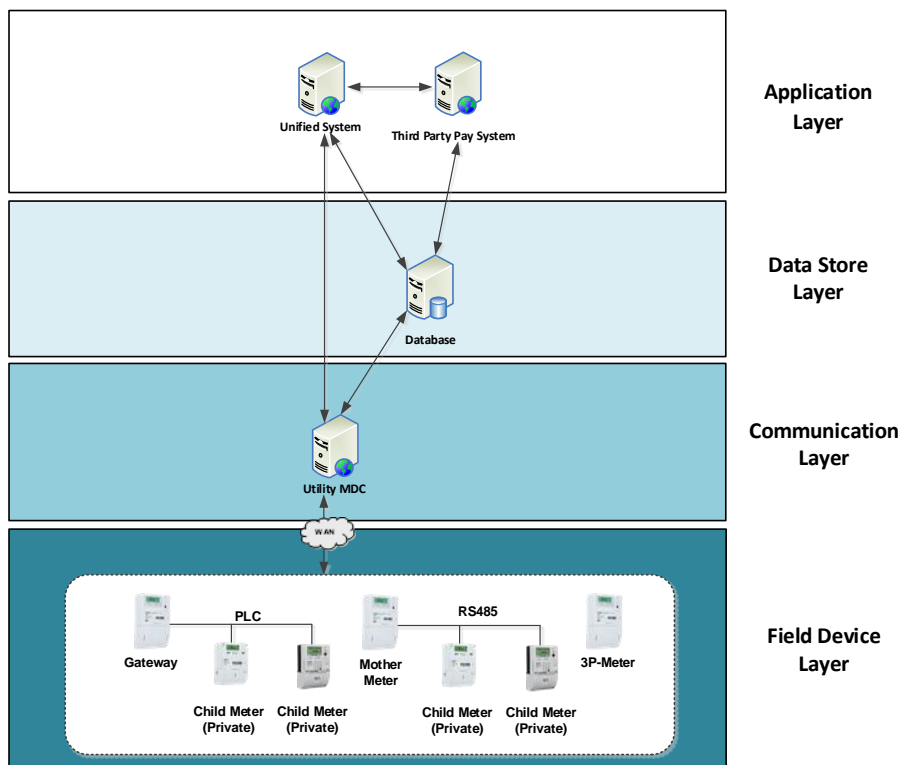
The encryption/decryption API from smart card manufacture must be able to generate Token which must contain the information of business type and length information. So that when smart card meter read the encrypted data in the card, the meter can separate the Token and identify the Token business itself.

POS read the smart cards from different manufactures via standard card read devices.

MIC communicates with GPRS meters of other factories according to standard data exchange mechanism.

Note: Token in this document means encrypted data.

1.2 Online Communication System Architecture



For online meter communication, all manufacturers should communicate with their online meters by WZPDCL's Head End System (HES).

And the related documents and updated API, please refer to

Annexure- A : Unified Meter Data Collection System: Addressing System;

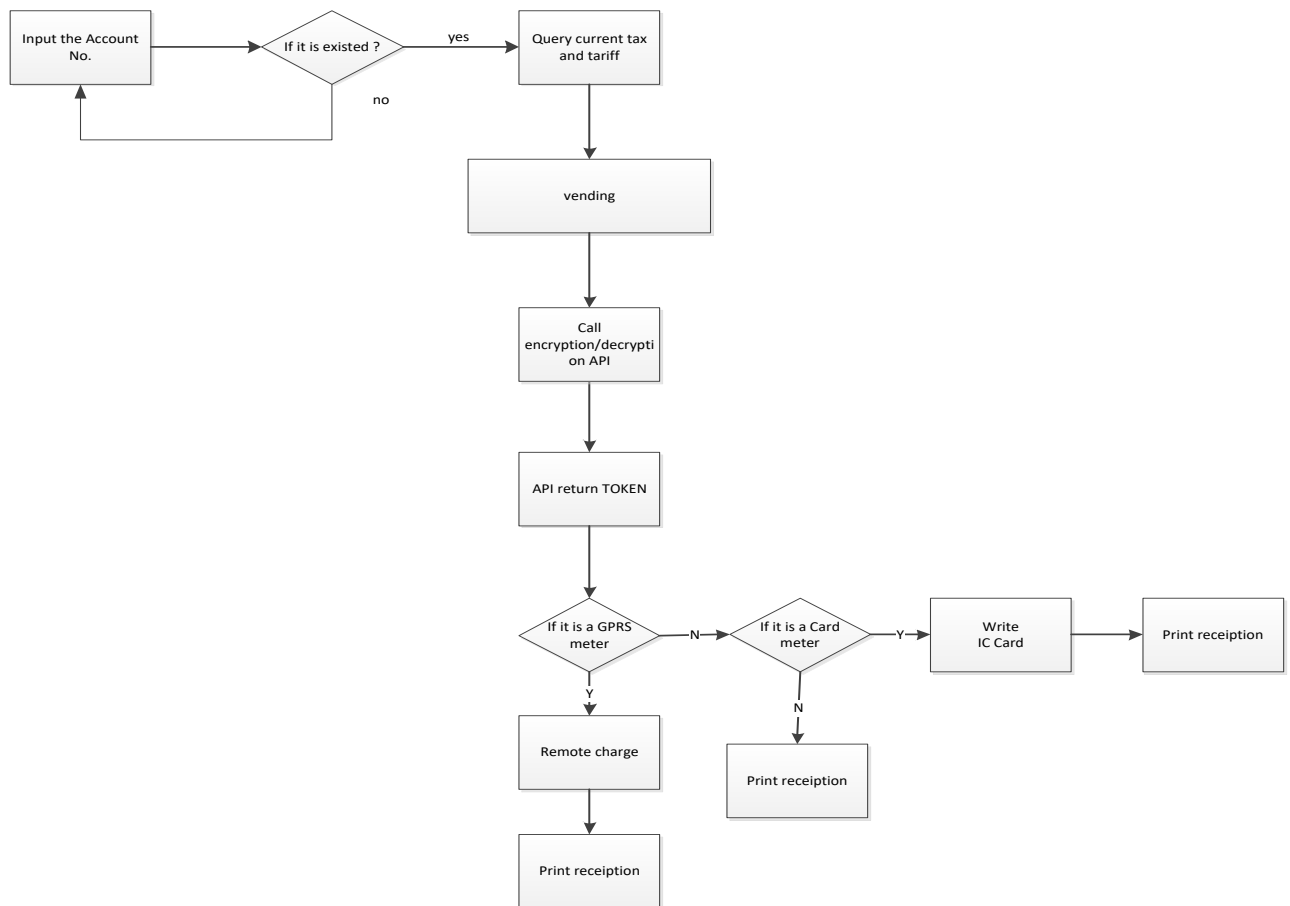
Annexure- B: Unified Meter Data Collection System: Meter Modeling;

Annexure- C: Unified Meter Data Collection System: DCU to HES;

Annexure- D: Unified System &HES Interface Specification;

2. Business Process

2.1 Vending as example:



3. Keypad Meters and Card Meter Access design

3.1 ErrorCode definition:

0 or empty: success

1: sequence number is not excepted

2: tariff Index argument error, not in scope

3: keyVersion argument not in scope

4: keyExpiredTime not in scope(0-255)

5: keyNo exceed 65535 or < 0

6: meterNo is not excepted

7: credit amount ≤ 0

8: unknown reason

3.2 Standard Interface for Generating A Variety of Token

3.2.1 Token Standard Interface Define

Programming language	JAVA
Functionality	Token standard interface class
Package	com.hx.ami.spi
Interface	Token
Class definition	<pre> public interface Token { Generatecredit Token public String getCreditToken(String meterNo, String sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo, double amount); Generate key change Token public String getKeyChangeToken (String meterNo, String sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, String nSgc, int nTariffIndex, int nKeyVersion,int nKeyExpiredTime, long nKeyNo); Generate Management Token Generate clear balance Token public String getClearBalanceToken (String meterNo, String Sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo); Generate clear event Token public String getClearEventToken (String meterNo, String Sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo); Generate max Power Limit Mode Token public String getMaxPowerLimitToken(String meterNo,String Sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo, int activationModel, String date,int[] maxPowerLimits, int[] hours); Generate single Tariff Token public String getSingleTariffToken(String meterNo, String Sgc, int tarrifIndex,int keyVersion, int keyExpiredTime, long keyNo, int seqNo,String activatingDate, int activatingModel, int validDate, int rate); Generate step Tariff Token public String getStepTariffToken(String meterNo, String Sgc, int tarrifIndex,int keyVersion, int keyExpiredTime, long keyNo, int seqNo,String activatingDate, String validDate, int[] rates, int[] steps); Generate Tou Tariff Token </pre>

	<pre> public String getTOUtariffToken(String meterNo, String Sgc, int tariffIndex,int keyVersion, int keyExpiredTime, long keyNo, int seqNo,String activatingDate, int activatingModel, int validDate, int[] rates, int[] times); Generate Friend Mode Token public String getFriendModeToken(String meterNo, String Sgc, int tariffIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo, int friendMode, int[] times, int[] days); Generate Public Holiday Token generateHolidayModeToken(String meterNo,String sgclD, int ti, int kv, int ke, int seq, int keyNo,int holidayMode, String[] days); Generate Change Meter Mode Token public String getChangeMeterModeToken(String meterNo, String Sgc, int tariffIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo,int mode); Generate Set Credit Amount Limit And Overdraw Amount Limit Token public String getSetCreditAmountLimitOrOverdrawAmountLimitToken(String meterNo, String Sgc, int tariffIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo, int amountType, int amountLimit); Generate Set Low Credit Warning Limit Token public String SetLowCreditWarningLimitToken(String meterNo, String Sgc, int tariffIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo, int amountType, int amountLimit); Generate LogoffReturn Token public String generateLogoffReturnToken (String meterNo, String Sgc, int tariffIndex, int keyVersion, int keyExpiredTime, int keyNo, int seqNo); Resolve the Return Token public String resolveReturnToke(String meterNo, String Sgc, int tariffIndex, int keyVersion, int keyExpiredTime, long keyNo, String Token); 4) Generate Test Token public String getTestToken (int manufacturingID, int control); } </pre>

3.2.2 Charge Interface Definition

Functionality	To get credit Token			
Application	<p>To call the function and generate credit token when vending.</p> <p>seqNo : Each token has sequence number except change-key-token. seqNo will increase 1 for each token generated and change to 1 when above 200;</p> <p>keyNo: when seqNo change from 200 to 1,keyNo add 1.</p> <p>keyExpiredTime: Global system parameter used as cipher fact. System can change it. Nothing to do with key expiration. Just a encryption fact.</p> <p>Key version: Global encryption fact, it will be changed in case all meter need to change keys.</p>			
Function name	getCreditToken			
Parameter list	Parameter name	Type	Scope or length	Description
	meterNo	String	String of 12 numbers	Meter number
	Sgc	String	String of 6 numbers	Supply group code System parameter.
	tarrifIndex	Int	1-99	Tariff index When custom change tariff, this value may change to any of 1-99
	keyVersion	Int	1-9	Key version Global encryption fact, it will be changed in case all meter need to change keys.
	keyExpiredTime	Int	0-255	Global system parameter used as cipher fact. System can change it. Nothing to do with key expiration. Just a encryption fact
	keyNo	Long	0-65535	Key Sequence, similar to key changed times, see above method descpt.
	seqNo	Int	1-200	Token Sequence

	amount	Int	0-999999999(scale&unit 0.01TK)	Credit amount	
Return value	Return XML String Xml format: <?xml version="1.0" encoding="UTF-8"?> <result> <errorCode></errorCode> <tokens> <token></token> ... <token></token> </tokens> </result> Note: errorCode see 3. Chart definition. If succeeded, need return an array of <tokens>elements.				
Function definition	public String getCreditToken(String meterNo, String sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo, int amount) { ... }				

3.2.3 Key ChangeInterface Definition

Functionality	To get key change Token				
Application	As soon as user wants to charge money , to generate the manage token and test token ,and judge if the encryption factor has been changed, if changed , to call function and generate change token. This function is called at four case: Meter installed and custom purchase energy at first time Called if tariff changed SeqNo change from 200 to 1. Called when operator press menu to change key. For the first time registration, parameter defines as below: tariffIndex=0; keyVersion=0; keyExpiredTime=0; keyNo=0;				
Function name	getKeyChangeToken				
Parameter list	Parameter name	Type	Scope or length	Description	
	meterNo	String	String of 12 numbers	Meterno.	
	Sgc	String	String of 6 numbers	Old Supply group code	

	tariffIndex	Int	1-99	Old Tariff index
	keyVersion	Int	1-9	Old Key version
	keyExpiredTime	Int	0-255	Old Key expire time
	keyNo	Long	0-65535	Old Key Sequence
	nSgc	Int	String of 6 numbers	Current supply grop code
	nTariffIndex	Int	1-99	Current Tariff index
	nKeyVersion	Int	1-9	Current Key version
	nKeyExpiredTime	Int	0-255	Current Key expire time
	nKeyNo	Int	0-65535	Current Key Sequence
Return value	Return XML String Xml format: <?xml version="1.0" encoding="UTF-8"?> <result> <errorCode></errorCode> <tokens> <token></token> ... <token></token> </tokens> </result> Note: errorCode definition refer to chart 3. If succeeded, need return an array of <tokens>elements			
Function definition	public String getKeyChangeToken (String meterNo, String sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, String nSgc, int nTariffIndex, int nKeyVersion, int nKeyExpiredTime, int nKeyNo) { ... }			

3.2.4 Management Token

3.2.4.1 Generate Clear Meter Balance Token

Functionality	To get clear balance Token			
Application	To clear balance			
Function name	getClearBalanceToken			
Parameter list	Parameter name	Type	Scope or length	Description

	meterNo	String	String of 12 numbers	MeterNo.
	sgc	String	String of 6 numbers	Supply group code
	tariffIndex	Int	1-99	Tariff index
	keyVersion	int	1-9	Key version
	keyExpiredTime	int	0-255	Key expire time
	keyNo	long	0-65535	Key Sequence
	seqNo	int	1-255	Token Sequence
Return value	<p>Return XML String</p> <p>Xml format:</p> <pre><?xml version="1.0" encoding="UTF-8"?> <result> <errorCode></errorCode> <tokens> <token></token> ... <token></token> </tokens> </result></pre> <p>Note: errorCode definition refer to chart 3.</p> <p>If succeeded, need return an array of <tokens>elements</p>			
Function definition	<pre>public String getClearBalanceToken (String meterNo, String Sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo) { ... }</pre>			

3.2.4.2 Generate Clear Event Token

Functionality	To get clear event Token
----------------------	--------------------------

Application	To clear event			
Function name	getClearEventToken			
Parameter list	Parameter name	Type	Scope or length	Description
	meterNo	String	String of 12 numbers	Meterno.
	sgc	String	String of 6 numbers	Supply group code
	tariffIndex	int	1-99	Tariff index
	keyVersion	int	1-9	Key version
	keyExpiredTime	int	0-255	Key expire time
	keyNo	long	0-65535	Key Sequence
	seqNo	int	1-255	Token Sequence
Return value	<p>Return XML String</p> <p>Xml format:</p> <pre><?xml version="1.0" encoding="UTF-8"?> <result> <errorCode></errorCode> <tokens> <token></token> ... <token></token> </tokens> </result></pre> <p>Note: errorCode definition refer to chart 3.</p> <p>If succeeded, need return an array of <tokens>elements</p>			
Function definition	<pre>public String getClearEventToken (String meterNo, String Sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo) { ...</pre>			

	}
--	---

3.2.4.3 Generate Setup MaxPowerLimitModeToken

Functionality	To get the set up MaxPowerLimitModeToken			
Application	To set up MaxPowerLimitMode Token			
Function name	getMaxPowerLimitToken			
Parameter list	Parameter name	Type	Scope or length	Description
	meterno.	String	String of 12 numbers	Meterno.
	sgc	String	String of 6 numbers	Supply group code
	tariffIndex	Int	1-99	Tariff index
	keyVersion	Int	1-9	Key version
	keyExpiredTime	Int	0-255	Key expire time
	keyNo	Long	0-65535	Key Sequence
	seq	Int	1-255	Token Sequence
	activatingModel	Int	0-1 0: Normal Mode 1: Immediately switch mode	Active Mode This parameter always 1.
	activatingDate	String	YYYY-MM-DD	Active Date Change Date type to String type: adapt to all kinds development languages
maxPowerLimits	int[]	1-2047 (array length :2) scale&unit:0.1kW	Max Power array	

	Hours	Int[]	0-23 (array length :2)unit:hour	Active time
Return value	<p>Return XML String</p> <p>Xml format:</p> <pre><?xml version="1.0" encoding="UTF-8"?> <result> <errorCode></errorCode> <tokens> <token></token> ... <token></token> </tokens> </result></pre> <p>Note: errorCode definition refer to chart 3.</p> <p>If succeeded, need return an array of <tokens>elements</p>			
Function definition	<pre>public String getMaxPowerLimitToken (String meterNo, String Sgc,int tarrifIndex, int keyVersion, int keyExpiredTime , long keyNo, int seq , int activatingModel, String date int[] maxPowerLimits, int[] hours) { ... }</pre>			

3.2.4.4 Generate Setup Single Tariff Token

Functionality	To get the Setup Single Tarrif Token			
Application	To set up single tarrif			
Function name	getSingleTariffToken			
Parameter list	Parameter name	Type	Scope or length	Description
	meterNo	String	String of 12 numbers	MeterNo.

	sgc	String	String of 6 numbers	Supply group code
	tariffIndex	Int	1-99	Tariff index
	keyVersion	Int	1-9	Key version
	keyExpiredTime	Int	0-255	Key expire time
	keyNo	Long	0-65535	Key Sequence
	seq	Int	1-255	Token Sequence
	activatingDate	String	YYYY-MM-DD	Active date Change Date type to String type: adapt to all kinds development languages
	activatingModel	Int	0-1 0: Normal Mode 1: Immediately switch mode	Active Mode always 1.
	validate	Int	0-7	Validate always 0.
	rate	Int	1-8191 (scale&unit: 0.01TK) By the integer bits and fractional bits, up to two decimal places, the maximum rate of price can be set to 81.91	Unit price
Return value	Return XML String Xml format: <?xml version="1.0" encoding="UTF-8"?> <result>			

	<pre> <errorCode></errorCode> <tokens> <token></token> ... <token></token> </tokens> </result> </pre> <p>Note: errorCode definition refer to chart 3.</p> <p>If succeeded, need return an array of <tokens>elements</p>
Function definition	<pre> public String getSingleTariffToken(String meterNo, String Sgc, int tarrifIndex, int keyVersion, int keyExpiredTime , long keyNo, int seq, String activatingDate, int activatingModel,int validDate, int rate) { ... } </pre>

3.2.4.5 Generate Setup Step Tariff Token

Functionality	To get the Setup Step Tarrif Token			
Application	To set up step tarrif			
Function name	getStepTariffToken			
Parameter list	Parameter name	Type	Scope or length	Description
	meterNo	String	String of 12 numbers	MeterNo.
	sgc	String	String of 6 numbers	Supply group code
	tariffIndex	int	1-99	Tariff index
	keyVersion	int	1-9	Key version
	keyExpiredTime	int	0-255	Key expire time

	keyNo	long	0-65535	Key Sequence
	seq	int	1-255	Token Sequence
	activatingDate	String	YYYY-MM-DD	Active date Change Date type to String type: adapt to all kinds development languages
	validate	int	0-7	Effective date
	activatingModel	Int	0-1 0: Normal Mode 1: Immediately switch mode	Effective Mode Always 1
	rates	int[]	Length 4 1-8191(scale&unit: 0.01TK) By the integer bits and fractional bits, up to two decimal places, the maximum rate of price can be set to 81.91	Price array
	steps	int[]	1-4096 (the max array length :8) scale&unit:1 kWh	Step array
Return value	Return XML String Xml format: <?xml version="1.0" encoding="UTF-8"?> <result> <errorCode></errorCode> <tokens> <token></token> ... <token></token>			

	<p><tokens></p> <p></result></p> <p>for example:</p> <p>0-100 kWh rate: 2.3TK</p> <p>100-200kWh rate: 2.7TK</p> <p>200-300kWh rate: 3.2TK</p> <p>300-∞ rate: 4.5TK</p> <p>rate[]={2.3,2.7,3.2,4.5}</p> <p>steps[]={100,200,300}</p> <p>If succeeded, need return an array of <tokens>elements</p>
Function definition	<pre>public String getStepTariffToken(String meterNo, String Sgc, int tarrifIndex,int keyVersion, int keyExpiredTime, long keyNo, int seq,String activatingDate, int activatingModel, int validDate, int[] rates, int[] steps) { ... }</pre>

3.2.4.6 Generate Setup TOU Tariff Token

Functionality	To get the Setup TOU tariff Token			
Application	To set up TOU tariff			
Function name	getTOUTariffToken			
Parameter list	Parameter name	Type	Scope or length	Description
	meterNo.	String	String of 12 numbers	MeterNo.
	Sgc	String	String of 6 numbers	Supply group code
	tariffIndex	Int	1-99	Tariff index
	keyVersion	Int	1-9	Key version

	keyExpiredTime	Int	0-255	Key expire time
	keyNo	long	0-65535	Key Sequence
	Seq	int	1-255	Token Sequence
	activatingDate	String	YYYY-MM-DD	Active Date Change Date type to String type: adapt to all kinds development languages
	activatingModel	Int	0-1 0: Normal 1: Immediately switch mode	Active Mode always 1.
	validate	Int	0-7	Effective Date
	rates	Int[]	Length 4 1-8191 (scale&unit: 0.01TK) By the integer bits and fractional bits, up to two decimal places, the maximum rate of price can be set to 81.91	Price
	times	int[]	Length 2 0-23	Hours period
Return value	Return XML String Xml format: <?xml version="1.0" encoding="UTF-8"?> <result> <errorCode></errorCode>			

	<pre> <tokens> <token></token> ... <token></token> </tokens> </result> </pre> <p>Note: errorCode definition refer to chart 3.</p> <p>If succeeded, need return an array of <tokens>elements</p>
Function definition	<pre> public String getTOUtariffToken(String meterNo, String Sgc, int tarrifIndex,int keyVersion, int keyExpiredTime, long keyNo, int seq,String activatingDate, int activatingModel, int validDate, int[] rates, int[] times) { ... } </pre>

3.2.4.7 Generate Setup friendly mode Token

Functionality	To get the Setup Friendly Mode Token			
Application	To set up friendly mode			
Function name	getFriendModeToken			
Parameter list	Parameter name	Type	Scope or length	Description
	meterNo	String	String of 12 numbers	MeterNo.
	Sgc	String	String of 6 numbers	Supply group code
	tariffIndex	int	1-99	Tariff index
	keyVersion	int	1-9	Key version
	keyExpiredTime	int	0-255	Key expire time
	keyNo	long	0-65535	Key Sequence
	seqNo	int	1-255	Token Sequence
	friendMode	int	0-1	Friendly mode

			0: friendly mode is enable 1:friendly mode is closed	
	Times	int[]	0-23 (array length :2)	Friendly time interval
	Days	int[]	0-6 means Saturday, Friday, Thursday, Wednesday, Tuesday, Monday and Sunday in sequence. (array length :7)	Weekly holiday Array value 0 means weekend and 1 means ordinary day
	N_of_allowable_days	int	0-99	No of allowable days that friendly hour will work after that without vending meter will not work in friendly hour
Return value	<p>Return XML String</p> <p>Xml format:</p> <pre><?xml version="1.0" encoding="UTF-8"?> <result> <errorCode></errorCode> <tokens> <token></token> ... <token></token> </tokens> </result></pre> <p>Note: errorCode definition refer to chart 3.</p> <p>If succeeded, need return an array of <tokens>elements</p>			

Function definition	<pre> public String getFriendModeToken(String meterNo, String Sgc, int tariffIndex, int keyVersion, int keyExpiredTime , long keyNo, int seqNo, int friendMode, int[] times, int[] days) { ... } </pre>
----------------------------	---

3.2.4.8 Generate Switch Meter Mode Token

Functionality	To get Switch Meter Mode Token			
Application	To set up switch meter mode			
Function name	getChangeMeterModeToken			
Parameter list	Parameter name	Type	Scope or length	Description
	meterNo	String	String of 12 numbers	MeterNo.
	Sgc	String	String of 6 numbers	Supply group code
	tariffIndex	int	1-99	Tariff index
	keyVersion	int	1-9	Key version
	keyExpiredTime	int	0-255	Key expire time
	keyNo	long	0-65535	Key Sequence
	seqNo	int	1-255	Token Sequence
	mode	int	0-1 0:switch to the ordinary meter mode; 1:switch to the pre-paid meter mode	Meter mode switch
Return value	Return XML String Xml format: <?xml version="1.0" encoding="UTF-8"?>			

	<pre> <result> <errorCode></errorCode> <tokens> <token></token> ... <token></token> </tokens> </result> </pre> <p>Note: errorCode definition refer to chart 3.</p> <p>If succeeded, need return an array of <tokens>elements</p>
Function definition	<pre> public String getChangeMeterModeToken(String meterNo, String Sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo, int mode) { ... } </pre>

3.2.4.9 Generate SetCreditAmountLimitAndOverdrawAmountLimitToken

Functionality	To get set credit amount limit and overdrawAmountLimit Token
Application	To set credit amount limit and overdrawAmountLimit.
Function name	getSetCreditAmountLimitAndOverdrawAmountLimit

Parameter list	Parameter name	Type	Scope or length	Description
	meterNo	String	String of 12 numbers	MeterNo.
	Sgc	String	String of 6 numbers	Supply group code
	tariffIndex	Int	1-99	Tariff index
	keyVersion	Int	1-9	Key version
	keyExpiredTime	Int	0-255	Key expire time
	keyNo	Long	0-65535	Key Sequence
	seqNo	Int	1-255	Token Sequence
	amountType	Int	0-1 0: creditAmountLimit 1: overAmountLimit	Balance Type
	amountLimit	Int	0~99999999 (scale&unit:0.01TK)	Amount
Return value	<p>Return XML String</p> <p>Xml format:</p> <pre><?xml version="1.0" encoding="UTF-8"?> <result> <errorCode></errorCode> <tokens> <token></token> ... <token></token> </tokens> </result></pre> <p>Note: errorCode definition refer to chart 3.</p> <p>If succeeded, need return an array of <tokens>elements</p>			
Function definition	<pre>public String getSetCreditAmountLimitOrOverdrawAmountLimitToken (String meterNo, String Sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, int seqNo, int amountType, int amountLimit)</pre>			

	<pre>{ ... }</pre>
--	----------------------

3.2.4.10 Generate Logoff Token

Functionality	To get reset Token			
Application	To reset meter			
Function name	generateLogoffReturnToken			
Parameter list	Parameter name	Type	Scope or length	Description
	meterNo	String	String of 12 numbers	MeterNo.
	Sgc	String	String of 6 numbers	Supply group code
	tariffIndex	Int	1-99	Tariff index
	keyVersion	Int	1-9	Key version
	keyExpiredTime	Int	0-255	Key expire time
	keyNo	Long	0-65535	Key Sequence
	seqNo	Int	1-255	Token Sequence
Return value	Return XML String Xml format: <?xml version="1.0" encoding="UTF-8"?> <result> <errorCode></errorCode> <tokens> <token></token> ...			

	<pre> <token></token> <tokens> </result> Note: errorCode definition refer to chart 3. If succeeded, need return an array of <tokens>elements </pre>
Function definition	<pre> public String generateLogoffReturnToken (String meterNo, String Sgc, int tariffIndex, int keyVersion, int keyExpiredTime, int keyNo, int seqNo) { ... } </pre>

3.2.4.11 Generate Credit/ Management Return Token

Functionality	To get return Credit/Management Return Token			
Application	User should get the return token before credit Return ,and send the meter information to the electricity sale system, or else the electricity sale system will not sale electricity to user ,it will helpful for subsequent management.			
Function name	resolveReturnToke			
Parameter list	Parameter name	Type	Scope or length	Description
	meterNo	String	String of 12 numbers	Meterno.
	Sgc	String	String of 6 numbers	SGCID
	tariffIndex	int	1-99	Tariff index
	keyVersion	int	1-9	Key version
	keyExpiredTime	int	0-255	Key expire time
	keyNo	long	0-65535	Key Sequence
	Token	String	Custom defined by each manufacturers	Token encryption character String

Return value

Return XML String

Xml format:

```
<?xml version='1.0' encoding='utf-8'?>
<result>
  <type>0</type>
  <balance>454.54</balance>
  <sequence>6</sequence>
  <event>
    <clockSetFlag>1</clockSetFlag>
    <batteryVoltageLowFlag>0</batteryVoltageLowFlag>
    <openCoverFlag>0</openCoverFlag>
    <openBottomCoverFlag>1</openBottomCoverFlag>
    <byPassFlag>0</byPassFlag>
    <reverseFlag>0</reverseFlag>
    <magneticInterfereFlag>0</magneticInterfereFlag>
    <relayStatusFlag>1</relayStatusFlag>
    <relayFaultFlag>0</relayFaultFlag>
    <overdraftUsedFlag>0</overdraftUsedFlag>
    <forwardActiveEnergyTol>11.23</forwardActiveEnergyTol>
    <tariffIndex>51</tariffIndex>
  </event>
</result>
```

Note:If token resolve fail then return null.

