

RFP No.: 3/ISA-MDTF/2026-ISA

Issued on: 21/04/2026

## Request For Proposal

**For Appointment of System Integrators (SI) for AI powered  
Implementation of GIS based Asset Management, Network Analysis,  
& Load Forecasting for DER Integration in DISCOMs**



International Solar Alliance (ISA)  
Secretariat, Surya Bhawan, NISE Campus,  
Gwal Pahari, Gurugram, Haryana – 122003, India  
Website: [www.isa.int](http://www.isa.int)

*RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.*

### RFP Notice

1. International Solar Alliance (ISA) invites proposal for the “RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.”
2. Ajmer Vidyut Vitran Nigam Limited (AVVNL) with support from International Solar Alliance (ISA), is initiating digitalization and development of a high-fidelity Digital Twin (DT) platform in targeted circles as defined in the terms of reference under this RFP.
3. The content of this RFP (3/ISA-MDTF/2026-ISA) enlists the requirements of the International Solar Alliance. It includes the terms which details out all that may be needed by the potential participants to understand the terms and the process and explain the contractual terms that the International Solar Alliance wish to specify at this stage.
4. The selection of agency/consortiums through this RFP/tendering will be carried out based on the technical and financial proposal in accordance with the terms and conditions put forward by ISA in consultation with AVVNL. ISA is not bound to select any of the organizations submitting the proposals and reserves the right of rejection of any or all proposals without assigning any reason(s) thereof.
5. The technical and financial proposal, as per the requirements detailed in later sections may be submitted in a PDF format to [mdtf\\_procurement@isa.int](mailto:mdtf_procurement@isa.int) before 19.05.2026, by 11:59 PM (IST) addressed to: MDTF Procurement, International Solar Alliance (ISA) at [mdtf\\_procurement@isa.int](mailto:mdtf_procurement@isa.int) with subject line RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.
6. Important dates, amounts and other details pertaining to this RFP Notice including submission and opening of proposal, address for communication, etc., are given in the TABLE below.

| Sr | Particulars                                                                                                              | Date       | Time                                                                                                     |
|----|--------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------|
| a) | Commencement of downloading of this RFP                                                                                  | 21.04.2026 | ISA Website                                                                                              |
| b) | Last date for Submission of query through e-mail: <a href="mailto:mdtf_procurement@isa.int">mdtf_procurement@isa.int</a> | 11.05.2026 | 05:00 PM (IST)                                                                                           |
| c) | Last date for receipt of documents as per RFP                                                                            | 19.05.2026 | 11:59 PM (IST) to be submitted to <a href="mailto:mdtf_procurement@isa.int">mdtf_procurement@isa.int</a> |

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

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## Section 1. Letter of Invitation

The International Solar Alliance (ISA) hereby invites you to submit a Proposal to this Request for Proposal (RFP) for the above-referenced subject.

This RFP includes the following documents and the General Terms and Conditions of Contract which is inserted in the Bid Data Sheet (BDS):

- Section 1: This Letter of Invitation
- Section 2: Instruction to Bidders
- Section 3: Bid Data Sheet (BDS)
- Section 4: Evaluation Criteria
- Section 5: Terms of Reference
- Section 6: Returnable Bidding Forms
  
- Form A: Technical Proposal Submission Form
- Form B: Bidder Information Form
- Form C: Joint Venture/Consortium/Association Information Form (Not Applicable)
- Form D: Qualification Form
- Form E: Format of Technical Proposal
- Form F: Financial Proposal Submission Form
- Form G: Financial Proposal Form

If you are interested in submitting a Proposal in response to this RFP, please prepare your Proposal in accordance with the requirements and procedure as set out in this RFP and submit it by the Deadline for Submission of Proposals set out in Bid Data Sheet.

Please acknowledge receipt of this RFP by sending an email to [mdtf\\_procurement@isa.int](mailto:mdtf_procurement@isa.int), indicating whether you intend to submit a Proposal or otherwise. You may send the Technical Proposal and the Financial Proposal files separately. The financial proposal shall be encrypted with password and clearly labelled. Any Amendments to the RFP will be notified on ISA Website. Should you require further clarifications, kindly communicate with the contact person/s identified in the attached Bid Data Sheet as the focal point for queries on this RFP.

ISA looks forward to receiving your Proposal and thank you in advance for your interest in ISA procurement opportunities.

Issued by: MTFD Procurement Unit

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## Section 2. Instructions to Bidders

| GENERAL PROVISIONS                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Introduction                              | <p>1.1 Bidders shall adhere to all the requirements of this RFP, including any amendments in Writing by ISA.</p> <p>1.2 Any Proposal submitted will be regarded as an offer by the Bidder and does not constitute or imply the acceptance of the Proposal by ISA. ISA is under no obligation to award a contract to any Bidder as a result of this RFP.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 2. Fraud & Corruption, Gifts and Hospitality | <p>2.1 ISA strictly enforces a policy of zero tolerance on proscribed practices, including fraud, corruption, collusion, unethical or unprofessional practices, and obstruction of ISA vendors and requires all bidders/vendors observe the highest standard of ethics during the procurement process and contract implementation.</p> <p>2.2 Bidders/vendors shall not offer gifts or hospitality of any kind to ISA staff members including recreational trips to sporting or cultural events, theme parks or offers of holidays, transportation, or invitations to extravagant lunches or dinners.</p> <p>2.3 In pursuance of this policy, ISA<br/>(a) Shall reject a proposal if it determines that the selected bidder has engaged in any corrupt or fraudulent practices in competing for the contract in question;<br/>(b) Shall declare a vendor ineligible, either indefinitely or for a stated period of time, to be awarded a contract if at any time it determines that the vendor has engaged in any corrupt or fraudulent practices in competing for, or in executing a ISA contract.</p> <p>2.4 All Bidders must adhere to the ISA Supplier Code of Conduct, which may be found at <a href="#">ISA Supplier Code of Conducts.pdf</a></p> |
| 3. Eligibility                               | <p>3.1 A vendor should not be suspended, debarred, or otherwise identified as ineligible by any UN Organization or the World Bank Group or any other international Organization. Vendors are therefore required to disclose to ISA whether they are subject to any sanction or temporary suspension imposed by these organizations.</p> <p>3.2 It is the Bidder's responsibility to ensure that its employees, joint venture members, sub-contractors, service providers, suppliers and/or their employees meet the eligibility requirements as established by ISA.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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| <p>4. Conflict of Interests</p> | <p>4.1 Bidders must strictly avoid conflicts with other assignments or their own interests, and act without consideration for future work. Bidders found to have a conflict of interest shall be disqualified. Without limitation on the generality of the above, Bidders, and any of their affiliates, shall be considered to have a conflict of interest with one or more parties in this solicitation process, if they:</p> <ul style="list-style-type: none"> <li>a) Are or have been associated in the past, with a firm or any of its affiliates which have been engaged by ISA to provide services for the preparation of the design, specifications, Terms of Reference, cost analysis/estimation, and other documents to be used for the procurement of the goods and services in this selection process;</li> <li>b) Were involved in the preparation and/or design of the programme/project related to the services requested under this RFP; or</li> <li>c) Are found to be in conflict for any other reason, as may be established by, or at the discretion of ISA.</li> </ul> <p>4.2 In the event of any uncertainty in the interpretation of a potential conflict of interest, Bidders must disclose to ISA, and seek ISA's confirmation on whether or not such a conflict exists. The ISA shall have the discretion to disqualify or proceed with a bidder where there is a probable conflict of interest subject to further evaluation and review of various factors such as access to sensitive information which may confer unfair advantage as against other bidders. The decision on a probable conflict of interest shall be made in the best interest of the work of the ISA.</p> <p>4.3 Similarly, the Bidders must disclose in their proposal their knowledge of the following:</p> <ul style="list-style-type: none"> <li>a) If the owners, part-owners, officers, directors, controlling shareholders, of the bidding entity or key personnel are family members of ISA staff involved in the procurement functions and/or the Government of the country or any Implementing Partner receiving services under this RFP; and</li> <li>b) All other circumstances that could potentially lead to actual or perceived conflict of interest, collusion or unfair competition practices.</li> </ul> <p>Failure to disclose such an information may result in the rejection of the proposal or proposals affected by the non-disclosure.</p> <p>4.4 The eligibility of Bidders that are wholly or partly owned by the Government shall be subject to ISA's further evaluation and review of various factors such as being registered, operated and managed as an independent business entity,</p> |
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|                                                                            | the extent of Government ownership/share, receipt of subsidies, mandate and access to information in relation to this RFP, among others. Conditions that may lead to undue advantage against other Bidders may result in the eventual rejection of the Proposal.                                                                                                                               |
| <b>PREPARATION OF PROPOSALS</b>                                            |                                                                                                                                                                                                                                                                                                                                                                                                |
| 5. General Considerations                                                  | <p>5.1 In preparing the Proposal, the Bidder is expected to examine the RFP in detail. Material deficiencies in providing the information requested in the RFP may result in rejection of the Proposal.</p> <p>5.2 The Bidder will not be permitted to take advantage of any errors or omissions in the RFP. Should such errors or omissions be discovered, the Bidder must notify the ISA</p> |
| 6. Cost of Preparation of Proposal                                         | 6.1 The Bidder shall bear any and all costs related to the preparation and/or submission of the Proposal, regardless of whether its Proposal was selected or not. ISA shall not be responsible or liable for those costs, regardless of the conduct or outcome of the procurement process.                                                                                                     |
| 7. Language                                                                | 7.1 The Proposal, as well as any and all related correspondence exchanged by the Bidder and ISA, shall be Written in the language (s) specified in the BDS.                                                                                                                                                                                                                                    |
| 8. Documents Comprising the Proposal                                       | <p>8.1 The Proposal shall comprise of the following documents:</p> <ul style="list-style-type: none"> <li>c) Documents Establishing the Eligibility and Qualifications of the Bidder;</li> <li>d) Technical Proposal;</li> <li>e) Financial Proposal;</li> <li>f) Proposal Security, if required by BDS;</li> <li>g) Any attachments and/or appendices to the Proposal.</li> </ul>             |
| 9. Documents Establishing the Eligibility and Qualifications of the Bidder | 9.1 The Bidder shall furnish documentary evidence of its status as an eligible and qualified vendor, using the Forms provided under Section 6 and providing documents required in those forms. In order to award a contract to a Bidder, its qualifications must be documented to ISA's satisfaction.                                                                                          |
| 10. Technical Proposal Format and Content                                  | <p>10.1 The Bidder is required to submit a Technical Proposal using the Standard Forms and templates provided in Section 6 of the RFP.</p> <p>10.2 The Technical Proposal shall not include any price or financial information. A Technical Proposal containing material financial information may be declared non-responsive.</p>                                                             |

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|                         | <p>10.3 Samples of items, when required as per Section 5, shall be provided within the time specified and unless otherwise specified by ISA, and at no expense to ISA</p> <p>10.4 When applicable and required as per Section 5, the Bidder shall describe the necessary training programme available for the maintenance and operation of the services and/or equipment offered as well as the cost to the ISA. Unless otherwise specified, such training as well as training materials shall be provided in the language of the Bid as specified in the BDS.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 11. Financial Proposals | <p>11.1 The Financial Proposal shall be prepared using the Standard Form provided in Section 6 of the RFP. It shall list all major cost components associated with the services, and the detailed breakdown of such costs.</p> <p>11.2 Any output and activities described in the Technical Proposal but not priced in the Financial Proposal, shall be assumed to be included in the prices of other activities or items, as well as in the final total price.</p> <p>11.3 Prices and other financial information must not be disclosed in any other place except in the financial proposal.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 12. Proposal Security   | <p>12.1 A Proposal Security, if required by BDS, shall be provided in the amount and form indicated in the BDS. The Proposal Security shall be valid up to thirty (30) days after the final date of validity of the Proposal.</p> <p>12.2 The Proposal Security shall be included along with the Technical Proposal. If Proposal Security is required by the RFP but is not found along with the Technical Proposal, the Proposal shall be rejected.</p> <p>12.3 If the Proposal Security amount or its validity period is found to be less than what is required by ISA, ISA shall reject the Proposal.</p> <p>12.4 In the event an electronic submission is allowed in the BDS, Bidders shall include a copy of the Bid Security in their proposal and the original of the Proposal Security must be sent via courier or hand delivery as per the instructions in BDS.</p> <p>12.5 The Proposal Security may be forfeited by ISA, and the Proposal rejected, in the event of any one or combination, of the following conditions:</p> <ol style="list-style-type: none"> <li>If the Bidder withdraws its offer during the period of the Proposal Validity specified in the BDS, or;</li> <li>In the event that the successful Bidder fails: <ol style="list-style-type: none"> <li>to sign the Contract after ISA has issued an award;</li> </ol> or </li> </ol> |

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|                                              | <p>ii. to furnish the Performance Security, insurances, or other documents that ISA may require as a condition precedent to the effectivity of the contract that may be awarded to the Bidder.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 13. Currencies                               | <p>13.1 All prices shall be quoted in the currency or currencies indicated in the BDS. Where Proposals are quoted in different currencies, for the purposes of comparison of all Proposals:</p> <p>a) ISA will convert the currency quoted in the Proposal into the ISA preferred currency, in accordance with the prevailing UN operational rate of exchange on the last day of submission of Proposals; and</p> <p>b) In the event that ISA selects a proposal for award that is quoted in a currency different from the preferred currency in the BDS, ISA shall reserve the right to award the contract in the currency of ISA's preference, using the conversion method specified above.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 14. Joint Venture, Consortium or Association | <p>14.1 If the Bidder is a group of legal entities that will form or have formed a Joint Venture (JV), Consortium or Association for the Proposal, they shall confirm in their Proposal that : (i) they have designated one party to act as a lead entity, duly vested with authority to legally bind the members of the JV, Consortium or Association jointly and severally, which shall be evidenced by a duly notarized Agreement among the legal entities, and submitted with the Proposal; and (ii) if they are awarded the contract, the contract shall be entered into, by and between ISA and the designated lead entity, who shall be acting for and on behalf of all the member entities comprising the joint venture.</p> <p>14.2 After the Deadline for Submission of Proposal, the lead entity identified to represent the JV, Consortium or Association shall not be altered without the prior written consent of ISA.</p> <p>14.3 The lead entity and the member entities of the JV, Consortium or Association shall abide by the provisions of Clause 15 herein in respect of submitting only one proposal.</p> <p>14.4 The description of the organization of the JV, Consortium or Association must clearly define the expected role of each of the entity in the joint venture in delivering the requirements of the RFP, both in the Proposal and the JV, Consortium or Association Agreement. All entities that comprise the JV, Consortium or Association shall be subject to the eligibility and qualification assessment by ISA.</p> <p>14.5 A JV, Consortium or Association in presenting its track record and experience should clearly differentiate between:</p> |