Return returnTokens:

Parameter	Scope of Length	Description
Type	0-1 0:credit return token 1:logoff return token	
Balance		Balance of meter
Sequence	0-1	Sequence of meter

		0:credit return token 1:logoff return token	
	clockSetFlag	0-1 0:unhappen 1:happen	Clock set event
	batteryVoltageLowFlag	0-1 0:unhappen 1:happen	Battery low voltage event
	openCoverFlag	0-1 0:unhappen 1:happen	Meter cover open event
	openBottomCoverFlag	0-1 0:unhappen 1:happen	Terminal cover open event
	byPassFlag	0-1 0:unhappen 1:happen	Bypass event
	reverseFlag	0-1 0:unhappen 1:happen	Reverse event
	magneticInterfereFlag	0-1 0:unhappen 1:happen	Magnetic interference event
	relayStatusFlag	0-1 0:connect 1:disconnect	Relay status
	relayFaultFlag	0-1 0:unhappen 1:happen	Relay fault event

	overdraftUsedFlag	0-1 0:no 1:yes	Emergency balance used or not
Function definition	<pre>public String resolveReturnToken (String meterNo, String Sgc, int tarrifIndex, int keyVersion, int keyExpiredTime, long keyNo, String Token) { ... }</pre>		

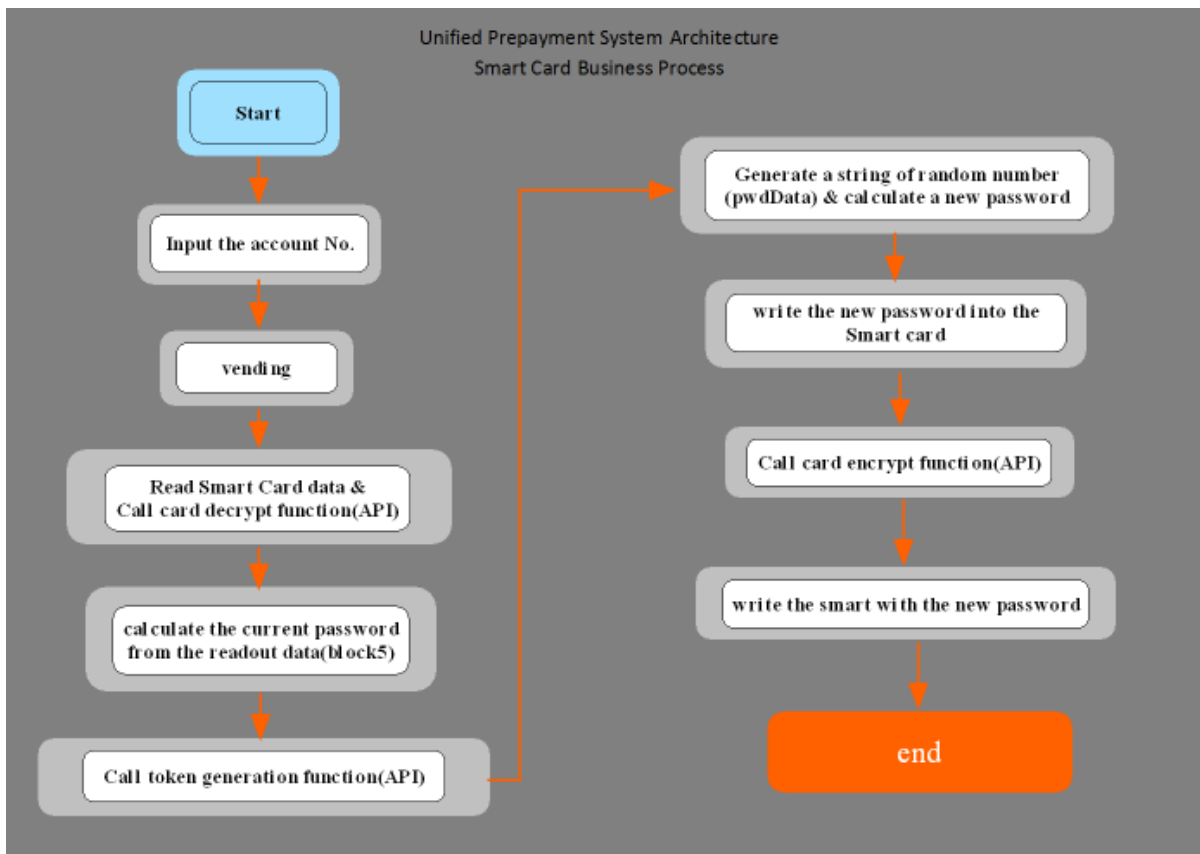
3.2.5 Test Function Interface Define

Functionality	To get test Token			
Application	To manage the user meter test and display, call the function and generate the test token.			
Function name	getTestToken			
Parameter list	Parameter name	Type	Scope or length	Description
	ManufacturingID	Int	2 numbers	Manufacturer code Hexing:14
	control	Int	0 : test all the contents 1 : test relay 2 : test LCD display 3 : teat total energy 4 : test max power limit 5 : display current meter status 6 : display current power 7: display meter version number 8: display current tariff unit price 9: display overload current limit 10: display credit numbers 11: display serial number of meter 12: display off numbers of relay 13: enter into accuracy test mode 18-36: save	Test token type
Return value	Return XML String Xml format: <?xml version="1.0" encoding="UTF-8"?> <result> <errorCode></errorCode>			

	<pre> <tokens> <token></token> ... <token></token> </tokens> </result> </pre> <p>Note: errorCode definition refer to chart 3. If succeeded, need return an array of <tokens>elements</p>
Function definition	<pre> public String getTestToken (int manufacturingID, int control) { ... } </pre>

4 Functionality of Read and Write With Card

Smart Cardbusiness process



4.1 Smart Card Data Format

<i>Data</i>	<i>Bytes</i>	<i>Memory Address (Bytes)</i>
Non Encrypted Data		
Answer To Reset	4	0-4

Binary Pattern	2	4-6
Version	1	6-6
Meter ID	10	7-16
Consumer ID	10	17-26
Utility ID	6	27-32
Sanctioned Load	6	33-38
Meter Type	1	39-39
Sanctioned Load exceeded	2	40-41
Last Recharge Amount	4	42-45
Last Recharge Date	3	46-48
Last Transaction ID	10	49-58
Encrypted Data as Generated by the Meter Manufacturer SDK/API		
The following Data must exist within the encrypted Data: <u>Data To Meter:</u> Meter ID Consumer ID Utility ID Tokens Credit Token Management Token Test Token <u>Data From Meter:</u> Tamper Status RTC Status LR Status Usage Data for the last 6 months individually Month Year KWh Taka Recharged Taka Used Average Power Reactive Power Maximum Power Volt Ampere KWh in Peak KWh in Offpeak KVarh in Peak KVarh in Offpeak Total charge in Peak Total charge in Offpeak Number of power failures Number of time sanctioned load exceeded	940	100-1024

Tamper		
Number of times tampered		
Date/Time of Tamper		
Retrun Token		

5 GPRS Meters Connection Platform Design

5.1 Concept Description of MIC Communication Access

Smart GPRS meters communicate with MIC using XML format based on TCP. It will use encryption and digital signature technical in TCP linker layer, and in data area of XML document, follow the standard DLMS protocol.

XML Communication Protocol Define

XML Format Define

```
<?xml version='1.0'?>
<h:rt xmlns h='ProtocolHead'>
<h:pv>1</h:pv>
<h:addr>030140000170</h:addr>
<h:dir>down</h:dir>
<h:pt>1</h:pt>
<h:fc>3</h:fc>
<h:seq>7</h:seq>
<h:e>10</h:e>
<h:a>0</h:a>
<h:r>4858451100000000000000007</h:r>< h:d>
0A15CEDF16.....0A15CEDF16
</h:d>
<h:sg>0203</h:sg>
</h:rt>
```

XML Label Description:

All data of XML should be transferred using ASCII code.

Protocol Presentation	Protocol Description	Note
<? xml version='1.0' ?>	XMLfixed head format	
<h:rt xmlns h='ProtocolHead'>	To name the space under root element.Protocol Head means the first layer of protocol.	
<h:pv>1</ h:pv>	XMLprotocol internal version number of company.	

	1: the first version	
< h:f>100000000</h:f>	Address of transmit end, the label means which transmit end the data come from. The address will be 1 if the transmit end is master station; The address will be meter address if the transmit end is meter, whose length is not fixed and the max length is 32 pcs ASCII code.	
<h:dir>down</h:dir>	The direction of transmission. up: meter to server down: server to meter	
<h:pt>1</h:pt >	Data transport protocol in data area. 1: DLMS transport protocol 2: XML transport protocol (Company will develop in the future, as the second stage)	
<h:fc>1</h:fc>	Function code: it is mainly for front-end processor distinguishes the data types. When front-end processor doesn't analysis the data or decrypt the encrypted data, it can response the frame transmitted from the meters. At the same time, the label can distinguish who is the transmit end. 1: Link interface test(meter launches) 2: Link interface test response frame(master station responses) 3: Request – response frame (master station responses) 4: Request—confirm/deny frame (master station responses) 5: Report initially- confirm/deny frame (meter launches) 6: Report initially confirm frame needed (meter launches) 7: Report initially confirm frame needless (meter launches) 8: business password refresh (master station launches) 9: manufacturer request (mainly for upgrade remotely) (master station launches) 10: manufacturer respond (mainly for upgrade remotely)) (master station launches)	
< h:seq>3< h:seq>	XML frame serial number, for defining which response frame was responded by the response end. The frame serial number is changed by primary end, it will add 1 when primary end launches one frame of message. The range of variation can be 0-99. Driven end regards the frame serial number of primary end as the response frame serial number.	

	<p>After messages transmitted by starting end, when the responded can't be received timely , the serial number of retransmission will be same if the starting end allows retransmission, and the max retransmission numbers is 3;</p> <p>2) If the driven end receives two starting frame with the same serial number in series, it means the response hasn't been received yet, then retransmission(and without dealing with the message again);</p> <p>3) If starting end receives two response frames with the same serial number in series, then will not deal with the second response frame.</p>	
< h:e>10</h:e>	<p>Data encryption algorithm</p> <p>00: without using encryption algorithm , data transmitted using plaintext form</p> <p>10: AES-128 In GCM Mode</p> <p>11: AES-192</p> <p>12: AES-256</p> <p>20: DES</p> <p>30: SHA</p> <p>40: ECC</p>	
< h:a>1</h:a>	<p>Verify algorithm</p> <p>0: without using verify</p> <p>1: SHA-256</p>	
< h:r>4827762</h:r>	<p>Random number. The starting end will regard the random number as vector to encrypt the data area, the receiving end will regard the random number as vector to decrypt the data area. It has 12 bytes, as 24 bytes HEX character String in XML.</p>	
< h:d >123456< /h:d >	<p>Data area, if without using encryption algorithm, the flag is plaintext ; if using encryption algorithm, the flag is the plaintext will be encrypted.</p>	
<h:sg>0203<h:sg>	<p>When without using verify, the flag is useless; when using verify, the flag is verify code for plaintext of data area.</p>	
</h:rt>	<p>XML end flag.</p>	

5.2 Function Code Description:

Link interface test: the function is distinguished in data area.

01: log in

02: quit

03: heartbeat

Link interface test response frame: the function is distinguished in data area.

01: log in

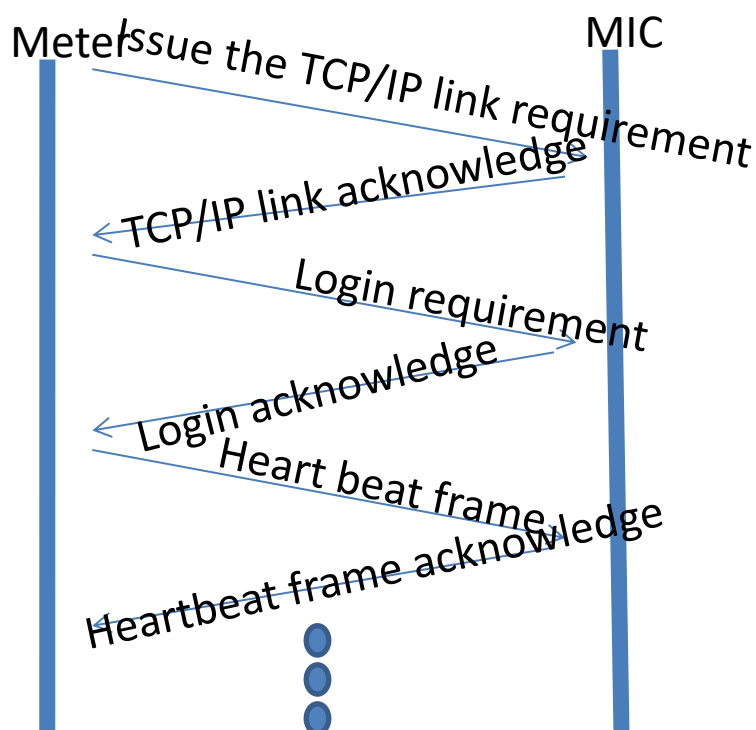
02: quit

03: heartbeat

In this system, meters as client side, MIC as server side, link build , log in request and heartbeat are transmitted by meters , and responded by MIC.

Log in frame: For transmitting a group of specific data to the MIC and confirming the link chaining relationship with master station , after meters connected with master station in TCP/IP.

Heartbeat frame: For transmitting a group of data to maintain the TCP/IP link chaining .



Request – response frame

Request – response frame is the request frame transmitted from master station and the response frame responded by meters.

The correct response means in XML layers, encryption and decryption runs correct or other data to be tested are correct, without including part or all deny for DLMS frames in DLMS layers.

Request- confirm\deny frame

Request- confirm\deny frame is the deny frame responded to the master station when errors happened on data that meters transmitted to the master station.

It will response confirm frame if the update key request to master station is correct.

Request- confirm\deny frame format:

Confirm frame	Function code:00	
Deny frame	Function code:01	Error code: 01: password error; 02: verify error;03: other error

Report initially-confirm\deny frame

For data meters transmitted to the master station , if need confirmation, front-end processor will using the function code to achieve confirmation and deny for meters.

The format refers to function code 3.

Report initially -confirm frame needed

For data meters reported to the master station initially, if need confirmed , sent according to the function code.

Report initially -confirm frame needless

For data meters reported to the master station initially, if confirmed needless , sent according to the function code.

Business password updated

To update the business password according to the function , sent by master station , encrypted by root key.

Manufacturer request

For self defined commands send from master station to the manufacturers.

Manufacturer response

For self defined commands responded from meters to the manufacturers.

It adopts plaintext transmission mode for data areas of function code 1,2,4,5.

Further information please check<The process of online meter communication >

Annexure –A

Unified Meter Data Collection System Addressing System

1. Introduction

1.1 Brief Introduction

The system interface architecture of the device is shown in the following figure; the electric energy meter, concentrator and front end system are simplified into several interfaces marked with correspondent code name respectively;

System Architecture



Device functions & Interoperability Interfacing Requirements are composed of 3 parts, including:

Package 0: Addressing System

Package 1: DCU to HES

Package 2: Meter Modeling

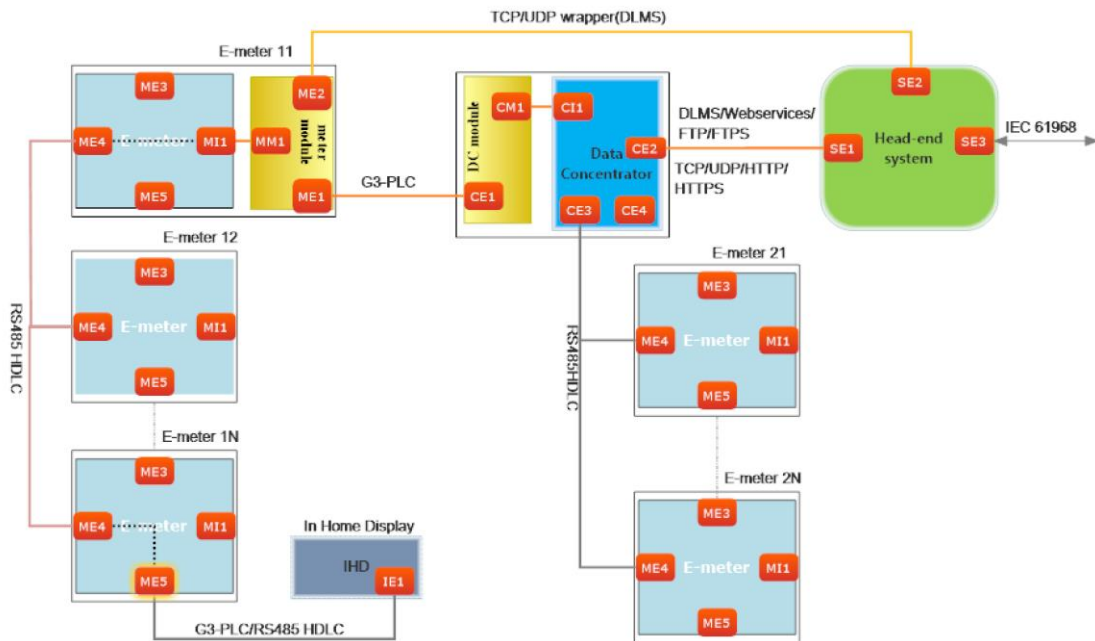
1.2 Reference Documents

Name
Blue_Book_12th_edition
Green_Book_8th_edition
Object_defs_v3.1_161215
White GlossaryOf DLMS COSEM Terms

2. Communications Architecture

The following diagram describes the communication architecture between HES, concentrator / collector, electricity energy meter and In Home Display unit;

System Architecture



2.1 Description of customer / server side architecture

The data exchange between the data acquisition system and the collected equipment, should refer to the communication mode of the client / server AP specified by DLMS. The client AP initiates the access request and the server AP responds, which is a question and answer communication mechanism; and the role of server AP is specified to be assumed by the meter or module.

By means of access management, one server AP can exchange data with one or more clientAPs at the same time, and a client AP can also access one or more server APs at the same time.

In addition to the normal question and answer mechanism, if there are abnormal events in the server AP, the event can be reported through the prescribed format.

The three-layer architecture of DLMS is shown in the following figure:

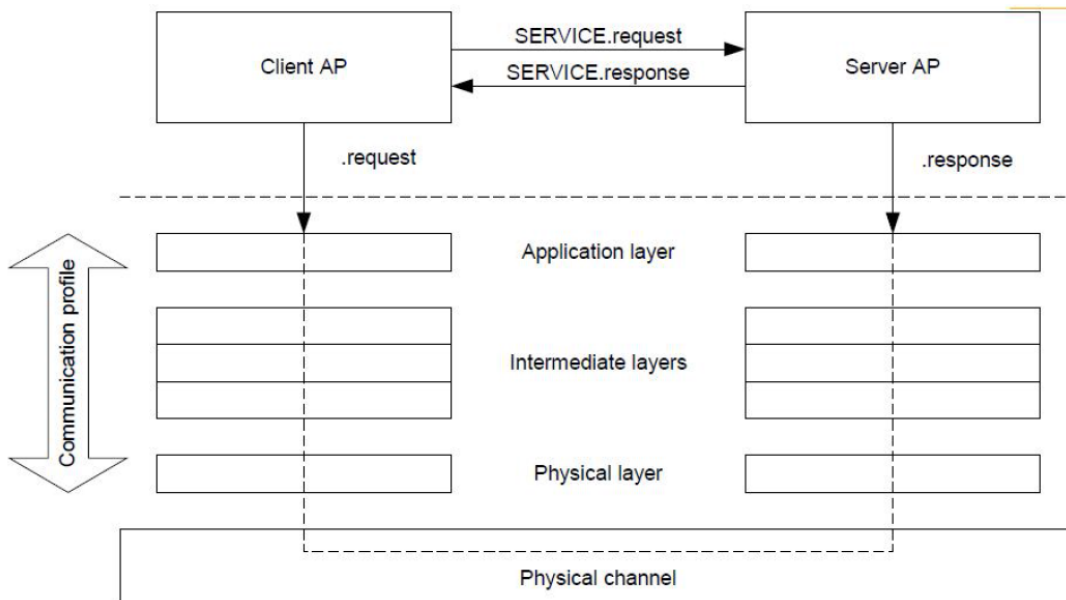


Figure 2 – Client/server relationship and protocols

Level 1: Physical Device Layer

Level 2: Logical Device Layer/ Intermediate Layer

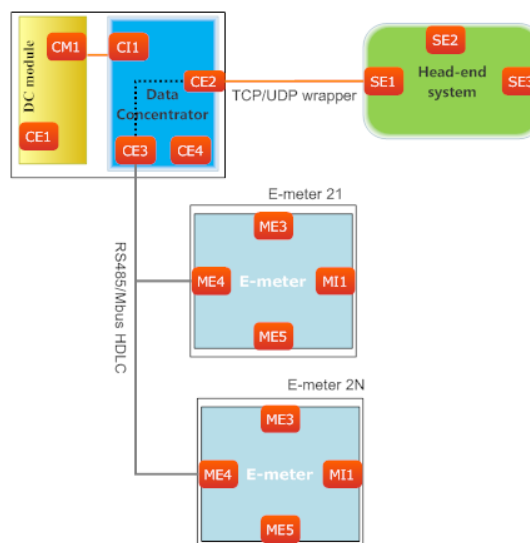
Level 3: COSEM Application Layer

2.2 Communication Structure Type

AMI system **client AP**-> **server AP**, there are six types in communication structure;

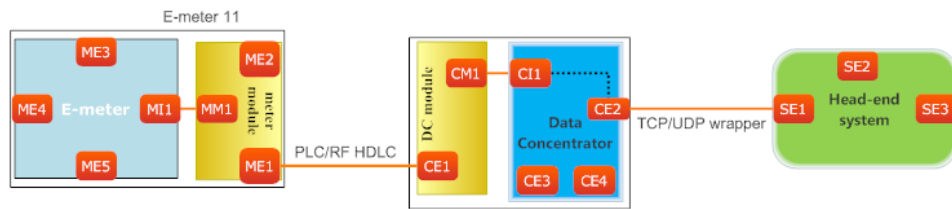
1. SE1(HES)->CE2(Data Concentrator/Collector)->CE3/CE4(Data Concentrator/Collector)->ME4(Electricity Energy Meter COSEM)

Addressing From I



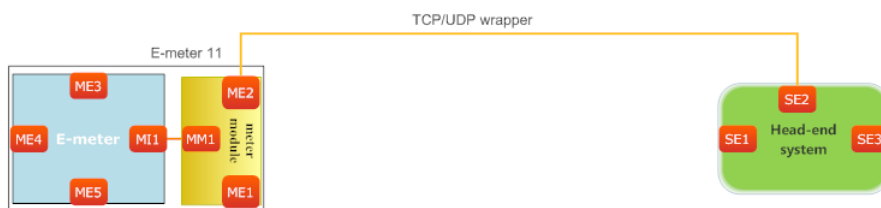
2. SE1(HES)->CE2(Data Concentrator/Collector)->CI1(Data Concentrator/Collector)->CE1(Data Concentrator/Collector) ->ME1(Electricity Energy Meter Communication Module)->MI1(Electricity Energy Meter COSEM)

Addressing From II



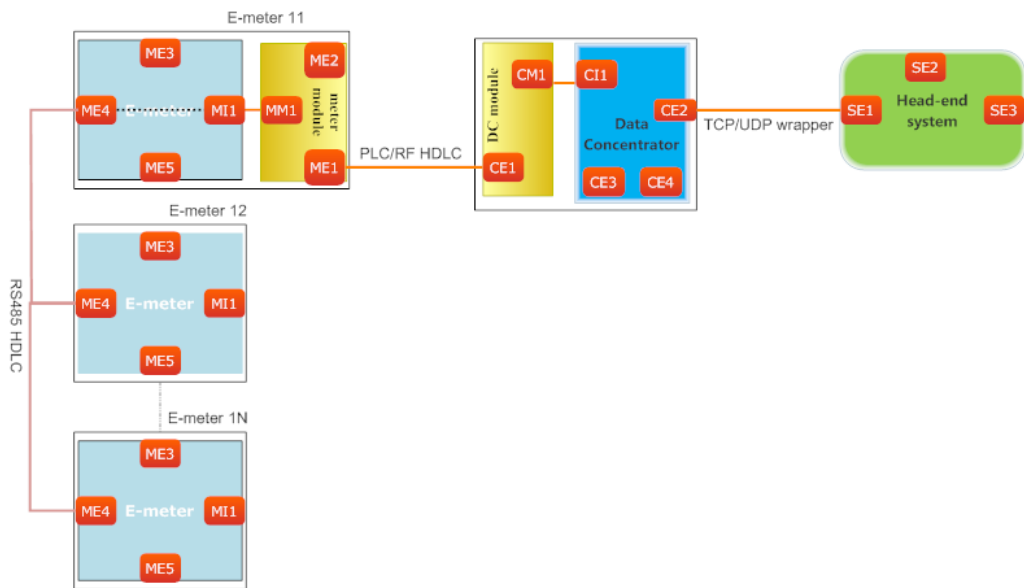
3. SE2(HES)->ME2(Electricity Energy Meter Communication Module)->MI1(Electricity Energy Meter COSEM)

Addressing From III



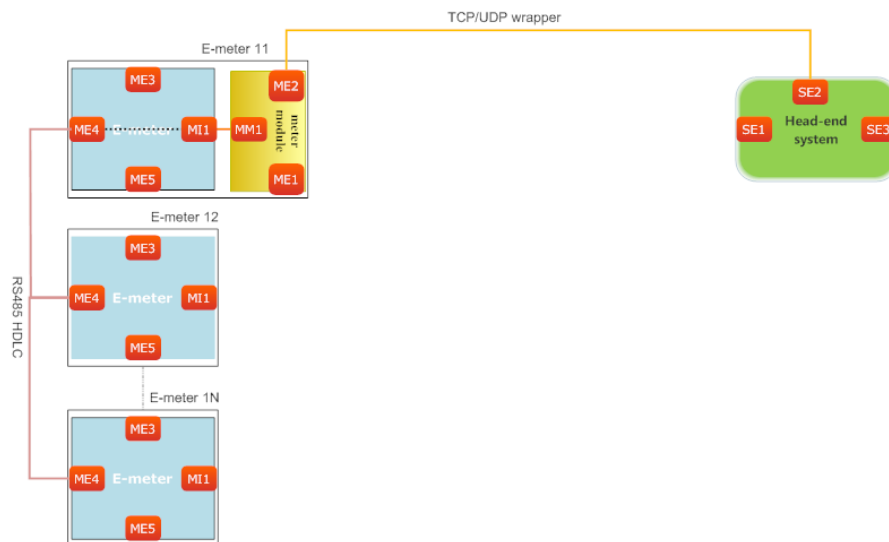
4. SE1(HES)->CE2(Data Concentrator/Collector)->CI1(Data Concentrator/Collector)->CE1(Data Concentrator/Collector) ->ME1(Electricity Energy Meter Communication Module)->ME4(Electricity Energy Meter COSEM)

Addressing From IV



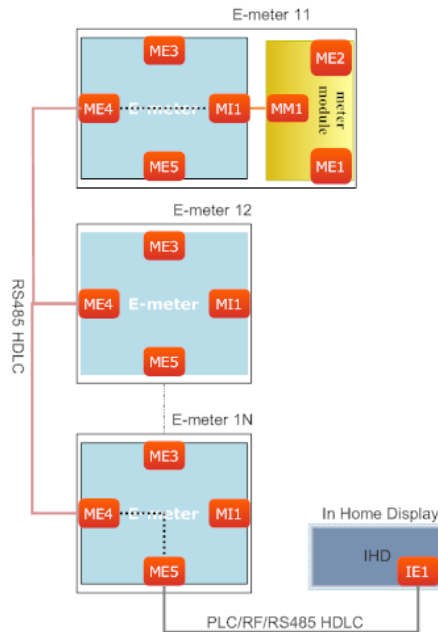
5. SE2(HES)->ME2(Electricity Energy Meter Communication Module)->ME4(Electricity Energy Meter COSEM)

Addressing From V



6. IE1(IHD)->ME5(Electricity Energy Meter IHD Interface)->ME4(Electricity Energy Meter COSEM)

Addressing From VI



2.3 Scope and Addressing Rules

As shown in the addressing system diagram, the range of addressing rules defined in this document mainly includes address assignment at the communication interface level of Wrapper, Gateway protocol and HDLC, and the corresponding conversion rules;

As shown in Chapter 2.2, the AMI system supports six types of typical AMI structures; It should be noted that the actual application is not limited to the above six types of form; Depending on the function changes of the device, the specific structure will change. For example, when the IHD can also serve as a server AP, the data can be forwarded through the ME5 interface via the meter by the data push service, and push it to HES;

In order to ensure the interoperability of the equipment and the unity of the system, for the same interface, no matter what kind of AMI structure is adopted, the way of accessing and addressing is the same.

3. Wrapper

3.1 Wrapper Address Format Description

Wrapper includes version, SSAP, DSAP and LEN, a total of 8 bytes in frame format as follows:

Version	SSAP	DSAP	LEN	COSEM APDU
---------	------	------	-----	------------

■Parameter Description:

Version: 2 bytes, Wrapper version, current version is 0x0001;

SSAP: 2 bytes, represents SAP address of sender;

DSAP: 2 bytes, values range is 0x0001 – 0xFFFF, represents destination address;

LEN: 2 bytes, values range is 0x0000 – 0xFFFF, indicates the byte length of the transmitted COSEM APDU;
 COSEM APDU: communication data content, does not belong to the wrapper category.

4. HDLC

4.1 HDLC Address Format Description

The frame format of HDLC is described here only for the address field as follows:

0x7e	Frame Type and Frame Length	Destination Address Field	Source Address Field	Control Domain	Frame Header Verification	LLC Frame Header	User Data Information	Data Frame Check	0x7e
------	-----------------------------	---------------------------	----------------------	----------------	---------------------------	------------------	-----------------------	------------------	------

The address field is divided into two parts, the destination address field and the source address field.

For the client AP, the destination address is the address of the accessed device (server AP) and the source address is the client AP address.

For the accessed device, it is opposite when replying to the access frame of the client AP. The destination address is the client AP address, and the source address is the address of the accessed device;

The client AP address is defined as 1 byte; the range of values is: 0x00-0x7F; the definition and reference is in the low bytes of the 4.2.1 SSAP client AP address;

The server AP address can support 1 / 2 / 4 bytes lengths, as shown in the following table:

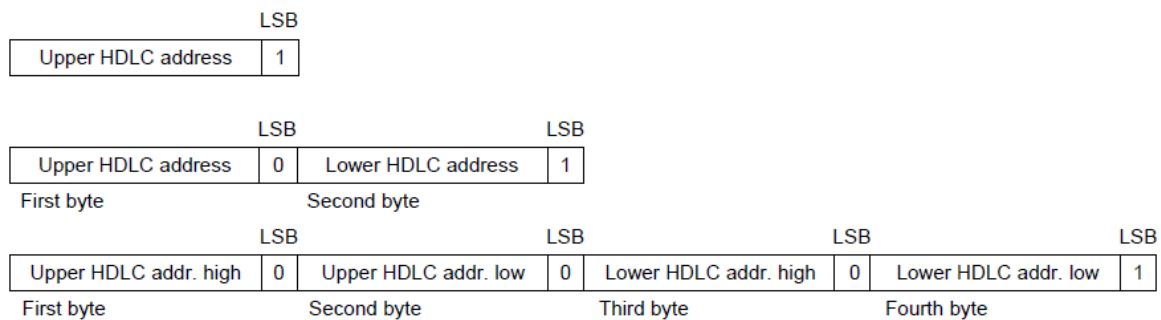


Figure 51 – Valid server address structures

Upper HDLC Address, used to express logical addresses,

Lower HDLC address, used to describe a physical address, 1 or 2 bytes.

Upper HDLC address, used to distinguish different logical devices within the same physical device.

LowerHDLC address cannot appear if not needed. For example, through infrared local access devices, it only needs the default upper HDLC address(0x01) without knowing the physical address.

5. Gateway Protocol

The Gateway protocol is mainly used for gateway devices (concentrator / collector / communication module), transparent forwarding of multilevel networks, as shown in the following figure:

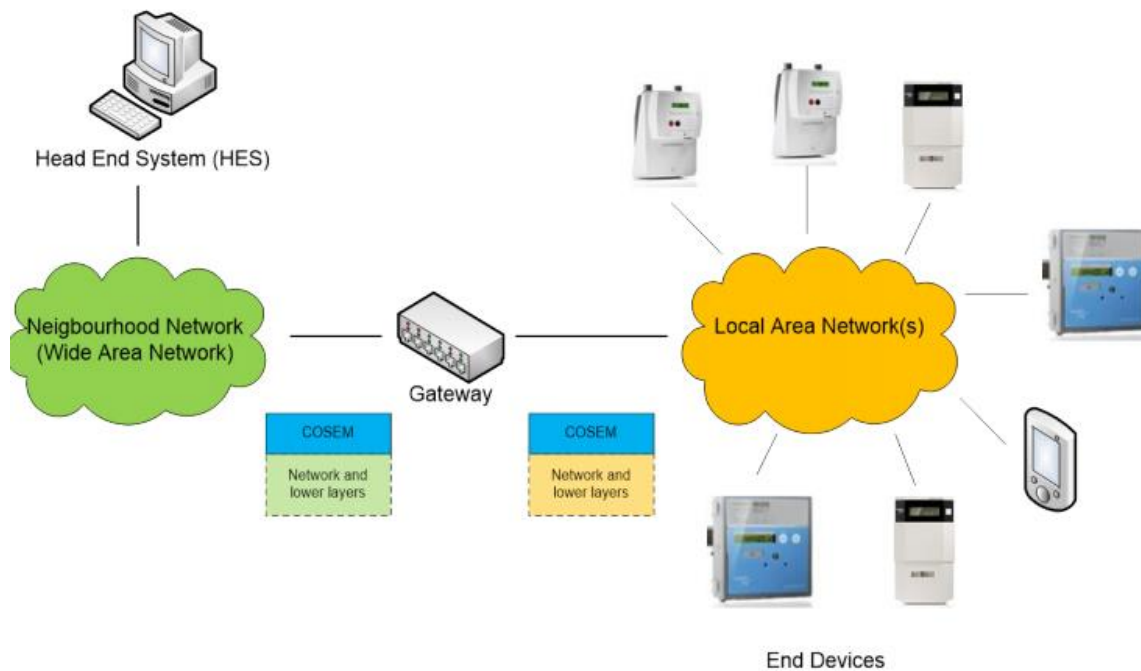


Figure 156 – General architecture with gateway

5.1 Gateway protocol Format Description

The definition of gateway protocol is as follows: Prefix for short;

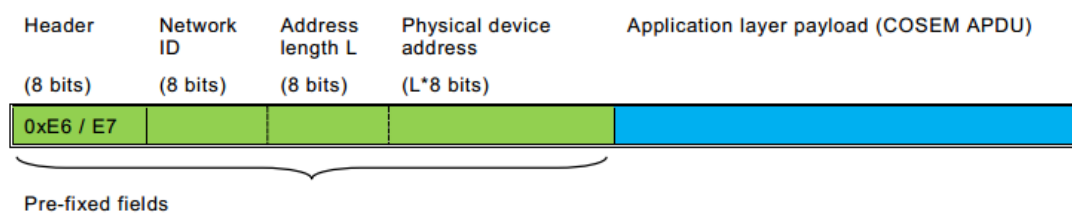


Figure 157 – The fields used for pre-fixing the COSEM APDUs

Parameter Description:

Header: 1 byte, indicating the data transfer direction, 0xE6 is a request or data report frame, 0xE7 is a response frame;

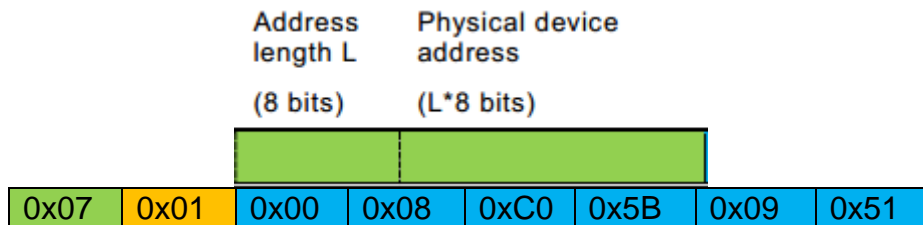
Network ID: 1 byte, network ID, indicating the forwarding of the lower channel number (network number);

Address length: 1 byte, target address length;

Physical device address: N bytes, the physical address of the target, whose length depends on the address length;

COSEM APDU: The communication data content, does not belong to the gateway protocol.

For example: the serial number of the equipment product is: 037586930001, then the physical address of gateway protocol is 0x0008C05B0951;



6. Address Delivery and Conversion Rules

This section mainly defines nesting rules in various level architecture of wrapper, Gateway protocol, HDLC and (APDU)COSEM when device is in forwarding and non-forwarding status.

6.1 Data Frame Nested Format

6.1.1 Non-Forwarding Rule

When the destination device is in the same accessed physical device (non-forwarding device), using the following structure to communicate according to the addressing structure in Chapter 2:

1. Wrapper+COSEM (APDU)

Version	SSAP	DSAP	LEN	COSEM APDU
---------	------	------	-----	------------

Among which, DSAP: $\leq 0x001F$

2. HDLC+COSEM(APDU)

0x7e	Frame Type and Frame Length	Destination Address Field	Source Address Field	Control Domain	Frame Head Check	LLC Frame Head	COSEM (APDU)	Data Frame Check	0x7e
------	-----------------------------	---------------------------	----------------------	----------------	------------------	----------------	--------------	------------------	------

The destination address: upper HDLC address $\leq 0x001F$;

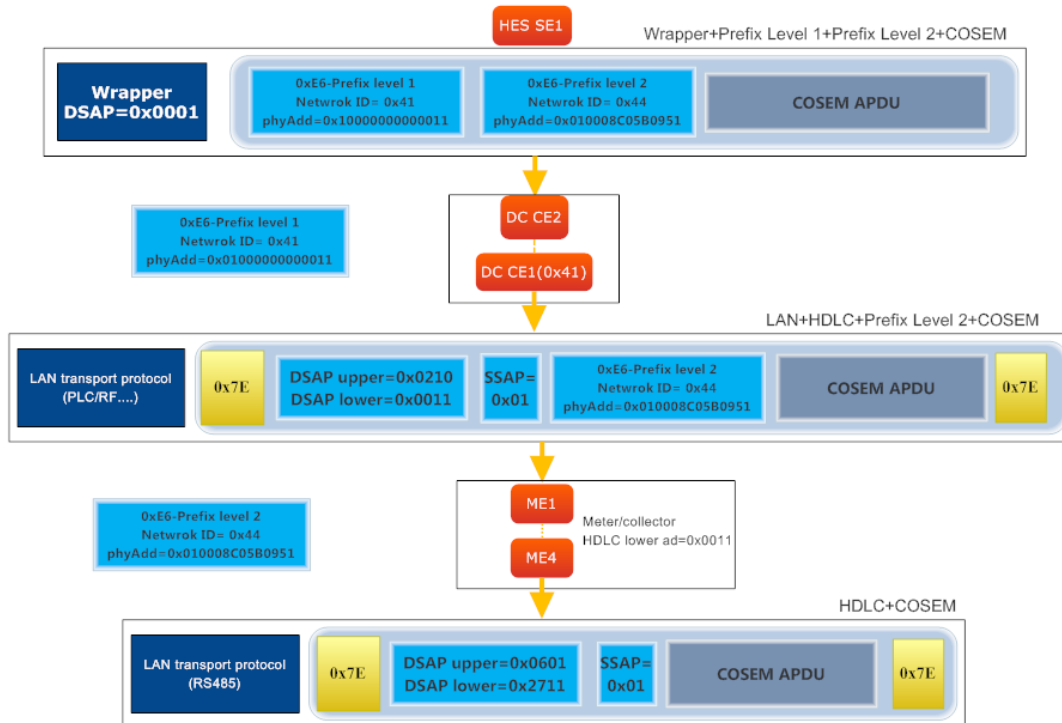
6.1.2 Gateway Protocol Forwarding

The Gateway forwarding is carried out according to the destination channel (network ID) in prefix and the physical address. In this forwarding protocol, the wrapper and HDLC are not nested, and the data domain content of all transmissions is prefix+APDU(COSEM); According to its own channel, the communication device packages MAC and data link layer for data communication;

6.1.2.1 Channel Occupancy Forwarding

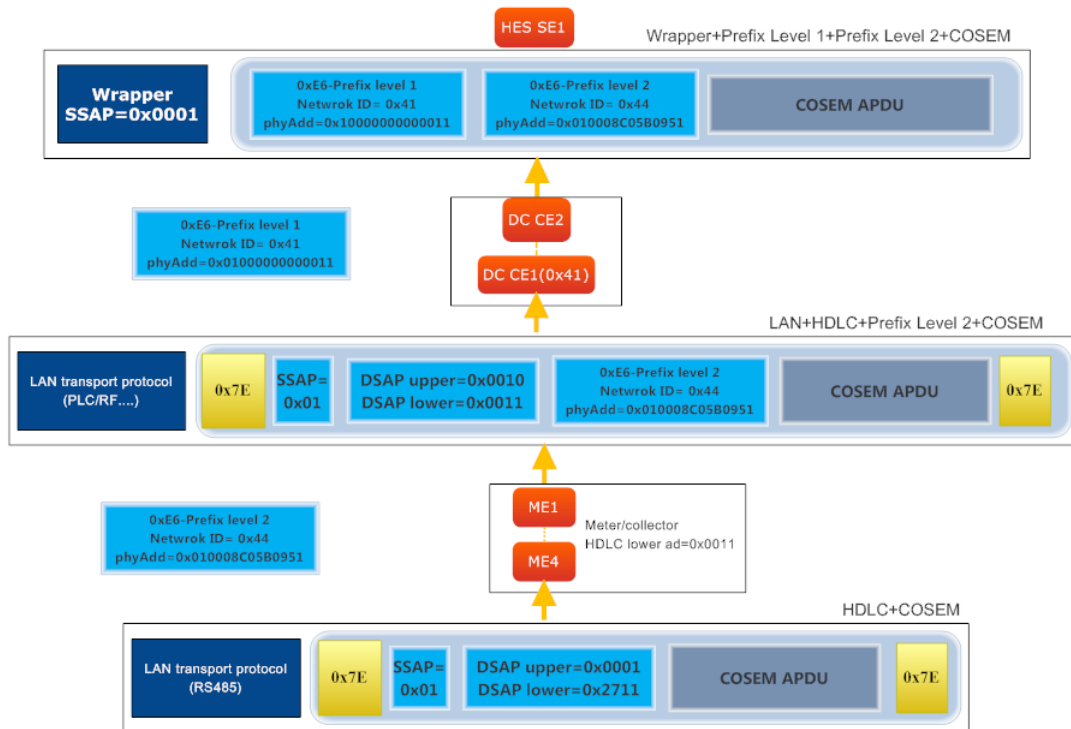
Corresponding to the channel occupancy forwarding, the superior equipment task is in the waiting status, and records and forwards the port information in task status and packs and delivers the data to the first level device after the data replies. Then the channel is released

Gateway Frame Architecture 1



Corresponding to the channel occupancy forwarding, the superior equipment task is in the waiting status, and records and forwards the port information in task status and packs and delivers the data to the first level device after the data replies. Then the channel is released.

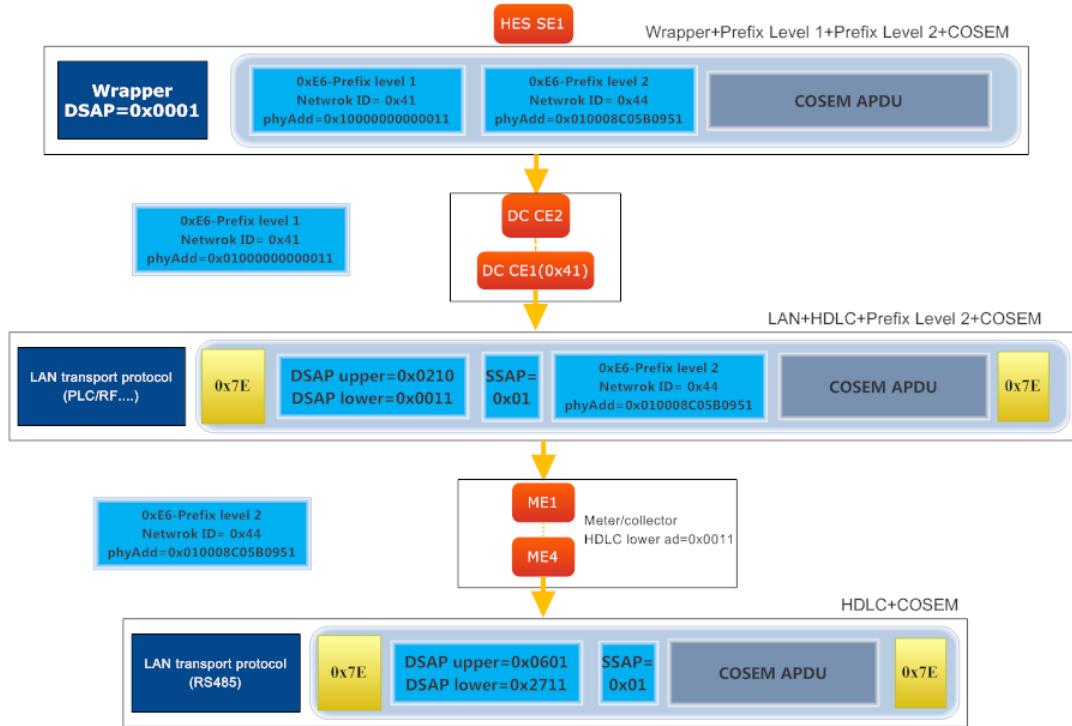
Gateway Frame Architecture 2



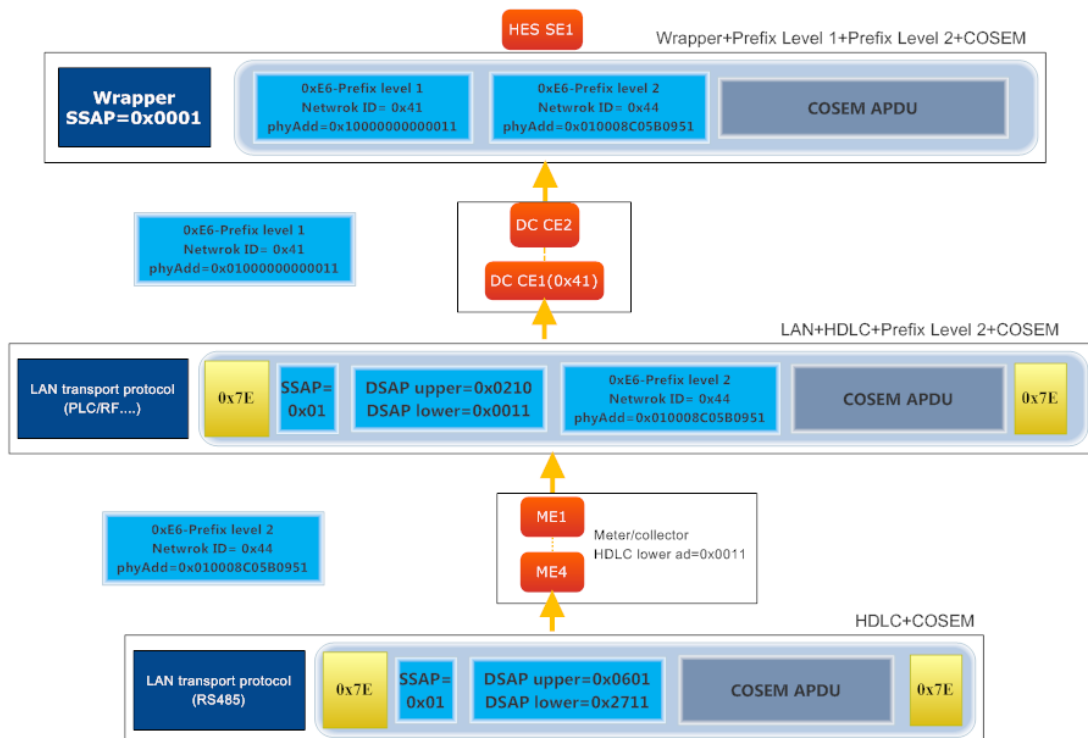
6.1.2.1 Address Conversion Forwarding

During the forwarding process, the forwarding port is marked to the next level of HDLC data frame, the forwarding task does not need to pause the current task of the channel passing through, and there is no need to wait for timeout. After the target replies the data, step by step reply will start according to the marked port number of each level;

Gateway Frame Architecture 3



Gateway Frame Architecture 4



Annexure-B

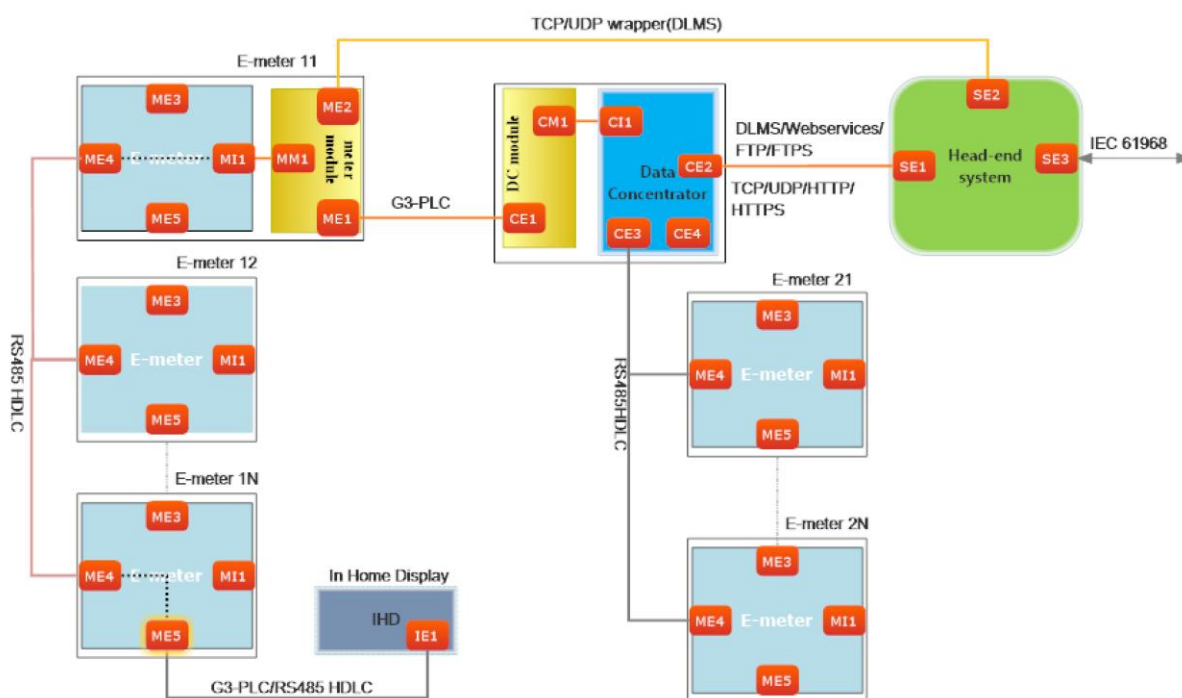
Unified Meter DataCollection System

Meter Modeling

1. Overview

The system interface architecture of the device is shown in the following figure; the electric energy meter, concentrator and front end system are simplified into several interfaces marked with correspondent code name respectively;

System Architecture



Device functions & Interoperability Interfacing Requirements are composed of 3 parts, including:

Package 0: Addressing System

Package 1: DCU to HES

Package 2: Meter Modeling

2. DLMS Client / Server Application Layer Description

2.1 Client / Server Architecture Description

The data exchange between the data acquisition system and the collected equipment, should refer to the communication mode of the client / server AP specified by DLMS. The client AP initiates the access request and the server AP responds, which is a question and answer communication mechanism; and the role of server AP is specified to be assumed by the meter or module.

By means of access management, one server AP can exchange data with one or more client APs at the same time, and a client AP can also access one or more server APs at the same time.

In addition to the normal question and answer mechanism, if there are abnormal events in the server AP, the event can be reported through the prescribed format. The three-layer architecture of DLMS is shown in the following figure::

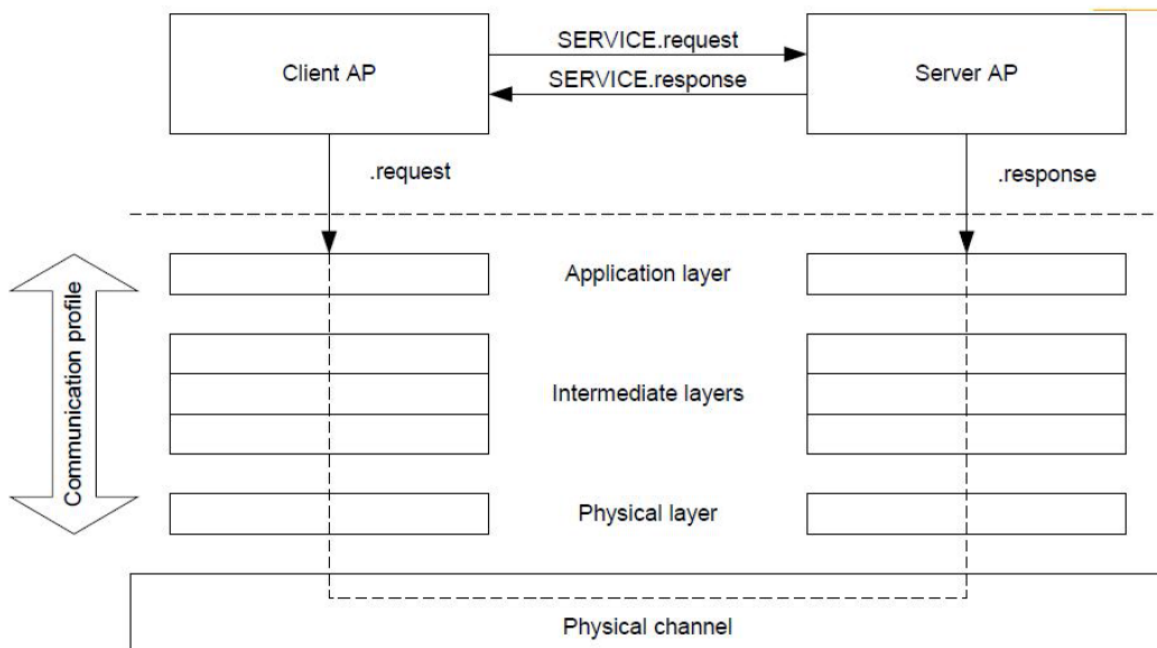


Figure 2 – Client/server relationship and protocols

Level 1: Physical Device Layer

Level 2: Logical Device/Intermediate Layer

Level 3: COSEM Application Layer

The physical device mentioned here may include multiple logical devices (for example, multiple logical devices in one physical device may communicate with different logical device addresses by using the same physical address, so as to be able to access meter or communication Module - two logical devices independently); For the energy meter, base meter, the default address of the logical device is:

ServerSAP = 0x01;

Each logical device has an object representing its logical device name, the default logical device name of OBIS:

(1, 0-0:42.0.0.255, Class ID: 1)

Each logical device supports up to 5 types of COSEM clients based on different communication interfaces and project requirements:

- Public Client (SAP: 016)
- Pre-established Client (SAP: 102)
- Management Client (SAP: 001)
- Reading Client (SAP: 002)
- Module Client (SAP: 096)

Public client (SAP: 016); Without any security level protection, it can only read the most basic information about the device, such as serial number, logical device name, SAP support list, etc .; can not program or set.

Pre-link client (SAP: 102); does not need to establish application layer connection; pre-link client link has been there, can not be disconnected, mainly is used to improve the reading efficiency of remote communications. In addition to pre-link and

module client, all other clients need to establish application-layer connection through AARQ; support for reading of necessary data items and programming of a small amount of data.

Management Client (SAP: 001); has administrator rights to operate the electricity meter, can do all the operations.

Read client (SAP: 002); for reading data locally and remotely, able to read almost all data items, but without programming and setting permissions.

Module client (SAP: 096); MI1 interface for data exchange between the meter and the module, pre-link, can read and program some module-related data items; only the MI1 interface supports this client

Client	Functions	Descriptions
Public Client	Read the basic data	Used for local and remote communication; Security level: No security certification Establish the connection via AARQ
Pre-link Client	Read and set some specified data items	Used for remote communication, pre-link, security certification is not required;
Management Client	Own all the administrator permissions for the read/write/action	Used for local and remote communication Security level: HLS (LLS) Establish the connection via AARQ
Read Client	Used for data reading	Used for local and remote communication Security level: HLS (LLS) Establish the connection via AARQ
Module client	User built-in module access the meter quickly	Used for MI1 pre-link, security certification is not required;

2.2PDU maximum size (ServerMaxReceivePduSize)

Electricity Meter, the default maximum negotiated APDU size is 1024 bytes; however, depending on the project and the communication scheme, adjustments may be made

ServerMaxReceivePduSize = 1024 bytes (default) ;

3.3 DLMS Application Layer Service

Application layer service by default only supportsLN(logical Name);

ContextName = LONG_NAMES;

Version No.:

DLMS version= 6;

According to the description of the DLMS standard, the service types supported by the electricity meter are as follows:

Service	Conformance Block Bit
general-protection	1
general-block-transfer	2
block-transfer-with-get	11
block-transfer-with-set	12
multiple-references	14
data-notification	16
Get	19
Set	20
selective-access	21
action	23

For different clients, the default supported services are as follows:

Client	Functions
Public Client	Get block-transfer-with-get
Pre-link Client	get set action data-notification general-block-transfer general-protection
Management Client	get block-transfer-with-get set block-transfer-with-set selective-access multiple-references action general-block-transfer general-protection
Read Client	get block-transfer-with-get selective-access multiple-references general-block-transfer general-protection
Module Client	get block-transfer-with-get set block-transfer-with-set selective-access multiple-references action general-block-transfer general-protection

For each client number with different logical device, there is an application layer connection object, Class15 (Association LN), used to describe the link information such as current link list, link status etc., in addition, you can also conduct HLS Authentication and the key modification through class 15; link object:
 “Current Associaon” (0-0:40.0.0.255, Class ID: 15)- urrent link object
 “Public Associaon” (0-0:40.0.1.255, Class ID: 15)
 “Management Associaon” (0-0:40.0.2.255, Class ID: 15)
 “Pre-established Associaon” (0-0:40.0.3.255, Class ID: 15)
 “Reading Associaon” (0-0:40.0.4.255, Class ID: 15)
 “Module Associaon” (0-0:40.0.5.255, Class ID: 15)

3. Communication Interface

3.1 MI1

The MI1 interface is used for the base energy meter to communicate with the remote communication module MM1 interface in the meter and it is in the server mode. The module types that this interface can support include but are not limited to the following categories:

- Celluar(GPRS/WCDMA/LTE)
- PLC
- RF
- Etherner
- RS485

interface	phy layer	Intermediate layer	COSEM
MI1	SmartII interface SmartIII interface	HDLC: Address length support: 1/2/4 bytes Support UI frame service; The default baud rate: 9600b/s N,8,1	Public Cent Pre-link clientManagement Cient Read client Module client

3.2 ME1

The ME1 interface is used for remote communication and communicates with the CE1 interface of the concentrator, and it is in the server mode. The specific communication architecture is determined by the specific module. It should be noted in the package 1 that the remote channel accesses PDU data of the electricity meter through the ME1 interface, and after processing in the physical layer and link layer in the module, the data will be converted into an HDLC data format and transmitted to the electricity meter through the MM1 interface, the module will not conduct any process to the PDU data. For the details of data conversion, please refer to pakage 2; the interface of ME1 includes but not limited to the following categories:

- PLC
- RF
- RS485

interface	phy layer	Intermediate layer	COSEM
ME1	PLC RF RS485	6lowPan HDLC Wrapper	Public Cent Pre-link clientManagement Cient

			Read client
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3.3 ME2

The ME2 interface is used for remote communication and communicates with the SE2 interface of the HES, and it is in the server mode. The specific communication architecture is determined by the specific module. It should be noted in the package 1 that the remote channel accesses PDU data of the electricity meter through the ME2 interface, and after processing in the physical layer and link layer in the module, the data will be converted into an HDLC data format and transmitted to the electricity meter through the MM1 interface, the module will not conduct any process to the PDU data. For the details of data conversion, please refer to package 2; the interface of ME2 includes but not limited to the following categories

- Cellular(GPRS/WCDMA/LTE)
- Ethernet

interface	phy layer	Intermediate layer	COSEM
ME2	Cellular(GPRS/WCDMA/LTE) Ethernet	Wrapper IPv4 IPv6 TCP/UDP	Public Cent Pre-link clientManagement Client Read client

3.4 ME3

ME3 interface is used for local communication, here mainly refers to the optical interface; and it is in server mode; can be used for local maintenance and programming settings

- optical port

interface	phy layer	Intermediate layer	COSEM
ME3	IEC62056-21 E	HDLC: Address length support: 1/2/4 bytes The default baud rate: 9600b/s N,8,1	Public Cent Management Client Read client

3.5 ME4

The ME4 interface is used for reading other types of utility meters such as water meters, gas meters, heat meters etc.; and it is in the client mode; this interface includes but not limited to the following communication types

- RS485

interface	phy layer	Intermediate layer	App layer
ME3	RS485	1.HDLC: Address length support: 1/2/4 bytes The default baud rate: 9600b/s N,8,1	1.COSEM:

3.6 ME5

MEE interface is used for communicating with the indoor display unit; and it is in server mode; this interface includes but not limited to the following types of communications:

- PLC
- RF
- RS485

interface	phy layer	Intermediate layer	COSEM
ME3	PLC RF RS485	HDLC: 6lowPan Wrapper	Public Cent Management Client Read client

4.6 HDLC Physical Address

Rules of HDLC device address default are as follows:

1. The value of the last four bits is 16-9999; set directly to the meter; For example: address: 037586937378, then RS485 HDLC address: decimal: 7378; hexadecimal number: 0x1CD2
2. The value of the last four bits is 0-15; set to meter after adding 10000; - HDLC prescribes 0-15 address, this area is not allowed to set; For example: address is: 037586930001, then HDLC address is: decimal: 10001; hexadecimal number: 0x2711;

If there is a duplicate address on the same bus during field installation, you can reset it; the range of addresses allowed to be reset is: 0x2720-0x27E7;

3.7 Communication Interface Settings

Each communication channel can be configured with the following objects:

- HDLC Setup3 (23, 0-3:22.0.0.255);
- Depending on the communication module, it is not configured in the meter; Depending on the communication module, it is not configured in the meter; □
- HDLC Setup 0 (23, 0-0:22.0.0.255);
- HDLC Setup 4 (23, 0-5:22.0.0.255);

4. DLMS Device Identification

This section is intended to show how devices are named according to the requirements of DLMS / COSEM. Each device corresponds to a unique name (serial number); Provide basis for third-party equipment registration, identification.