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|                             | <p>a) Those that were undertaken together by the JV, Consortium or Association; and</p> <p>b) Those that were undertaken by the individual entities of the JV, Consortium or Association.</p> <p>14.6 Previous contracts completed by individual experts working privately but who are permanently or were temporarily associated with any of the member firms cannot be claimed as the experience of the JV, Consortium or Association or those of its members, but should only be claimed by the individual experts themselves in their presentation of their individual credentials.</p> <p>JV, Consortium or Associations are encouraged for high value, multi-sectoral requirements when the spectrum of expertise and resources required may not be available within one firm.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 15.Only One Proposal        | <p>15.1 The Bidder (including the individual members of any Joint Venture) shall submit only one Proposal, either in its own name or as part of a Joint Venture.</p> <p>15.2 Proposals submitted by two (2) or more Bidders shall all be rejected if they are found to have any of the following:</p> <ul style="list-style-type: none"> <li>h) they have at least one controlling partner, director or shareholder in common; or</li> <li>i) any one of them receive or have received any direct or indirect subsidy from the other/s; or</li> <li>j) they have the same legal representative for purposes of this RFP; or</li> <li>k) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about, or influence on the Proposal of, another Bidder regarding this RFP process;</li> <li>l) they are subcontractors to each other's Proposal, or a subcontractor to one Proposal also submits another Proposal under its name as lead Bidder; or</li> <li>m) some key personnel proposed to be in the team of one Bidder participates in more than one Proposal received for this RFP process. This condition relating to the personnel, does not apply to subcontractors being included in more than one Proposal.</li> </ul> |
| 16.Proposal Validity Period | <p>16.1 Proposals shall remain valid for the period specified in the BDS, commencing on the Deadline for Submission of Proposals. A Proposal valid for a shorter period may be rejected by ISA and rendered non-responsive.</p> <p>16.2 During the Proposal validity period, the Bidder shall maintain its original Proposal without any change, including the</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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|                                          | availability of the Key Personnel, the proposed rates and the total price.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 17.Extension of Proposal Validity Period | <p>17.1 In exceptional circumstances, prior to the expiration of the proposal validity period, ISA may request Bidders to extend the period of validity of their Proposals. The request and the responses shall be made in writing, and shall be considered integral to the Proposal.</p> <p>17.2 If the Bidder agrees to extend the validity of its Proposal, it shall be done without any change in the original Proposal.</p> <p>17.3 The Bidder has the right to refuse to extend the validity of its Proposal, and in which case, such Proposal will not be further evaluated.</p>                                                                                                                                                                                                                                  |
| 18.Clarification of Proposal             | <p>18.1 Bidders may request clarifications on any of the RFP documents no later than the date indicated in the BDS. Any request for clarification must be sent in writing in the manner indicated in the BDS. If inquiries are sent other than specified channel, even if they are sent to an ISA staff member, ISA shall have no obligation to respond or confirm that the query was officially received.</p> <p>18.2 ISA will provide the responses to clarifications through the method specified in the BDS.</p> <p>18.3 ISA shall endeavor to provide responses to clarifications in an expeditious manner, but any delay in such response shall not cause an obligation on the part of ISA to extend the submission date of the Proposals, unless ISA deems that such an extension is justified and necessary.</p> |
| 19.Amendment of Proposals                | <p>19.1 At any time prior to the deadline of Proposal submission, ISA may for any reason, such as in response to a clarification requested by a Bidder, modify the RFP in the form of an amendment to the RFP. Amendments will be made available to all prospective bidders.</p> <p>19.2 If the amendment is substantial, ISA may extend the Deadline for submission of proposal to give the Bidders reasonable time to incorporate the amendment into their Proposals.</p>                                                                                                                                                                                                                                                                                                                                              |
| 20.Alternative Proposals                 | <p>20.1 Unless otherwise specified in the BDS, alternative proposals shall not be considered. If submission of alternative proposal is allowed by BDS, a Bidder may submit an alternative proposal, but only if it also submits a proposal conforming to the RFP requirements. ISA shall only consider the alternative proposal offered by the Bidder whose conforming proposal ranked the highest as per the specified evaluation method. Where the conditions for its acceptance are met, or justifications are clearly established, ISA reserves the right to</p>                                                                                                                                                                                                                                                     |

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|                                            | <p>award a contract based on an alternative proposal.</p> <p>20.2 If multiple/alternative proposals are being submitted, they must be clearly marked as “Main Proposal” and “Alternative Proposal”</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 21.Pre-Bid Conference                      | <p>21.1 When appropriate, a Bidder’s conference will be conducted at the date, time and location specified in the BDS. All Bidders are encouraged to attend. Non-attendance, however, shall not result in disqualification of an interested Bidder. Minutes of the Bidder’s conference will be sent to all the participants of the pre-bid conference. No verbal statement made during the conference shall modify the terms and conditions of the RFP, unless specifically incorporated in the Minutes of the Bidder’s Conference or issued/posted as an amendment to RFP.</p>                                                                                                                                                                                                |
| <b>SUBMISSION AND OPENING OF PROPOSALS</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 22.Submission                              | <p>22.1 The Bidder shall submit a duly signed and complete Proposal comprising the documents and forms in accordance with the requirements in the BDS. The submission shall be in the manner specified in the BDS.</p> <p>22.2 The Proposal shall be signed by the Bidder or person(s) duly authorized to commit the Bidder. The authorization shall be communicated through a document evidencing such authorization issued by the legal representative of the bidding entity, or a Power of Attorney, accompanying the Proposal.</p> <p>22.3 Bidders must be aware that the mere act of submission of a Proposal, in and of itself, implies that the Bidder fully accepts the ISA General Contract Terms and Conditions.<br/> <a href="#">ISA GTBs.pdf</a></p>               |
| Email Submission                           | <p>22.4 Email submission, if allowed or specified in the BDS, shall be governed as follows:</p> <ul style="list-style-type: none"> <li>a) Electronic files that form part of the proposal must be in accordance with the format and requirements indicated in BDS;</li> <li>b) The Technical Proposal and the Financial Proposal files MUST BE COMPLETELY SEPARATE. The financial proposal shall be encrypted with password and clearly labelled. The files must be sent to the dedicated email address specified in the BDS.</li> <li>c) The password for opening the Financial Proposal should be provided only upon request of ISA. ISA will request password only from bidders whose Technical Proposal has been found to be technically responsive. Failure to</li> </ul> |

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|                                                             | provide correct password may result in the proposal being rejected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 23. Deadline for Submission of Proposals and Late Proposals | <p>23.1 Complete Proposals must be received by ISA in the manner, and no later than the date and time, specified in the BDS. ISA shall only recognize the date and time that the bid was received by ISA</p> <p>23.2 ISA shall not consider any Proposal that is submitted after the deadline for the submission of Proposals.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 24. Withdrawal, Substitution, and Modification of Proposals | <p>24.1 A Bidder may withdraw, substitute or modify its Proposal after it has been submitted at any time prior to the deadline for submission.</p> <p>24.2 Manual and Email submissions: A bidder may withdraw, substitute or modify its Proposal by sending a written notice to ISA, duly signed by an authorized representative, and shall include a copy of the authorization (or a Power of Attorney). The corresponding substitution or modification of the Proposal, if any, must accompany the respective written notice. All notices must be submitted in the same manner as specified for submission of proposals, by clearly marking them as "WITHDRAWAL" "SUBSTITUTION," or "MODIFICATION"</p> <p>24.3 Proposals requested to be withdrawn shall be returned unopened to the Bidders, only for manual submissions. For online submissions, bids will be disregarded by ISA.</p> |
| 25. Proposal Opening                                        | <p>25.1 There is no public bid opening for RFPs. ISA shall open the Proposals in the presence of an ad-hoc committee formed by ISA, consisting of at least two (2) members.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>EVALUATION OF PROPOSALS</b>                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 26. Confidentiality                                         | <p>26.1 Information relating to the examination, evaluation, and comparison of Proposals, and the recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with such process, even after publication of the contract award.</p> <p>26.2 Any effort by a Bidder or anyone on behalf of the Bidder to influence ISA in the examination, evaluation and comparison of the Proposals or contract award decisions may, at ISA's decision, result in the rejection of its Proposal and may be subject to the application of prevailing ISA vendor sanctions procedures.</p>                                                                                                                                                                                                                                                             |
| 27. Evaluation of Proposals                                 | <p>27.1 The Bidder is not permitted to alter or modify its Proposal in any way after the proposal submission deadline except as permitted under Clause 24 of this RFP. ISA will conduct the evaluation solely on the basis of the submitted Technical and</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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|                                                    | <p>Financial Proposals.</p> <p>27.2 Evaluation of proposals is made of the following steps:</p> <ul style="list-style-type: none"> <li>n) Preliminary Examination</li> <li>o) Minimum Eligibility and Qualification (if pre-qualification is not done)</li> <li>p) Evaluation of Technical Proposals</li> <li>q) Evaluation of Financial Proposals</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 28.Preliminary Examination                         | <p>28.1 ISA shall examine the Proposals to determine whether they are complete with respect to minimum documentary requirements, whether the documents have been properly signed, and whether the Proposals are generally in order, among other indicators that may be used at this stage. ISA reserves the right to reject any Proposal at this stage.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 29.Evaluation of Eligibility and Qualification     | <p><b>B.</b> Eligibility and Qualification of the Bidder will be evaluated against the Minimum Eligibility/Qualification requirements specified in the Section 4 (Evaluation Criteria).</p> <p><b>C.</b> In general terms, vendors that meet the following criteria may be considered qualified:</p> <ul style="list-style-type: none"> <li>i. They are not included in the UN Security Council 1267/1989 Committee's list of terrorists and terrorist financiers.</li> <li>ii. They have a good financial standing and have access to adequate financial resources to perform the contract and all existing commercial commitments,</li> <li>iii. They have the necessary similar experience, technical expertise, production capacity where applicable, quality certifications, quality assurance procedures and other resources applicable to the provision of the services required;</li> <li>iv. They are able to comply fully with ISA General Terms and Conditions of Contract;</li> <li>v. They do not have a consistent history of court/arbitral award decisions against the Bidder; and</li> <li>vi. They have a record of timely and satisfactory performance with their clients.</li> <li>vii. The consulting firm should provide credentials, through adequate references or documentation, their current local presence in the ISA focus regions. Past experience of working with ISA and/or with multilateral/international organizations will be an added advantage.</li> </ul> |
| 30.Evaluation of Technical and Financial Proposals | <p>30.1 The evaluation team shall review and evaluate the Technical Proposals on the basis of their responsiveness to the Terms of Reference and other RFP documents, applying the evaluation criteria, sub-criteria, and point system specified in the Section 4 (Evaluation Criteria). A Proposal shall be</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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|                   | <p>rendered non-responsive at the technical evaluation stage if it fails to achieve the minimum technical score indicated in the BDS. When necessary and if stated in the BDS, ISA may invite technically responsive bidders for a presentation related to their technical proposals. The conditions for the presentation shall be provided in the bid document where required.</p> <p>30.2 In the second stage, only the Financial Proposals of those Bidders who achieve the minimum technical score will be opened for evaluation. The Financial Proposals corresponding to Technical Proposals that were rendered non-responsive shall remain unopened, and, in the case of manual submission, be returned to the Bidder unopened. For emailed Proposals submissions, ISA will not request for the password of the Financial Proposals of bidders whose Technical Proposal were found not responsive.</p> <p>30.3 The evaluation method that applies for this RFP shall be as indicated in the BDS, which may be either of two (2) possible methods, as follows: (a) the lowest priced method which selects the lowest evaluated financial proposal of the technically responsive Bidders; or (b) the combined scoring method which will be based on a combination of the technical and financial score.</p> <p>30.4 When the BDS specifies a combined scoring method, the formula for the rating of the Proposals will be as follows:</p> <div style="border: 1px solid black; padding: 10px; margin-top: 10px;"> <p><u>Rating the Technical Proposal (TP):</u></p> <p style="text-align: center;">TP Rating = (Total Score Obtained by the Offer / Max. Obtainable Score for TP) x 100</p> <p><u>Rating the Financial Proposal (FP):</u></p> <p style="text-align: center;">FP Rating = (Lowest Priced Offer / Price of the Offer Being Reviewed) x 100</p> <p><u>Total Combined Score:</u></p> <p style="text-align: center;">Combined Score = (TP Rating) x (Weight of TP, e.g. 70/100) + (FP Rating) x (Weight of FP, e.g., 30/100)</p> </div> |
| 31. Due Diligence | <p>31.1 ISA reserves the right to undertake a due diligence exercise, also called post qualification, aimed at determining to its satisfaction, the validity of the information provided by the Bidder. Such exercise shall be fully documented and may include, but need not be limited to, all or any combination of</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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|                                                      | <p>the following:</p> <ul style="list-style-type: none"> <li>a) Verification of accuracy, correctness and authenticity of information provided by the Bidder;</li> <li>b) Validation of extent of compliance to the RFP requirements and evaluation criteria based on what has so far been found by the evaluation team;</li> <li>c) Inquiry and reference checking with Government entities with jurisdiction on the Bidder, or with previous clients, or any other entity that may have done business with the Bidder;</li> <li>d) Inquiry and reference checking with previous clients on the performance on on-going or contracts completed, including physical inspections of previous works, as necessary;</li> <li>e) Physical inspection of the Bidder's offices, branches or other places where business transpires, with or without notice to the Bidder;</li> <li>f) Other means that ISA may deem appropriate, at any stage within the selection process, prior to awarding the contract.</li> </ul> |
| 32. Clarification of Proposals                       | <p>32.1 To assist in the examination, evaluation and comparison of Proposals, ISA may, at its discretion, ask any Bidder for a clarification of its Proposal.</p> <p>32.2 ISA's request for clarification and the response shall be in writing and no change in the prices or substance of the Proposal shall be sought, offered, or permitted, except to provide clarification, and confirm the correction of any arithmetic errors discovered by ISA in the evaluation of the Proposals, in accordance with RFP.</p> <p>32.3 Any unsolicited clarification submitted by a Bidder in respect to its Proposal, which is not a response to a request by ISA, shall not be considered during the review and evaluation of the Proposals.</p>                                                                                                                                                                                                                                                                       |
| 33. Responsiveness of Proposal                       | <p>33.1 ISA's determination of a Proposal's responsiveness will be based on the contents of the Proposal itself. A substantially responsive Proposal is one that conforms to all the terms, conditions, TOR and other requirements of the RFP without material deviation, reservation, or omission.</p> <p>33.2 If a Proposal is not substantially responsive, it shall be rejected by ISA and may not subsequently be made responsive by the Bidder by correction of the material deviation, reservation, or omission.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 34. Nonconformities, Repairable Errors and Omissions | <p>34.1 Provided that a Proposal is substantially responsive, ISA may waive any non-conformities or omissions in the Proposal that, in the opinion of ISA, do not constitute a material</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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|                                                    | <p>deviation.</p> <p>34.2 ISA may request the Bidder to submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities or omissions in the Proposal related to documentation requirements. Such omission shall not be related to any aspect of the price of the Proposal. Failure of the Bidder to comply with the request may result in the rejection of its Proposal.</p> <p>34.3 For Financial Proposal that has been opened, ISA shall check and correct arithmetical errors as follows:</p> <ul style="list-style-type: none"> <li>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 unit price shall prevail and the line item total shall be corrected, unless in the opinion of ISA there is an obvious misplacement of the decimal point in the unit price; in which case the line item total as quoted shall govern and the unit price shall be corrected;</li> <li>b) if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail, and the total shall be corrected; and</li> <li>c) if there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail.</li> </ul> <p>34.4 If the Bidder does not accept the correction of errors made by ISA, its Proposal shall be rejected.</p> |
| <b>D. AWARD OF CONTRACT</b>                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 35.Right to Accept, Reject, Any or All Proposals   | 35.1 ISA reserves the right to accept or reject any Proposal, to render any or all of the Proposals as non-responsive, and to reject all Proposals at any time prior to award of contract, without incurring any liability, or obligation to inform the affected Bidder(s) of the grounds for ISA's action. ISA shall not be obliged to award the contract to the lowest priced offer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 36.Award Criteria                                  | 36.1 Prior to expiration of the proposal validity, ISA shall award the contract to the qualified Bidder based on the award criteria indicated in the BDS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 37.Right to Vary Requirements at the Time of Award | 37.1 At the time of award of Contract, ISA reserves the right to vary the quantity of services and/or goods, by up to a maximum twenty-five per cent (25%) of the total offer, without any change in the unit price or other terms and conditions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 38.Contract<br>Signature                     | 38.1 Within fifteen (15) days from the date of receipt of the Contract, the successful Bidder shall sign and date the Contract and return it to ISA. Failure to do so may constitute sufficient grounds for the annulment of the award, and forfeiture of the Proposal Security, if any, and on which event, ISA may award the Contract to the Second Ranked Bidder or call for new Proposals.                                                                                                                                                                                                                                                                                                                                                                              |
| 39.Performance<br>Security                   | 39.1 A performance security, if required in BDS, shall be provided in the amount specified in BDS. Within fifteen (15) days of the contract signature by both parties. Where a performance security is required, the receipt of the performance security by ISA shall be a condition for rendering the contract effective.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 40.Bank Guarantee<br>for Advanced<br>Payment | 40.1 Except when the interests of ISA so require, it is ISA's preference to make no advance payment(s) (i.e., payments without having received any outputs). If an advance payment is allowed as per BDS, and exceeds 20% of the total contract price, or USD 30,000, whichever is less, the Bidder shall submit a Bank Guarantee in the full amount of the advance payment.                                                                                                                                                                                                                                                                                                                                                                                                |
| 41.Liquidated<br>Damages                     | 41.1 If specified in BDS, ISA shall apply Liquidated Damages resulting from the Contractor's delays or breach of its obligations as per the Contract.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 42.Payment<br>Provisions                     | 42.1 Payment will be made only upon ISA's acceptance of the work performed. The terms of payment shall be within thirty (30) days, after receipt of invoice and certification of acceptance of work issued by the proper authority in ISA with direct supervision of the Contractor. Payment will be affected by bank transfer in the currency of contract.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 43.Other<br>Provisions                       | <p>43.1 ISA may withdraw the RFP at any time by providing written notice to the bidder in any case in which the mandate of ISA applicable to the performance of the Contract or the funding of ISA applicable to the RFP is curtailed or terminated, whether in whole or in part.</p> <p>43.2. The ISA is striving to achieve gender parity in all its activities. In this regard, female-owned organizations and/or teams with significant gender diversity are strongly encouraged to submit a proposal.</p> <p>43.3. The ISA recognizes the importance of valuing diversity and promoting inclusion in all our work programs and partnerships. The ISA strives to engage with organizations and/or teams that reflect its geographical representation and diversity.</p> |