Device serial number: "Device ID7" COSEM object (1-0: 0.0.0.255, Class ID: 1);

This encoding is unique and by default is a string of 11 digits. Depending on different power company's requirements, this encoding rule will change to supporting a maximum of 14 digits; this code is set by the manufacturer to the device at the factory and is also printed on the device's panel

System ID(system title): According to different project requirements, each device has a unique 8-byte system identification code, which is fixed to the device before shipment. It is used for mutual authentication and identification between different vendors, different device types, and different device serial numbers in the same system. For details, please see section 5.1.

Logical device name: "COSEM Logical Device Name" COSEM object (0-0: 42.0.0.255, Class ID: 1). As described above, each physical device may correspond to multiple logical devices. The logical device name is a logical device unique identifier, and the specific encoding format is in Section 5.2.

4.1 System ID (SYSTEM TITLE)

Electricity Meter, Power Concentrator, Collector, HES, each device has a unique system ID (8 bytes). According to the definition of DLMS / COSEM, the system ID is as follows

Byte1	Byte2	Byte3	Byte4	Byte5(4-7)	Byte5(0-3)	Byte6	Byte7	Byte8
I	H	M	DT	FT	SNM	SNM	SNM	SNM

Byte1-3: "IHM"ASCII code, vendor identification number registered by the manufacturer in DLMS.

DT: Device type (001-255)

- 001: 1P BS (Terminal Base) Meter
- 002: 1P ANSI (Socket Base) Meter
- 003: 3P Direct Connection Meter
- 004: 3P CT connection Meter
- 005: 3P CT/PT connection Meter
- 006: 1P DIN Meter
- 007-029: Reserved
- 030: Data Concentrator
- 031: Data Collector(RS485 type)
- 032...39: Reserved
- 040: Head-end System
- 041...049: Reserved
- 050: HHU
- 051...255: Reserved

FT: Function type. The corresponding position 1 indicates that the device has this function

- bit0=1 Disconnecter exists
- bit1=1 Load Management exists
- bit2=1 MulUility meter is supported
- bit3=0 reserved

SNM: The last 8 digits of the device serial number;Stored in 28-bit SMN in hexadecimal.

For example, if the device serial number of a single-phase BS-mounted electricity meter (DT: 001) is: 37912345678 (0x0BC614E), with load control function and supports the ME4 interface (FT: 0111),Then the device system title is (hexcode).

Byte1	Byte2	Byte3	Byte4	Byte5(4-7)	Byte5(0-3)	Byte6	Byte7	Byte8
49	48	4D	01	7	0	BC	61	4E

4.2 Logical Device Name (0-0:42.0.0.255, Class ID: 1)

The name of the logical device in COSEM is 16 bytes and is defined as follows:

Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
I	H	M	DT	DT	DT	FT	FT

Byte9	Byte10	Byte11	Byte12	Byte13	Byte14	Byte15	Byte16
SNM	SNM	SNM	SNM	SNM	SNM	SNM	SNM

The values of DT, FT and SNM here are the same as the system ID, but the expression format is ASCII; if DT = 0x01, the ASCII code is "001" in the name of the logical device, accounting for 3 bytes.

4.3 Device ID

In addition to the above, the device ID also contains at least the following COSEM objects, depending on the project, the specific definition will be different

Device ID1 0-0:96.1.0.255: Device hardware serial number
Device ID2:0-0:96.1.1.255: Device type identification code
Device ID3:0-0:96.1.2.255: Asset name
Device ID4:0-0:96.1.3.255: GPS info
Device ID5:0-0:96.1.4.255: End user name
Device ID6:0-0:96.1.5.255: Power company certification code

5. Device Automatical Registration

Automatic device registration refers to the process of pushing the device's logical device name and IP address to the HES through the Data-notification service after the device is installed, and the HES reply that the device is successfully registered after receiving.

Automatic registration of the device for the electricity meter, it means through the MT1 interface, using the setting content of the push setup –on installation (0-7.25.9.0.255, class 40) object, send the registration information to the MT1 interface via the service of Data-notification; MI1 interface uses HDLC UI frame to transmit registration information by default; only pre-link client supports Data-notification service by default in the device.

After receiving the data frame, the communication module establishes the data link as soon as possible and reports the information to the upper level device. After the higher level device (concentrator or HES) receives the registration information and confirms it, it replies and set the information of “E_instal”to the meter's user information display (0-0: 96.13.1.255, class 1).

Long press the wheel button on the device for 10 seconds (LCD prompt "install_S"), you can trigger the device to automatically report the register information; At the same time, you can also configure the time of automatic registration and retransmission times, etc. by setting the push setup –on installation.

Push objects of automatical registration by default:

Logical device name: (1, 0-0:42.0.0.255, 2);

IPv4 Setup –local IP address (42, 0-0:25.1.0.255, 3);

6. Tariff Management

The electric meter can conduct time-sharing measurement for active, reactive and apparent electricity consumption. It can define up to eight tariffs, which means that the meter can be divided into eight different tariff measurement storage unit. The daily maximum can be divided into 24 periods, each time period corresponds to a unique tariff tag.

The tariff conversion of the electricity meter is based on the daily tariff table as the basic unit, the meter can pre-store up to 16 sets of daily tariffs table, support for 50 special holidays by default; And then select corresponding daily tariff table according to the holiday tariff schedule, seasonal tariff schedule, weekly tariff table to achieve period tariff conversion in different holidays, different seasons, different workdays in a week.

During the tariff management process of the electricity Meter, the COSEM need to be involved as follows:

The objects need to be set during the tariff configuration:

- Special Days Table (0-0:11.0.0.255, Class ID: 11);-Current holiday table
- Passive Special Days Table (0-0:11.0.1.255, Class ID:11);-Spare holiday table
- Activity Calendar (0-0:13.0.0.255, Class ID: 20);-Activity calendar tariff schedule

- Default Energy Tariff in Case of Invalid Clock (0-0:96.14.9.255, Class ID: 1);-Time error default energy tariff
 - Default Max. Demand Tariff in Case of Invalid Clock (0-0:96.14.10.255, Class ID: 1);- Time error demand tariff
- Auxiliary Return (read) Object:
- Clock (0-0:1.0.0.255, Class ID: 8);-Time
 - Tariffication Script Table (0-0:10.0.100.255, Class ID:9);-Tariff switch script
 - Passive Tariffication Script Table (0-0:10.1.100.255, Class ID:9);-Standby tariff switch script
 - Register Activation- Energy(0-0:14.0.1.255, Class ID: 6);- Activity energy register
 - Register Activation- Maximum Demand (0-0:14.0.2.255, Class ID: 6);-Activity demand register
 - Currently Active Energy Tariff (0-0:96.14.0.255, Class ID: 1);-Current energytariff
 - Currently Active Maximum Demand Tariff (0-0:96.14.1.255, Class ID: 1);-Current demand tariff
 - Energy Registers (... , Class ID: 3)-Energy register (1.8.0...)
 - Maximum Demand Registers (... , Class ID: 4)-Demand register (1.6.0...)

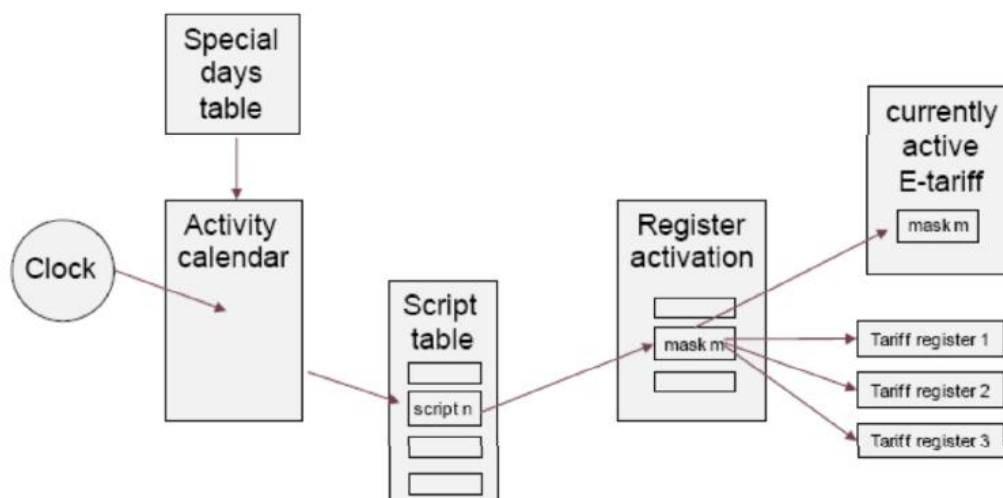


Figure 11: Tariffication Process

Tariff conversion diagram

6.1 Default Tariff

If the device clock fails, then the equipment needs to measure the consumption in accordance with the default tariff set; default tariff settings for the following two COSEM objects:

- Default Energy Tariff in Case of Invalid Clock (0-0:96.14.9.255, Class ID: 1);
- Default Max. Demand Tariff in Case of Invalid Clock (0-0:96.14.10.255, Class ID: 1);

The above two objects can be set up locally or remotely

6.2 Current Tariff

The current running tariff can be obtained by reading the following two objects

- Currently Active Energy Tariff (0-0:96.14.0.255, Class ID: 1);
- Currently Active Maximum Demand Tariff (0-0:96.14.1.255, Class ID: 1);

7. Meter Measurement Data

The acquisition of measurement data of the electricity meter can be carried out through "GET" or "data-notification" service. All the measurement data supported by the electricity meter can be found in the following locations according to different projects.

"Reigster IC 3 Energy"

"Reigster IC 3 parameters"-----"Related parameter of power operation"

"Ext. Reigster IC 4"

The default measurement accuracy is as follows:

Parameter	Unit	Resolution	Scalar
Current	A	0.01	-2
Voltage	V	0.1	-1
Energy (1P, 3P-DC and 3P-CT)	Wh/VARh	1	0
Energy (CT/PT Meter)	Wh/VARh	0.1	-1
Power Factor	-	0.001	-3
Frequency	Hz	0.01	-2
Harmonics Parameters	%	0.1	-1

8. Curve Type

8.1 Curve

The COSEM objects of all the curves can be found in the following positions in the 《OBIS data item details》 according to different projects, which are generally divided into four categories: event record curve, power quality curve, bill curve and ME4 interface curve.

"Profile IC 7 Event records"-Event record

" Profile IC 7 load profile"-Power quality

" Profile IC 7 billing profile"-Bill

" Profile IC 7 ME4 profile"- Submeter reading

The table contains information about the default capture objects, optional capture objects, capture cycles, and maximum memory for all curves in this project; in addition,

The curve supports two modes of reading in the "selective-access" service, in the time period and the point of point; the curve in the default state:

For the event record curve, it need to capture the event code, and the code definition of the event refer to "Event_list".

9. Power Quality

Power quality monitoring mainly includes the following items:

- Undervoltage and overvoltage;
- Phase loss (outage);
- Average voltage;
- Sudden drop and raise in voltage (CT/PT Meters);
- THD(CT/PT Meters);
- Each harmonic (CT/PT Meters);

It should be noted that, for a certain phase voltage within the same period of time, undervoltage / overvoltage / phase loss / voltage interrupt occurs only in a situation; overvoltage / undervoltage / phase loss / voltage interruption threshold for determination cannot overlap; if one phase is under undervoltage / overvoltage / phase loss / state when the voltage interruption occurs, so the electricity meter will be considered undervoltage / overvoltage / phase event has been finished.

110%-200%Un	overvoltage
51%-90%Un	undervoltage
11%-50%Un	phase loss
0%-10%Un	voltage interruption

9.1 Undervoltage / Overvoltage

The electricity meter needs to monitor all undervoltage and overvoltage phenomena; if the amplitude of the voltage fluctuation is greater than the set threshold and the duration exceeds the set time, it is judged that the undervoltage / overvoltage event occurs; if the voltage is within Undervoltage / overvoltage condition, returns to normal voltage and maintains above the set threshold, the undervoltage / overvoltage event is over. According to the requirements of the project, over-voltage and under-voltage threshold can be set, setting range, overvoltage 110% -200% of the reference voltage, undervoltage 51% -90% of the reference voltage, unit is %; Set objects are as follows:

- Threshold for Under Voltage (class 3, 1-0:12.31.0.255, 2);
- Threshold for Over Voltage (class 3, 1-0:12.35.0.255, 2);

The default overvoltage judgment time is 15S, the undervoltage judgment time is 60S; the settable range is 1-180S; the start and end events use the same judgment delay, which can be modified by the following two objects:

- Time Threshold for Over Voltage (3, 1-0:12.44.0.255, 2);
- Time Threshold for Under Voltage (3, 1-0:12.43.0.255, 2);

If an overvoltage or undervoltage event has occurred; then the start and end event record needs to be recorded in the below curve:

- Power Quality Event Log (7, 0-0:99.98.4.255); (Specific capture object, please see "OBIS data item details")

In addition, the electricity meter also records the total number of overvoltage / undervoltage events, the last time they occurred, the percentage of the voltage at the last trigger event relative to the reference voltage, and is stored in the following objects:

- Number of Under Voltage in Phase L1 (1, 1-0:32.32.0.255);
- Number of Under Voltage in Phase L2 (1, 1-0:52.32.0.255);
- Number of Under Voltage in Phase L3 (1, 1-0:72.32.0.255);
- Duration of Last Under Voltage in Phase L1 (3, 1-0:32.33.0.255);
- Duration of Last Under Voltage in Phase L2 (3, 1-0:52.33.0.255);
- Duration of Last Under Voltage in Phase L3 (3, 1-0:72.33.0.255);
- Magnitude of Last Under Voltage in Phase L1 (3, 1-0:32.34.0.255);
- Magnitude of Last Under Voltage in Phase L2 (3, 1-0:52.34.0.255);
- Magnitude of Last Under Voltage in Phase L3 (3, 1-0:72.34.0.255);
- Number of Over Voltage in Phase L1 (1, 1-0:32.36.0.255);

- Number of Over Voltage in Phase L2 (1, 1-0:52.36.0.255);
- Number of Over Voltage in Phase L3 (1, 1-0:72.36.0.255);
- Duration of LastOver Voltage in Phase L1 (3, 1-0:32.37.0.255);
- Duration of LastOver Voltage in Phase L2 (3, 1-0:52.37.0.255);
- Duration of LastOver Voltage in Phase L3 (3, 1-0:72.37.0.255);
- Magnitude of Last Over Voltage in Phase L1 (3, 1-0:32.38.0.255);
- Magnitude of Last Over Voltage in Phase L2 (3, 1-0:52.38.0.255);
- Magnitude of Last Over Voltage in Phase L3 (3, 1-0:72.38.0.255);

9.2 Phase loss

If the meter detects that the grid voltage is lower than the set phase loss threshold and the duration is greater than the set threshold, then the phase loss event is considered as occurring. If the grid voltage is restored to normal and continues for longer than the set threshold time, it is considered that the phase loss event has ended. The start and end events of phase loss in any phase of L1, L2, and L3 need to be recorded in the lower curve

- Power Quality Event Log (7, 0-0:99.98.4.255);
Configuration objects for phase-missing event thresholds:
- Threshold for Voltage Cut(Class ID: 3, 1-0:12.39.0.255,2);Default value: 50% Vref;setting range 11%-50%;
- Time Threshold for Voltage Cut (Class ID: 3, 1-0:12.45.0.255,2);Default value: 30 seconds, setting range 1-180 seconds;

9.3 Average Voltage

The electricity meter can monitor the average value of each phase voltage over a period of time, the calculation cycle can be set in the range of 1-60 minutes with the COSEM object, the default calculation period is 10 minutes, the calculation must be at least 1 cycles before an average, then all phases power down, it does not calculate; Related COSEM objects are as follows;

- MeasurementPeriod 3 for Instantaneous Value (3, 1-0:0.8.2.255, 2)-Calculation period, default 10min, 1-60分钟;
- Average voltage L1 (Class ID: 3, 1-0:32.24.0.255);-L1 average voltage
- Average voltage L2 (Class ID: 3, 1-0:52.24.0.255);-L2 average voltage
- Average voltage L3 (Class ID: 3, 1-0:72.24.0.255);-L3 average voltage

According to EN 50160's weekly average voltage pass rate requirements, and based on the average voltage calculated above, the electricity meter carry out the statistics of pass rate for each of the above calculated average voltage within the past seven days; If in the past 7 days (the default calculation period: start from 0:00 every Sunday), the average voltage greater than 5% exceeds the range of +/-10% Uref, the it needs to record the voltage and quality difference events in the following curves.

- Power Quality Event Log (7, 0-0:99.98.4.255);

The event code corresponding to the voltage quality difference is as follows:

- Event Code 92: Bad Voltage Quality L1
- Event Code 93: Bad Voltage Quality L2
- Event Code 94: Bad Voltage Quality L3

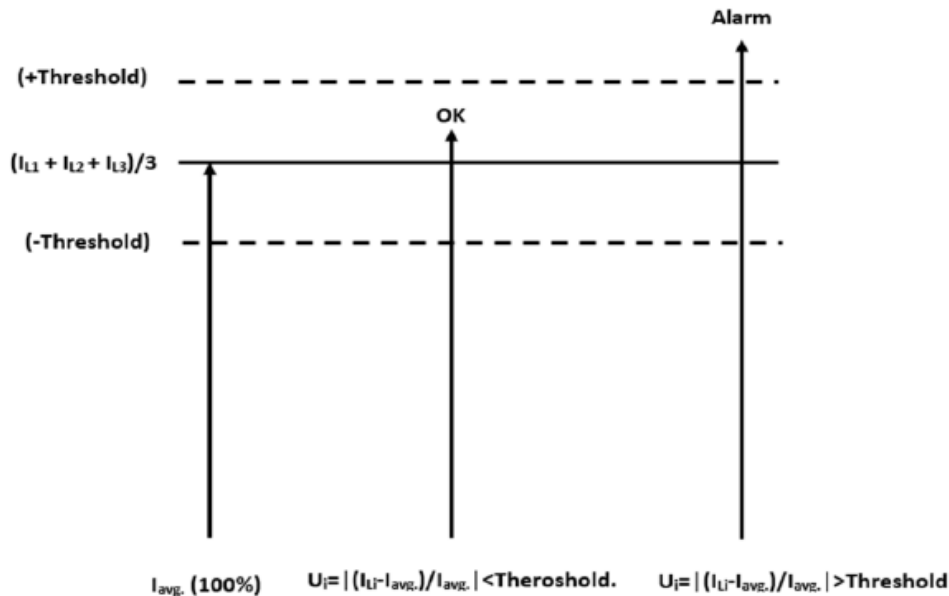
9.4 Harmonic/THD Measurement (3P CT/PT Meters)

For the CT / PT meter, the watt-hour meter has the function of measuring and recording the 31st harmonic component. At the same time, the THD harmonic content of each phase voltage and current can be recorded separately. The corresponding COSEM object can be found in the OBIS list class3

9.5 Load Imbalance (Three-phase Meter)

If the current of each phase is greater than the set unbalanced load judgment current threshold and the difference between the average current value of any one phase and the average value of the three-phase currents is greater than the set judgment threshold, then it is considered that the load imbalance occurs. In this state, the UBL of the status word Profile Status 1 (1, 0-0: 96.10.1.255) in all the curves will be set; at the same time, a load imbalance event will also be generated (specific event code referring to event code List) and recorded in the following curve

□ Power Quality Event Log (7, 0-0:99.98.4.255);



As shown in the above figure, I_{Li} is the average current value of the previous calculation period of L_i phase; the calculation period of this average current is determined by the capture period set in the average curve (class ID: 7,1-0: 99.133.0.255) Default value is 15 minutes). When a new average value is calculated, the electricity meter will judge whether it is in the unbalanced load power supply mode according to the above rules, and confirm whether to report the event according to the setting.

It should be noted that the calculation of the average must be full cycle; related settings COSEM object:

UnbalanceLoad Detection (1, 1-0:96.98.15.255)

The data structure of this object is as follows:

```
{
    long_unsigned minimum current that activate unbalance task in meter (default
1A)
    long_unsigned Unbalance threshold (default 50%)
}
```

Current object used to determine the imbalance event:

Last Average Value of Current L1 (3,1-0:31.25.0.255,2)

Last Average Value of Current L2(3,1-0:51.25.0.255,2)

Last Average Value of Current L3(3,1-0:71.25.0.255,2)

10. Maximum Demand

Demand: the average power within the specified time.

Period of demand: a continuous equal interval of time for measuring the average power.

Maximum Demand: The maximum value of demand recorded during a specified period of time.

10.1 The Maximum Demand Calculation Instructions

- In the agreed time interval (usually a month or a meter reading settlement cycle), measure the forward active, reverse active, combined reactive 1, combined reactive 2, forward apparent, reverse apparent maximum demand; Sub-period forward active, reverse active, combined reactive 1, combined reactive 2, forward apparent, reverse apparent maximum demand and the date and time of maximum demand occurs.

- The maximum demand measurement can be programmed to choose slip mode or interval mode.

- Demand cycle and slip time can be set.

- Demand cycle can be selected in 5,10,15,30,60 min.

Slip demand cycle slip time can be selected in 1, 2, 3, 5min.

The demand cycle should be an integral multiple of 5 for the slip time. Factory default: demand cycle 15min, slip time 3min.

- The maximum demand measurement is continuous

The measurement of the maximum demand for each tariff period is carried out within the complete measurement period of the corresponding tariff period.

When power-on, reset, clock adjustment, period conversion, demand cycle changes, power flow direction conversion, etc. occurs on the voltage line, the meter should start from the current moment, measure the demand according to demand cycle.

When the first demand cycle is completed, start the maximum demand record according to the slip interval.

In the incomplete demand cycle, do not record the maximum demand

10.2 Maximum Demand Settlement

- Automatic settlement: At the appointed daily / monthly settlement day at zero hour, the meter automatically stores the maximum demand and the date and time of the maximum demand within the settlement day / month; and makes the current maximum demand register unit Reset, restart maximum demand calculation of the new meter reading settlement date / month.

- Manual settlement: When the meter parameters are set or the operating conditions are changed, the maximum demand for the current meter settlement date / month needs to be recalculated. You can calculate the maximum demand with the sealing device on the panel Key to make the energy meter store the maximum demand and the date and time of the maximum demand in the settlement cycle; and reset the current maximum demand register unit, and re-calculate the maximum demand of the new meter reading settlement day / month .

Note: Demand automatic settlement and manual settlement mode can be set, the two settlement methods can not be valid at the same time.

10.3 Maximum Demand Clearance

- The electric energy meter can achieve maximum clearance through the infrared communication interface. The maximum demand clearance has a programming switch and password limit.

- In automatic settlement mode, reset the maximum demand register unit in this settlement day / month by using the maximum demand settlement button with sealing device on the panel.

10.4 Maximum Demand Storage

Meter can store the maximum demand each month and the maximum demand occurred date and time of the past 13 months,

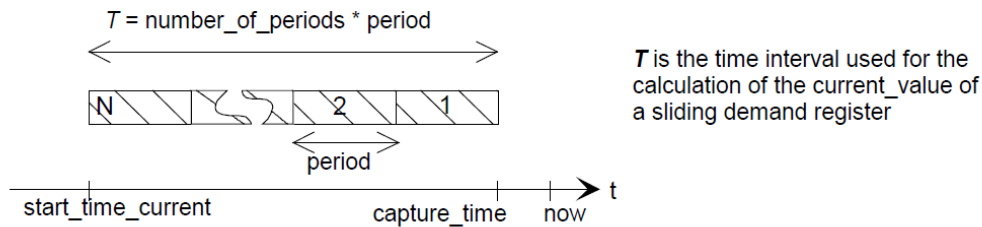
		Monthly Data	Daily Data
Forward Active Maximum Demand	Total, per phase, per rate	13 months	124 days
Reverse Active Maximum Demand	Total, per phase, per rate	13 months	124 days
Reactive Maximum Demand Combination 1	Total, per phase, per rate	13 months	124 days
Reactive Maximum Demand Combination 2	Total, per phase, per rate	13 months	124 days
Forward Apparent Maximum Demand	Total, per phase, per rate	13 months	124 days
Reverse Apparent Maximum Demand	Total, per phase, per rate	13 months	124 days

10.4 Maximum Demand Calculation Object (Class ID5)

For the above calculation, the class structure of Class ID5 is implemented. The structure contains the current average value, the previous average value, the previous average value generation time, the current period starting time, and the calculation period as shown in the following figure:

Demand register	0...n	class_id = 5, version = 0			
Attributes	Data type	Min.	Max.	Def.	Short name
1. logical_name (static)	octet-string				x
2. current_average_value (dyn.)	CHOICE			0	x + 0x08
3. last_average_value (dyn.)	CHOICE			0	x + 0x10
4. scaler_unit (static)	scal_unit_type				x + 0x18
5. status (dyn.)	CHOICE				x + 0x20
6. capture_time (dyn.)	octet-string				x + 0x28
7. start_time_current (dyn.)	octet-string				x + 0x30
8. period (static)	double-long-unsigned	1			x + 0x38
9. number_of_periods (static)	long-unsigned	1		1	x + 0x40
Specific methods	<i>m/o</i>				
1. reset (data)	o				x + 0x48
2. next_period (data)	o				x + 0x50

The calculation cycle $= \text{period} * \text{number_of_periods}$ demand for period and number_of_periods, can be individually set, when number_of_periods > 1, as the row difference calculation method, when the number_of_periods = 1 as interval calculation; number_of_periods set the range of 1-60; period can choose between 300, 600, 900, 1800, 3600 seconds; as shown below:



The demand object has two values: the current average value and the last average value.

The current average value refers to the calculated value from the beginning time of the current demand calculation cycle to the current time cumulative energy / T (period * number_of_periods).

The last average refers to the value calculated from the start time of the current demand calculation cycle and the energy / T (period * number_of_periods) accumulated at the end of the previous period;

Note: the last average value is updated after every period. When the last average value is greater than the value in the corresponding object in classID 4, the maximum demand in classID 4 will be updated.

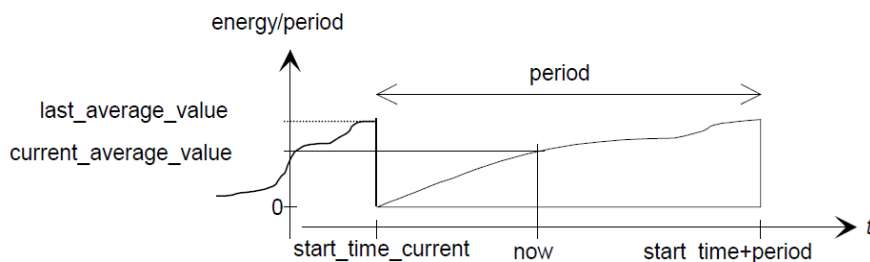
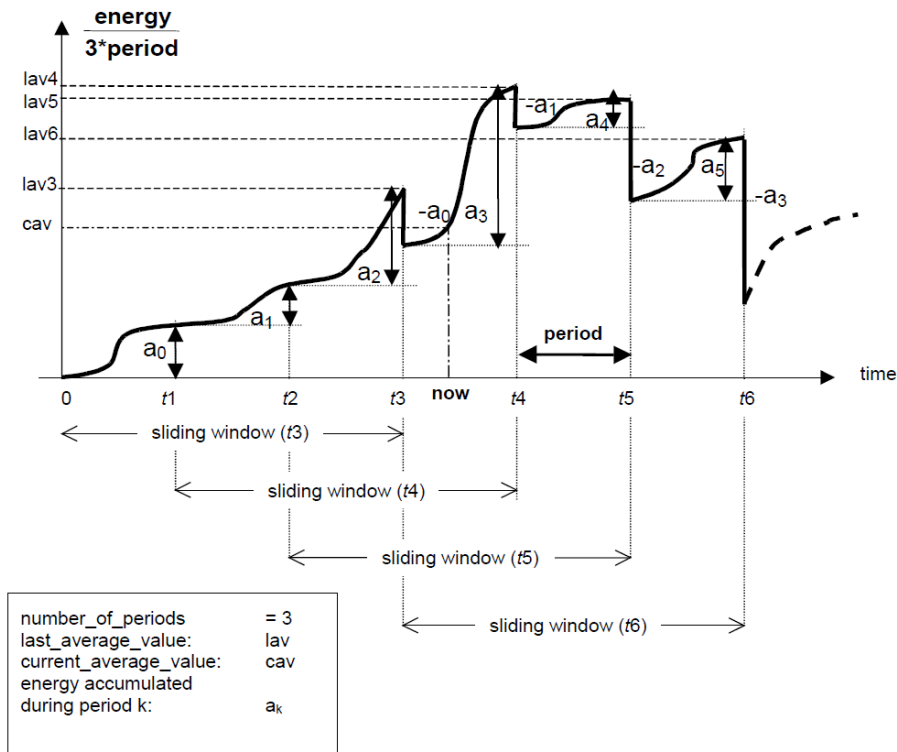


Figure 9 – The attributes in the case of block demand



11. Voltage Interruption

After the meter has been powered up for a minimum of 5S (configurable 1-120s, minimum 5S by default) and the voltage supply at any phase of the meter is below the minimum voltage supply (0.1 Uref by IEEE) A voltage interruption will occur. When the voltage interruption time is greater than or equal to the setting of "Time Threshold for Long Power Failure" (0-0: 96.7.20.255, Class ID: 3) (default 3 minutes, 1-30 minutes configurable range).It is considered as Long time voltage interrupt event;

If the voltage interruption time is less than the long power failure , it is considered that a short voltage interruption event. If the voltage interruption event occurs on all the voltages of the phases, the power down event occurs.