### Section 3. Bid Data Sheet

The following data for the services to be procured shall complement, supplement, or amend the provisions in the Request for Proposals. In the case of a conflict between the Instructions to Bidders, the Data Sheet, and other annexes or references attached to the Data Sheet, the provisions in the Data Sheet shall prevail.

| BD No. | Re f to Se cti on. 2 | Data                                                                  | Specific Instructions / Requirements                                                                                                                                                                                      |
|--------|----------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | 7                    | Language of the Proposal                                              | English                                                                                                                                                                                                                   |
| 2      |                      | Submitting Proposals for Parts or sub-parts of the TOR (partial bids) | Not Allowed                                                                                                                                                                                                               |
| 3      | 20                   | Alternative Proposals                                                 | Shall not be considered                                                                                                                                                                                                   |
| 4      | 21                   | Pre-proposal conference                                               | May 08, 2026, 2:00 PM – 3:00 PM (IST)<br>Pre-Bid Meeting Link:<br><a href="https://teams.microsoft.com/meet/48485502485521?p=hQI560qtEXy9quyJaf">https://teams.microsoft.com/meet/48485502485521?p=hQI560qtEXy9quyJaf</a> |
| 5      | 10                   | Proposal Validity Period                                              | 90 days                                                                                                                                                                                                                   |
| 6      | 14                   | Bid Security                                                          | NIL                                                                                                                                                                                                                       |
| 7      | 41                   | Advanced Payment upon signing of contract                             | Not Allowed                                                                                                                                                                                                               |
| 8      | 42                   | Liquidated Damages                                                    | Will be imposed as follows:                                                                                                                                                                                               |

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

|    |    |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----|----|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |    |                                                                 | <p>a. Where the contractor fails to fulfill the performance of the deliverables in accordance with the specified timelines in the approved strategy document or</p> <p>b. Where there is non-satisfactory performance of the contract in line with the contract terms, the contractor shall be liable to pay ISA the liquidated damages of a daily charge of 3% (three percent) of the total contract sum, for each day of the daily occurrence, up to a maximum amount of 20% (twenty percent) of the contract sum; which surcharge is deductible from the vendor's outstanding invoices. Provided that ISA may the event of the contractor's default or failure to meet a timeline issue a Notice of Breach as a warning of first instance; and in the second instance terminate the contract; and the invoice due shall be calculated on a pro-rata basis following the provision of this section</p> |
|    | 40 | Performance Security                                            | Not Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 10 | 18 | Currency of Proposal                                            | <p>USD/INR</p> <p>For companies registered in India, the payment will be made in INR, and the applicable exchange rate will be locked as per the UN Operational Rates of Exchange on the date of bid submission. Reference: <a href="https://treasury.un.org/operationalrates/OperationalRates.php">https://treasury.un.org/operationalrates/OperationalRates.php</a></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 11 | 31 | Deadline for submitting requests for clarifications / questions | 7 days before the submission deadline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 12 | 31 | Contact Details for submitting clarifications /questions        | <p>Focal Person in ISA: Procurement Unit</p> <p>E-mail: <a href="mailto:mdtf_procurement@isa.intand">mdtf_procurement@isa.intand</a></p> <p>Address: International Solar Alliance, 3rd Floor, Surya Bhawan, NISE Campus, Gwal Pahari, Gurugram, Haryana - 122003, India</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

|        |                        |                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------|------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1<br>3 | 18,<br>19<br>and<br>21 | Manner of Disseminating Supplemental Information to the RFP and responses/clearifications to queries | Direct communication to prospective Proposers by email<br><br><u>E-mail:</u> mdtf_procurement@isa.int and CC                                                                                                                                                                                                                                                                                                                                             |
| 1<br>4 | 23                     | Deadline for Submission                                                                              | May 19, 2026 – 11:59 PM (Indian Standard Time)                                                                                                                                                                                                                                                                                                                                                                                                           |
| 1<br>4 | 22                     | Allowable Manner of Submitting Proposals                                                             | <input type="checkbox"/> Submission by email                                                                                                                                                                                                                                                                                                                                                                                                             |
| 1<br>5 | 22                     | Proposal Submission Address                                                                          | <u>E-mail:</u> mdtf_procurement@isa.int                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1<br>6 | 22                     | Electronic submission (email) requirements                                                           | <ul style="list-style-type: none"> <li>▪ Format: PDF files only</li> <li>▪ File names must be maximum 60 characters long and must not contain any letter o/r special character other than from Latin alphabet/keyboard.</li> <li>▪ All files must be free of viruses and not corrupted.</li> <li>▪ Password for financial proposal <u>must</u> not be provided to ISA until requested by ISA</li> <li>▪ Max. File Size per transmission: 5 MB</li> </ul> |
| 1<br>7 | 27<br>36               | Evaluation Method for the Award of Contract                                                          | Combined Scoring Method, using the 70%-30% distribution for technical and financial proposals respectively<br><br>The minimum technical score required to pass is 70%.                                                                                                                                                                                                                                                                                   |
| 1<br>8 |                        | Expected date for commencement of Contract                                                           | June 2026                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 1<br>9 |                        | Maximum expected                                                                                     | The Project Deliverables shall be completed within a period of nine (9) months from the date of issuance of Letter of Award. The Project shall be also followed                                                                                                                                                                                                                                                                                          |

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

|    |    |                                      |                                                                                                                                                                                                                                                                                                        |
|----|----|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |    | duration of contract                 | by a subscription period of one (1) year commencing from the Go-Live date. Subject to satisfactory performance during the initial subscription period and DISCOM's budgetary provisions, the subscription may be extended for an additional period of four (4) years on the same terms and conditions. |
| 20 | 35 | ISA will award the contract to:      | One Proposer only                                                                                                                                                                                                                                                                                      |
| 21 | 39 | Type of Contract                     | Services contract                                                                                                                                                                                                                                                                                      |
| 22 |    | Other Information Related to the RFP | [All other instructions and information not yet mentioned so far in this Data Sheet but are relevant to the RFP must be cited here, and any further entries that may be added below this table row]                                                                                                    |

## Section 4. Evaluation Criteria

### Preliminary Examination Criteria

Proposals will be examined to determine whether they are complete and submitted in accordance with RFP requirements as per below criteria on a Yes/No basis:

- Appropriate signatures
- Power of Attorney
- Minimum documents provided
- Technical and Financial Proposals submitted separately
- Bid Validity
- Bid Security submitted as per RFP requirements with compliant validity period

### Minimum Eligibility and Qualification Criteria

Eligibility and Qualification will be evaluated on Pass/Fail basis.

| Subject                                          | Criteria                                                                                                                                                                                                                          | Document Submission requirement            |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| ELIGIBILITY                                      |                                                                                                                                                                                                                                   |                                            |
| Legal Status                                     | A bidder is a legally registered entity/firm.<br>JV/Consortium/Sub - contracting is allowed under this contract.                                                                                                                  | Form B: Bidder Information Form            |
| Eligibility                                      | Bidder is not suspended, nor debarred, nor otherwise identified as ineligible by any UN Organization, ADB or the World Bank Group or any other international Organization in accordance with ITB clause 3 and Country Governments | Form A: Technical Proposal Submission Form |
| Conflict of Interest                             | No conflicts of interest in accordance with clause 4.                                                                                                                                                                             | Form A: Technical Proposal Submission Form |
| Bankruptcy                                       | Not declared bankruptcy, not involved in bankruptcy or receivership proceedings, and there is no judgment or pending legal action against the Bidder that could impair its operations in the foreseeable future.                  | Form A: Technical Proposal Submission Form |
| QUALIFICATION                                    |                                                                                                                                                                                                                                   |                                            |
| History of Non-Performing Contracts <sup>1</sup> | Non-performance of a contract did not occur as a result of contractor default for the last 3 years.                                                                                                                               | Form D: Qualification Form                 |
| Litigation History                               | No consistent history of court/arbitral award decisions against the Bidder for the last 3 years.                                                                                                                                  | Form D: Qualification Form                 |

<sup>1</sup> Non-performance, as decided by ISA, shall include all contracts where (a) non-performance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract, and (b) contracts that were so challenged but fully settled against the contractor. Non-performance shall not include contracts where Employers decision was overruled by the dispute resolution mechanism. Non-performance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the Bidder have been exhausted.

|                     |                                                                                                                                                                                                                                                                                                            |                                                           |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Previous Experience | As per below table under “Minimum Eligibility Criteria”                                                                                                                                                                                                                                                    | Form D: Qualification Form (Previous Relevant Experience) |
| Financial Standing  | Minimum Average annual turnover of Amount (USD/INR) as per below table under “Minimum Eligibility Criteria” over past 3 years Latest 3 years Audited Financial Statement – income statement and balance sheet to indicate Its financial stability, liquidity, credit standing, and market reputation, etc. | Form D: Qualification Form                                |
|                     | Bidder must demonstrate the current soundness of its financial standing and indicate its prospective long-term profitability.                                                                                                                                                                              | Form D: Qualification Form                                |

Technical Proposal of Bidders who passes the minimum eligibility criteria will only be evaluated.

#### Minimum Eligibility Criteria

| Criteria                    | Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Supporting Documents | Max Points                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------|
| Technical Requirements      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                     |
| Years of Operation          | The Sole/ Lead Bidder must demonstrate prior experience in the technology or infrastructure sector. Points will be awarded based on the number of completed years of relevant operation as of the bidsubmission date.                                                                                                                                                                                                                                                                                    |                      | Certificate of Incorporation, Company Profile of 15 |
|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                     |
|                             | Years of Operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Marks                |                                                     |
|                             | up to ≤ 5 years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 10                   |                                                     |
|                             | > 5 years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15                   |                                                     |
|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                     |
| Relevant Project Experience | The Sole/ Lead Bidder/ any other Consortium Member should have successfully implemented Eligible Projects involving Geospatial and Technical Data Collection or GIS-based web application for tracking digitised assets for any Power Distribution Company or Power Transmission Company within the last three (3) years from the date of issuance of this EOI. Such Eligible Projects must include: <ul style="list-style-type: none"><li>Aggregate project value across eligible engagements</li></ul> |                      | References along with                               |

**RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.**

|                                                                             | <table><tr><th>Aggregate Project Value (USD, excl. taxes)</th><th>Marks</th></tr><tr><td>≤ \$100,000</td><td>7</td></tr><tr><td>&gt;\$100,000 and &lt; \$500,000</td><td>13</td></tr><tr><td>&gt;\$5,000,000</td><td>20</td></tr></table> <p>Each of the projects need to have signed contracts and work orders as on date of bid submission. In cases where a signed contract or work order is not available due to the pilot nature of the project, the bidder must submit a completion certificate along with evidence of the available funding.<br/>The implementation should have covered Geospatial and Technical data collection of power grid assets.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Aggregate Project Value (USD, excl. taxes)                             | Marks | ≤ \$100,000 | 7 | >\$100,000 and < \$500,000 | 13 | >\$5,000,000 | 20 | requisite contract/<br>Purchase Order (PO)/<br>Work Order (WO). The<br>references should<br>indicate client name,<br>scope of work, Project<br>start date. | 20 |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-------|-------------|---|----------------------------|----|--------------|----|------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Aggregate Project Value (USD, excl. taxes)                                  | Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                        |       |             |   |                            |    |              |    |                                                                                                                                                            |    |
| ≤ \$100,000                                                                 | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        |       |             |   |                            |    |              |    |                                                                                                                                                            |    |
| >\$100,000 and < \$500,000                                                  | 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                        |       |             |   |                            |    |              |    |                                                                                                                                                            |    |
| >\$5,000,000                                                                | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                        |       |             |   |                            |    |              |    |                                                                                                                                                            |    |
| Demonstrated Experience in Multi-Software Integration for Unified Dashboard | <p>Sole/ Lead Bidder/ any other Consortium Members must clearly indicate their level of relevant experience in the following categories (provide supporting evidence such as project descriptions, client references, or case studies):</p> <ul style="list-style-type: none"><li>• No prior experience in integrating multiple software systems into a common dashboard. → Not eligible / zero marks</li><li>• General experience in integrating multiple heterogeneous software applications / platforms into a single unified / common dashboard using APIs (REST/SOAP) 5 marks:</li><li>• Sector-specific experience in the power / electricity / utility sector: Proven track record of successfully integrating multiple specialized power-sector software systems into a single operational / common dashboard via APIs, including at least two of the following systems: 10 marks</li></ul> <ul style="list-style-type: none"><li>• SCADA / EMS</li><li>• GIS / network mapping tools</li><li>• AMI / Meter Data Management (MDM)</li><li>• OMS / ADMS / SMS</li><li>• ERP / CIS / billing systems</li><li>• Asset management / CMMS systems</li></ul> | BOM/BOQ                                                                | 10    |             |   |                            |    |              |    |                                                                                                                                                            |    |
| Availability of GIS COTS Software Solution                                  | <p>Sole/ Lead Bidder/ any other Consortium Member</p> <ul style="list-style-type: none"><li>• No COTS solution. GIS-based web application to be built to requirement - 0</li><li>• Demonstrated COTS software solution with an operational GIS-based Web Application - 5</li><li>• Demonstrated COTS software solution with an operational GIS-based Web Application for database of digitised and geotagged power utility asset tracking, including analytics dashboards – 10</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Work Order / Completion Certificate / Client Certificate and citations | 10    |             |   |                            |    |              |    |                                                                                                                                                            |    |

**RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.**

| Key Personnel                  | Professionals with qualifications in computer science or related fields, and experience in building software applications, project management and other relevant areas.                                                                                                                                                                                                                                                                                                                                                       | CVs of Key Personnel                                 | 15    |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-------|-------------|---|-----------------------------|----|-------------|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                                | <table><tr><th>No. of Full-Time Professionals</th><th>Marks</th></tr><tr><td>&lt; 5</td><td>5</td></tr><tr><td>≥ 5 and ≤ 10</td><td>10</td></tr><tr><td>&gt; 10</td><td>15</td></tr></table>                                                                                                                                                                                                                                                                                                                                  | No. of Full-Time Professionals                       | Marks | < 5         | 5 | ≥ 5 and ≤ 10                | 10 | > 10        | 15 |                                                                                                                                                                                                                  |    |
| No. of Full-Time Professionals | Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                      |       |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |
| < 5                            | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                      |       |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |
| ≥ 5 and ≤ 10                   | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      |       |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |
| > 10                           | 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      |       |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |
| Quality Certification          | 1. The Sole/ Lead Bidder should have ISO 9001 certificate – 10<br>2. Valid ISO 9001 certification, along with additional relevant ISO certifications (e.g., ISO 27001 for information security, ISO 20000 for IT service management) - 15                                                                                                                                                                                                                                                                                     | ISO 9001 / ISO 27001 Certificate copies to be shared | 15    |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |
| Financial Requirements         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                      |       |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |
| Financial Capacity of the SI   | The Sole/ Lead Bidder must demonstrate financial capacity through audited financial statements showing a minimum annual turnover & Working capital in last two Financial Years<br><table><tr><th>Turnover (USD)</th><th>Marks</th></tr><tr><td>&lt; \$100,000</td><td>5</td></tr><tr><td>≥ \$100,000 and ≤ \$500,000</td><td>10</td></tr><tr><td>&gt; \$500,000</td><td>15</td></tr></table><br>Work orders from international non- governmental non-profit organizations shall be considered valid for financial assessment. | Turnover (USD)                                       | Marks | < \$100,000 | 5 | ≥ \$100,000 and ≤ \$500,000 | 10 | > \$500,000 | 15 | A certificate duly certified by the statutory auditor / Chartered Account of the Agency mentioning the average annual turnover for last two audited financial years along with the audited financial statements. | 15 |
| Turnover (USD)                 | Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                      |       |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |
| < \$100,000                    | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                      |       |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |
| ≥ \$100,000 and ≤ \$500,000    | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      |       |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |
| > \$500,000                    | 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                      |       |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |
|                                | Total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                      | 100   |             |   |                             |    |             |    |                                                                                                                                                                                                                  |    |

For the purposes of satisfaction of Technical Requirement, the following shall apply:

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

1. Eligible Projects, as referred in Technical Requirement, shall mean any project consisting of Geospatial and Technical data capture of power grid assets and a GIS-based web application to track digitised power grid assets
2. The Eligible Project(s) in the Power sector shall mean projects relating to generation or transmission or distribution of electricity.
3. The Bidder must obtain a minimum score of seventy (70) points in the Pre-Qualification (PQ) evaluation in order to be considered eligible for the second stage of bidding.