- Short Power Failure/Interruption (Simply "Power Failure");
- Long Power Failure/Interruption;
- Power Down;

Short Power Failure event will not be recorded, but the number occurrence is recorded in the following objects:

- Number of Short Power Failures in All Phases (0-0:96.7.0.255,Class ID: 1);
 - Number of Short Power Failures in L1 (0-0:96.7.1.255,Class ID: 1);
 - Number of Short Power Failures in L2 (0-0:96.7.2.255,Class ID: 1);
 - Number of Short Power Failures in L3 (0-0:96.7.3.255,Class ID: 1);
 - Number of Short Power Failure in Any Phases (0-0:96.7.21.255,Class ID: 1);
- After a Long Power Failure event occurs at any phase or all phase voltages, at the end of the event; the end time of the event, the type of event, and the duration are recorded in the "Power Failure" event curve;

At the same time, the number of occurrence of such events and the duration of the last long voltage interruption shall be separately recorded in the data items of class 1 and class 3 below;

- Power Failure event log (1-0:99.97.0.255,Class ID: 7)
- Number of Long Power Failures in All Phases (0-0:96.7.5.255,Class ID: 1);
- Number of Long Power Failures in Phase L1 (0-0:96.7.6.255,Class ID: 1);
- Number of Long Power Failure in Phase L2 (0-0:96.7.7.255,Class ID: 1);
- Number of Long Power Failure in Phase L3 (0-0:96.7.8.255,Class ID: 1);
- Number of Long Power Failure in Any Phase (0-0:96.7.9.255,Class ID: 1);
- Duration of Last Long Power Failure in All Phases (0-0:96.7.15.255,Class ID: 3);
- Duration of Last Long Power Failure in Phase L1 (0-0:96.7.16.255,Class ID: 3);
- Duration of Last Long Power Failure in Phase L2 (0-0:96.7.17.255,Class ID: 3);
- Duration of Last Long Power Failure in Phase L3 (0-0:96.7.18.255,Class ID: 3);
- Duration of Last Long Power Failure in Any Phase (0-0:96.7.19.255,Class ID: 3);

The power up/power down events are recorded in "standard event log".

- standard event log (1-0:99.98.0.255,Class ID: 7)

Note:

1: overvoltage (110%-200%Uref), undervoltage (51-90%Uref), phase 10-50% (Uref) and voltage interruption ($\leq 10\%$ Uref) are mutually exclusive events which means only one event can happens at the same time. If voltage interrupt occurs at the time of undervoltage,the undervoltage event will end

12. Relay Control

The logic of the relay action in the electric energy meter is controlled by the following three ways:

- Remote Control;
- Manual;
- Locally (as internal process);

Remote control refers to the control of the relay through communication interface; manual control refers to control of relay by physical buttons on the meter; Local control refers to control of relay by judgment logic in the electric energy meter program, such as overload, overvoltage events which will activate the relay control; According to the definition of COSEM classID70, the relay control is divided into three states:

- Disconnected;
- Ready for Reconnection;
- Connected;

The conversion of the three states is shown in the following figure:

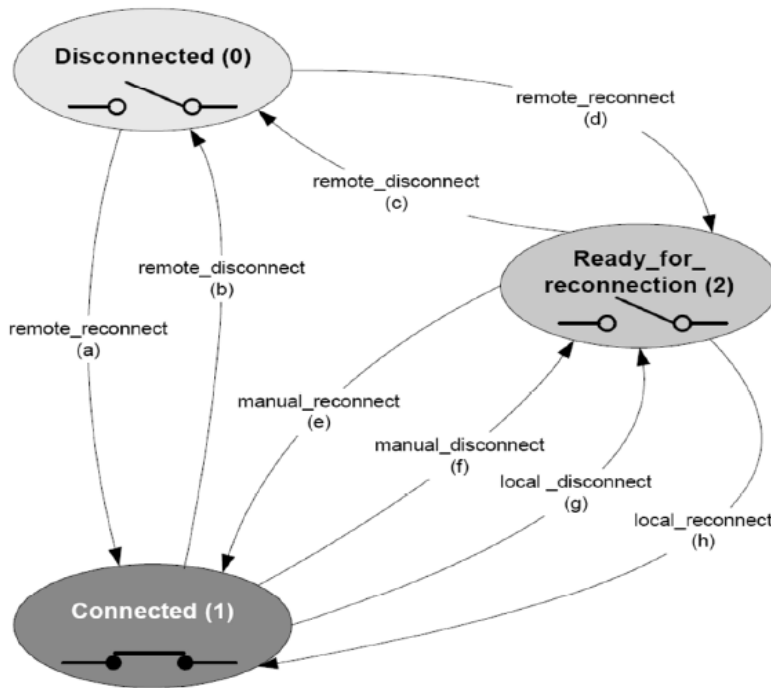


Figure 23: Disconnect Control, State Diagram and Transitions

As shown above, the three states of relay can be converted through 8 ways: "a" -- "H"; By configuring different control mode (70, 0-0:96.3.10.255, 4), the state switching method is selected, and the default state is control_mode = 6.

control_mode	Disconnection			Reconnection				
	Remote	Manual	Local	Remote	Manual	Local		
enum:	(b)	(c)	(f)	(g)	(a)	(d)	(e)	(h)
(0)	-	-	-	-	-	-	-	-
(1)	x	x	x	x	-	x	x	-
(2)	x	x	x	x	x	-	x	-
(3)	x	x	-	x	-	x	x	-
(4)	x	x	-	x	x	-	x	-
(5)	x	x	x	x	-	x	x	x
(6)	x	x	-	x	-	x	x	X

NOTE 3 In Mode (0) the disconnect control object is always in 'connected' state.

NOTE 4 Local disconnection is always possible unless the corresponding trigger is inhibited.

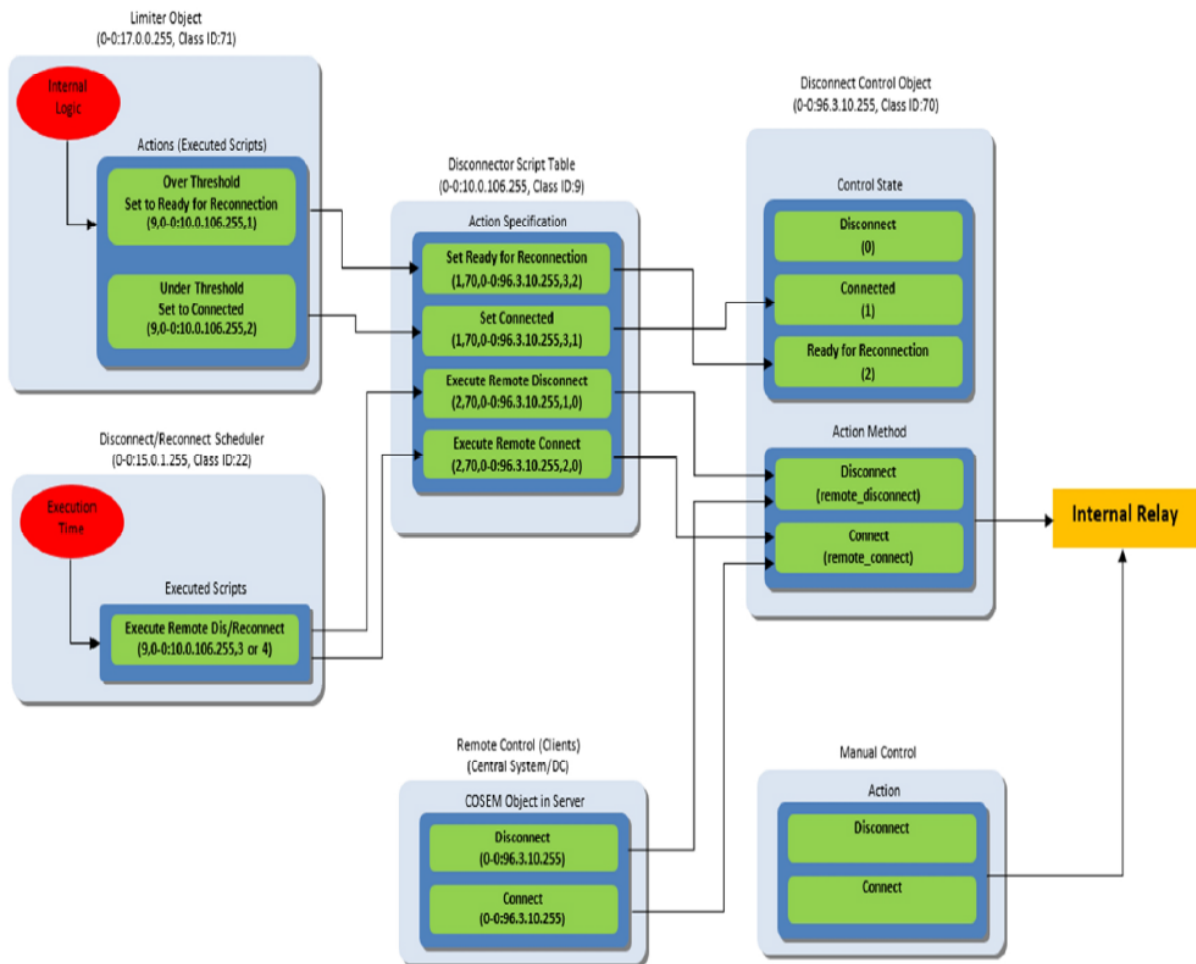
Example: electric energy meter in mode 6, the current relay is disconnected. The remote system issues a remote reconnect command to the electric energy meter. Mode 6 supports the path (d), the meter receives the command, the relay status will switch to ready_for_reconnection. At this point if you want the relay closed (converted to connected) state, you need to operate through the path (e); the specific operation is done on physical keys;

12.1 Relay Control Related COSEM Objects:

The list of objects related to the relay control function is as follows:

- Disconnect Control (0-0:96.3.10.255, Class ID: 70)
- Disconnect/Reconnect Control Scheduler (0-0:15.0.1.255, Class ID: 22);
- Disconnect Script Table (0-0:10.0.106.255, Class ID: 9);
- Limiter (0-0:17.0.0.255, Class ID: 71);
- Reclosing Configuration (0-0:96.98.10.255, Class ID: 1);
- Supervision monitor L1 (21, 1-0:31.4.0.255);
- Supervision monitor L2 (21, 1-0:51.4.0.255);
- Supervision monitor L3 (21, 1-0:71.4.0.255);
- Limiter Acvate Scheduler (22, 0-0:96.98.11.255);
- Limiter Threshold Scheduler (22, 0-0:96.98.12.255);
- Limiter Script Table (9, 0-0:96.98.13.255);

The following diagram is the logic block diagram of the relay control:



13. Billing

The electric energy meter can store the historical billing data history for 13 months. The bill function is described by class ID:22 calling script MDI Reset/End of Billing Period (class id:9, 0-0:10.0.1.255); the related OBIS code of the bill function is as follows:

- MDI Reset/End of Billing Period (class ID:9, 0-0:10.0.1.255);
- End of Billing Period 1 Scheduler (class ID:22, 0-0:15.0.0.255);
- Data of Billing Period 1 (monthly) (class ID:7, 0-0:98.1.0.255);
- Disable/Enable Manual Demand Reset (class ID:1,0-0:96.98.15.255);

The date of the bill is set through End of Billing Period 1 Scheduler (class ID:22, 0-0:15.0.0.255,4). By default, it is the 00:00:00 ("00000000", "FFFFFF01FF") on the first day of the month and the "FF" means not to specify. The action of settlement is as follows:

Maximumdemand in resetting month {class ID:4, 1-0:X.6.Y.255} (X is the power type, Y is the rate numbered) is all the data items in the register;

Freeze all required reading power data registers, store them in Data of Billing Period 1 (monthly) (class ID:7, 0-0:98.1.0.255);

Freeze all types of power data registers and store them in their monthly billing curves.

For the curve Data of Billing Period 1 (monthly) (class ID:7, 0-0:98.1.0.255,3), the capture objects can be configured according to project requirements, which is used for remote reading of monthly historical data. The list of capture objects is as follows:

The bill curve Data of Billing Period 1 (monthly) (class ID:7, 0-0:98.1.0.255,3) supports 50 capture objects, and storage of 13 historical bills can be set up according to different projects.

Different types of electric energy exist in the following curves respectively.

For specific projects, this kind of curve capture object cannot be set

Data of Billing of Period 1 (monthly) 1 (class, ID:7, 0-0:98.1.1.255) - all energy data

Data of Billing of Period 1 (monthly) 2 (class, ID:7, 0-0:98.1.2.255) - all demand data;

14. Meter Clock

Time by "Clock" COSEM object (0-0:1.0.0.255, Class ID 8), and time related items are as follows:

- Clock - time {class ID:8,0-0:1.0.0.255, 2}, - read and set the current time
- Clock -UTC{class ID:8,0-0:1.0.0.255, 3}, - minutes from UTC
- Clock - time state {class ID:8,0-0:1.0.0.255, 4}, - read-only
- Clock - summer time starting time {class ID:8,0-0:1.0.0.255, 5}
- Clock - summer time end time {class ID:8,0-0:1.0.0.255, 6},
- Clock - daylight saving time change time {class ID:8,0-0:1.0.0.255, 7}, - minutes of time change for daylight saving time conversion
- Clock - start summer time {class ID:8,0-0:1.0.0.255, 8}, - 1, activate summer time switching, 0, prohibit summer time switching
- Clock - time benchmark {class ID:8,0-0:1.0.0.255, 9}, - read-only

Time state corresponding bits:

- bit 0 (LSB): invalid a value,
- bit 1: doubtful b value,
- bit 2: different clock base c,
- bit 3: invalid clock status d,
- bit 4: reserved,
- bit 5: reserved,
- bit 6: reserved,

bit 7 (MSB): daylight saving active

Time benchmarks:

- enum (0) not defined,
- : (1) internal crystal,
- (2) mains frequency 50 Hz,
- (3) mains frequency 60Hz,
- (4) GPS (global positioning system),
- (5) radio controlled

14.1 Time CalibrationEvent Record

When the time difference before and after calibration is greater than the value in the COSEM object "Clock Time Shi Limit" (Class ID 3,1-0: 0.9.11.255, 2), a calibration event record is generated and stored in the curve Standard Event log (0-0: 99.98.0.255, Class ID 7),

Two types of events need to be captured for the calibration event: 1.Clock Adjusted 1 (Event Code: 4) records the time before calibration; 2.Clock Adjusted 2 : 5) record the new time after calibration

If the time difference before and after proofreading is less than "Clock Time Shi Limit" (Class ID 3,1-0: 0.9.11.255, 2), no event record is generated; (Class ID 3,1-0 : 0.9.11.255, 2) The values can be configured in "Clock Time Shi Limit";

14.2 Display Item

For the LCD display item, the OBIS encoding of the time is as follows (this OBIS is used only for display):

- Local Time (1-0:0.9.1.255, Class ID 1);
- Local Date (1-0:0.9.2.255, Class ID 1);

15 . Firmware Update

The electric energy meter and its internal modules can run upgrade firmware through the communication interface; through the class IC DLMS/COSEM 18 image transfer service; electric energy meter / equipment can store two versions of firmware at the same time, support breakpoint and power off resume in the process of upgrading the firmware. Upgrade related objects are as follows:

- Image transfer (0-0:44.0.0.255, Class ID: 18);
- Image Transfer Activation Scheduler (0-0:15.0.2.255, Class ID: 22);
- Image Activation Script (0-0:10.0.107.255, Class ID: 9);
- Active Firmware Identifier (Metrology Relevant Firmware)(1-0:0.2.0.255, Class ID: 1);- version number
- Active Firmware Identifier 1 (Meter Application Relevant Firmware) (1-1:0.2.0.255, Class 1); - version number
- Active Firmware Identifier 2 (GPRS Communication Module Firmware) (1-2:0.2.0.255, Class1); - version number
- Active Firmware Signature (1-0:0.2.8.255, Class ID: 1); - verification and (digital signature)
- Active Firmware Signature 1 (1-1:0.2.8.255, Class ID: 1); - verification and (digital signature)
- Active Firmware Signature 2 (1-2:0.2.8.255, Class ID: 1); - verification and (digital signature)

The upgrade process is as follows:

Step1:Read image block size A (class 18 0.0.44.0.0.255 attribute 2) ;

Step2:Initiate image transfer(class 18 0.0.44.0.0.255 action 1);

Step3: transfer image block in size A from the first to the last (class 18 0.0.44.0.0.255 action 2)

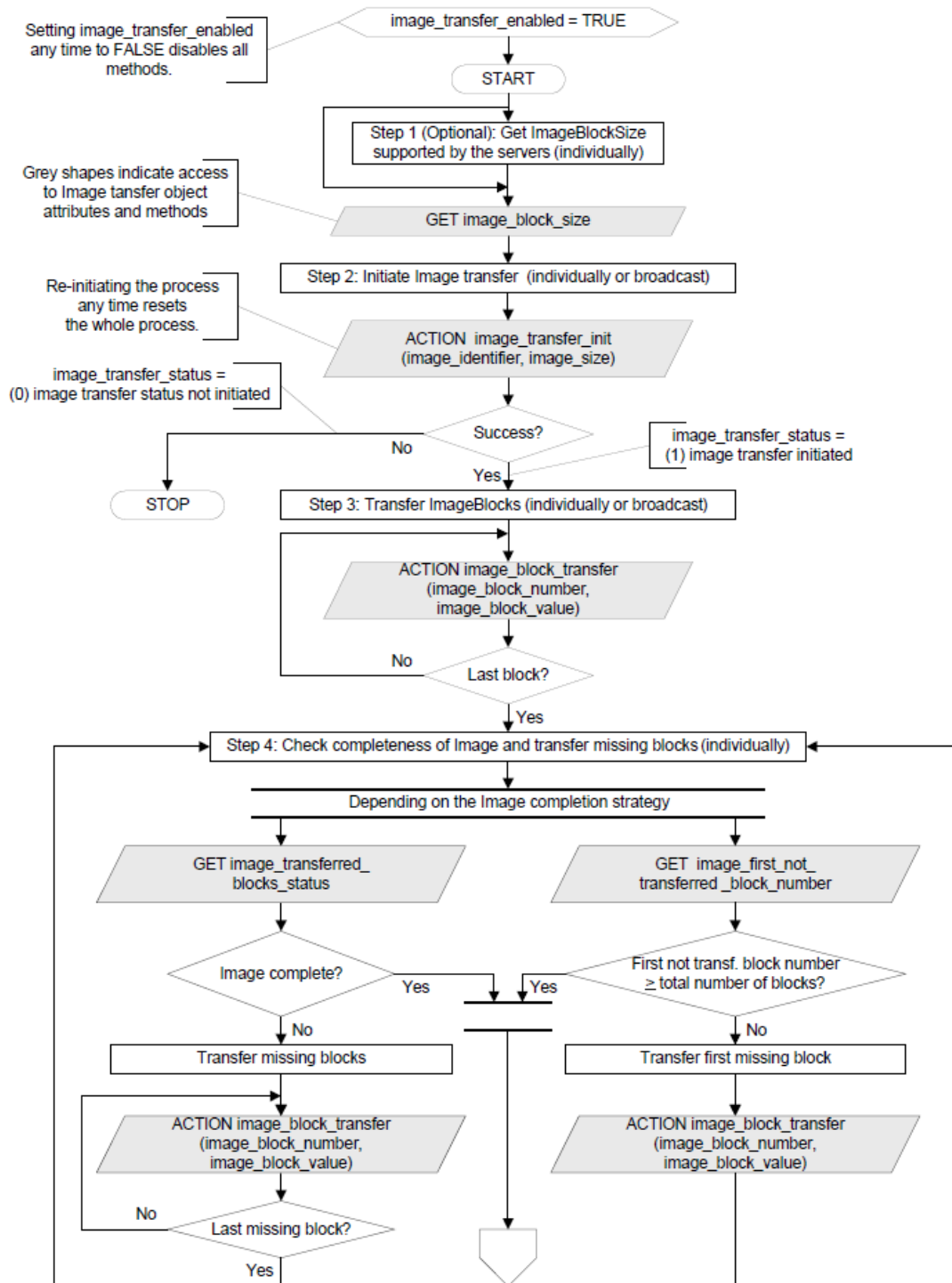
Step4:Read image transferred block status (class 18 0.0.44.0.0.255 attribute 3) ; if finished continue, otherwise transfer the missing blocks;

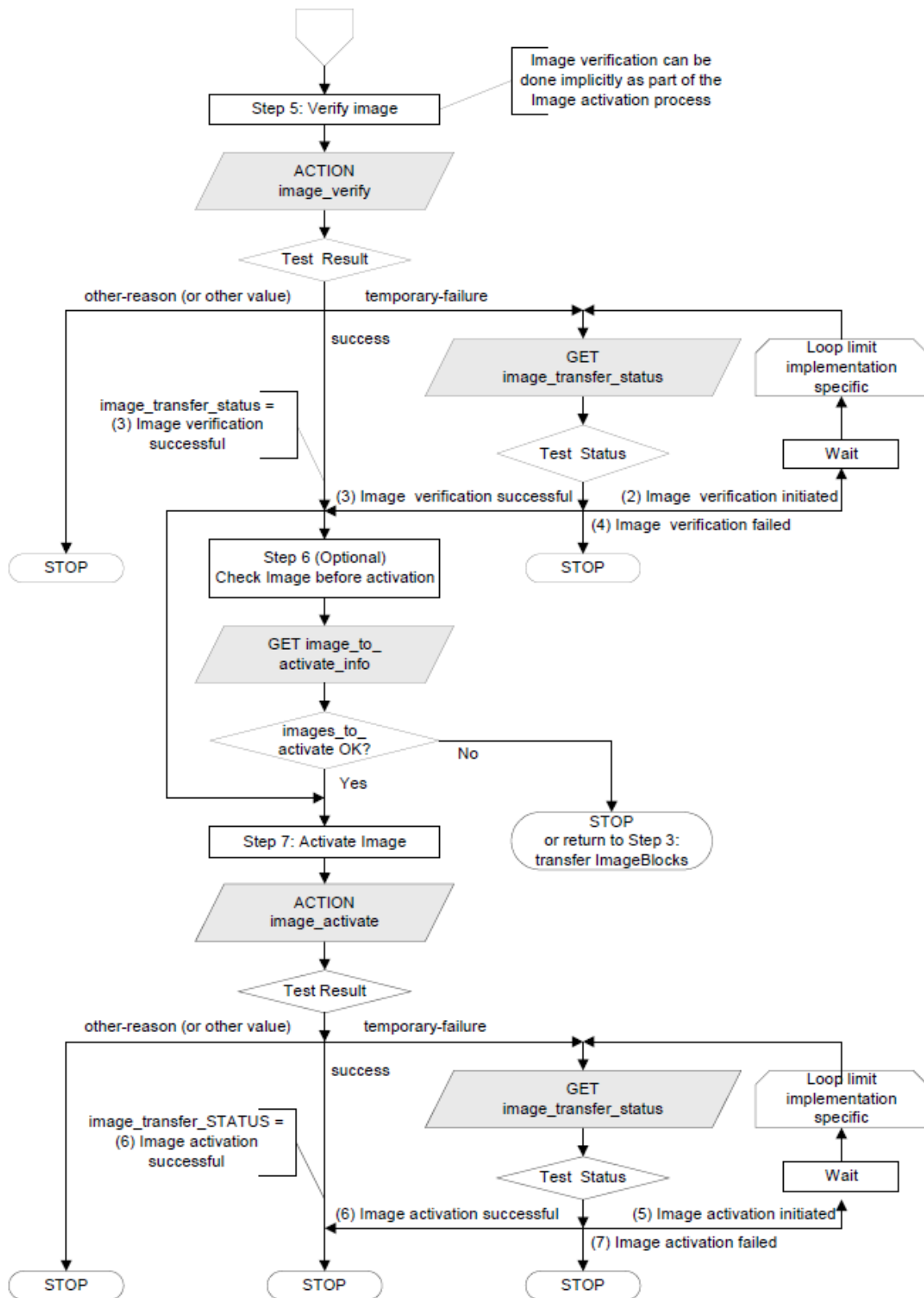
Step5:verify image (class 18 0.0.44.0.0.255 action 3);

Step6:set the new image activate time (class 22 0-0:15.0.2.255 attribute 4) or Activate Image Immediately(class 18 0.0.44.0.0.255 action 4)

Step7:end。

The flow chart is as follows:





15.1 Firmware Upgrade Event Record

There are the following types of events in the firmware upgrade process:

Firmware Ready for Activation event code: 17

Firmware Verification Failed, event code: 51

Firmware Activated, event code: 18

Firmware Ready for Activation event code: 17 event occurs when the upgrade package transfer is completed and verified.

If the verification fails then produce Firmware Verification Failed, event code: 51 event occurs.

When the new firmware is activated, a Firmware Activated, event code: 18 event is generated.

These three events are stored in Standard Event (log curve 0-0:99.98.0.255, Class, ID) in 7;

16. Event Management

Event log mainly records the time of occurrence of events, the types of events (event code), and the information when event occurred (depending on the type of events). There are mainly two kinds of information:

Normal event

Alarm event

Normal events are generally stored only through the event curve, and are not actively reported and alerted. Alarm events can be configured by configuring Alarm Filter 1 (1, 0-0: 97.98.10.255) / Alarm Filter 2 (1, 0-0: 97.98.11.255) to choose whether to take the initiative to report on specific events; The following is the event management related objects:

- Error register 1 (1,0-0:97.97.0.255);--Bit definition is the same as Alarm Register 1
- Alarm Register 1 (1, 0-0:97.98.0.255);
- Alarm Register 2 (1, 0-0:97.98.1.255);
- Alarm Descriptor 1 (1, 0-0:97.98.20.255);
- Alarm Descriptor 2 (1, 0-0:97.98.21.255);
- Alarm Filter 1 (1, 0-0:97.98.10.255);
- Alarm Filter 2 (1, 0-0:97.98.11.255);
- Alarm Monitor 1 (21, 0-0:16.1.0.255);
- Alarm Monitor 2 (21, 0-0:16.1.0.255);
- Push Script Table(9, 0-0:10.0.108.255);
- Push Setup-Alarm (40, 0-4:25.9.0.255);
- Standard Events Log (7, 0-0:99.98.0.255);
- Fraud Detection Events Log (7, 0-0:99.98.1.255);
- Disconnect Control Events Log (7, 0-0:99.98.2.255);
- Power Quality Event Log (7, 0-0:99.98.4.255);
- Communication Events Log (7, 0-0:99.98.5.255);
- Power Failure Events Log (7, 1-0:99.97.0.255);

16.1 Event Type And Curve Object

The default events are divided into the following seven categories:

- Standard Events Log (7, 0-0:99.98.0.255);
- Fraud Detection Events Log (7, 0-0:99.98.1.255);
- Disconnect Control Events Log (7, 0-0:99.98.2.255);
- Power Quality Log (7, 0-0:99.98.4.255);
- Communication Events Log (7, 0-0:99.98.5.255);
- Power Failure Event Log (7, 1-0:99.97.0.255);

Each event corresponds to different capture object.

The capture objects of event log are generally not configurable.

The storage method of event log curve is FIFO first in first out mode, and the maximum number of records depends on the project.

16.2 Events Reading

The events reading can be done selectively with class IC7 which supports reading of event log by point segment or time segment

If a new event occurs in the curve of one of the above types, the bit corresponding to "Unread_Log_Files_Status_Register" (1,0-0: 96.98.14.255,2) is set to 1,If this curve buffer is read, the corresponding bit is cleared.Remote system can read Unread_Log_Files_Status_Register and determine whether there is a new event occurred

16.3 Event Reporting

Alarm Register 1 (1, 0-0:97.98.0.255);

- Alarm Register 2 (1, 0-0:97.98.1.255);
- Alarm Descriptor 1 (1, 0-0:97.98.20.255);
- Alarm Descriptor 2 (1, 0-0:97.98.21.255);
- Alarm Filter 1 (1, 0-0:97.98.10.255);
- Alarm Filter 2 (1, 0-0:97.98.11.255);

The event reporting uses Data Notification Service of DLMS, when there is an event that needs to be reported, the alarm information is pushed to the system side. Every Alarm Register, Alarm Descriptor, and Alarm Filter are 32bit, and they have exactly the same definition of bits; each one representing an event type;



The above picture is the processing flow of event reporting:

1. Determine whether this type of event needs to be reported according to the configuration in Alarm Filter;
2. When there is an event that needs to be reported, the corresponding bit in Alarm Register is set to be "1".
3. If the corresponding bit of this event is "0" in the previous Alarm Register, then the corresponding bit in the Alarm Descriptor is "1";
4. Send alarm information to the superior system through Data Notification Service

16.3.1 Alarm Register

Alarm Register 1 (1, 0-0:97.98.0.255) of Alarm / Register 2 of (1, 0-0:97.98.1.255) corresponding to 32bit and a total of 64 types of events; Each bit indicates whether the current event is in the state, if the event has ended, then the corresponding bit in the Alarm Register is "0"

In addition, the value in Alarm Register can also be modified through the communication port, but only allowed to write "0".

If the event continues after being cleared, it will be reset to "1" by the meter.

16.3.2 Alarm Descriptor

- Alarm Descriptor 1 (1, 0-0:97.98.20.255);
- Alarm Descriptor 2 (1, 0-0:97.98.21.255);

Alarm Descriptor is used to describe whether the event has been successfully reported, when a bit is set to 1, it will send alarm information to the system side;

After receiving the report, the receiving system needs to write "0" to the corresponding bit in the Alarm Descriptor after receiving the report information, indicating that the report information has been received.

The system can also read the Alarm Descriptor to determine what events are in the reporting state.

16.3.3 Alarm Filter

- Alarm Filter 1 (1, 0-0:97.98.10.255);
- Alarm Filter 2 (1, 0-0:97.98.11.255);

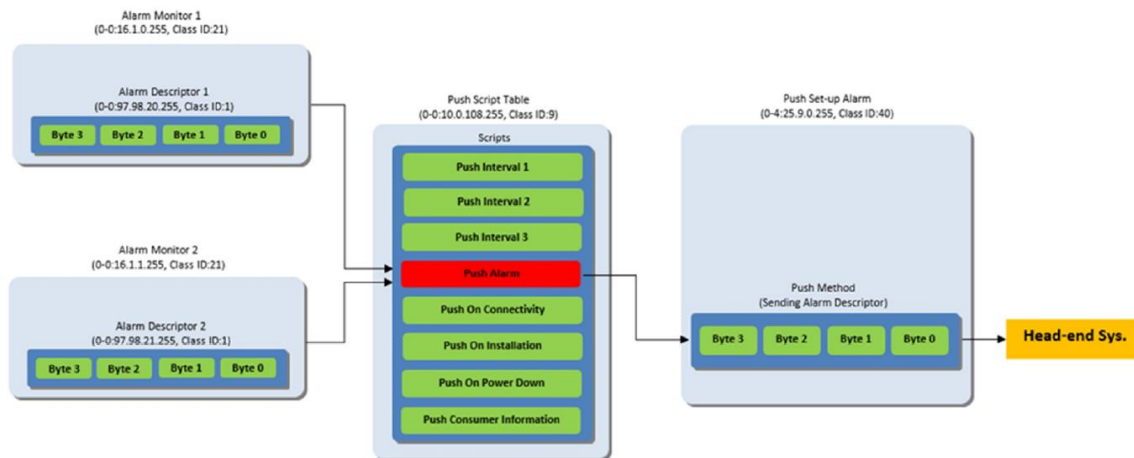
It is used to configure what events need to be reported.

16.3.4 Event Sending

Event reporting, as shown in Section 3.3, shows that Data Notification Service is only supported in the pre-linked client in default condition;

When events need to be reported, there is no need to establish links.

The following figure shows the event reporting process.



The message of event reporting is sent through the following objects:

- Alarm Monitor 1 (21, 0-0:16.1.0.255);
- Alarm Monitor 2 (21, 0-0:16.1.1.255);
- Push Script Table (9, 0-0:10.0.108.255);
- Push Setup Alarm (40, 0-4:25.9.0.255);

Alarm Monitor 1 (21, 0-0:16.1.0.255,3) and Alarm Monitor 2 (21, 0-0:16.1.1.255,3) monitor Alarm Descriptor 1 (1, 0-0:97.98.20.255,2) and Alarm Descriptor 2 (1, 0-0:97.98.21.255,2) respectively by default.

For Alarm Monitor 1 (21, 0-0:16.1.0.255,2) and Alarm Monitor 2 (21, 0-0:16.1.1.255,2) the default monitoring threshold value is "0"; when any value in the Alarm Descriptor is not "0", the default action script Push Script Table (9, 0-0:10.0.108.255) set in Alarm Monitor 1 (21, 0-0:16.1.0.255,4) and Alarm Monitor 2 (21, 0-0:16.1.1.255,4) is triggered, message reporting will be activated.

After the system end receives the report message, it will set the alarm bit in Alarm Descriptor to "0", then stop the alarm from generating again;

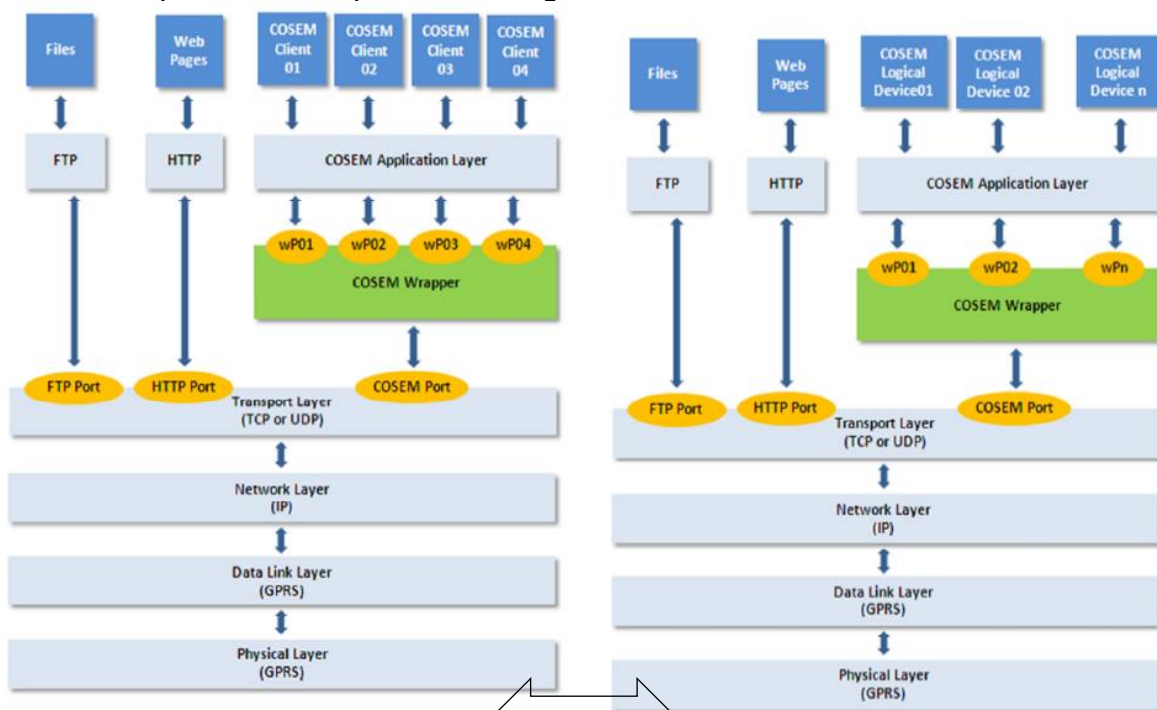
If for some reason the alarm information is not delivered, the alarm will be resent according to the retry delay Push Setup Alarm(40, 0-4:25.9.0.255,7) and the retry times Push Setup Alarm(40, 0-4:25.9.0.255,6);

The user can set the retry delay and the number of times;

17. GPRS Link

The link of GPRS is handled by the GPRS module, the corresponding class in the electric energy meter can only conduct read and setting, and do not realize the function.

When the GPRS module is powered on, the operation parameters are synchronized to the module. If the parameter changes, it is necessary to call the restart GPRS module script to load the parameters again. Structure is as shown below:



GPRS needs to configure all communication layers in the architecture diagram before establishing a communication link. The objects that need to be configured are as follows:

- Physical Layer Configuration:
GPRS Modem Setup (45, 0-0:25.4.0.255);
- Data Link Layer Configuration:
MAC Address Setup (43, 0-0:25.2.0.255);
PPP setup (44, 0-0:25.3.0.255)
- Network Layer Configuration:
IPv4 Setup (42, 0-0:25.1.0.255);
IPv6 Setup (48, 0-0:25.7.0.255)
- Transport Layer Configuration:
TCP-UDP Setup (41, 0-0:25.0.0.255);

17.1 Physical Layer Configuration(45, 0-0:25.4.0.255)

Configuring the following information by configuring COSEM object GPRS Modem Setup (0-0:25.4.0.255, Class ID 45):

GPRS-APN (Class ID 45, 0-0:25.4.0.255, 2); - If operators do not request, it can not be configured

GPRS-PIN_code (Class ID 45, 0-0:25.4.0.255, 3); - need not to be configured;

17.2 Data Link Layer Configuration

The data link layer contains objects MAC Address Setup and PPP Setup; configuration item:

MAC Address Setup (Class ID43, 0-0:25.2.0.255, 2) - MAC address needs not to be configured

"PPP Setup" -PPP authentication (Class ID 44, 0-0:25.3.0.255, 5) -- only supports PAP authentication, configures user-name and PAP-password, and needs not to be configured according to the operator's requirement.

17.3 Network Layer Configuration

The network layer is configured by class IC 42 IPv4 setup;

Configurable objects:

IPv4 Setup - local IP address (42, 0-0:25.1.0.255, 3); - can be set (static) or automatic acquisition (dynamic);

IPv4 Setup – DNS preferred (42, 0-0:25.1.0.255, 9); - the default is 8.8.8.8, and if a domain name access is required it needs to be set up;

IPv4 Setup - standby DNS (42, 0-0:25.1.0.255, 10); - the default is 0, and if a domain name access is required it needs to be set up;

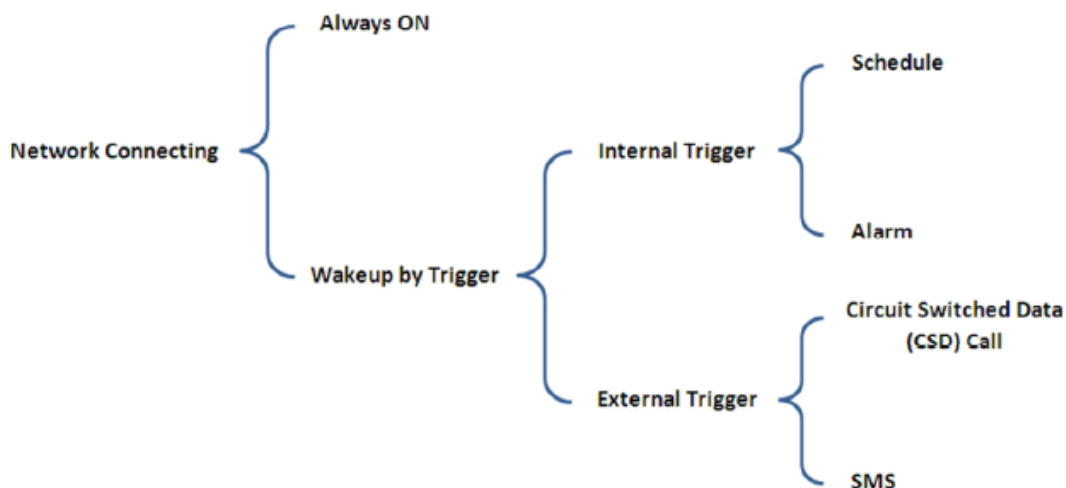
17.4 Transport Layer Configuration

The transport layer is carried out by TCP-UDP Setup (41, 0-0:25.0.0.255), configurable items:

TCP-UDP Setup - local communication ports (41, 0-0:25.0.0.255, 2) - the default value is 4059, the remote port is consistent with the local;

TCP-UDP Setup – TCP timeout (41, 0-0:25.0.0.255, 6) -- beyond this time if no data is received from the system end then the connection is automatically disconnected. 180 seconds by default, configurable; if configured as 0, then no timeout;

17.5 GPRS Network Connection Mechanism



As shown above, GPRS network connection support always online and online wake-up ;Wake-up mode can be internal or external clock, external alarm SMS, call wake (auto answer);

For TCP connections, the device is the client by default and the target address is the server; Network connection mechanism is configured via "AutoConnect" object (29, 0-0: 2.1.0.255).

"AutoConnect" - mode (29, 0-0:2.1.0.255, 2) - support 0101102103104 five modes can be configured;

"AutoConnect" - reconnect times (29, 0-0:2.1.0.255, 3) - number of reconnect can be configured;

"AutoConnect" - reconnect delay (29, 0-0:2.1.0.255, 4) - reconnect delay time is configurable;

"AutoConnect" - communication time window (29, 0-0:2.1.0.255, 5) - Automatic connection of communication time window, is effective in mode 102103;

"AutoConnect" - connection target (29, 0-0:2.1.0.255, 5) - connected target address, IP address, can be set up to maximum 5 numbers.

Auto Answer - Wake-Up Period (28, 0-0: 2.2.0.255, 3) - Configure the period during which the communication can be woken up;

Auto Answer (CSD Call / SMS) - Number of wake-up rings (28, 0-0: 2.2.0.255, 6) - Number of rings required to configure wakeup;

Auto Answer - Allow Wakeup Number List (28, 0-0: 2.2.0.255, 7) - Configure the communication number that allows wakeup;

The following example illustrates the process of setting the automaticGPRS link connection:

Step1: Set APN: "CNNET"; \

Step2: Set the PPP user name for PAP authentication: "CMC" and password "1234".

Step3: Set TCP local communication port: 4059, TCP timeout: 180S;

Step4: Set the number of AutoConnect reconnection 3, Reconnect delay: 60S;

Step5: Set AutoConnect time window: 23: 00-4: 00 everyday;

Step5: Set the AutoConnect link two target IP addresses: "8.8.8.8", "192.168.1.1";

Step6: Set AutoConnect mode: 103;

Step7: Call the restart GPRS module script (9, 0-0: 10.1.0.255) to resynchronize the parameters;

After setting, the meter will automatically link to the server through the set APN and PPP authentication username and password every day from 23:00 to 04:00.

The preferred destination address is 8.8.8.8. If the link fails, after 60 seconds, try to link 192.168. 1.1, failure repeated up to 3 times; default link port: 4059;

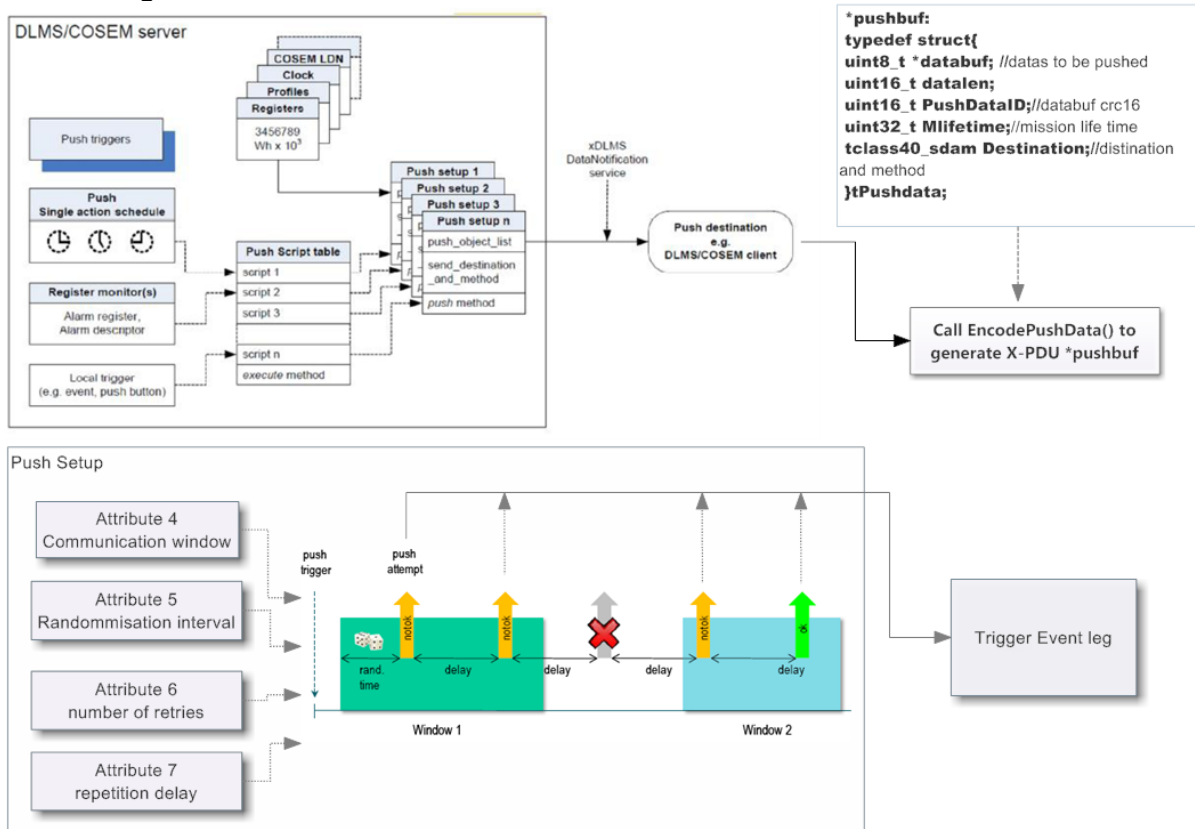
If the system does not receive the data within 180 seconds, the link will be cut off automatically; If the maximum failure in this time window has reached 3 times, then no longer try to link until the next time window again try to take the initiative to link.

At any time, any message, incoming call, scheduled data push or alarm will trigger the automatic link and send the data to the target server. If the connection is not activated within 180s, it will be automatically disconnected if no data is received from the server connection;

18. Active Push (push)

Active push is mainly used for abnormal event reporting and scheduled active data upload. The active push adopts the DLMS / COSEM data notification service to push a set of configured data. The push service processing is performed in an electric meter. If there is a data frame to be sent Communication module directly through the

MI1 interface using HDLC UI frame, pushed to the module, the module cache push data and complete the sending; the module can cache the maximum 3 frames push data, please refer to the specific package 2; Push service processing flow is as follows Figure:



As described in Chapter 18, if the device can wake up the remote data link function (such as GPRS) through event reporting or scheduled data push to send data to the remote server, the wake-up function can be configured through the following objects:

- Push action scheduler – Interval_1(0-1:15.0.4.255, Class ID: 22);
- Push action scheduler – Interval_2 (0-2:15.0.4.255, Class ID: 22);
- Push action scheduler – Interval_3 (0-3:15.0.4.255, Class ID: 22);
- Push Setup- Interval_1 (0-1:25.9.0.255, Class ID: 40);
- Push Setup- Interval_2 (0-2:25.9.0.255, Class ID: 40);
- Push Setup- Interval_3 (0-3:25.9.0.255, Class ID: 40);
- Alarm Monitor 1 (0-0:16.1.0.255, Class ID: 21);
- Alarm Monitor 2 (0-0:16.1.1.255, Class ID:21);
- PushSetup-On Connectivity (0-0:25.9.0.255, Class ID: 40);
- PushSetup-On-Alarm (0-4:25.9.0.255, Class ID: 40);
- PushSetup- On-Installation (0-7:25.9.0.255, Class ID: 40);

18.1 Scheduled Trigger Push:

According to the project requirements, you can configure different scheduled push frequency and push content, the following objects can be used to set scheduled push:

- Push action scheduler-Interval_n execution time (22,0-n: 15.0.4.255, 4); - Configure push time
- Push Setup- Interval_n Push object list (40, 0-n: 25.9.0.255,2); - Configure push content, default null
- Push Setup- Interval_n push target IP address (40, 0-n: 25.9.0.255,3); -

- configure the target IP address
- Push Setup- Interval_n Push Random Window Time (40, 0-n: 25.9.0.255,5); - Configure Random Window Time
- Push Setup- Interval_n Number of push retries (40, 0-n: 25.9.0.255,6); - Number of retries configured
- Push Setup - Interval_n Push Retry Delay (40, 0-n: 25.9.0.255,7); - Configure Retry Delay

For the scheduled trigger push, the system does not reply; the meter is pushed only once and is processed by the module successfully; the methods of different communication modules are greatly different in the way of ensuring the success of the push;

18.2 Alarm Trigger Push

Section 17.3 shows how to trigger the message push mechanism after an event occurs.

For the push triggered by the alarm, after the system receives the alarm event, the bit corresponding to the Alarm Descriptor in the device is set to 0.

The device determines whether the alarm has been successfully uploaded by judging the Alarm Descriptor, so as to trigger the resend times and resend Delay mechanism

18.3 GPRS Connection Trigger Push

When the device detects that a new TCP connection is set up (GPRS), it triggers the automatic registration information push.

This connection can be done through the scheduled automatic connection as described in chapter 18.5, or it can be a wake-up link. This part of the function is conducted by the energy meter.

After detecting a new GPRS connection, the GPRS module sends an action command (9, 0-0.10.0.108.255) to the watt-hour meter through the MM1 interface, script_identifier = 5, and triggers the push setup on connectivity service.

The wake-up registration configuration can be done with the following objects:

- Push Setup-On Connectivity - push object list (40, 0-0: 25.9.0.255, 2) -; to configure pushed objects;
- Push Setup-On Connectivity - push destination IP address (40, 0-0: 25.9.0.255,3); - configure destination IP address
- Push Setup-On Connectivity - push random window time (40, 0-0: 25.9.0.255,5); - configure random window time
- Push Setup-On Connectivity - push retries (40, 0-0: 25.9.0.255,6); - configure retries
- Push Setup-On Connectivity - push retry delay (40, 0-0: 25.9.0.255,7); - configure retry delay

For Push Setup-On Connectivity, the system end does not reply; if the device receives the push of the DLMS data from the system side to trigger resend times and resend delay mechanism;

By default, the system reads the Logical Device Name (1, 0-0: 42.0.0.255, 2) of the energy meter after the push message is received to maintain the link.

Default push content:

- Logical Device Name (1, 0-0:42.0.0.255, 2);
- IPv4 setup-GPRS (42,0-0:25.1.0.255, 3);

19. Security Mechanism

The device supports low level and high level two types of security mechanisms. The default factory configuration is low level. When the security level needs to be increased, the device does not need to be securely encrypted. To reduce the security level, you must encrypt the data Can be set by the following objects:

- Security Setup (Management Client/Pre-Establishment Client) (64, 0-0:43.0.0.255,2)
- Security Setup (Reading Client) (64, 0-0:43.0.2.255,2)
- Security Setup (Consumer Information) (64, 0-0:43.0.1.255,2)-CIP

The default factory key is as follows:

Security parameter	Default value (hex)
LLS default password	12345678
Global Authentication key	0xD0 D1 D2 D3 D4 D5 D6 D7 D8 D9 DA DB DC DD DE DF
Global Broadcast key	0x0F 0E 0D 0C 0B 0A 09 08 07 06 05 04 03 02 01 00
Global Encryption key	0x00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
Global CIP Authentication key	0xC0 C1 C2 C3 C4 C5 C6 C7 C8 C9 CA CB CC CD CE CF
Global CIP Encryption key	0x10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
Global Reading Authentication key	0 x E0 E1 E2 E3 E4 E5 E6 E7 E8 E9 EA EB EC ED EE EF
Global Reading Encryption key	0 x F0 F1 F2 F3 F4 F5 F6 F7 F8 F9 FA FB FC FD FE FF
Master key	0X00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF

Security Setups	Keys
Security Setup (Management Client/Pre-Establishment Client) (64, 0-0:43.0.0.255)	Unicast Global Key Broadcast Global Key Authentication Key Master Key
Security Setup (Reading Client) (64, 0-0:43.0.2.255)	Unicast Global Reading Key Authentication Reading Key
Security Setup (Consumer Information) (64, 0-0:43.0.1.255)	CIP Unicast Global Key CIP Authentication Key

For communication on the local port, you can limit the number of times the wrong authentication allowed and the time that the port is locked after the maximum number of times is reached by setting the Local Authenction on protection object (1,0-0: 96.98.20.255.2)

structure

```
{
unsigned: failed attempts (1-10 times)
unsigned: lockout time (1-180 minutes)
}
```

When communicating using the Broadcast key or unicast key, the device records frame counters in the following objects:

- Security - Receive Frame Counter - Unicast Key (Remote) (0-0:43.1.0.255);
- Security - Receive Frame Counter – Broadcast Key (Remote) (0-1:43.1.0.255);
- Security - Receive Frame Counter - Unicast Key (Local) (0-0:43.0.2.255);

Annexure- C

Unified Meter Data Collection System

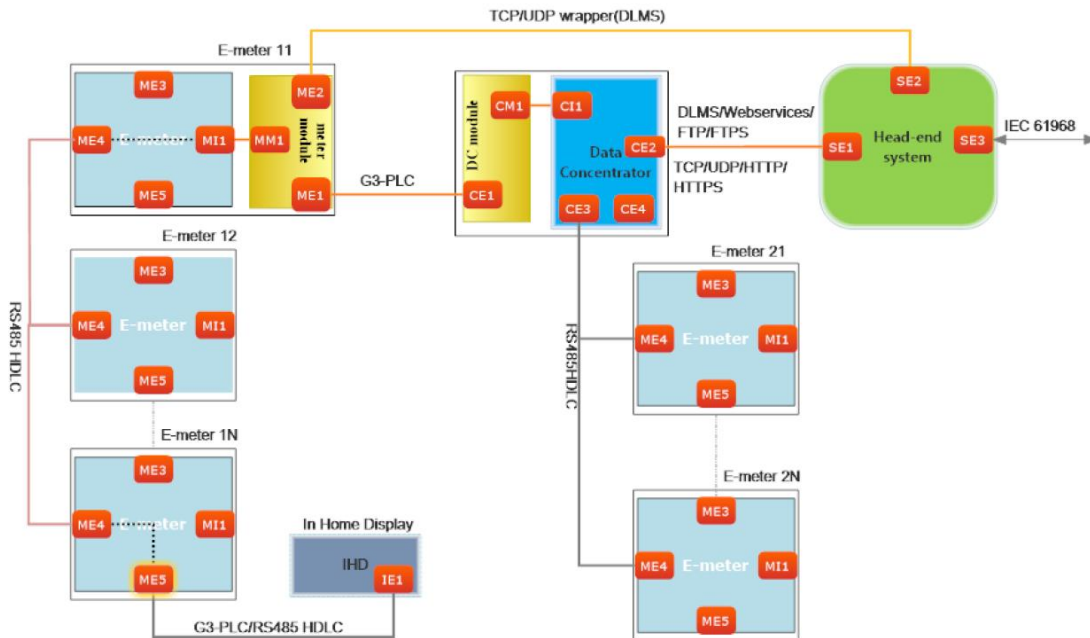
DCUto HES

1. General

1.1 Introduction

The system interface architecture of the device is shown in the following figure; the electric energy meter, concentrator and front end system are simplified into several interfaces marked with correspondent code name respectively;

System Architecture



Device functions & Interoperability Interfacing Requirements are composed of 3 parts, including:

Package 0: Addressing System

Package 1: DCU to HES

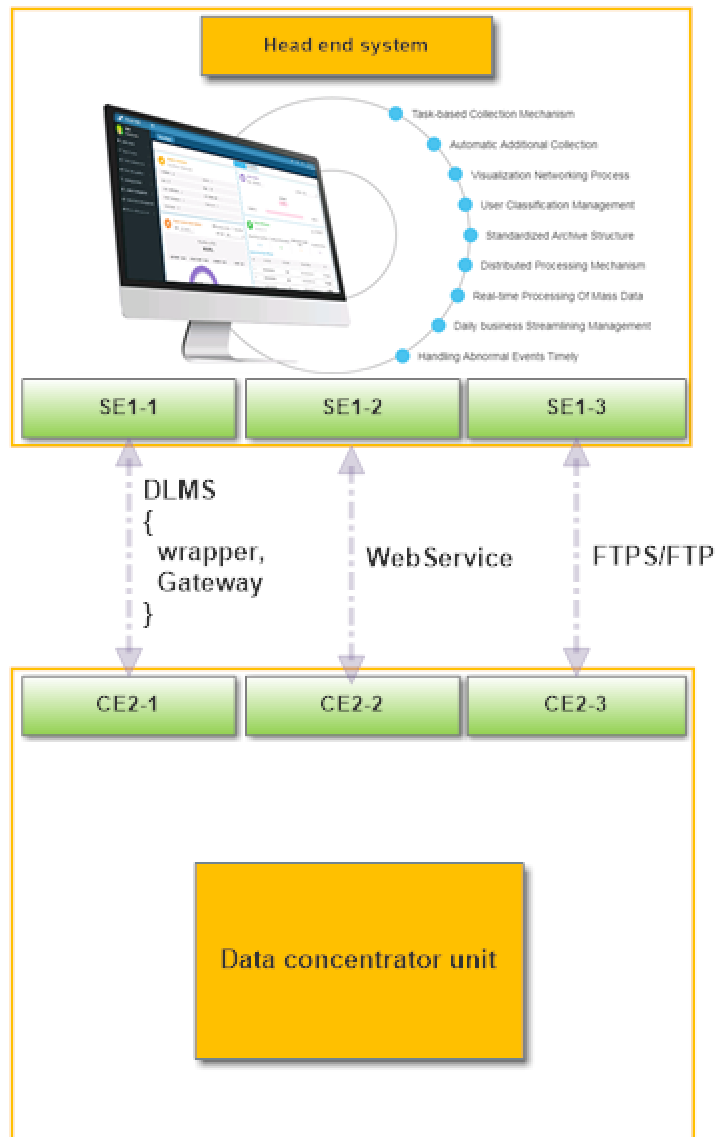
Package 2: Meter Modeling

1.2 Reference Documents

Name
Blue_Book_12th_edition
Green_Book_8th_edition
Object_defs_v3.1_161215
White_Glossary OfDlmsCosemTerms

2. Communication Structure

SE1-CE2 DCU to HES



Above figure is direct communication structure between HES and DCU, which contains 3 independent channels. In specific, the system itself is featured by its high flexibility and compatibility for various requirements. Interface CE2-1, CE2-2, CE2-3 of DCU could be configured to remote port with network at will.

As shown in the structure diagram, data exchange between data collection system and devices to be read supports 3 standard communication models:

- DLMS in IEC 62056
- Webservice
- FTPS/FTP

3. DLMS

3.1 DLMS Communication Model

The data exchange between the data acquisition system and the collected equipment, should refer to the communication mode of the client / server AP specified by DLMS. The client AP initiates the access request and the server AP responds, which is a question and answer communication mechanism; and the role of server AP is specified to be assumed by the meter or module.

By means of access management, one server AP can exchange data with one or more client APs at the same time, and a client AP can also access one or more server APs at the same time.