**\*Note: Startups shall be governed in accordance with the applicable rules and guidelines issued under GFR and DPIIT, Government of India**

**Note: Power Distribution Franchisee shall be considered as ISA for the sake of assessing Potential SI experience.**

#### Technical Evaluation Criteria

| S. No. | Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Max. Marks | Supporting Documents                                                                   |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------|
| 1.     | <p>Mobile App Software Readiness: Demonstration of a mature Mobile Application to digitize grid assets, as per EOI requirements.</p> <p>L1 Asset Digitisation (max 10 points):</p> <ul style="list-style-type: none"> <li>• Feeders : 3 points</li> <li>• Substations and Transformers: 3 points</li> <li>• Distributed Energy Resources: 4 points</li> </ul> <p>L2 Depth of Asset Digitisation (max 10 points):</p> <ul style="list-style-type: none"> <li>• Substation sub-assets including Circuit Breakers, CTPT sets, Power Transformers, isolators, Switches, Fuses, Busbars, Bus couplers/sectionalisers, Meters, Lightning arresters and asset connections (5 points)</li> <li>• Distribution Transformer sub-assets incl. switches, fuses, phases and meters (3 points)</li> <li>• Feeder sub-assets including meters, individual poles and connecting cables (2 points)</li> </ul> | 20         | Evidence of capability (Technical Presentation / Minimum viable product demonstration) |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |                                                                                        |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------------------------------------------------------|
| 2. | <p>Web Application Software maturity: Demonstration of a mature AI-powered Web Application for tracking digitized assets, their connections and conducting load flow analysis, as per EOI requirements.</p> <p>Map Visualization (5 points if all below sub- features are demonstrated):</p> <ul style="list-style-type: none"> <li>• The SI must demonstrate a Geographic Information System (GIS)-based tool capable of visualizing grid assets and associated data with high accuracy and interactivity.</li> <li>• Interactive Map Rendering: Showcase zoomable maps with accurate geospatial asset placement (e.g., substations, feeders) and toggle-able layers for assets or load metrics.</li> </ul> | 35 | Evidence of capability (Technical Presentation / Minimum viable product demonstration) |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------------------------------------------------------|

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
|  | <p>Load Flow Analysis (max 10 points if all below sub- features are demonstrated):</p> <ul style="list-style-type: none"> <li>• Comprehensive load flow analysis incl. accurate voltage profiles, line-wise power flow, power losses and power source-wise consumption tracking on each asset</li> <li>• Power Flow Metrics: Calculate and display voltage profiles, power losses and capacity loading for buses and lines, with results visualized in time-series plots.</li> <li>• RMS Data Overlays: Visualize RMS data (e.g., voltage) as color-coded overlays, updating dynamically with clickable asset details.</li> </ul> <p>Digital SLD (max 10 points if all below sub-features are demonstrated):</p> <ul style="list-style-type: none"> <li>• The SI must demonstrate a module for generating and editing digital single-line diagrams representing the electrical network topology.</li> <li>• Editable Interface: Demonstrate drag-and-drop editing of SLDs (e.g., reconfiguring connections) with real-time validation against grid rules and versioning support.</li> </ul> <p>Natural Language based Querying (max 10 points if all below sub-features are demonstrated):</p> <ul style="list-style-type: none"> <li>• The SI must demonstrate an AI-powered chat interface that can operate on databases of DISCOMs and can successfully query the data using natural language queries.</li> <li>• The SI must demonstrate different output formats (Tables, Bar charts, Line charts) autogenerated using the natural language queries as requested.</li> <li>• The interface must support follow-up queries while saving context on previous queries and data shared.</li> </ul> |  |  |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|

| S. No.                      | Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Max. Marks                  | Supporting Documents                                                                                       |                        |   |                        |    |           |    |    |                                                          |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------|------------------------|---|------------------------|----|-----------|----|----|----------------------------------------------------------|
| 3.                          | <p>On-ground Digitisation Capability: Experience in power grid digitization projects, showcased via GIS- based Web application:</p> <table><tr><th>Volume of Assets digitised*</th><th>Score</th></tr><tr><td>&gt;=100,000 and &lt;200,000</td><td>5</td></tr><tr><td>&gt;=200,000 and &lt;500,000</td><td>10</td></tr><tr><td>&gt;=500,000</td><td>15</td></tr></table> <p>*Assets are defined as unique Substations, DTs and Poles</p>                                        | Volume of Assets digitised* | Score                                                                                                      | >=100,000 and <200,000 | 5 | >=200,000 and <500,000 | 10 | >=500,000 | 15 | 15 | Work Order / Completion Certificate / Client Certificate |
| Volume of Assets digitised* | Score                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                                                                            |                        |   |                        |    |           |    |    |                                                          |
| >=100,000 and <200,000      | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |                                                                                                            |                        |   |                        |    |           |    |    |                                                          |
| >=200,000 and <500,000      | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |                                                                                                            |                        |   |                        |    |           |    |    |                                                          |
| >=500,000                   | 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |                                                                                                            |                        |   |                        |    |           |    |    |                                                          |
| 4.                          | <p>Proposed Solution Demonstration (30 Marks):</p> <ul style="list-style-type: none"><li>• <i>Understanding of the scope of work and Utility's requirements – 10 Marks</i></li><li>• <i>Approach &amp; Methodology – 10 Marks</i></li><li>• <i>Work Plan – 10 Marks</i></li></ul> <p>[The SI has to score minimum 10 marks in this criterion. In case the SI is scoring less than 10 marks, the SI is liable for rejection and may be considered technically disqualified.]</p> | 30                          | Presentation and Solution demonstration by SIs (Approx. Time – 60 mins) - Shall be notified by the Utility |                        |   |                        |    |           |    |    |                                                          |
| Maximum Marks               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 100                         |                                                                                                            |                        |   |                        |    |           |    |    |                                                          |

- Maximum 100 marks shall be awarded under Technical Evaluation and marking for the same is defined in the Technical Evaluation Criteria above.
- The SI is supposed to give a Technical Presentation and demonstration after the opening of the Technical Proposal of their bid, which shall be carried out only for the SIs who fulfil the Eligibility Criteria.
- The marks scored by the SI in the presentation/ demonstration shall become a part of the technical evaluation criteria of total 100 marks.
- The Bidder's financial offer shall be considered only if the Bidder scores a minimum of seventy (70) marks in the Technical Evaluation. Final scoring will then be based on both technical and financial evaluations, as below.
  - Rating the Technical Criteria (TC):
    - TC Rating = (Total Score Obtained by the Offer / Max. Obtainable Score for TP) x 100
  - Rating the Financial Proposal (FP):
    - FP Rating = (Lowest Priced Offer / Price of the Offer Being Reviewed) x 100
  - Final scores are awarded using a composite scoring system = 70% of TC Rating + 30% of FP Rating
  - Bidder with the highest score is to be awarded the contract for the relevant state

## Section 5. Terms of Reference

### AI powered GIS based Asset Management, Network Analysis, Load Forecasting for DER Integration System Requirements & Service Level Agreements for 1 year Subscription

#### 05. Introduction

To drive the modernization of its distribution network, Ajmer Vidyut Vitran Nigam Limited (AVVNL) with support from International Solar Alliance (ISA) is initiating the digitalization and development of a high-fidelity Digital Twin (DT) platform, initially targeting the Ajmer, Udaipur, and Sikar circles (the circles are tentative and may change at the time of implementation). This project involves creating a virtual replica of the utility's physical infrastructure to enable advanced simulations and real-time operational analysis, though the specific circles remain subject to change based on requirements at the time of implementation. All technical specifications for the underlying assets and infrastructure to be modeled within these regions are detailed given in the below table, serving as the baseline for the Digital Twin's physical-to-digital synchronization. It should be noted that the underlying data may vary at the time of actual execution

| Sl. No. | Asset Type                                                  | Ajmer Circle | Udaipur circle | Sikar Circle |
|---------|-------------------------------------------------------------|--------------|----------------|--------------|
| 1.      | LT Feeders (415 V or 230 V) – km                            | 15995        | 14420          | 33334        |
| 2.      | HT Feeders (11 KV) – km                                     | 14150        | 19825          | 19328        |
| 3.      | Substations                                                 | 160          | 155            | 304          |
| 4.      | Consumer Meters (415 V or 230 V) Nos                        | 444678       | 676252         | 794197       |
| 5.      | Distributed Power Generators under Kusum (33kV to 11kV) Nos | 9            | 1              | 30           |
| 6.      | Roof Top SPG (415 V to 230 V) Nos                           | 4023         | 7620           | 9688         |
| 7.      | Total Energy Under Management (Input MUs)                   | 1945         | 2185           | 2927         |
| 8.      | Number of Circles                                           | 1            | 1              | 1            |
| 9.      | Number of Divisions                                         | 4            | 6              | 8            |
| 10.     | Number of Sub-Divisions                                     | 15           | 23             | 32           |
| 11.     | Number of DTs (11/0.4kV)                                    | 60258        | 78437          | 130145       |

## 06. Scope of Work

The proposed solution should include the following modules and features:

| Sl No. | Product Feature/Module                                                                                                        |
|--------|-------------------------------------------------------------------------------------------------------------------------------|
| 1.     | Discom Grid Asset Digitization                                                                                                |
| 1a     | Generate and associate unique QR codes for feeders & DT assets                                                                |
| 2.     | AI-powered Mobile Application for Linemen                                                                                     |
| 3.     | AI-powered Web Application for DISCOM Officials                                                                               |
| 4      | Web-application for Energy department officials for relevant data coordination among Energy dept & DISCOM mainly on EE/DF/DSM |

### a. Discom Grid Asset Digitization

The SI shall conduct a comprehensive one-time digitization of the DISCOM's grid assets to establish a foundational dataset for the proposed solution. This effort will involve:

#### i. Asset Coverage: Digitization of all grid assets, including:

1. All 132kV/220kV Transco substation
2. All and 33/11kV Substations and sub-assets vis feeders, vcb & Power transformers
3. and 33kV Feeders, Poles, Segments, cables and buses
4. 11kV Feeders, DT, Poles, Segments, cables and buses
5. All types of Distributed Energy Resources (DER) such as Solar Power generators (SPGs), Wind Turbines, Battery Energy Storage Solutions (BESS), V2G EVs connected till 11kV and Capacitor Banks attached to lines of, 33kV and 11KV lines.

#### ii. Validation Mechanism Requirement for One-Time Digitization Effort of Grid Assets: The DISCOM requires System Integrators (SIs) to propose a robust validation mechanism for the one- time digitization of grid assets (e.g., substations, feeders, transformers, poles, cables and wires, solar power generators). The mechanism must leverage Artificial Intelligence (AI) and Machine Learning (ML) to ensure data accuracy, completeness and reliability while optimizing the use of DISCOM's existing capacity and resources. Proposals must detail how the SI will meet these requirements. The SI must implement a multi-tier validation workflow that integrates field verification, automated AI/ML checks and supervisory oversight to deliver high-quality digitized data. The mechanism should minimize rework, reduce manual effort and align & integrate with DISCOM systems. Proposals must address the following tiers:

1. Tier 1: Field-Level Validation

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

- a. Requirement: The SI must capture asset data (e.g., Asset ID, geospatial coordinates, technical specifications and photographs) with real-time validation. Mandatory fields and input checks (e.g., format validation for serial numbers, range checks for voltage ratings) are required.
  - i. Include anomaly detection using an ML model to flag errors in data entry (e.g., coordinates of connected assets outside possible limits, duplicate IDs, etc)
  - ii. Provide AI-driven guided data entry / clean-up, suggesting plausible values based on historical patterns
  - iii. DISCOM Capacity Optimization: The solution must leverage existing field staff, enhancing their efficiency with AI tools to minimize additional personnel needs
  - iv. All DISCOM assets captured in the system must be indexed / tagged / referenced using the official DISCOM nomenclature.

This includes (but is not limited to):

- Substation names / codes
- Feeder names / codes
- Distribution Transformer (DT) IDs / numbering
- Pole / tower identifiers
- Any other asset / element identifiers as per the DISCOM's internal naming conventions, standards, or master data registry

#### 1. Tier 2: Automated Cross-Checking Against Existing DISCOM Records

- a. Requirement: The SI must synchronize digitized data with a backend system and cross-check it against DISCOM databases (e.g. billing records, asset registries) provided by the DISCOM.
  - i. Use ML algorithms (e.g., fuzzy matching) to identify discrepancies (e.g., mismatched pole locations, unregistered transformers).
  - ii. Implement AI-based geospatial validation to detect and correct coordinate mismatches against GIS data.
  - iii. Employ ML clustering to detect duplicate entries (e.g., two poles with identical coordinates).
  - iv. DISCOM Capacity Optimization: The solution must utilize DISCOM's existing datasets as a reference, reducing manual re-verification efforts.

#### 2. Tier 3: Supervisory Review and AI-Enhanced Validation

- a. Requirement: The SI's Web Application must provide a dashboard for supervisors to review discrepancy reports and flagged anomalies, with options to approve, reject, or escalate issues for field re-verification.
  - i. Include AI-driven anomaly prioritization, ranking discrepancies by severity
  - ii. Use ML models trained on DISCOM data to predict errors and suggest fixes.
  - iii. Validate network topology (e.g., feeder-to-substation linkages) using AI to ensure physical grid rule compliance (e.g., voltage compatibility).

- iv. Capacity Optimization: The solution must enhance existing supervisors' decision-making with AI insights, minimizing additional staffing requirements.
- 3. Tier 4: Final Validation and Reporting
  - a. Requirement: The SI must perform a final AI-driven consistency check on the validated dataset and generate reports for DISCOM approval.
    - i. Ensure data integrity across assets (e.g., pole alignment with feeder paths, transformer ratings matching feeder specs).
    - ii. Calculate accuracy metrics (e.g., % of assets validated without discrepancies, geospatial accuracy rate) using ML.
    - iii. Provide AI-generated heatmaps of validation issues (e.g., regions with frequent mismatches) for review.
    - iv. DISCOM Capacity Optimization: The solution must deliver actionable insights using DISCOM's existing reporting structures, avoiding external consultancy needs.
- ii. Evaluation Criteria
  - 1. Completeness and accuracy of digitized asset data.
  - 2. Accuracy of AI/ML anomaly detection (e.g., >95% true positive rate).
  - 3. Quantified reduction in manual validation effort (e.g., hours saved per 100 assets).
  - 4. Completeness, clarity and usability of validation reports for approval.
  - 5. Evidence of scalability and effective use of DISCOM capacity in the proposed approach.
- b. The System Integrator (SI) shall generate and associate unique QR codes for feeder & DT assets.
  - Scope of Coverage QR codes must be generated for all digitized / captured assets in the system, including but not limited to:
    - Distribution Transformers (DTs)
    - Feeders / feeder segments
  - QR Code Functionality & Standards
    - Each QR code must be unique and permanently linked to the asset's record in the database (using the DISCOM-official nomenclature / asset ID as the primary key).
    - Scanning the QR code (via mobile app or standard QR scanner) should immediately retrieve and display:
      - Basic asset details (ID, type, location, DISCOM nomenclature, installation date, capacity/rating, etc.)
      - Current status (operational / faulty / under maintenance)
      - Option to log new field updates / readings / faults directly from the app (subject to user role permissions)
    - QR codes should follow standard formats (e.g., QR Code ISO/IEC 18004) with sufficient error correction (Level H recommended for outdoor/field use).
    - Size & durability: Suitable for field printing on weather-resistant, tamper-evident labels/stickers (UV-resistant, vinyl material recommended).
  - Generation & Assignment Process

- The platform must include an automated QR code generation module triggered upon successful asset capture / upload / validation.
- QR codes should be downloadable in bulk (PDF / image batch) or individually for printing and physical affixation on assets during field surveys or maintenance activities.
- Maintain a centralized repository / mapping table: Asset ID (DISCOM nomenclature) ↔ QR Code String ↔ QR Image File.
- Integration & Workflow
  - Integrate QR code scanning capability directly into the mobile/field app used for asset verification, survey, or O&M activities.
  - Ensure offline support: QR generation and basic scanning should function offline where possible, with sync upon reconnection.
  - Support role-based access (e.g., field technician can scan & update, supervisor can view full history).
- c. Requirements for AI-Powered Mobile Application for Linemen:
 

The DISCOM requires System Integrators (SIs) to propose an AI-powered Mobile Application for linemen and field engineers to collect, validate and manage grid asset data in real-time during the one-time digitization effort and ongoing operations. The application must enhance grid visibility, streamline field workflows, support consumer-to-grid mapping and facilitate the DISCOM's transition to Distributed Energy Resources (DER) such as Solar Power generators (SPGs), Wind Turbines, Battery Energy Storage Solutions (BESS). The following detailed requirements outline the expected functionalities, incorporating advanced AI capabilities and operational integration.