In addition to the normal question and answer mechanism, if there are abnormal events in the server AP, the event can be reported through the prescribed format.

The three-layer architecture of DLMS is shown in the following figure:

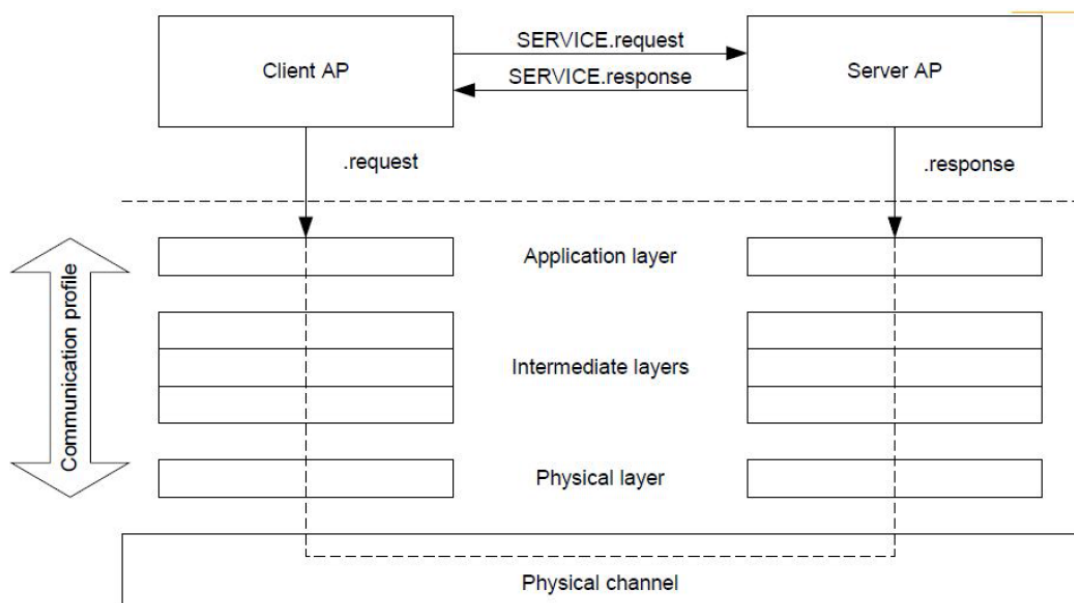


Figure 2 – Client/server relationship and protocols

Level 1: Physical Device Layer

Level 2: Logical Device/Intermediate Layer

Level 3: COSEM Application Layer

3.2 DLMS Application Layer Service

Application layer service default settings is supporting LN(logical Name) only;
ContextName = LONG_NAMES;

Version No.:

DLMS version = 6;

According to DLMS standard, meter supports service types as below chart:

Service	Conformance Block Bit
general-protection	1
general-block-transfer	2
block-transfer-with-get	11
block-transfer-with-set	12
multiple-references	14
data-notification	16
Get	19
Set	20
selective-access	21
action	23

For different clients, defaulted services supported are as below chart:

Client	Function
Public Client	Get block-transfer-with-get
Pre-linked Client	get set action data-notification general-block-transfer general-protection
Management Client	get block-transfer-with-get set block-transfer-with-set selective-access multiple-references action general-block-transfer general-protection
Read Client	get block-transfer-with-get selective-access multiple-references general-block-transfer general-protection
Module Client	get block-transfer-with-get set block-transfer-with-set selective-access multiple-references

	action general-block-transfer general-protection
--	--

For different client No. of each logical device, there is an application layer connection subject. Class 15 (Association LN) is used for describing present connection information including connection list and connection status, etc. Moreover, it could also modify key through Class 15 with HLS verification, connection subject list as below:

- “Current Association” (0-0:40.0.0.255, Class ID: 15)-present connection subject
- “Public Association” (0-0:40.0.1.255, Class ID: 15)
- “Management Association” (0-0:40.0.2.255, Class ID: 15)
- “Pre-established Association” (0-0:40.0.3.255, Class ID: 15)
- “Reading Association” (0-0:40.0.4.255, Class ID: 15)
- “Module Association” (0-0:40.0.5.255, Class ID: 15)

3.3 Wrapper

3.3.1 Wrapper Format

Wrapper includes 8 bytes for version, SSAP, DSAP and LEN. Frame format as below:

Version	SSAP	DSAP	LEN	COSEM APDU
---------	------	------	-----	------------

■Parameters Descriptions:

Version: 2 bytes, Wrapper version, present version is 0x0001;

SSAP: 2 bytes, refer to sender SAP address;

DSAP: 2 bytes, range 0x0001 – 0xFFFF, refer to destination address;

LEN: 2 bytes, range 0x0000 – 0xFFFF, refer to bit length of COSEM APDU transmitted;

COSEM APDU: communication data content, out of range of wrapper.

3.3.2 SSAP Client Address

SSAP length is 2 bytes, refer to client address, defined as below:

High Byte	Low Byte
-----------	----------

High byte: master station address range 0x01 – 0xFF refer to various transformer master station address, 0x00 means not specified master station address (default);

Low byte: client address 0x10/0x02/0x01/..., refer to public/read/write/..client id, SSAP

3.3.3 DSAP Service Address

DSAP length is 2 bytes, refer to service address; mainly refer to device address accessed, division of DSAP is mainly used to identify logical device of the accessed device.

3.4 Gateway Protocol

Gateway protocol is mainly use for gateway devices (DCU/collector/communication module), which supports multiple layer network transparent transfer, as shown in below figure:

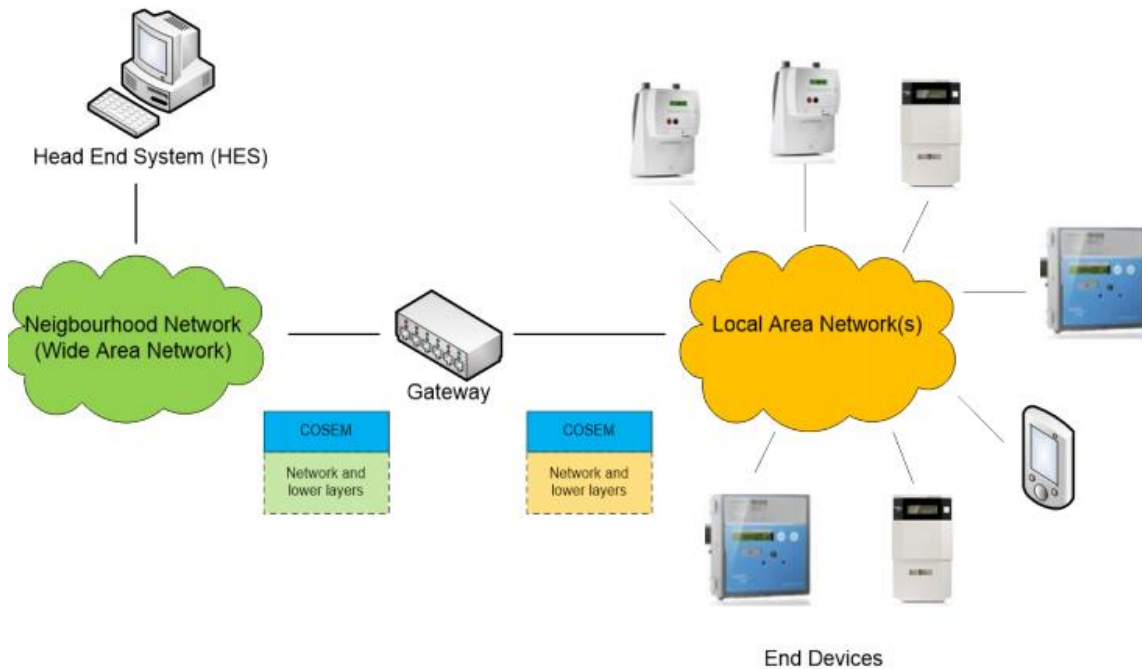


Figure 156 – General architecture with gateway

3.4.1 Gateway Protocol Format

Gateway protocol definition as below, Prefix for short;

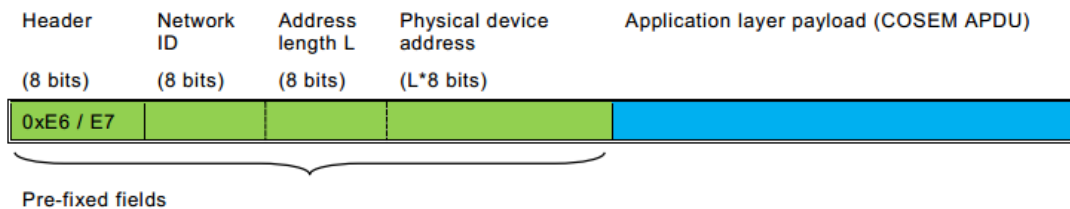


Figure 157 – The fields used for pre-fixing the COSEM APDUs

■Parameter Description:

Header: 1 byte, indicating the data transfer direction, 0xE6 is a request or data report frame , 0xE7 is a response frame;

Network ID: 1 byte, network ID, indicating the forwarding of the lower channel number (network number);

Address length: 1 byte, target address length;

Physical device address: N bytes, the physical address of the target, whose length depends on the address length;

COSEM APDU: The communication data content, does not belong to the gateway protocol.

3.4.1 Gateway Protocol Address

3.4.1.1 Network ID

Network ID		
NO	Address	
1	0x0000	Default fixed port (1 port only)
8	0x0041	XE1 port (module 1, PLC /RF/...);
9	0x0042	XE2 port (remote ports: 4G/3G/GPRS/Ethernet);

10	0x0043	XE3 port (RS485 1);
11	0x0044	XE4 port (RS485 2);
12	0x0045~0x006F	Port reserved

3.4.1.2 Physical device address

Gateway protocol destination address definitions as below:

Address length: 0x07; 7bytes physical address;

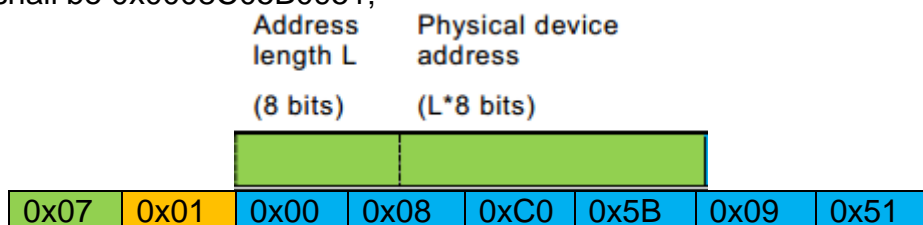
Physical device address: 7bytes.

1 byte, logic address;

Physical device upper address		
NO	Address	
1	0x00	No-station
2	0x01	Main logical device/(DCU/meter/collector)
3	0x02~0x0F	DLMS UA reserved
4	0x10	Communication module 1 function area
5	0x11	Communication module 1 firmware area
6	0x10~0x001F	Main logical device reserved
7	0x22~0x3F	DC reserved
8	0x41	XE1 port (module 1, PLC /RF/...);
9	0x42	XE2 port (remote ports: 4G/3G/GPRS/Ethernet);
10	0x43	XE3 port (RS4851);
11	0x44	XE4 port (RS4852);
12	0x45~0x6F	Port reserved

6 bytes, target physical address; product serial No. in 16 carry scale code;

E.g.: Device serial No.: 037586930001, then physical address in gateway protocol shall be 0x0008C05B0951;



3.5 DLMS Device Identification

Belows are for description about how devices are defined according to DLMS/COSEM requirements. Each device has an unique ID (serial No.) correspondently, which provides proof for registration of device in HES system;

Device ID: "Device ID7" COSEM object (1-0:0.0.0.255, Class ID: 1); this ID is unique, default in 11 digits, coding may be changed as per utility's requirement, supports 14 digits in maximum. The ID is set in device at factory settings by manufacturer and shall be labeled on device nameplate;

System Title: As per requiremetn of various projects, each device has an unique 8 bytes system title/code, which has been written in device firmware at factory

settings; it facilitates identification and verification of various manufacturers or device models in the same system.

Logical Device Name: “COSEM Logical Device Name” COSEM object (0-0:42.0.0.255, Class ID: 1). As mentioned in above context, each physical device may correspond to multiple logical devices, logical devices name is the unique ID for identify logical device.

3.6 DLMS Device Automatic Registration

Device automatic registration refers to the process of sending device logical device name, IP address to HES through Data-notification service after device installed and HES responses with registration completion after receiving.

DLMS device automatic registration refers to configuration contents of subjects which adopted push setup –on installation (0-7.25.9.0.255, class 40) send registration information to the upper layer devices by Data-notification service. Default settings in device supports pre-linked Client for Data-notification service only.

Upper layer devices shall response after receiving registration information and confirm, and then set “E_instal” information to data item (0-0:96.13.1.255, class 1).

Press device scroll display button for 10 seconds, (LCD shows “install_S”), then trigger device automatic registration report; it also support configuration by push setup –on installation for automatic registration time and tryout times, etc. In default settings, subjects are automatically registered and sent:

Logical Device Name: (1, 0-0:42.0.0.255, 2);

IPv4 Setup –local IP address (42, 0-0:25.1.0.255, 3);

4. Webservices

Webservice is realized in SOAP 1.1 format. SOAP Information transmission process from HTTP adopts HTTP over TLS1.2(HTTPS) for data encryption;

4.1 Webservices

HES could make main operations through webservices provided by DCU. All configuration and reading commands have user name and password protection. User name and password are configurable through local programming or through higher authorization in DLMS. Commands are as below:

Default User Name: DefaultUser

Password: helloworld

4.1.1 GWTransReq

“**GWTransReq**” : Gateway transmission request is used for transparent data transmission to down layer devices under each ports, response with

“**GWTransResp**” for settings; After DCU completes execution of command, then inform HES with “**GWTransInfo**”.

4.1.2 ConfigDCUcom

“**ConfigDCUcom**”: set DCU for modification of meter reading configurations, such asDLMS Client No., HES address, etc. After configuration, response with

“**ConfigDCUcomResp**” to HES.

4.1.3 GetConfigDCUcom

“**GetConfigDCUcom**”: Acquire DCU current operation parameters, shall correspondent with contents in “ConfigDCUcom”, then DCU response

“**GetConfigDCUcomResp**” with correspondent parameters;

4.1.4SetDatatime

“**SetDatetime**”: set DCU current time; If NTP server is set, DCU would automatically synchronize clock, but HES could also directly set DCU clock through this service, then response with “**SetDatetimeResp**”

4.1.5GetDatatime

“**GetDatetime**”: Acquire DCU current time; If NTP server is set, DCU would automatically synchronize clock, but HES could also directly set DCU clock through this service, then response with “**GetDatetimeResp**”.

4.1.6SetDeviceDoc

“**SetDeviceDoc**”: Acquire or modify meter data under all or certain port, then response with: “**SetDeviceDocResp**”.

4.1.7GetDeviceDoc

“**GetDeviceDoc**”: Acquire all meter data information and its correspondent address under each port, then response with “**GetDeviceDocResp**”.

4.1.8GetOnlinelist

“**GetOnlinelist**” : Acquire currently online meter list of certain port, then response with “**GetOnlinelistResp**”.

4.1.9AMRTask

“**AMRTask**”: Set automatic meter reading task of each port, able to set multiple automatic meter reading task, daily/monthly/customized cycle and select meter reading item list to place commands; then response with “**AMRTaskResp**”.

4.1.10GetAMRTask

“**GetAMRTask**”: Acquire automatic meter reading task of each port and response with “**GetAMRTaskResp**”.

4.1.11RestartAMRTask

“**RestartAMRTask**”: Freeze single or multiple automatic meter reading task and restart, then response with “**RestartAMRTaskResp**”.

4.1.12GetDeviceData

“**GetDeviceData**”: Acquired device data from DCU after executing “AMRTask”; able to acquired single or all data, then response with “**GetDeviceData**”.

4.1.13DeviceUpgradeTask

“**DeviceUpgradeTask**”: Set upgrade tasks for devices managed by DCU. After configuration, DCU shall download upgrade file in specific time from FTP and execute the task, then response with “**DeviceUpgradeTaskResp**”; After execution, DCU shall inform HES through “**DeviceUpgradeTaskInfo**”.

4.1.14GetDeviceUpgradeSta

“**GetDeviceUpgradeSta**”: Acquire meter upgrade task execution status and response with “**GetDeviceUpgradeStaResp**”.

4.1.15DCUUpgradeTask

“**DCUUpgradeTask**”:Set upgrade tasks forDCU. After configuration, DCU shall download upgrade file in specific time from FTP and execute the task, then response with“**DCUUpgradeTaskRes**”; After upgrade, DCU shall inform HES “**DCUUpgradeTaskInfo**”.

4.1.16ScheduleTack

“**ScheduleTask**”: Configure schedule task in single or multiple commands are available;

“**ScheduleTaskInfo**”: After task completed, DCU shall inform HES

“**ScheduleTaskResp**”.

4.2 XML Example

GWTransReq:TaskNum:00-99 Protocoltype:0:DLMS

```
<?xml version="1.0"?>
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/ "
xmlns:lh="http://localhost:8086/DcuSoap">
<soapenv:Body >
<lh:GWTransReq UserID="DefaultUser" Password="hellowrold" PortID="CE1"
DeviceID="37999900001">
<TaskNum>01</ TaskNum >
<!--one or more repetitions:-->
<Trans>
<Protocoltype>0</ Protocoltype >
<Databody>(encrypted COSEM)</ Databody >
</Trans>
<Trans>
<Protocoltype>0</ Protocoltype >
<Databody>(encrypted COSEM)</ Databody >
</Trans>
</lh: GWTransReq >
</soapenv:Body>
</soapenv:Envelope>
```

DCU shall inform HES through GWtransInfo after completing task;

GWTransInfo:TaskNum:00-99 TransResult:0:succeed others: Error Code

```
<?xml version="1.0"?>
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/ "
xmlns:lh="http://localhost:8086/DcuSoap ">
<soapenv:Body >
<lh:GWTransInfo UserID="DefaultUser" PortID="CE1" DeviceID="37999900001">
<TaskNum>01</ TaskNum >
<!--one or more repetitions:-->
<TransResp>
<TransResult>0</ TransResult >
<DataReap>(encrypted COSEM)</ DataReap >
</ TransResp >
< TransResp >
<TransResult>0</ TransResult >
<DataReap>(encrypted COSEM)</ DataReap >
</ TransResp >
</lh: GWTransInfo>
</soapenv:Body>
</soapenv:Envelope>
```

SetDatatime :TaskNum:00-99

```
<?xml version="1.0"?>
```

```

<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/ "
xmlns:lh="http://localhost:8086/DcuSoap ">
<soapenv:Body >
<lh:SetDatatime UserID="DefaultUser" Password="hellowrold" >
<TaskNum>01</ TaskNum >
<Datatime>2018-01-02F00:00:00Z</ Datatime >
  </lh: SetDatatime >
</soapenv:Body>
</soapenv:Envelope>

```

DCU shall inform HES in SetDatatimeResp after execution;
SetDatatimeResp:TaskNum:00-99 Result:0:succeed others:error code

```

<?xml version="1.0"?>
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/ "
xmlns:lh="http://localhost:8086/DcuSoap ">
<soapenv:Body >
<lh:SetDatatimeResp UserID="DefaultUser">
<TaskNum>01</ TaskNum >
<Result>0</Result >
  </lh: SetDatatimeResp>
</soapenv:Body>
</soapenv:Envelope>

```

For more examples, please refer to WSDL document.

5. FTP/FTPS

FTP/FTPS service is applicable for DCU remote upgrade. HES may configure FTP server address through webservice or DLMS protocol. DCU shall download update files from FTP service in specified time to finish upgrade during execution of upgrade task.

FTP/FTPS service is also applicable schedule automatic meter reading data upload to server. After finishing task, configuration completed.

Annexure- D

Unified System &HES Interface Specification

CIM based InteroperableStandard

1. Overview

This document specifies an implementation profile for Unified System and MDC using common information model (CIM). CIM(IEC61968) mandates how the various messages may be transported from a system to another system. The current version of CIM deals with webservices and JMS as the barriers of transported messages, This document describes how the message payloads are conveyed using web services. The goal is to provide the sufficient details which are needed for the interoperable implementation of CIM. To this aim, the communication architecture is proposed and the required communication interfaces are specified.

2. Communication Architecture

2.1 Introduction

MDC and an Unified System provide two service interfaces, depicted in Figure 1.1. Each MDC provides an interface called “doCommand”, to serve the operation and data collection commands from its corresponding Unified System. The synchronous responses to the commands are sent to the Unified System as a return value of calling doCommand. An Unified System may ask for an asynchronous response to its sent command by setting the tag of “AsyncReplyFlag” True in header of its input command. In this case, the asynchronous response is sent to the Unified System via “getResponse” service.

Note that, in case of asking for an asynchronous response, the return value of “doCommand” is a xml formatted data which contains the acknowledgement response and the business-level response which will be sent later to the Unified System by calling “getResponse” service.

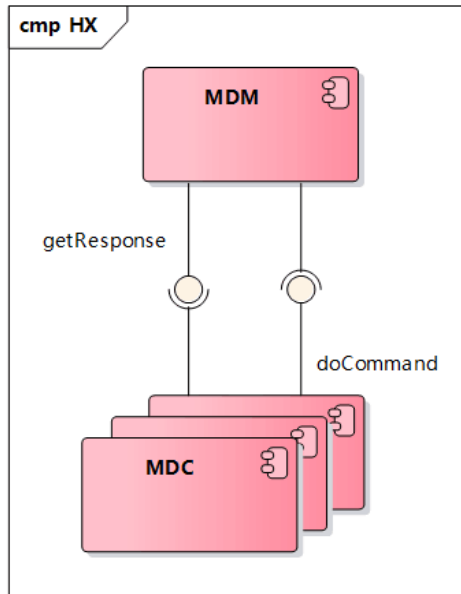


Figure 1.1 Communication Architecture

2.2 Service Interface

As mentioned, two different interfaces are provided by MDC and Unified System, described in the following table. In the both of the interfaces the types of the input parameters and the output results are native “string”. The contents of the input and the output strings conform to IEC61968 standard.

Table 1.1: Service Interface Specification

Service Name	Provider	Input	Output	Description
doCommand	MDC	A string parameter in XML format, conforming to IEC61968 standard for requests.	A string output result in XML format, conforming to IEC61968 standard for responses.	The commands are sent to MDC via this interface and the synchronous responses are returned as the service calls' results.
getResponse	Unified System	A string parameter in XML format, conforming to IEC61968 standard for responses.	No output(void type)	This command receives the asynchronous responses which are sent by MDC. Unified System doesn't need to respond any message to MDC.

3. Transporting Message

3.1 Introduction

In accordance to this document, in order to establish interoperability between Unified System and MDC of meter manufactures, messages structure should be complied with IEC61968

standards. Since this standard is an open standard, there should be some kind of consensus between manufactures. After reaching consensus regarding message structures, MDC should be tested to verify the accuracy of the implementation.

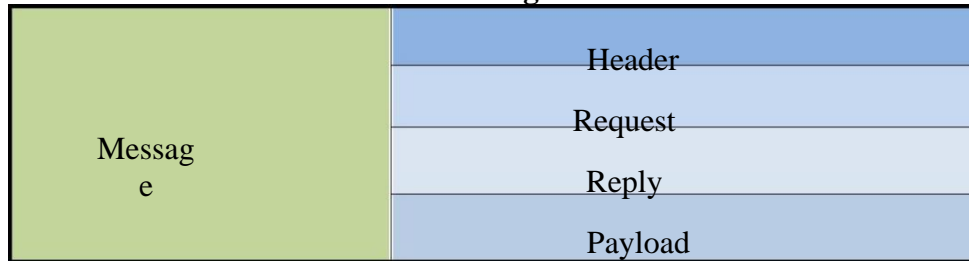
Manufactures should be considered following points:

Messages should be completely based on IEC61968 and there should be no innovation in messages.

All elements used in the messages should be based on the document.

According to IEC61968, general structure of messages is defined in the following tables:

Table 2.1: Message Structure



In the above structure, the presence of "Header" is Mandatory and its format is defined in Table 2.2:

Table 2.2: Format of the Header

Header	
Elements	Content
Verb	Identifies the action of the source Valid value: refer to other Section
Noun	Identifies the message type Valid value: Refer to other Section
Revision	Identifies the XSD version for the inbound meter reads Valid value: 2.0
Context	
Timestamp	Time of sending the message by sender
Source	Source of Data Unified System/MDC(sender)
AsyncReplyFlag 1	true/false2
ReplyAddress	Call back URL. String
AckRequired3	true/false2
User1	UserID string
	Organization
MessageID	UUID01
CorrelationID	Request Message ID
Comment	String
Property4	Name "timeout(s)"/"timeout(m)"/"timeout(h)"
	Value integer
Property5	Name "GetConnectedToTheMeter"
	Value true/false*****
Property6	Name "password"

Header	
Elements	Content
	Value string
1-This element is used just in request messages which are sent by Unified System.	
2-It is true/false if the transaction is asynchronous/synchronous.	
3-It is only used when the transaction is asynchronous, true means MDC need to return Acknowledgement to Unified System, false means no need.	
4-This node can be used for identifying the amount of timeout for request messages.	
5-This element is used when collecting data from the meter is required, not from server's database. (This element is not usually used.)	
6-This node along with "User" node can be used Authentication process for the messages.	

According to the IEC61968, two kinds of message is defined: request message, response message. Any IEC 61968-9 message, whether it is a request message, response message, is composed as an XML document. These different message types are distinguished by the top-level element in the XML document. This must always be one of <RequestMessage>, <ResponseMessage> accordingly.

3.2 Request Message

Request messages are used for sending queries or commands. For example, a request message might be sent from a Unified System to an MDC to obtain a set of meter readings. Response messages are used for returning the corresponding data or status information to a request message.

The elements used in the request message are observed in Table 2.4:

Table 2.4: Request Message

Request Message	Header	According to Table 2.2
	Payload	According to verb and noun

3.3 Response Message

Response messages are also used to indicate whether a given request succeeded or whether there were any failures in performing the command. In an asynchronous way, response messages will be used for sending simple acknowledgements in the context of webservices, MDC sends an acknowledgement to Unified System indicating that it received the message, MDC then goes away and in its own time performs a session with the meters of interest, reads the values and when it is ready, sends it back to Unified System in response message. As mentioned before, in an asynchronous message, there is a "response message" besides the acknowledgement. More details regarding the "Simple Acknowledgement" message is provided in Table 2.5:

Table 2.5: Simple Acknowledgement Message

Response Message (Acknowledgement)	Header	According to Table 2.2
	Reply	Result code OK Error code 0.3

The response message is defined with more details in Table 2.6:

Table 2.6: Response Message

Response Message	Header	According to Table 2.2
------------------	--------	------------------------

	Reply*	Result	OK/Failed/Partial **
		Error code	RefertoTable2.8
	Payload***		More details in next sections

*This node is used in every response message.

**If error code is 0.0 the result isOK. Other Error codes are provided inTable2.7.

***Payload is only used when data is transferred.

Details for Reply element of response message are provided in Table below:

Note that there may be multiple Error node, showing different error.codes.

Table2.7: Reply

Reply	Result	OK/PARTIAL/FAILED	
	Error (Unbounded)	Code	RefertoTable2.8
		Level	INFORM/WARNING/FATAL/CATASTROPHIC
		reason	
		details*	String
operationId**			

*In this node, more detail about the error is provided.

**This is used for identifying the number of data packet in a PARTIAL reply, i.e. the Result=PARTIAL and operationId identifies which number of data packet is being sent.

In the following, there are some error codes which are sent from MDC in response to Unified System request:

Table 2.8: Error Codes

No.	Code	Description
1	0.0	Successful/no error
2	0.1	Partial result(additional results conveyed in separate messages)
3	0.2	Partial result(no further results to follow)
4	0.3	Acknowledgement
5	2.4	Invalid meter(not registered)
6	2.6	Invalid ReadingType
7	2.5	Invalid Noun
8	2.9	Invalid Verb
9	2.12	Invalid Usagepoint(s)
10	2.13	Meter/Usage Point mismatch
11	2.14	Invalid source
12	2.15	Invalid RequestID
13	2.33	Invalid PricingStructure(s)
14	3.2	Too many pending requests
15	4.1	Request timedout
16	4.2	Service not available
17	4.3	Local error in processing
18	5.3	Unable to process the request-transaction attempted and failed
19	5.5	Some or allof the requested readingtypes are unavailable in Unified SystemS
20	5.7	Some or all of the requested data is unavailable

21	5.8	Unable to process the request-.Mandatory field(s) missing
22	6.5	Request canceled by user
23	7.4	Authentication failure
24	7.5	Action not authorized for user
For other Reply Codes refer to annex B of IEC61968-9		

4. Meter Archive Synchronization

4.1 Introduction

This section aims at presenting message structures regarding adding an equipment.

4.2 Usecase Description

Firstly Unified System should be to validating the meter's information. After that Unified System will send the command of synchronizing the meter to MDC which contains meter's full profile. The details of Unified System's request to MDC are available in the following Tables:

Table 4.1: Meter Archive Synchronization (add meter)

Meter Addition			
Message type	Verb	Noun	Main elements
Request	create	MeterConfig	Header/Payload
Response	reply	MeterConfig	Header/Reply

Note:

This transaction can be conducted only in synchronous modes. In synchronous mode, a reply will sent back to Unified System, showing the successfulness/unsuccessfulness.

Table 4.2: Meter Archive Synchronization (modify meter)

Meter Modification			
Message type	Verb	Noun	Main elements
Request	change	MeterConfig	Header/Payload
Response	reply	MeterConfig	Header/Reply

Note:

This transaction can be conducted only in synchronous modes. In synchronous mode, a reply will sent back to Unified System, showing the successfulness/unsuccessfulness.

Table 4.3: Meter Archive Synchronization (delete meter)

Meter Deletion			
Message type	Verb	Noun	Main elements
Request	delete	MeterConfig	Header/Payload

Response

reply

MeterConfig

Header/Reply

Note:

This transaction can be conducted only in synchronous modes. In synchronous mode, a reply will sent back to Unified System, showing the successfulness/unsuccessfulness.

Payload's elements regarding this request are presented in Table 4.4:

Table 4.4: MeterConfig

Payload of MeterConfig			
MeterConfig	Meter (unbounded)	mRID	Meter ID
		Names	name Serial Number "serialNumber"
		Names	name Meter Model (HX110-KP,INHE110-SP)
		Names	NameType name "meterModel"
		Names	name Meter Type (01:485,02:GPRS,04:PLC,06:RF)
		Names	NameType name "meterType"
		Names	name Meter Mode (01:Postpaid,02:Prepaid)
		Names	NameType name "meterMode"
		Names	name Manufacturer Code (14:HEXING,33:INHE,66:KAIFA)
		Names	NameType name "manufacturer"
Names	name Value of current transformer ratio (1/1,100/5,200/5)		
Names	NameType name "ctRadio"		
Names	name Value of potential transformer ratio (1/1,100/5,200/5)		
Names	NameType name "ptRadio"		
Names	name Protocol Type (03:DLMS,15:HDLC)		
Names	NameType name "protocolType"		

If MDC need other parameters, Unified System be able to extend the element which named "Names".

4.3 Examples of XML Message

4.3.1 MeterConfig

```

<?xml version="1.0" encoding="UTF-8" ?>
<RequestMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/MeterConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>create</Verb>
<Noun>MeterConfig</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-03-14T20:04:39+04:30</Timestamp>
<Source>Unified System</Source>
<AsyncReplyFlag>>false</AsyncReplyFlag>
<AckRequired>>false</AckRequired>

```

```

<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
<Property>
<Name>timeout(m)</Name>
<Value>30</Value>
</Property>
</Header>
<Request>
<m:MeterConfig>
<m:Meter>
<m:mRID>014000000011</m:mRID>
<m:Names>
<m:name>014000000011</m:name>
<m:NameType>
<m:name>serialNumber</m:name>
</m:NameType>
</m:Names>
<m:Names>
<m:name>HXEP1000T</m:name>
<m:NameType>
<m:name>meterModel</m:name>
</m:NameType>
</m:Names>
<m:Names>
<m:name>14</m:name>
<m:NameType>
<m:name>manufacturer</m:name>
</m:NameType>
</m:Names>
<m:Names>
<m:name>1/1</m:name>
<m:NameType>
<m:name>ctRadio</m:name>
</m:NameType>
</m:Names>
<m:Names>
<m:name>1/1</m:name>
<m:NameType>
<m:name>ptRadio</m:name>
</m:NameType>
</m:Names>
<m:Names>
<m:name>03</m:name>
<m:NameType>
<m:name>protocolType</m:name>
</m:NameType>
</m:Names>
</m:Meter>
</m:MeterConfig>
</Request>
</RequestMessage>

```

4.3.2 ReplyMeterConfig

```
<?xml version="1.0" encoding="UTF-8" ?>
<ResponseMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/MeterConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>reply</Verb>
<Noun>MeterConfig</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-06-24T02:30:00+04:30</Timestamp>
<Source>MDC-001</Source>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
</Header>
<Reply>
<Result>OK</Result>
<Error>
<code>0.0</code>
</Error>
</Reply>
</ResponseMessage>
```

5. DeviceArchive Synchronization

5.1 Introduction

This section aims at presenting message structures regarding adding an equipment.

5.2 Usecase Description

Firstly Unified System should be to validating the meter's information. After that Unified System will send the command of synchronizing the device to MDC which contains device's full profile. The details of Unified System's request to MDC are available in the following Tables:

Table 4.1: Device Archive Synchronozation (add device)

Device Addition			
Message type	Verb	Noun	Main elements
Request	create	EndDeviceConfig	Header/Payload
Response	reply	EndDeviceConfig	Header/Reply

Note:

This transaction can be conducted only in synchronous modes. In synchronous mode, a reply will sent back to Unified System, showing the successfulness/unsuccessfulness.

Table 4.2: DeviceArchive Synchronizaton (modify device)

Device Modification			
Message type	Verb	Noun	Main elements
Request	change	EndDeviceConfig	Header/Payload
Response	reply	EndDeviceConfig	Header/Reply

Note:

This transaction can be conducted only in synchronous modes. In synchronous mode, a reply will sent back to Unified System, showing the successfulness/unsuccessfulness.

Table 4.3: DeviceArchive Synchronizaton (delete device)

Device Deletion			
Message type	Verb	Noun	Main elements
Request	delete	EndDeviceConfig	Header/Payload
Response	reply	EndDeviceConfig	Header/Reply

Note:

This transaction can be conducted only in synchronous modes. In synchronous mode, a reply will sent back to Unified System, showing the successfulness/unsuccessfulness.

Payload's elements regarding this request are presented in Table 4.4:

Table 4.4: EndDeviceConfig

Payload of EndDeviceConfig				
EndDeviceC onfig	EndDevcie (unbounded)	mRID		Deivce ID
		Names	name NameType	Serial Number name "serialNumber"
		Names	name NameType	Protocol Type (16:DCU-DLMS) name "protocolType"

If MDC need other parameters, Unified System be able to extend the element which named "Names".

5.3 Examples of XML Message

5.3.1 EndDeviceConfig

```
<?xml version="1.0" encoding="UTF-8" ?>
```

```

<RequestMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/EndDeviceConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>create</Verb>
<Noun>EndDeviceConfig</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-03-14T20:04:39+04:30</Timestamp>
<Source>MDM</Source>
<AsyncReplyFlag>>false</AsyncReplyFlag>
<AckRequired>>false</AckRequired>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
<Property>
<Name>timeout(m)</Name>
<Value>30</Value>
</Property>
</Header>
<Payload>
<m:EndDeviceConfig>
<m:EndDevice>
<m:mRID>014000000011</m:mRID>
<m:Names>
<m:name>014000000011</m:name>
<m:NameType>
<m:name>serialNumber</m:name>
</m:NameType>
</m:Names>
<m:Names>
<m:name>03</m:name>
<m:NameType>
<m:name>protocolType</m:name>
</m:NameType>
</m:Names>
</m:EndDevice>
</m:EndDeviceConfig>
</Payload>
</RequestMessage>

```

5.3.2 ReplyEndDeviceConfig

```

<?xml version="1.0" encoding="UTF-8" ?>
<ResponseMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/EndDeviceConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>reply</Verb>

```

```

<Noun>EndDeviceConfig</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-06-24T02:30:00+04:30</Timestamp>
<Source>MDC-001</Source>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
</Header>
<Reply>
<Result>OK</Result>
<Error>
<code>0.0</code>
</Error>
</Reply>
</ResponseMessage>

```

6. Mother-Child Meter Relation Synchronization

6.1 Introduction

According to IEC 61968-9, in order to perform a linkage between a meter and another device, "MasterDataLinkageConfig" service is used. The sketch of this service is provided in Table 5.1, Table 5.2 and Table 5.3. It is noteworthy to say that, sometimes a meter is linked to some submeters.

Table 5.1: Mother-Child Meter Relation Synchronization (install child meter to mother meter)

Child Meter Installation			
Message type	Verb	Noun	Main elements
Request	create	MasterDataLinkage Config	Header/Payload
Response	reply	MasterDataLinkage Config	Header/Reply

Note:

This transaction can be conducted only in synchronous modes. In synchronous mode, a reply will be sent back to Unified System, showing the successfulness/unsuccessfulness.

Table 5.2: Mother-Child Meter Relation Synchronization (change child meter to a new mother meter or change mother meter)

Child Meter Change

Message type	Verb	Noun	Main elements
Request	change	MasterDataLinkage Config	Header/Payload
Response	reply	MasterDataLinkage Config	Header/Reply

Note:

This transaction can be conducted only in synchronous modes. In synchronous mode, a reply will be sent back to Unified System, showing the successfulness/unsuccessfulness.

Table 5.3: Mother-Child Meter Relation Synchronization (remove child Meter from mother meter)

Child Meter Deletion			
Message type	Verb	Noun	Main elements
Request	delete	MasterDataLinkage Config	Header/Payload
Response	reply	MasterDataLinkage Config	Header/Reply

Note:

This transaction can be conducted only in synchronous modes. In synchronous mode, a reply will be sent back to Unified System, showing the successfulness/unsuccessfulness.

6.2 Usecase Description

Payload's elements regarding this request are presented in Table 5.4 and 5.5:

Table 5.4: MasterDataLinkageConfig (install and remove child meter)

Payload of MasterDataLinkageConfig				
MasterData LinkageCon fig	Meter (unbounded)	mRID	Meter ID	
		Names (unbounded)	name NameType	subMeter ID "subMeter"

Table 5.5: MasterDataLinkageConfig (change mother meter)

Payload of MasterDataLinkageConfig				
MasterData LinkageCon fig	Meter (unbounded)	mRID	Meter ID	
		Names (only one)	name NameType	masterMeter ID "masterMeter"

6.3 Examples of XML message

6.3.1 MasterDataLinkageConfig

```
<?xml version="1.0" encoding="UTF-8" ?>
<RequestMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/MasterDataLinkageConfig#"

```



```

xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>create</Verb>
<Noun>MasterDataLinkageConfig</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-03-14T20:04:39+04:30</Timestamp>
<Source>Unified System</Source>
<AsyncReplyFlag>>false</AsyncReplyFlag>
<AckRequired>>false</AckRequired>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
<Property>
<Name>timeout(m)</Name>
<Value>30</Value>
</Property>
</Header>
<Payload>
<m:MasterDataLinkageConfig>
<m:Meter>
<m:mRID>014000000011</m:mRID>
<m:Names>
<m:name>014000000012</m:name>
<m:NameType>
<m:name>subMeter</m:name>
</m:NameType>
</m:Names>
</m:Meter>
</m:MasterDataLinkageConfig>
</Payload>
</RequestMessage>

```

6.3.2 ReplyMasterDataLinkageConfig

```

<?xml version="1.0" encoding="UTF-8" ?>
<ResponseMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/MasterDataLinkageConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>reply</Verb>
<Noun>MasterDataLinkageConfig</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-06-24T02:30:00+04:30</Timestamp>
<Source>MDC-001</Source>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>

```

```

<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
</Header>
<Reply>
<Result>OK</Result>
<Error>
<code>0.0</code>
</Error>
</Reply>
</ResponseMessage>

```

7. Gateway-Child Meter RelationSynchronization

7.1. Introduction

This section aims at presenting message structures regarding Installing an equipment.

7.2. Usecase Description

In order to perform a linkage between a meter and a EndDevice, "MasterDataLinkageConfig" service is used.

The details of Unified System's request to MDC are available in the following Tables:

Table 10.1:MasterDataLinkageConfig

MasterDataLinkageConfig			
Message type	Verb	Noun	Main elements
Request	create	MasterDataLinkageConfig	Header/Payload
Response	reply	MasterDataLinkageConfig	Header/Reply

Note:

This transaction can be conducted only in synchronous modes. In synchronous mode, a reply will sent back to Unified System, showing the successfulness/unsuccessfulness.

If the accuracy of uninstallation is evident to Unified System, Unified System sends the command ofunregistering the meter to MDC.

The overview of this usecase is shown in Table below:

Table 7.2: Services used in meter uninstallation

MasterDataLinkageConfig			
Message type	Verb	Noun	Main elements
Request	delete	MasterDataLinkageConfig	Header/Payload
Response	reply	MasterDataLinkageConfig	Header/Reply

Note:

This transaction can be conducted only in synchronous modes. In synchronous mode, a reply will sent back to Unified System, showing the successfulness/unsuccessfulness.

Payload's elements regarding this request are presented in Table 7.2:

Table 7.3: **MasterDataLinkageConfig**

Payload of MasterDataLinkageConfig				
MasterData LinkageCon fig	EndDevice	mRID		Device ID
		Names	name NameType	"Terminal" "DeviceType"
	Meter	mRID		Meter ID
		Names	name NameType	"Meter" "DeviceType"

7.3 Examples of XML message

7.3.1 MasterDataLinkageConfig

```
<?xml version="1.0" encoding="UTF-8" ?>
<RequestMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/MasterDataLinkageConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>create</Verb>
<Noun>MasterDataLinkageConfig</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-03-14T20:04:39+04:30</Timestamp>
<Source>Unified System</Source>
<AsyncReplyFlag>>false</AsyncReplyFlag>
<AckRequired>>false</AckRequired>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
<Property>
<Name>timeout(m)</Name>
<Value>30</Value>
</Property>
</Header>
<Payload>
<m:MasterDataLinkageConfig>
<m:EndDevice>
<m:mRID>01400004</m:mRID>
<m:Names>
<m:name>Meter</m:name>
<m:NameType>
<m:name>DevcieType</m:name>
</m:NameType>
</m:Names>
</m:EndDevice>
<m:Meter>
<m:mRID>014000000011</m:mRID>
<m:Names>
```

```

<m:name>Meter</m:name>
<m:NameType>
<m:name>DevcieType</m:name>
</m:NameType>
</m:Names>
</m:Meter>
</m:MasterDataLinkageConfig>
</Payload>
</RequestMessage>

```

7.3.2 ReplyMasterDataLinkageConfig

```

<?xml version="1.0" encoding="UTF-8" ?>
<ResponseMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/MasterDataLinkageConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>reply</Verb>
<Noun>MasterDataLinkageConfig</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-06-24T02:30:00+04:30</Timestamp>
<Source>MDC-001</Source>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
</Header>
<Reply>
<Result>OK</Result>
<Error>
<code>0.0</code>
</Error>
</Reply>
</ResponseMessage>

```

8. Token Sending

8.1 Introduction

Some times we need intergrate for Prepay system, and it should have the ability to send Tokens to meters.

This section aims at presenting message structure regarding this usecase. General Usecase specifications along with the services used in this respect are provided in Table 5.1.

Table 6.1: Services used in Sending Tokens to Interface Billing

Sending Tokens			
Type of message	Verb	Noun	Mainelements
Request*	create	EndDeviceControls	Header/Payload
Acknowledgement	reply	EndDeviceControls	Header/Reply
Response**	reply	EndDeviceControls	Header/Reply

Note:

This transaction can be conducted only in asynchronous modes.

*The token is stored in payload's name node in sequence, the data format:

token1,token2,token3...

** This response used to Indicate the successfulness/unsuccessfulness of performing the command on

the meter in asynchronous transaction. The execution result of token is stored in reply's detail node, the data format: token1:result1,token2:result2..., the result code reference on table 6.2

Table 6.2: Result Code of Token

Code	Name
0	Token Processing Successful
1	Token Interpretation Error
2	Token Used
3	Token Expired
4	Key Expired
5	Recharge Value Exceed the Accumulate Amount Limit
6	Key Type Don't Allow Recharge
7	Test Token Generated by Non-specified Manufacturer
8	If input the 1st modified key Token, then input is not the 2nd modified key TOKEN
9	Key Type shouldn't change to 3
10	If the parent key type is not the initial one, the child key type can't be changed to initial key
11	Token serial number not correct
12	Token setting parameter invalid

8.2 Usecase Description

Table6.3 shows payload's elements for Prepaycommand to MDC regarding this usecase:

Table 6.3: Payload for EndDeviceControls (Sending Tokens)

EndDeviceCo ntrols	EndDeviceCont rol(Unbounded)	reason	"sendTokens"	
		EndDeviceControlType ref	15.13.112.78	
		EndDevices	mRID	Meter ID
			Names	name

In this case, it provide two ways for bulking operations, one is you can set multily tokens for a meter, and the other one is you can set multily tokens for multily meters when the meters use the same tokens.

8.3 Examples of XML Message

8.3.1 SendTokens

```
<?xml version="1.0" encoding="utf-8"?>
<RequestMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/EndDeviceControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>create</Verb>
<Noun>EndDeviceControls</Noun>
<Revision>2.0</Revision>
<Timestamp>2016-01-01T00:00:00+04:30</Timestamp>
<Source>Unified System</Source>
<AsyncReplyFlag>true</AsyncReplyFlag>
<ReplyAddress>http://ip:port/AmiWeb/services/Metering</ReplyAddress>
<AckRequired>true</AckRequired>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
<Property>
<Name>timeout(m)</Name>
<Value>30</Value>
</Property>
</Header>
<Payload>
<m:EndDeviceControls>
<m:EndDeviceControl>
<m:reason>SendTokens</m:reason>
<m:EndDeviceControlType ref="15.13.112.78"/>
<m:EndDevices>
<m:mRID>014000000012</m:mRID>
<Names>
<name>Token1,Token2,Token3</name>
</Names>
</m:EndDevices>
</m:EndDeviceControl>
</m:EndDeviceControls>
</Payload>
</RequestMessage>
```

8.3.2 Acknowledgement

```
<?xml version="1.0" encoding="UTF-8"?>
<ResponseMessage
xmlns= "http://iec.ch/TC57/2011/schema/message"
xmlns:xsi= "http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation= "http://iec.ch/TC57/2011/schema/message Message.xsd">
```

```

<Header>
<Verb>reply</Verb>
<Noun>EndDeviceControls</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-06-24T02:30:00+04:30</Timestamp>
<Source>MDC-001</Source>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
</Header>
<Reply>
<Result>OK</Result>
<Error>
<code>0.3</code>
</Error>
</Reply>
</ResponseMessage>

```

8.3.3 ReplySendTokens

```

<?xml version="1.0" encoding="UTF-8" ?>
<ResponseMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/EndDeviceControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>reply</Verb>
<Noun>EndDeviceControls</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-03-14T20:04:39+04:30</Timestamp>
<Source>MDC-001</Source>
<User>
<UserID>...</UserID>
</User>
<MessageID>601BD4C0-F3E2-4833-BF83-7494460E74BE</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
<Property>
<Name>timeout(m)</Name>
<Value>1</Value>
</Property>
</Header>
<Reply>
<Result>OK</Result>
<Error>
<code>0.0</code>
<details>token1:0,token2:1,token3:2</details>
</Error>
</Reply>

```

9. On Demand Meter Reading

9.1 Introduction

This section aims at presenting message structures regarding the second usecase of MDC. In this usecase, the process of on demand meter reads is clarified in detail. Table 7.1 provides the general message structure of this usecase:

Table 7.1: Meter Reading

Meter Reading			
Type of message	Verb	Noun	Mainelements
Request	Get	MeterReadings	Header/Payload
Acknowledgement	Reply	MeterReadings	Header/Reply
Response	Reply	MeterReadings	Header/Reply/Payload

9.2 Usecase Description

Request elements regarding the on demand meter reading is depicted in Table 7.2. In this usecase, for demanding meter readings, the OBIS of DLMS should be included the request message which are available in Table 7.4 of this document.

Table 7.2: Request of GetMeterReadings

GetMeter Readings	EndDevice (Unbounded)	mRID			MeterID
	ReadingType (Unbounded)	Names	name NameType	name	OBIS of DLMS "ReadingType"

Payload of the response message can be observed in Table 4.3.

Table 4.3: Payload of MeterReading

MeterReading s	MeterReading (unbounded) Note: Each meter has its own "MeterReading"	Meter Readings (unbounded) Note: For each reading interval, one "Readings" is considered. Moreover, for each "Readings" there is a "ReadingType Ref"	mRID	MeterID
			reason timeStamp value ReadingTypeRef	"inquiry" Readvalue OBIS of DLMS

The ReadingTypes about instantaneous data reference on the blue document.

9.3 Examples of XML Message

9.3.1 MeterReadings

```
<?xml version="1.0" encoding="UTF-8" ?>
<RequestMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/GetMeterReadings#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>get</Verb>
<Noun>MeterReadings</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-03-14T20:04:39+04:30</Timestamp>
<Source>Unified System</Source>
<AsyncReplyFlag>true</AsyncReplyFlag>
<ReplyAddress>http://ip:port/AmiWeb/services/Metering</ReplyAddress>
<AckRequired>true</AckRequired>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
<Property>
<Name>timeout(m)</Name>
<Value>1</Value>
</Property>
</Header>
<Request>
<m:GetMeterReadings>
<m:EndDevice>
<m:mRID>014000000012</m:mRID>
</m:EndDevice>
<m:ReadingType>
<m:Names>
<m:name>3#1.0.31.7.0.255#2</m:name>
<m:NameType>
<m:name>ReadingType</m:name>
</m:NameType>
</m:Names>
</m:ReadingType>
</m:GetMeterReadings>
</Request>
</RequestMessage>
```

9.3.2 Acknowledgement

```
<?xml version="1.0" encoding="UTF-8"?>
<ResponseMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

```

xsi:schemaLocation= "http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>reply</Verb>
<Noun>MeterReadings</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-06-24T02:30:00+04:30</Timestamp>
<Source>MDC-001</Source>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
</Header>
<Reply>
<Result>OK</Result>
<Error>
<code>0.3</code>
</Error>
</Reply>
</ResponseMessage>

```

9.3.3 ReplyMeterReading

```

<?xml version="1.0" encoding="UTF-8" ?>
<ResponseMessagexmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:gmr="http://iec.ch/TC57/2011/GetMeterReadings#"
xmlns:m="http://iec.ch/TC57/2011/MeterReadings#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>reply</Verb>
<Noun>MeterReadings</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-03-14T20:05:08+04:30</Timestamp>
<Source>MDC-001</Source>
<User>
<UserID>...</UserID>
</User>
<MessageID>601BD4C0-F3E2-4833-BF83-7494460E74BE</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
<Property>
<Name>timeout(m)</Name>
<Value>1</Value>
</Property>
</Header>
<Reply>
<Result>OK</Result>
<Error>
<code>0.0</code>
</Error>

```

```

</Reply>
<Payload>
<m:MeterReadings>
<m:MeterReading>
<m:Meter>
<m:mRID>014000000012</m:mRID>
</m:Meter>
<m:Readings>
<m:reason>inquiry</m:reason>
<m:timeStamp>2015-03-14T20:05:03+04:30</m:timeStamp>
<m:value>141</m:value>
<m:ReadingType ref="3#1.0.31.7.0.255#2"/>
</m:Readings>
</m:MeterReading>
</m:MeterReadings>
</Payload>
</ResponseMessage>

```

10. Meter Connect and Disconnect

10.1 Introduction

The current use case describes the process of remote disconnection or reconnection of electricity supply to a customer on a designated date.

The steps regarding this use case (disconnection) are:

1. The EndDeviceControl message is sent from the Unified System to the MDC to disconnect the meter.
2. Remote meter disconnect is performed.

General Usecase specifications along with the services used in this respect are provided in Table 8.1.

Table 8.1: Services used for Meter Disconnect and Reconnect

Disconnect					
Message type	Verb	Noun	Main elements	Sender	Receiver
Request	create	EndDeviceControls	Header/ Payload	Unified System	MDC
Acknowledgement	reply	EndDeviceControls	Header/Reply	MDC	Unified System
Response	reply	EndDeviceControls	Header/Reply	MDC	Unified System

Note that following the disconnection, there may be a meter reconnect sequence which is performed as below:

1. The EndDeviceControl message is sent from the Unified System to the MDC to reconnect the meter.
2. Remote meter reconnect is performed.

10.2 Usecase Description

Table 8.3 shows payload's elements for EndDeviceControls message:

Table 8.3: Request of EndDeviceControls

Payload of EndDeviceControls						
EndDeviceControls	EndDeviceControl(Unbounded)	reason	"Disconnect"/"Reconnect"			
		EndDeviceControlType ref	Control Code(refer to Table 8.5)			
		EndDevices(Unbounded)	mRID	Meter ID		
			Names	name	"Disconnect"/"Reconnect"	
NameType	name	"ControlType"				

Details of the Simple acknowledgement from MDC to Unified System in the case of asynchronous transaction are provided in Table 2.5.

More details regarding EndDeviceControlType are provided in Table 8.5.

Table 8.5: Controlling code

ControlDescription	Control Code	Type	Domain	SubDomain	Action
Remote disconnection	3.0.211.23	ElectricMeter	n/a	RemoteAccess	Disconnect
Remote connection	3.0.211.18	ElectricMeter	n/a	RemoteAccess	connect

10.3 Examples of XML Message

10.3.1 MeterConenctDisconnect

```
<?xml version="1.0" encoding="utf-8"?>
<RequestMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/EndDeviceControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>create</Verb>
<Noun>EndDeviceControls</Noun>
<Revision>2.0</Revision>
<Timestamp>2016-01-01T00:00:00+04:30</Timestamp>
<Source>Unified System</Source>
<AsyncReplyFlag>true</AsyncReplyFlag>
<ReplyAddress>http://ip:port/AmiWeb/services/Metering</ReplyAddress>
<AckRequired>true</AckRequired>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
<Property>
<Name>timeout(m)</Name>
<Value>30</Value>
</Property>
```

```

</Header>
<Payload>
<m:EndDeviceControls>
<m:EndDeviceControl>
<m:reason>Disconnect/Reconnect</m:reason>
<m:EndDeviceControlType ref="3.0.211.23"/>
<m:EndDevices>
<m:mRID>014000000012</m:mRID>
<m:Names>
<m:name>Disconnect</m:name>
<m:NameType>
<m:name>ControlType</m:name>
</m:NameType>
</m:Names>
</m:EndDevices>
</m:EndDeviceControl>
</m:EndDeviceControls>
</Payload>
</RequestMessage>

```

10.3.2 Acknowledgement

```

<?xml version="1.0" encoding="UTF-8"?>
<ResponseMessage
xmlns= "http://iec.ch/TC57/2011/schema/message"
xmlns:xsi= "http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation= "http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>reply</Verb>
<Noun>EndDeviceControls</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-06-24T02:30:00+04:30</Timestamp>
<Source>MDC-001</Source>
<User>
<UserID>...</UserID>
</User>
<MessageID>83c643e6-85c5-43c0-9e0a-fa1deb469b72</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
</Header>
<Reply>
<Result>OK</Result>
<Error>
<code>0.3</code>
</Error>
</Reply>
</ResponseMessage>

```

10.3.3 ReplyMeterConnectDisconnect

```

<?xml version="1.0" encoding="UTF-8" ?>
<ResponseMessage
xmlns="http://iec.ch/TC57/2011/schema/message"
xmlns:m="http://iec.ch/TC57/2011/EndDeviceControls#"

```

```

xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2011/schema/message Message.xsd">
<Header>
<Verb>reply</Verb>
<Noun>EndDeviceControls</Noun>
<Revision>2.0</Revision>
<Timestamp>2015-04-25T11:11:03+04:30</Timestamp>
<Source>MDC-001</Source>
<User>
<UserID>...</UserID>
</User>
<MessageID>601BD4C0-F3E2-4833-BF83-7494460E74BE</MessageID>
<CorrelationID>1001</CorrelationID>
<Property>
<Name>password</Name>
<Value>...</Value>
</Property>
<Property>
<Name>timeout(m)</Name>
<Value>1</Value>
</Property>
</Header>
<Reply>
<Result>OK</Result>
<Error>
<code>0.0</code>
</Error>
</Reply>
</ResponseMessage>

```

11. Meter Reading Data

Daily frozen data, monthly frozen data and event data will be transferred by file from MDC to Unified System.

11.1. File Transfer Rule

- 1) The file interface interacts via FTP to transfer data, the file is in CSV format.
- 2) FTP set up two dedicated accounts for Unified System and MDC, limit access to client IP to ensure security.
- 3) FTP has two directories: one is "exportDir" which store the data file exported by MDC, another directory is "historyDir" which store historical data, the data file will move to "historyDir" which has been processed by Unified System, historical data store in the folder named: yyyyMMdd.
- 4) Naming rules of data file: the data file is divided into three types: daily frozen data(01_yyyyMMddHHmmss.csv), monthly frozen data(02_yyyyMMddHHmmss.csv) and event data(03_yyyyMMddHHmmss.csv).
- 5) In consideration of data processing efficiency, each data file contains maximum 100000 pieces of data.
- 6) The first line of data file is the name of each data field.
- 7) Data read and write synchronization: when exporting data, MDC produces a lock file with the suffix .lock which has the same name with the data file, the lock file will be deleted after MDC completes exporting the data file.
- 8) Data exporting frequency, daily frozen data and monthly frozen data: once a day, event data: once

one hour.

11.2.Data Format

11.2.1. Daily Frozen Data

Column	Data Name	Data Type	Description
1	Meter No.	String(12)	sb_dlsj.sjid
2	Data Time	String(8)	sb_dlsj.sjsj,yyyyMMdd
3	Active Energy(+) Total	NUMBER(16,4)	sb_dlsj.zxygz,kWh
4	Active Energy(+) T1	NUMBER(16,4)	sb_dlsj.zxygz1,kWh
5	Active Energy(+) T2	NUMBER(16,4)	sb_dlsj.zxygz2,kWh
6	Active Energy(+) T3	NUMBER(16,4)	sb_dlsj.zxygz3,kWh
7	Active Energy(+) T4	NUMBER(16,4)	sb_dlsj.zxygz4,kWh
12	Reactive Energy(+) Total	NUMBER(16,4)	sb_dlsj.zxwgz,kvarh
13	Meter Balance	NUMBER(16,4)	sb_dlsj.dbye,TK

11.2.2. Monthly Frozen Data

Column	Data Name	Data Type	Description
1	Meter No.	String(12)	sb_dlsj_ydj.sjid
2	Data Time	String(6)	sb_dlsj_ydj.sjsj,yyyyMM
3	Active Energy(+) Total	NUMBER(16,4)	sb_dlsj_ydj.zxygz,kWh
4	Active Energy(+) T1	NUMBER(16,4)	sb_dlsj_ydj.zxygz1,kWh
5	Active Energy(+) T2	NUMBER(16,4)	sb_dlsj_ydj.zxygz2,kWh
6	Active Energy(+) T3	NUMBER(16,4)	sb_dlsj_ydj.zxygz3,kWh
7	Active Energy(+) T4	NUMBER(16,4)	sb_dlsj_ydj.zxygz4,kWh
12	Reactive Energy(+) Total	NUMBER(16,4)	sb_dlsj_ydj.zxwgz,kvarh
13	Meter Balance	NUMBER(16,4)	sb_dlsj_ydj.dbye,TK

11.2.3. Meter Event

Column	Data Name	Data Type	Description
1	Meter No.	String(12)	sb_gj.sjid
2	Event Code	String(30)	sb_gj.gjbm
3	Event Start Time	String(14)	sb_gj.rqsj,yyyyMMddHHmmss
4	Event End Time	String(14)	sb_gj.jssj,yyyyMMddHHmmss

[N.B. If any changes made in API that will be disclosed to the tenderer before presentation/ demonstration of the functionality on the sample meters and pre-payment metering system.]