The proposed solution should include the following modules and features:

| SI No. | Product Feature/Module                            |
|--------|---------------------------------------------------|
| 1.     | Data Capture for Nodes in the Network             |
| 2.     | Data Capture for Lines in the Network             |
| 3.     | Avenue to Edit Asset and Linkage Details          |
| 4.     | AI-powered Validation of Digitized Assets         |
| 5.     | Photo Capture and AI-Powered Asset Identification |
| 6.     | Alerts and Notifications                          |

#### i. Detailed Requirements

##### 1. Data Capture for Nodes in the Network

Description: The application must enable linemen to capture detailed data for network nodes, including 33/11kV substations, sub-assets (e.g., buses, transformers) and Distributed Energy Resources (DER) (33kV and 11KV) such as Solar Power generators (SPGs), Wind Turbines, Battery Energy Storage Solutions (BESS) and EV Community chargers.

- a. Required Features:
  - i. Capture geospatial coordinates (latitude/longitude) with sub-meter accuracy..
  - ii. Record asset specifications: Asset ID/serial number, voltage rating, capacity and technical parameters (e.g., bus type, active/inactive status).
  - iii. Support dropdown menus or auto-suggestions for standardized fields (e.g., voltage levels: 33kV, 11kV).
  - iv. For ease of data entry, every probable or default value should be entered implicitly.
- b. Use ML to pre-populate fields based on historical node data patterns (e.g., typical substation capacities), reducing manual input errors.

## 2. Data Capture for Lines in the Network

Description: The application must facilitate comprehensive data collection for network lines, including 132kV,33kV and 11kV feeders, poles and segments.

- a. Required Features:
  - i. Record geospatial paths (start/end coordinates and intermediate points) for feeders and segments.
  - ii. Capture technical specifications: conductor type, length, impedance per km, thermal/power limits and shunt admittance (optional).
  - iii. Include serial numbers for poles and segments, with options to link to tender records.
- b. Leverage AI to suggest conductor types or lengths based on feeder voltage and location, validated against DISCOM standards.

## 3. Avenue to Edit Asset and Linkage Details

Description: The application must allow linemen to edit asset details and network topology linkages post-capture, ensuring flexibility to correct errors or update information.

- a. Required Features:
  - i. Provide an intuitive interface to modify asset data (e.g., update serial number, adjust coordinates) with timestamps.
  - ii. Enable editing of network linkages (e.g., reassign Pole from one Transformer to another) via drag-and-drop or tap-to-reconnect.
  - iii. Display an editable network diagram with zoom and highlight options for edited sections.
  - iv. Include a change log.
  - v. Validate edited linkages against logical rules (e.g., voltage compatibility).
  - vi. All cable-related functions are to be easily accessible via menus and/or toolbar icons, streamlining operations without deep menu navigation.
  - vii. The software should allow users to select an already laid cable by clicking on it, automatically setting it as the current type. This is useful for extending or

continuing existing cable runs without manual re-entry.

- viii. Functionality to be made available for integrating new connections into existing lines. Users should be able to select a network node symbol in advance and apply it during line configuration.
- ix. Users should be able to add or remove cable types, adjust spacing and alignment and edit each feeder line individually through an intuitive GUI.
- x. Feeder cable laying to be executed with simple icon clicks. The software should support continuation of existing multiple feeders to new locations and the connection of separate feeder paths using arcs or roundabout routing.
- xi. A full suite of editing tools is available for cables and transmission lines, allowing:
  - 1. Drawing connections by selecting end points of two feeders.
  - 2. Extending a single cable line.
  - 3. Unlinking or re-linking feeder poles from/to cables.
  - 4. Moving poles using a drag-and-drop mechanism.
  - 5. Deleting full lines or segments by selecting the start and end positions.
  - 6. Replacing a line designation with a new one through selection.
  - 7. Updating non-graphical attributes of cables via interactive GUI forms.
  - 8. Displaying updated non-graphical data directly on the graphical layout.
- b. Use AI to suggest corrections for edited data, flagging inconsistencies.
- c. Installing new sections on single/ two phase lines: Provide proper checks for two phase / single phase lines on subsequent sections, while installing a section. Use the Network analysis module for the same.

#### 4. AI-Powered Validation of Digitized Assets

Description: The application must include a robust validation framework to ensure data accuracy, leveraging AI/ML.

- a. Required Features:
  - i. Enforce real-time input validation.
  - ii. Cross-check data against pre-loaded DISCOM records upon sync.
  - iii. Use AI-based anomaly detection to flag inconsistencies, with corrections.
  - iv. Generate a validation summary.
- b. Train ML models on DISCOM data to predict and resolve errors.

#### 5. Photo Capture and AI-Powered Asset Identification

Description: The application must enable linemen to capture and analyze visual data for asset documentation and identification.

- a. Required Features:
  - i. Allow photo capture with automatic tagging of Asset ID and coordinates.
  - ii. Support annotation tools and text notes.
  - iii. Enable video recording for complex assets with timestamping.
  - iv. Validate AI results against manual entries, flagging discrepancies.

- b. Use ML-models fine-tuned on DISCOM asset images for improving accuracy.

6. Alerts and Notifications

- a. Description: The Alerts and Notifications module for the Mobile Application (Lineman App) equips on-ground linemen with real-time, actionable notifications to address grid issues, maintenance tasks and operational events efficiently. Designed for field use, this module prioritizes simplicity, delivering concise alerts with clear instructions and geospatial guidance. It integrates network modelling and AI-driven Remote Monitoring System (RMS) data analysis to generate context-aware notifications tailored to linemen's roles and assigned areas, minimizing alert fatigue and enabling rapid response.
- b. Functional Requirements:
  - i. Alert Generation: The module generates alerts from network modelling and AI-driven RMS data analysis, ensuring linemen receive only relevant notifications for their geographic jurisdiction and shift. Supported alerts are optimized for field action:
    - 1. Fault Detection Alerts:
      - a. Description: Triggered for faults detected via network modelling.
      - b. Details: Provides fault location with GPS coordinates and asset ID, fault type and affected area.
      - c. Delivery: Push notification with vibration and audible alert, including GIS-based navigation to the site.
    - 2. Load Imbalance Alerts:
      - a. Description: Generated when phase imbalances exceed predefined thresholds, requiring field verification.
      - b. Details: Specifies feeder ID and imbalance details.
      - c. Delivery: Push notification, escalated to linemen for on-site action.
    - 3. Voltage Violation Alerts:
      - a. Description: Triggered for voltage deviations beyond acceptable limits.
      - b. Details: Specifies node, voltage level and duration.
      - c. Delivery: Push notification for escalated field verification tasks.
    - 4. High Upstream DER Power Flow Alerts:
      - a. Description: Triggered when DER power exceeds local demand, causing upstream flow to higher voltages, impacting DISCOM finances.
      - b. Details: Includes DER asset ID, power flow data and estimated financial impact. Provides navigation to DER site.
      - c. Delivery: High-priority push notification with vibration.
    - 5. Predictive Maintenance Alerts:
      - a. Description: Identifies assets at risk based on network modelling and AI analysis.
      - b. Details: Includes asset ID and stress factors.

- c. Delivery: Push notification with asset location and maintenance instructions.
- 6. Load Trend Alerts:
  - a. Description: Detects abnormal load changes over a defined period.
  - b. Details: Includes asset ID and load trend summary.
  - c. Delivery: Push notification for verification tasks.
- 7. Generation Trend Alerts:
  - a. Description: Identifies DER generation anomalies.
  - b. Details: Includes DER asset ID and trend summary.
  - c. Delivery: Push notification with navigation to DER site.
- 8. Voltage Trend Alerts:
  - a. Description: Detects persistent voltage anomalies.
  - b. Details: Includes node ID and trend summary.
  - c. Delivery: Push notification for verification.
- ii. Notification Delivery and Management
  - 1. Role-Based Delivery: Alerts target linemen based on their assigned area and shift.

2. Priority Levels: Critical, High, Medium, Low, with distinct
3. vibration/audible cues.
4. Escalation Workflows: Unacknowledged Critical/High alerts escalate to supervisors via SMS after 10 minutes.
5. Acknowledgment Tracking: Linemen acknowledge alerts in-app; unacknowledged alerts trigger reminders after 3 minutes.
6. Multi-Channel Delivery: Push notifications, SMS for low-connectivity areas.
7. User Customization: Configurable vibration/sound settings within admin limits.
8. Audit Logs: Tracks alert delivery, acknowledgment and actions for compliance

| Alert Type                   | Priority Levels | Delivery Method          |
|------------------------------|-----------------|--------------------------|
| Fault Detection              | Critical/High   | Push, Vibration, Audible |
| Load Imbalance               | Medium          | Push, Informational      |
| Voltage Violation            | High/Medium     | Push, Escalated          |
| High Upstream DER Power Flow | High            | Push, Vibration          |
| Predictive Maintenance       | Medium/Low      | Push, Informational      |
| Load Trend                   | Medium          | Push, Informational      |
| Generation Trend             | Medium          | Push, Informational      |
| Voltage Trend                | Medium          | Push, Informational      |

c. Requirements for AI-Powered Web Application for DISCOM Officials:

The Web Application will serve as the centralized platform for DISCOM officials to manage digitized assets, perform advanced analytics, simulate grid scenarios and optimize operations. It must include the following features:

| SI No. | Feature                                                                                           |
|--------|---------------------------------------------------------------------------------------------------|
| 1      | AI-driven Analytics - Dashboard, Network Analysis, Map Visualization, DT Health, Outage Managment |
| 2      | AI-powered What-If Simulations - Grid planning, DRE Integration                                   |
| 3      | Chat-based Natural Language querying feature for data analysis and insight generation             |
| 4      | Digital Single-Line Diagrams - AI-generated and editable network diagrams                         |
| 5      | Asset Management and Data Repository                                                              |
| 6      | Alerts and Notifications                                                                          |

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

|   |                                                    |
|---|----------------------------------------------------|
| 7 | Integration with Existing DISCOM IT Infrastructure |
| 8 | User Management and Security                       |
| 9 | Training and Knowledge Base                        |

i. Detailed Requirements

1. AI-Driven Analytics

A robust, AI-driven module delivering real-time and historical insights into grid performance, consumer behavior, energy losses and spatial data through the integrated sub-components. This module empowers DISCOM officials with actionable intelligence for operational efficiency, loss reduction and long-term planning, leveraging data from the Mobile Application, SCADA and billing systems.

a. Dashboard

An AI-powered, customizable interface providing a holistic view of grid operations, digitization progress and consumer metrics, designed for both high-level oversight and detailed technical analysis.

- i. Display AI-calculated key performance indicators (KPIs): total assets digitized, validation completion rate, outage incidents, billing compliance and load distribution.
- ii. Offer AI-generated time-series charts for load profiles, fault frequency and energy consumption, with granular filters by region, feeder, substation, or date range.
- iii. Provide role-based dashboards: executive summary, operational view and engineering analytics, dynamically tailored by AI based on user role, past interactions and preferences.
- iv. Include AI-driven alerts for critical events with drill-down options to detailed data.
- v. Support exportable AI-formatted snapshots of dashboard views for reporting purposes. Leverage ML to detect trends, predict anomalies and prioritize alerts based on severity and operational impact.

| Category                       | Sub-Category / Data Point                                  | Seniority Level Availability  |
|--------------------------------|------------------------------------------------------------|-------------------------------|
| Consumption and Supply Summary | MTD/YTD Consumption by Source (Thermal, Solar, Wind, etc.) | Executive Engineers and above |
|                                | Blended Cost of Supply (Rs./kWh)                           | Executive Engineers and above |
|                                | Year-over-Year Consumption and Cost Changes                | Executive Engineers and above |

|                         |                                              |                               |
|-------------------------|----------------------------------------------|-------------------------------|
| Grid Operations         | Outage Incidents (Daily/Weekly/Monthly)      | All levels                    |
|                         | Load Distribution and Feeder Loading         | All levels                    |
|                         | Asset Health and Critical Event Alerts       | Senior Engineers and below    |
|                         | Loss Metrics (Technical and Commercial)      | Executive Engineers and above |
| Digitization Status     | Total Assets Digitized and Validation Rate   | Executive Engineers and above |
|                         | Task Completion Rate (Field Team Efficiency) | Executive Engineers and above |
| Consumer Metrics        | Billing Compliance and Complaint Resolution  | Executive Engineers and above |
|                         | Energy Consumption Trends                    | All levels                    |
| MTD Savings             | Solar Integration Savings                    | Executive Engineers and above |
|                         | BESS Integration Savings                     | Executive Engineers and above |
|                         | Deviation Penalty Savings                    | Executive Engineers and above |
| Predictive Analytics    | AI-Generated Demand Forecast                 | Executive Engineers and above |
| Dashboard Functionality | Customizable Views and Exportable Snapshots  | All levels                    |

b. Network Analysis

An AI-driven analytical tool for evaluating grid performance, identifying inefficiencies and predicting maintenance needs, critical for ensuring stability and optimizing energy delivery across 33kV and 11kV networks. This feature should also identify technical and commercial losses, providing detailed diagnostics and mitigation strategies to enhance revenue and grid efficiency.

i. Required Features:

1. Calculate AI-analyzed metrics: voltage profiles for every bus, power factor,

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

- current/power losses per line, percentage capacity loading, voltage drops and overload warnings.
2. Display AI-generated technical outputs: current angles in diagrams, power factor correction recommendations, terminal voltage drops for loads, real/reactive power losses and voltage/current unbalance factors.
  3. Perform AI-enhanced fault analysis: open-phase faults, short circuit capacity, symmetrical/unsymmetrical faults and fault location estimation.
  4. Provide AI-driven growth analysis: single/multi-year load growth, AC/DC load flow calculations and solar/wind yield/loss estimates.
  5. Generate AI-visualized outputs: time-series plots, loss calculations and Sankey diagrams showing energy balance.
  6. Enable AI-powered anomaly detection for predictive maintenance with trend analysis.
  7. Train ML models on historical data, SCADA/RMS inputs and Mobile Application data to refine predictions, detect subtle issues and recommend optimizations.
  8. Compare AI-analyzed energy supplied vs. billed consumption to calculate losses.
  9. Flag AI-detected anomalies: potential theft, metering errors or technical losses.
  10. Generate AI-compiled loss reports by feeder, substation or region, with breakdowns of data.
  11. Provide AI-driven loss attribution: categorize losses by source with geospatial mapping.
  12. Suggest AI-optimized mitigation
  13. Use ML to pinpoint loss sources, predict loss trends and refine mitigation strategies based on historical success rates.
- ii. Additional Analysis Features for compliance:
1. Define / evaluate annual load factor and loss load factor from the load duration details obtained from RMS data.
  2. Allocate Load by Feeder Demand, DT demand, Power Factor etc from the meter database. Divide Load in proportion to kWH / connected KW.
  3. kWH parameter shall be updated regularly by subdivision working. New load (consumer) added in the subdivision is automatically taken into account in load flow calculations.
  4. Compare and analyze power flow study reports in a single consolidated tabular view.
  5. Compare results of specific information such as the electrical load flow calculation results for buses, branches, loads, or sources.
  6. Create a baseline report & quickly identify deviations for all cases
  7. Facility to export summary view into Microsoft® Excel for maximum data flexibility & visualization.
  8. Unified Unbalanced Power Flow allows for analysis of unbalanced distribution networks due to large single phase loads. The solution ensures that

distribution networks can be solved per phase.

9. Automated Protection and Coordination Evaluation capability which should provide automatic detection and evaluation of system protection and coordination / selectivity based on customized design criteria and industry guidelines.
10. Automated & intelligent detection of protection zones, Automated Overcurrent Protection & Coordination Evaluation.
11. Option to store load flow statistics with different names and reload them when required further.

Below is a list of Technical analysis that is required to be conducted:

| Network Analysis Type                                               | Input Sources                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Usefulness to DISCOM                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage profiles for every bus                                      | Data from One-time Digitisation:<br>- Network topology data: Asset location, Bus specification (type of bus), Total number of buses<br>- Line and cable data: impedance/km (resistance/km, inductance/km), conductor type, line length, line limit (thermal or power limit whichever is applicable)                                                                                                                                                                                            | Ensures voltage regulation and stability across the network, enabling proactive adjustments to prevent under/over-voltage conditions to enhance operational efficiency, can do “What if” or contingency analysis to improve service reliability, indicate the need of voltage compensation                                                                                                                                                         |
| Power factor, current, current-angle and power losses on every line | - SPG, BESS, Diesel generators, Shunt capacitors, voltage regulator: Bus number at which they are connected<br><br>Existing DISCOM databases and Sensor data:<br>- Status of the circuit breakers defining whether the bus is active or not, nominal voltage level, desired voltage limit<br>- Load data: Balanced load, unbalanced load (phase wise load required)<br>- Transformer data: Rating/capacity, Tap setting (if applicable), impedance, Real time Active and Reactive power output | - Identifies inefficient lines, reduces energy losses and enhances power quality<br>- Efficiency enhancement can be done by identifying the scope of compensation (power factor correction), reducing reactive power costs, avoiding penalties by recommending corrective measures like capacitor additions. This leads to cost savings and improved grid performance<br>- Aiding engineers in balancing loads and resolving power quality issues. |
| Percentage capacity loading of every asset                          | Data from One-time digitisation:<br>- Asset specs and ratings<br>- Network topology data<br><br>Existing DISCOM databases and Sensor data:<br>- historical usage data                                                                                                                                                                                                                                                                                                                          | Identifies the underutilization of an asset, Prevents asset overloading, extends equipment lifespan and supports capacity planning by highlighting assets nearing limits.                                                                                                                                                                                                                                                                          |

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                              |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              | - RMS latest load data                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                              |
| Voltage drop calculations across the network | <p>Data from One-time digitisation:</p> <ul style="list-style-type: none"> <li>- Network topology</li> <li>- line lengths &amp; conductor impedance</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- load data per bus (Historical and RMS latest)</li> <li>- voltage per bus (Historical and RMS latest)</li> </ul>                                        | Optimizes voltage regulation, enhanced power quality and consumer satisfaction, reduces consumer complaints about low voltage and informs infrastructure upgrades to maintain service quality.               |
| Bus / transformer / cable overload warnings  | <p>Data from One-time digitisation:</p> <ul style="list-style-type: none"> <li>- Asset specs and ratings</li> <li>- Network topology data</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- historical usage data</li> <li>- historical overload trends (if available)</li> <li>- RMS latest load data</li> <li>- Temperature data (if available)</li> </ul> | Mitigates equipment failure risks, enhances safety and minimizes outage downtime by providing early warnings for overloaded assets, minimizes revenue loss.                                                  |
| Terminal voltage drops for loads             | <p>Data from One-time Digitisation:</p> <ul style="list-style-type: none"> <li>- Network topology: Transformer connectivity, DT load locations</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- DT load profiles</li> <li>- historical voltage data</li> <li>- RMS latest load voltage</li> </ul>                                                           | Enhances consumer satisfaction by ensuring adequate voltage at load points, guiding targeted interventions to address specific drop issues.                                                                  |
| Real and reactive power losses               | <p>Data from One-time digitisation:</p> <ul style="list-style-type: none"> <li>- Line impedance, network topology</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- historical load data</li> <li>- historical billing records</li> <li>- RMS latest load data</li> </ul>                                                                                    | Pinpoints loss sources for mitigation, increases revenue by reducing unbilled energy and supports loss reduction strategies.                                                                                 |
| Voltage and current unbalance factors        | <p>Data from one-time digitisation:</p> <p>Bus and line connectivity, phase wise load distribution, historical unbalance data, load profiles, real-time voltage/current per phase</p>                                                                                                                                                                                                                            | Detects unbalance issues to prevent equipment stress and outages, ensuring balanced operation and prolonging asset life, enhanced power quality increasing the life span of the assets and consumer's loads. |

|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                     |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Open-phase fault calculations                    | <p>Data from One-time digitisation:</p> <ul style="list-style-type: none"> <li>- Network topology: line/asset specs, Line impedance, line admittance (if applicable), impedance of each asset</li> <li>- System grounding, load type and configuration, sequence impedances information for each applicable asset</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- System voltage level (nominal)</li> <li>- Pre-fault conditions: voltage at each bus, current in each phase, power flow in each phase, fault location, faulted phase</li> <li>- Digital fault recorder data(if applicable), relay settings, relay operation (if applicable)</li> </ul> | <p>Speeds up fault identification and quick restoration by identifying open-phase issues, reducing downtime and improving reliability for affected consumers.</p>                   |
| Single-year and multi-year load growth analysis  | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- Asset locations</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- historical and latest RMS load data</li> <li>- historical load growth trends</li> <li>- consumer expansion records</li> </ul>                                                                                                                                                                                                                                                                                                                                                                          | <p>Supports long-term planning by forecasting demand growth, ensuring infrastructure scalability and avoiding future capacity shortages.</p>                                        |
| Solar/Wind farm annual yield and loss estimation | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- Renewable asset specs, location</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Weather data (solar irradiance and wind profile)</li> <li>- historical yield/loss records</li> <li>- RMS latest generation</li> </ul>                                                                                                                                                                                                                                                                                                                                                  | <p>Maximizes renewable energy utilization by estimating output and losses, aiding in investment decisions and grid integration planning, losses can be identified and minimized</p> |
| Time-series plots                                | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- Asset and load locations</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Historical and latest RMS data</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p>Tracks performance trends over time, enabling proactive maintenance and operational adjustments to address emerging issues like demand spikes or loss increases.</p>             |

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                           |
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| Loss calculations at any point in time                  | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- Network topology, line impedance</li> <li>- asset types and their impedance data</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- historical RMS data</li> <li>- RMS latest power flow</li> </ul>                                                                                                                      | Provides instant loss insights for real-time decision-making, reducing operational inefficiencies and supporting immediate corrective actions.            |
| Power and energy losses in 33kV lines and transformers  | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- 33kV line/transformer specs, Network topology</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- historical and latest RMS data</li> </ul>                                                                                                                                                                               | Targets loss reduction at high voltage level, improving efficiency and revenue at critical network levels (33kV and 33/11kV).                             |
| Sankey diagram showing energy balance                   | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- Network topology</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Load/consumer data</li> <li>- Energy supply/billing records</li> <li>- RMS latest power flow data</li> </ul>                                                                                                                                         | Visualizes energy flow and losses for strategic planning, identifying technical/non-technical loss areas to enhance billing accuracy and grid efficiency. |
| AI-powered anomaly detection for maintenance            | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- Asset specs</li> <li>- Network topology,</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Historical records of maintenance, faults</li> <li>- Asset/device specific RMS latest and historical metrics &amp; technical data</li> <li>- THD data (if available)</li> <li>- Asset/device specific sensor data</li> </ul> | Predicts maintenance needs, reducing unexpected failures and downtime and optimizing maintenance budgets through early anomaly detection.                 |
| Trend analysis of voltage fluctuations, outages, losses | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- Network topology</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Historical voltage, outage, loss records</li> <li>- RMS latest load data</li> </ul>                                                                                                                                                                  | Identifies recurring issues for root cause analysis, improving reliability and reducing outage frequency through data-driven insights.                    |

|                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                 |
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| System's short circuit capacity estimation                                                           | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- Network topology, asset impedance, short circuit ratings</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Historical fault data</li> <li>- RMS latest current data</li> <li>- Impedance data of each source unit connected at a bus</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Ensures system resilience by assessing fault withstand capacity, guiding upgrades to handle short circuits and maintaining stability.                                                           |
| Symmetrical/unsymmetrical short circuit fault                                                        | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- Line impedance</li> <li>- line admittance (if applicable)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | - Enhances fault management by analyzing fault types, reducing restoration time and improving safety through precise                                                                            |
| Feeder Protection: Over current and Earth fault relay settings of radial feeders, Relay coordination | <p>Data from One-time Digitization:</p> <ul style="list-style-type: none"> <li>- Relay location, CT ratio</li> </ul> <p>Existing DISCOM Databases and Sensor Data:</p> <ul style="list-style-type: none"> <li>- Steady state, nominal/rated current</li> <li>- minimum and maximum fault current (historical)</li> <li>- neutral grounding resistance</li> <li>- residual current</li> <li>- acceptable current unbalancing</li> <li>- circuit breaker (CB) data (type, operating time)</li> <li>- recloser setting</li> </ul> <p>Inputs for Scenario Building:</p> <ul style="list-style-type: none"> <li>- Desired overloading setting/factor</li> <li>- Coordination time interval (CTI) required</li> </ul> <p>Derived from Network Analysis:</p> <ul style="list-style-type: none"> <li>- Fault current at each relay location (if real-time data unavailable)</li> </ul> | <ul style="list-style-type: none"> <li>- Increases revenue by minimizing feeder downtime with optimal coordination</li> <li>- Protects assets by reliably isolating faulted sections</li> </ul> |
| Transformer Overload & Earth fault relays and                                                        | <p>Data from One-time Digitization:</p> <ul style="list-style-type: none"> <li>- Transformer rating, winding connection</li> <li>- CT ratio</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | - Increases transformer lifespan by preventing maloperation of relays                                                                                                                           |

|                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                              |
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| coordinates them to avoid maloperation                                                | <p>Existing DISCOM Databases and Sensor Data:</p> <ul style="list-style-type: none"> <li>- Steady state, nominal/rated current, inrush current, minimum fault current (historical)</li> <li>- Neutral grounding resistance</li> <li>- Residual current, acceptable current unbalancing</li> <li>- CB data (type, operating time)</li> <li>- Recloser setting</li> </ul> <p>Inputs for Scenario Building:</p> <ul style="list-style-type: none"> <li>- Desired overloading setting/factor</li> <li>- CTI required</li> </ul>                                                                                                                                                       |                                                              |
| Power Transformer fuse protection on HT side, Overload & Earth fault relay on LT side | <p>Data from One-time Digitization:</p> <ul style="list-style-type: none"> <li>- Transformer rating, winding connection</li> <li>- CT ratio</li> <li>- Nominal voltage, rated current</li> <li>- Type of fuse, breaking capacity</li> </ul> <p>Existing DISCOM Databases and Sensor Data:</p> <ul style="list-style-type: none"> <li>- Steady state, nominal/rated current, inrush current, minimum fault current (historical)</li> <li>- Neutral grounding resistance</li> <li>- Residual current, acceptable current unbalancing</li> </ul> <p>Inputs for Scenario Building:</p> <ul style="list-style-type: none"> <li>- Desired overloading setting/factor</li> </ul>         | - Increases transformer lifespan; minimizes power downtime   |
| Power Transformer Sequence - of - operation fault analysis                            | <p>Data from One-time Digitization:</p> <ul style="list-style-type: none"> <li>- Transformer ratings (MVA, kV)</li> <li>- HT side fuses (rating, breaking capacity), CT ratios (HT and LT side)</li> </ul> <p>Existing DISCOM Databases and Sensor Data:</p> <ul style="list-style-type: none"> <li>- Transformer Percentage or pu impedance, vector group, tap changer details, rated current</li> <li>- Fault type, location, minimum and maximum fault current, fault recorder data</li> <li>- CB operating time, recloser setting</li> <li>- Differential protection settings (bias and operating current)</li> <li>- Overcurrent &amp; earth fault relay settings</li> </ul> | - Minimal disruption through precise fault sequence analysis |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                   |
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|                                                   | <p>(pickup, time dial, characteristic curve)</p> <ul style="list-style-type: none"> <li>- Restricted earth fault relay settings</li> <li>- Overflux protection settings</li> </ul> <p>Derived from Network Analysis:</p> <ul style="list-style-type: none"> <li>- Sequence of operations based on fault analysis</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                   |
| Power Transformer Equipment damage curve plotting | <p>Data from One-time Digitization:</p> <ul style="list-style-type: none"> <li>- Transformer ratings (MVA, kV), percentage or pu impedance, vector group, tap changer details, rated current</li> </ul> <p>Existing DISCOM Databases and Sensor Data:</p> <ul style="list-style-type: none"> <li>- Transformer percentage or pu impedance, vector group, tap changer details, rated current</li> <li>- Minimum and maximum fault current</li> <li>- Thermal time constant (from manufacturer datasheet)</li> <li>- Overload limits (continuous and short-term)</li> <li>- Mechanical withstand current</li> <li>- Thermal withstand current</li> <li>- Differential protection settings</li> <li>- Overcurrent protection settings</li> <li>- Earth fault protection settings</li> <li>- Overfluxing protection settings</li> <li>- Thermal overload protection settings</li> </ul> | <ul style="list-style-type: none"> <li>- Prevents transformer damage due to excessive current or prolonged overloading</li> </ul> |

c. Map Visualization

An AI-enhanced Geographic Information System (GIS)-based tool meticulously crafted to spatially visualize digitized grid asset data, sensor inputs and analytical insights, empowering DISCOM officials to monitor, analyze and strategically plan grid operations within a comprehensive geographic framework. This module seamlessly integrates multi-layered data sources—ranging from latest Sensor feeds to historical records—employing advanced visualization techniques and AI-driven insights to deliver a dynamic, interactive platform. It supports operational oversight, rapid fault detection and infrastructure optimization, enabling precise decision-making for grid management, renewable energy integration and loss reduction initiatives.

- i. Display AI-Integrated Maps with Zoomable Views and Advanced Customization:
  1. Present interactive maps with scalable granularity, accurately rendering asset locations using precise geospatial coordinates derived from high- resolution data.
  2. Offer customizable layers that can be toggled via AI-driven recommendations, dynamically prioritizing layers based on user roles such as field engineers or management personnel.
  3. Support intelligent layering capabilities, automatically displaying relevant layers at specific zoom scales or operational conditions, with manual override options for operators to enable or disable layers as needed.
  4. Provide a user-friendly interface with drag-and-drop functionality to rearrange layer order and preview changes before finalizing map views.
  5. The toolbars can be removed from the screen when not required.
  6. Offer dimensioning capabilities, with measurement of length on the map views.
  7. Facility to export Network directly from tree view of the network. The comments/user text to be exported along with the selected graphs and network diagrams.
- ii. Overlay AI-Analyzed Latest Sensor Data from Diverse Sources:
  1. Integrate latest Sensor data streams from SCADA systems, Remote Monitoring Systems (RMS), Load Flow Analysis (LFA) and IoT-enabled devices, visually representing critical metrics across the grid network.
  2. Highlights availability of historical maintenance records and feeder configurations from DISCOM databases, integrated with geospatial asset locations.
  3. Shows gaps where high-frequency SCADA/RMS data, protection devices statuses and consumer meter readings are not available or integrated.
  4. Generate anomaly overlays with high temporal resolution based on the latest Sensor data, highlighting irregularities, complemented by predictive overlays that forecast potential issues based on historical patterns and AI analysis.
    - a. Show overloaded equipment as blinking with overloaded color.
    - b. View complaints affected nodes with a different color.
  5. Enable cross-source validation by cross-referencing latest Sensor data against multiple inputs, ensuring visualized anomalies are accurate and actionable, with color-coded alerts for severity.
- iii. Provide AI-Generated Heatmaps with Multi-Dimensional Analysis:
  1. Generate detailed heatmaps illustrating congestion, technical and commercial losses and demand hotspots, employing gradient scales to reflect intensity.
  2. Support layered heatmap combinations, allowing users to overlay multiple metrics with adjustable opacity for clarity and leverage AI to suggest focus areas based on operational priorities.
  3. Include interactive controls to zoom into heatmap zones, revealing granular data points contributing to visualized trends.

- iv. Enable Complex Spatial Queries with AI-Filtered Results:
  - 1. Facilitate spatial queries using jurisdiction selections, enabling users to define custom areas and visualize assets or conditions within those boundaries.
  - 2. Provide AI-driven query optimization, refining results to highlight the most relevant geospatial data, with options to export visualized outputs in formats suitable for reporting.

Support dynamic query adjustments, allowing users to refine search parameters on-the-fly and instantly update map displays.

  - 4. Filtered search for node tracing
    - a. Node searching should be provided with systematically filtered search.
    - b. Node search should support global as well as Feeder ID/Feeder Name/Transformer ID/Transformer Name/ Absolute ID oriented search.
    - c. Node search initiation basis consumer information i.e. Service No. / Account No. etc.
    - d. Allow multiple nodes selection.
    - e. Any node selected can be deselected deliberately.
  - 5. Option to dynamically select one or more attributes of an object, to be displayed as a label or Tool Tip of the object.
- v. Offer AI-Driven Power Flow Tracing with Advanced Diagnostics:
  - 1. Present a tree view structure of the network- representing root at Sub-division/GSS and successive feeders/ transformers.
  - 2. Visualize energy paths from substations to distribution transformers, displaying flow metrics from the latest Sensor data in an intuitive, color-coded format.
  - 3. Dynamically highlight bottlenecks and fault propagation paths, with AI- driven diagnostics pinpointing root causes and suggesting mitigation strategies.
  - 4. Include predictive tracing capabilities, simulating future flow scenarios based on load forecasts and provide optimization suggestions for infrastructure adjustments.
- vi. Include Clickable Asset Details with Comprehensive Historical and Predictive Trends:
  - 1. Display detailed pop-ups upon clicking assets, presenting maintenance history alongside status indicators from the latest Sensor data.
  - 2. Provide graphical visualizations of historical trends and predictive trends, leveraging AI to extrapolate from past data.
  - 3. Allow users to annotate pop-ups with notes or attach multimedia for enhanced documentation.
- vii. Provide Historical Map Views with AI-Processed Archived Data and Interactive Playback:

1. Enable visualization of past grid states using a time-slider interface, allowing users to scroll through historical configurations.
  2. Support animated playback with pause, rewind and fast-forward controls, marking significant events with clickable markers for detailed insights.
  3. Incorporate AI-driven historical analysis, identifying trends or anomalies and offering exportable snapshots of specific timeframes for archival or presentation purposes.
- viii. Support Multi-Circuit Visualization:
1. Display multi-circuit lines on poles / towers / underground, differentiating circuits by configuration, with clickable overlays revealing detailed specs and connectivity status.
  2. Allow toggling between simplified and detailed views to balance clarity and information density based on user needs.
- ix. Enable Land Base Representation with Interactive Elements:
1. Present an intelligent land base layer integrating topographic and administrative data, with clickable entities displaying geospatial attributes such as name and address.
  2. Support topology visualization, superimposing the electrical network onto land base maps to illustrate connectivity and spatial relationships.
  3. Provide zoomable overlays of land features to contextualize grid assets within their physical environment.
  4. Enable the system to import satellite imagery in formats like GeoTIFF and JPEG, enhancing land base visuals with high-resolution data for improved situational awareness.
- x. Provide Advanced Navigation and Interaction Tools:
1. Equip the interface with intuitive GUI tools for zooming, panning and highlighting network features, ensuring rapid navigation across large-scale maps.
  2. Include locator tools to instantly zoom to specific entities using coordinates, asset codes, or location names, with dynamic mode-switching between views.
  3. Support pan-and-scan functionality to smoothly traverse the map display, enhancing usability for detailed inspections.
  4. Option to traverse the network by keyboard from the selected node in upward and downward directions.
- xi. Offer Customizable Symbology and Scaling:
1. Enable customization of symbols for network elements, with options to adjust color, shape and size based on attributes.
  2. Support automatic scaling of symbols to maintain consistent visibility across zoom levels, ensuring readability without manual adjustments, with user-defined defaults for standardization.
  3. Allow symbology updates based on the latest Sensor data to reflect changing conditions dynamically.

4. Provide different shapes for different types of sections like - Cut-Point, Double-Pole structure, Composite line, Composite double circuit, Double Supply, Four Pole Structure, Six-pole structure.
5. Labels loaded on the network to be made invisible if required
- xii. **Power Transformer Protection Zone Selection & Viewer:**
  1. Enable DISCOM officials to define, visualize and manage protection zones spatially across the grid, enhancing fault management by identifying areas covered by protective devices and their coordination logic. This feature maps fault boundaries and operational statuses to minimize downtime and improve reliability.
  2. Visualization: Display protection zones as color-coded overlays on the GIS map, with boundaries dynamically adjusted based on latest available fault data and protection settings, highlighting overlaps or gaps in coverage across all digitised power transformers.
  3. Interactive Viewer: Allow users to select a zone to view associated protective devices, their settings and fault history, with AI-driven suggestions for optimizing coordination to reduce outage duration.
  4. Fault Management: Integrate fault location estimates (from Network Analysis) to visually flag affected zones, enabling rapid isolation and restoration strategies, supported by real-time CB/recloser status updates.
- xiii. **Enable Versioning for Map Data:**
  1. Implement versioning capabilities to track and manage changes in map visualizations, preserving historical states for reference or rollback purposes.
  2. Support version management with timestamps for each update, allowing users to compare different iterations of the grid map via side-by-side displays or overlays.
  3. Ensure version tracking integrates with playback features, enabling animated transitions between versions to visualize network evolution over time.
- xiv. **Support Data Editing for Visualization Accuracy:**
  1. Enable dynamic editing of network entity relationships, such as reassigning hierarchical connections, with validation based on the latest Sensor data to ensure compatibility and logical consistency.
  2. Provide an intuitive graphical and textual editing interface, allowing authorized users to modify asset positions, connectivity, or attributes directly on the map, with security controls to restrict access based on user roles.
  3. Include tools for annotating edits and visualizing updates instantly, ensuring the map reflects the most current grid configuration for operational use.

| Feature Category | Detailed Requirements |
|------------------|-----------------------|
|------------------|-----------------------|

|                                             |                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AI-Integrated Maps with Zoomable Views      | <ul style="list-style-type: none"> <li>- Interactive maps with scalable granularity showing asset locations via precise coordinates.</li> <li>- Customizable layers toggled via AI recommendations with role-based prioritization.</li> <li>- Intelligent layering for scale-specific visibility and manual control, with drag-and-drop layer management.</li> </ul> |
| Latest Sensor Data Overlay                  | <ul style="list-style-type: none"> <li>- Integrate SCADA, RMS, LFA and IoT data with color-coded visuals.</li> <li>- Anomaly overlay with high-frequency updates and predictive overlays based on AI forecasts.</li> <li>- Cross-source data validation with severity alerts.</li> </ul>                                                                             |
| AI-Generated Heatmaps                       | <ul style="list-style-type: none"> <li>- Heatmaps for congestion, losses and demand with gradient scales and interactive zoom.</li> <li>- Layered combinations with adjustable opacity and AI-suggested focus areas.</li> </ul>                                                                                                                                      |
| Spatial Queries                             | <ul style="list-style-type: none"> <li>- Spatial queries with polygon selections and buffer zones for custom area analysis.</li> <li>- AI-optimized visualized results with export options.</li> <li>- Dynamic query refinement with instant map updates.</li> </ul>                                                                                                 |
| AI-Driven Power Flow Tracing                | <ul style="list-style-type: none"> <li>- Visualize energy paths with flow metrics from latest Sensor data in color-coded format.</li> <li>- Highlight bottlenecks and fault propagation with AI diagnostics.</li> <li>- Predictive tracing with optimization suggestions for infrastructure adjustments.</li> </ul>                                                  |
| Clickable Asset Details                     | <ul style="list-style-type: none"> <li>- Pop-ups with maintenance history and status indicators from the latest Sensor data.</li> <li>- Historical and predictive trends visualized graphically, with annotation options.</li> </ul>                                                                                                                                 |
| Historical Map Views with Playback          | <ul style="list-style-type: none"> <li>- Display past states with time-slider and version comparison.</li> <li>- Animated playback with controls, event markers and AI insights.</li> <li>- Exportable snapshots of specific historical views.</li> </ul>                                                                                                            |
| Multi-Circuit and Multi-Cable Visualization | <ul style="list-style-type: none"> <li>- Display multi-circuit lines with clickable configuration details.</li> <li>- Visualize multi-cable layouts with trench cross-sections and toggling options.</li> </ul>                                                                                                                                                      |
| Land Base Representation                    | <ul style="list-style-type: none"> <li>- Intelligent land base with clickable entities and topology overlay.</li> <li>- Zoomable topographic/administrative overlays for context.</li> <li>- Import satellite imagery in formats like GeoTIFF and JPEG for enhanced visuals.</li> </ul>                                                                              |

|                                         |                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Navigation and Interaction Tools        | <ul style="list-style-type: none"> <li>- GUI-based zooming, panning and highlighting with toolbar icons.</li> <li>- Locator tools for entity-specific zooming and mode switching.</li> <li>- Pan-and-scan for smooth map traversal.</li> </ul>                                                                   |
| Customizable Symbology and Scaling      | <ul style="list-style-type: none"> <li>- Attribute-based symbol customization for elements.</li> <li>- Automatic symbol scaling across zoom levels with user-defined defaults.</li> <li>- Symbology updates based on the latest Sensor data for dynamic conditions.</li> </ul>                                   |
| Versioning for Map Data                 | <ul style="list-style-type: none"> <li>- Track visualization changes with versioning and timestamps.</li> <li>- Manage versions for historical comparison and animated transitions.</li> <li>- Preserve baseline maps with update logs.</li> </ul>                                                               |
| Data Editing for Visualization Accuracy | <ul style="list-style-type: none"> <li>- Edit network relationships with compatibility validation using the latest Sensor data.</li> <li>- GUI-based graphical/textual editing with security controls and instant visualization.</li> <li>- Annotate edits for traceability and operational accuracy.</li> </ul> |

## 2. What-If Simulations

Description: An AI-powered module for modeling grid scenarios, planning expansions, integrating Distributed Energy Resources (DER) and optimizing agricultural feeder rosters, enabling DISCOM officials to test, refine and validate infrastructure strategies with predictive insights. This module leverages advanced machine learning to simulate operational changes, assess long-term impacts and recommend optimal configurations, supporting DISCOM's goals of reliability, sustainability and scalability.

### a. Actual Mode & Analysis Mode

There should be separate modes to maintain precious data - Actual Mode or Real Mode and Analysis mode for any study.

- i. In "actual mode" the network must be connected with actual network data and updated regularly with the associated module. Any changes made to the system are recorded and can be further traced. Since its information is precious to the organization and must be updated through proper channels.
- ii. In "actual mode" Cut, Paste, Save and Consumer shifting should be allowed but with proper check on user authenticity.
- iii. An analysis mode of the network will be such that whatever ad-hoc changes made to the network for analysis will not affect the actual "network/subdivision data", which represents actual network propriety of the organization.
- iv. In "Analysis mode" Cut, Paste and all editing options shall be allowed so that users

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can analyze the network with different configurations and modifications.

- v. Automatic vanishing of new nodes added at the time of new proposals/augmentation, on closing of the network.
- vi. Nodes added at the time of scenario building should be mapped with dash or different line color/ node-id to distinguish them from persistent nodes.

b. General Simulations

Simulate grid planning scenarios with AI optimization to evaluate infrastructure changes and operational adjustments, providing a foundational framework for testing network modifications and their short- and long-term effects. This section includes advanced optimization techniques to enhance voltage profiles, reduce technical losses and improve reliability, while addressing evolving load dynamics through concepts like Equivalent Load for short-term planning.

- i. Model AI-optimized scenarios: load increase/decrease, new loads with line sections, conductor size changes, topology reconfiguration and new substations/distribution transformers (DTs).
- ii. Include AI-enhanced integrations: shunt capacitors, regulators and Distributed Energy Resources (DER).
- iii. Provide AI-visualized results: impact analysis, load flow changes and cost estimates.
- iv. Use machine learning (ML) to suggest optimal parameters and predict outcomes based on historical load data, weather patterns and asset performance metrics.
- v. Simulate network optimization using Equivalent Load: calculate a fictitious load for short-term planning that balances energy losses against year-wise load growth and discount rates.
- vi. Strategically place shunt capacitors: identify optimal locations and bank sizes for voltage support and power factor correction, minimizing costs and releasing branch capacity.
- vii. Perform Volt/VAR Optimization (VVO): manage voltage levels and reactive power flow to reduce losses and peak demand using Conservation Voltage Reduction (CVR).
- viii. Integrate Distributed Energy Resources (DER) with power flow analysis for optimal placement.
- ix. Provide for at least one slack bus for simulations.
- x. Facility to merge two studies in order to work in a distributed environment.
- xi. Export whole or part of a network to a new study via selecting transformers and feeders.

| Simulation Scenario | Inputs Required | Utility to DISCOM |
|---------------------|-----------------|-------------------|
|---------------------|-----------------|-------------------|

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|                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                          |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Increase/decrease load levels of a feeder/network (single multiplier) | <p>Data from One-time digitisation:</p> <ul style="list-style-type: none"> <li>- Feeder/network topology (line segments, buses, switches)</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Base load data (historical or RMS latest kW/kVA values per node)</li> <li>- Transformer/line thermal ratings</li> </ul> <p>Inputs for Scenario building:</p> <ul style="list-style-type: none"> <li>- Multiplier range</li> <li>- Voltage limits</li> </ul>                                                                                             | <ul style="list-style-type: none"> <li>- Assess overloading risks</li> <li>- Plan capacity upgrades</li> <li>- Optimize load shedding strategies</li> </ul>                              |
| Increase/decrease load at a selected bus                              | <p>Data from One-time digitisation:</p> <ul style="list-style-type: none"> <li>- Bus ID and location in the network</li> <li>- Upstream/downstream network impedance</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Existing load profile (kW, kVAR, power factor)</li> <li>- Existing transformer tap setting</li> <li>- Circuit breaker, recloser and protection device settings</li> </ul> <p>Input for Scenario building:</p> <ul style="list-style-type: none"> <li>- New load value (absolute or percentage change in kW, kVAR)</li> </ul> | <ul style="list-style-type: none"> <li>- Identify voltage violations</li> <li>- Optimize transformer tap settings</li> <li>- Assess suitability of existing protection assets</li> </ul> |
| Add new loads with additional line sections                           | <p>Data from One-time digitisation:</p> <ul style="list-style-type: none"> <li>- Existing network model (with adjacent feeder capacity and utilization factor)</li> </ul> <p>Input for Scenario building:</p> <ul style="list-style-type: none"> <li>- New load locations (GPS coordinates or nearest bus)</li> <li>- Load characteristics (type, phasing)</li> <li>- Line parameters (resistance, reactance, length)</li> <li>- Desired nominal voltage at load end</li> </ul>                                                                                                                         | <ul style="list-style-type: none"> <li>- Plan cost-effective network extensions</li> <li>- Minimize losses</li> </ul>                                                                    |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                  |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Increase/decrease conductor size for all/part of a feeder | <p>Data from One-time Digitisation:</p> <ul style="list-style-type: none"> <li>- Current conductor specs (type, ampacity, R/X values)</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Load profiles</li> <li>- Thermal limits (ambient temperature, derating factors)</li> <li>- Cost data (material + labor)</li> </ul> <p>Input for Scenario building:</p> <ul style="list-style-type: none"> <li>- Proposed conductor specs</li> </ul>                                                                       | <ul style="list-style-type: none"> <li>- Reduce technical losses</li> <li>- Defer costly infrastructure upgrades</li> </ul>      |
| Reconfigure network topology or reroute feeders           | <p>Data from One-time digitisation:</p> <ul style="list-style-type: none"> <li>- Feeder connectivity map</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Switch/breaker/bus coupler status (open/closed)</li> <li>- Load distribution (balanced/unbalanced phases)</li> <li>- Regulatory constraints</li> </ul> <p>Derived from Network analysis:</p> <ul style="list-style-type: none"> <li>- Fault current contributions</li> </ul>                                                                           | <ul style="list-style-type: none"> <li>- Minimize outage times</li> <li>- Improve reliability (SAIDI/SAIFI reduction)</li> </ul> |
| Add new substations/injection points & reconfigure        | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- Upstream transmission capacity</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Land acquisition costs</li> </ul> <p>Input for scenario building:</p> <ul style="list-style-type: none"> <li>- Load growth projections</li> </ul> <p>Derived from Network analysis:</p> <ul style="list-style-type: none"> <li>- Substation capacity (MVA rating, voltage levels)</li> <li>- Location coordinates (via load density)</li> </ul> | <ul style="list-style-type: none"> <li>- Reduce line losses</li> <li>- Balance load distribution</li> </ul>                      |

|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                        |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Add new distribution transformers (DTs) and reconfigure        | <p>Data from one-time digitisation:</p> <ul style="list-style-type: none"> <li>- DT ratings</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Load clustering data (peak demand per cluster)</li> <li>- Historical DT utilization factor</li> <li>- Failure rate history</li> </ul>                                                                                            | <ul style="list-style-type: none"> <li>- Prevent DT overloading</li> <li>- Optimize service area boundaries</li> </ul> |
| Integrate shunt capacitors, regulators, or BESS                | <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Renewable generation patterns</li> <li>- Tariff structures</li> </ul> <p>Derived from Network analysis:</p> <ul style="list-style-type: none"> <li>- Device specifications (capacitor bank size/MVAR, BESS kWh/kW)</li> <li>- Voltage profiles</li> <li>- Desired voltage profile/power factor</li> <li>- Control strategies</li> </ul> | <ul style="list-style-type: none"> <li>- Improve voltage regulation</li> <li>- Reduce peak demand charges</li> </ul>   |
| Forecast electricity demand using historical trends & DRE data | <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Historical load data (hourly/daily/monthly)</li> <li>- DRE penetration (solar rooftop capacity, feed-in patterns)</li> <li>- Population/economic growth rates</li> </ul>                                                                                                                                                                | <ul style="list-style-type: none"> <li>- Accurate capacity planning</li> <li>- Dynamic tariff design</li> </ul>        |
|                                                                | <ul style="list-style-type: none"> <li>- Event calendars</li> </ul>                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                        |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                             |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Simulate grid expansion<br>(Solar, BESS, new infrastructure) | <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Solar irradiance/Wind speed data</li> <li>- Land use/zoning regulations</li> <li>- Cost parameters (capex/opex)</li> <li>- Regulatory targets</li> </ul> <p>Derived from Network analysis:</p> <ul style="list-style-type: none"> <li>- BESS specs (cycle life, efficiency)</li> </ul>                     | <ul style="list-style-type: none"> <li>- Prioritize cost-effective investments</li> <li>- Maximize renewable hosting capacity</li> </ul>    |
| Optimize network with Equivalent Load                        | <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Current ampere loading</li> <li>- Year-wise load growth rates</li> <li>- Discount rate of money</li> </ul> <p>Derived from Network analysis:</p> <ul style="list-style-type: none"> <li>- Energy loss calculations</li> </ul>                                                                              | <ul style="list-style-type: none"> <li>- Improve short-term planning</li> <li>- Balance investment utilization</li> </ul>                   |
| Switching optimization                                       | <p>Data from One-time digitisation:</p> <ul style="list-style-type: none"> <li>- Existing switch locations and status</li> </ul> <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Load profiles</li> <li>- Voltage conditions</li> </ul> <p>Derived from Network analysis:</p> <ul style="list-style-type: none"> <li>- Feeder load balance data</li> </ul> | <ul style="list-style-type: none"> <li>- Minimize kW losses</li> <li>- Reduce voltage violations</li> <li>- Balance feeder loads</li> </ul> |
| Volt/VAR Optimization (VVO)                                  | <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Load profiles</li> <li>- Generator/inverter setpoints</li> <li>- Voltage limits</li> <li>- Transformer tap positions</li> </ul> <p>Derived from Network analysis:</p>                                                                                                                                      | <ul style="list-style-type: none"> <li>- Reduce system losses</li> <li>- Lower peak demand via CVR</li> </ul>                               |
|                                                              | <ul style="list-style-type: none"> <li>- Capacitor bank/SVC settings</li> </ul>                                                                                                                                                                                                                                                                                                                       |                                                                                                                                             |

|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                          |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Fault Management and Service Restoration (FMSR) | <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- SCADA/AMI event/fault data</li> <li>- Feeder connectivity status</li> </ul> <p>Derived from Network analysis:</p> <ul style="list-style-type: none"> <li>- Fault isolation plans</li> <li>- Restoration options</li> </ul>                                                                                        | <ul style="list-style-type: none"> <li>- Minimize customer outages</li> <li>- Optimize restoration speed</li> </ul>      |
| Economically viable network options             | <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Technical constraints</li> <li>- Cost models</li> </ul> <p>Derived from Network analysis:</p> <ul style="list-style-type: none"> <li>- Expansion/restructuring scenarios</li> </ul>                                                                                                                               | <ul style="list-style-type: none"> <li>- Justify network investments</li> <li>- Optimize HT/LT configurations</li> </ul> |
| Distributed Energy Resources (DER) integration  | <p>Existing DISCOM databases and Sensor data:</p> <ul style="list-style-type: none"> <li>- Solar/wind generation patterns</li> <li>- Load flow data</li> </ul> <p>Input for Scenario building:</p> <ul style="list-style-type: none"> <li>- DER specs (solar, wind, BESS)</li> </ul> <p>Derived from Network analysis:</p> <ul style="list-style-type: none"> <li>- Harmonic/time-series analysis</li> </ul> | <ul style="list-style-type: none"> <li>- Optimize DER placement</li> <li>- Enhance grid stability</li> </ul>             |

c. Grid Expansion

Plan and simulate large-scale grid expansion scenarios within the simulation framework to accommodate growing demand, new geographic coverage and infrastructure upgrades, ensuring scalability and reliability while optimizing investment decisions.

- i. Simulate AI-predicted grid expansion impacts: model the addition of new feeders, substations and transformers, with load redistribution effect.
- ii. Assess AI-analyzed expansion requirements: calculate capacity needs, line lengths and asset specifications based on population growth, industrial development and electrification forecasts.
- iii. Provide AI-driven optimization: recommend expansion layouts, phasing strategies and cost-effective configurations.
- iv. Generate AI-visualized expansion outcomes: display new network topology, load flow impacts, loss estimates and financial projections.
- v. Integrate with external data sources: incorporate AI-processed demographic

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- data, land use plans and regulatory constraints for realistic simulations.
- vi. Monitor AI-analyzed expansion metrics: post-expansion reliability, capacity utilization and consumer coverage.
- vii. Train ML models on historical expansion data, current grid performance and external factors to predict expansion needs, optimize site selection and refine cost-benefit analyses.

d. DRE and BESS Integration Planning

Plan renewable energy and Battery Energy Storage System (BESS) integration within simulations to align with DISCOM's sustainability goals, ensuring efficient utilization of renewables and grid stability.

- i. Simulate AI-predicted DRE impacts with suggested connection points.
- ii. Track AI-analyzed renewable performance with annual estimates.
- iii. Provide AI-driven optimization with load balancing projections.
- iv. Use ML to optimize DRE placement and capacity based on load patterns and solar irradiance.
- e. Energy Efficiency (EE) and Demand Side Management (DSM) Planning
  - i. Support the DISCOM in integrating energy efficiency and demand-side management into distribution planning using digital grid analytics, enabling targeted interventions, peak load reduction, and improved regulatory compliance.
  - ii. Identify high-load and high-loss feeders using AI-enabled analytics to prioritize EE and DSM interventions.
  - iii. Track AI-estimated demand reduction potential from EE programs across consumer segments such as C&I.
  - iv. Provide AI-supported demand response and load shifting projections to support peak management strategies.
  - v. Use ML models to optimize targeting of EE measures and demand flexibility programs based on consumption patterns and network constraints.
- f. Cost Estimation

Provide detailed financial analysis and cost estimation within simulation scenarios to evaluate the economic feasibility of infrastructure changes, expansions and integrations, enabling DISCOM officials to optimize budgets, prioritize investments and maximize return on investment (ROI).

- i. Required Features:
  1. Simulate AI-predicted cost impacts: calculate capital expenditure (CAPEX) for new assets, operational expenditure (OPEX) and lifecycle costs.
  2. Assess AI-analyzed cost drivers: break down expenses by category, timeframes and scenarios.
  3. Determine economic and break-even loading limits of conductors and

cables.

4. Provide AI-driven cost optimization: recommend cost-saving alternatives, phasing options and financing strategies.
5. Generate AI-visualized cost outcomes: display cost breakdowns, cash flow projections, ROI estimates and sensitivity analyses.
6. Integrate with external financial data: incorporate vendor quotes, market trends and DISCOM budget constraints for accurate estimations.
7. Monitor AI-analyzed cost metrics: track budget adherence, cost-benefit ratios and savings from optimizations.
8. Train ML models on historical project costs, current asset data and external economic indicators to predict costs, optimize spending and refine ROI projections.

ii. Additional Features, for compliance:

1. The module should be capable of preparing cost estimates of lines, substations etc. based on the cost data.
2. Provision for users to input customized costs for special structures like river crossings, railway crossings.
3. Provision to input the cost data of storing the material and associated equipment, erection charges, other standard and non-standard estimate components.
4. Preparing project estimates consisting of several lines and substations.
5. Facility to store the cost data of several areas and more than one version of the project report.
6. Capture the works proposed under various studies and create the estimates of the studies performed by transferring the initial works proposed in the studies without again entering those details.
7. Automatically create cost estimates for study picked up, by selecting the complete details of the lines and equipment proposed.
8. Cost / value estimation of any proposal should also include the depreciation of "Item recovered".
9. Provide the commercial feasibility of any technical modification proposed, using cost benefit analysis of any network under various proposed alternatives.
10. Calculate the financial parameters such as internal rate of return, pay back period, sensitivity analysis etc. so as to optimize the investment for an electrical distribution system.
11. Provide the optimal solution for any given network and shall have provisions for minimization of losses so as to maximize the net benefit.

3. Chat-based Natural language querying module

Description : This module is a custom natural language based querying feature designed to empower DISCOM officials with advanced analytics and data retrieval capabilities without requiring specialized MIS expertise. It provides a conversational interface that enables users to query databases, analyze operational metrics and extract actionable insights in real time.

This self-service model enhances decision-making, reduces dependency on technical teams and ensures faster access to critical grid and consumer data.

- a. Natural Language Query Processing with Instant AI Responses
  - i. Supports human-like, intuitive interactions, allowing users to query structured and unstructured datasets using plain language (e.g., “Show me transformer failure rates by region over the last six months”).
  - ii. Parses complex multi-layered queries, understanding context, intent and entity relationships for accurate results.
  - iii. Provides real-time response generation, reducing the time required for manual data extraction and analysis.
- b. AI-Driven Insights via Interactive Data formats
  - i. Converts query outputs into intuitive, interactive visualizations, allowing users to explore and interpret data seamlessly.
  - ii. Supports multiple data representations, including:
    - 1. Tables for structured datasets like failure reports, AT&C loss percentages and outage logs.
    - 2. Map views for geospatial asset tracking, network visualization and location-based analytics.
    - 3. Line graphs for trend analysis on power demand, revenue collection and performance KPIs.
    - 4. Filtered lists to quickly retrieve asset, consumer and operational records based on dynamic parameters.
- c. AI-Visualized Outputs for Complex Queries
  - i. Translates multi-variable, time-series and geospatial queries into AI-generated, easy-to-read visual reports.
  - ii. Automates the generation of heat maps, bar charts, correlation matrices and predictive trend graphs based on query complexity.
  - iii. Ensures seamless drill-down analysis, allowing officials to zoom into specific data points, filter datasets and cross-reference information without manual intervention.
    - 1. Substation: Substation design print schematic, Substation inventory summary, Subdivision level consumers report
    - 2. Feeders: Individual, Summary & Detailed feeder parameters, Circuit parameters Graph, Distance V/s Pole, Current V/s Load, Power losses, Consumers reports, Consumer service lines losses detailed
    - 3. Transformers: Transformer parameters individual Static, Transformer parameters individual (dynamic), Consumers reports
- d. AI-Suggested Follow-Up Questions for Contextual Exploration
  - i. Uses ML-driven query expansion to suggest intelligent follow-up questions, guiding users toward deeper insights.
  - ii. Example: If a user queries “What is the energy consumed in Ajmer district in the last 30 days with a time granularity of 1 hour? Show it as a table?”, the AI might suggest:
    - 1. “Would you like to compare this with the previous 30 days?”

2. “Do you want to view consumption trends by consumer category (residential, industrial, commercial)?”
  3. “Would you like an anomaly detection report to flag irregular consumption patterns?”
  4. “Do you want a heatmap visualization of energy consumption across different feeders?”
  5. “Would you like to overlay this data with temperature and weather patterns?”
- e. AI-Driven Data Export & Report Generation
    - i. Provides AI-assisted data extraction for officials to export query results in structured formats (CSV, Excel, JSON, PDF).
    - ii. Enables custom report generation, allowing users to define parameters, add visual elements and apply filters dynamically.
    - iii. Automates email-based reporting, sending periodic summary insights, alerts and performance updates to stakeholders.
  - f. AI-Model Trained on DISCOM-Specific Data
    - i. Uses a fine-tuned GPT model trained on DISCOM’s historical and real-time data, ensuring context-aware, precise responses.
    - ii. Incorporates DISCOM’s operational policies, performance metrics, consumer behavior patterns and historical maintenance logs into its learning model.
    - iii. Provides DISCOM-specific terminologies and process-based reasoning, improving accuracy over generic AI tools.
  - g. Machine Learning-Based Query Refinement & User Adaptation
    - i. Leverages ML algorithms to refine suggestions based on:
    - ii. User behavior patterns (e.g., frequently accessed data, preferred report formats).
    - iii. Query history analysis, learning from previous interactions to anticipate information needs.
    - iv. Feedback mechanisms, where users can rate AI responses, improving the system’s relevance and accuracy over time.
    - v. Ensures continuous learning, adapting responses based on evolving operational data and user inputs.

| Feature                           | Detailed Aspect               | Description                                                                            |
|-----------------------------------|-------------------------------|----------------------------------------------------------------------------------------|
| Natural Language Query Processing |                               |                                                                                        |
| Instant AI                        | Human-Like Interactions       | Supports intuitive conversational queries in plain language                            |
|                                   | Context & Intent Recognition  | Understands query structure user intent and entity relationships for precise responses |
|                                   | Real-Time Response Generation | Reduces manual effort by instantly retrieving and presenting requested data            |

|                                            |                                 |                                                                                                                          |
|--------------------------------------------|---------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Responses                                  | Multi-Turn Dialogues            | Supports context retention across multiple interactions enabling users to refine and modify queries dynamically          |
|                                            | Multi-Language Support          | Provides multilingual querying capabilities allowing officials to interact in their preferred language                   |
| Contextual Understanding                   | DISCOM-Specific Terminologies   | Recognizes operational jargon synonyms and abbreviations relevant to DISCOM workflows                                    |
|                                            | Multi-Layered Query Processing  | Handles complex queries including comparisons aggregations and conditional logic                                         |
|                                            | Data Source Integration         | Connects with multiple databases MIS systems and real-time IoT sensor feeds for holistic data                            |
|                                            |                                 | access                                                                                                                   |
| Conversation History & Context Retention   | Persistent Memory               | Enables AI to remember user interactions ensuring context-aware responses over time                                      |
|                                            | Session-Based Context Retention | Maintains query history within a session to support follow-up questions and refinements                                  |
|                                            | Cross-Session Memory            | Preserves historical queries and responses allowing users to pick up where they left off                                 |
| AI-Driven Insights via Interactive Widgets |                                 |                                                                                                                          |
| Multi-Format Data Representation           | Tables                          | Displays structured data including failure reports AT&C loss and outage logs                                             |
|                                            | Map Views                       | Provides geospatial visualization of network assets outages and distribution trends                                      |
|                                            | Line Graphs                     | Represents trends such as power demand revenue collection and KPI performance over time                                  |
|                                            | Filtered Lists                  | Enables dynamic filtering to retrieve specific assets consumer data or operational records                               |
|                                            | Hierarchical Data Views         | Allows users to drill down from high-level KPIs to individual consumer transactions meter readings and asset health data |
| Drill-Down Capabilities                    | Interactive Data Exploration    | Allows users to zoom in on specific data points for deeper analysis                                                      |
|                                            | Cross-Referencing Information   | Supports multi-dimensional analysis across different datasets without manual intervention                                |

|                                           |                                   |                                                                                                               |
|-------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------|
|                                           | AI-Generated Summaries            | Provides concise AI-generated summaries of long datasets for quick insights                                   |
| AI-Visualized Outputs for Complex Queries |                                   |                                                                                                               |
| Automated Report Generation               | Heat Maps                         | Visualizes geospatial patterns in power demand outage density and AT&C losses                                 |
|                                           | Bar Charts & Correlation Matrices | Provides comparative and statistical insights for operational metrics                                         |
|                                           | Predictive Trend Graphs           | Uses AI to forecast demand failure rates and revenue fluctuations                                             |
|                                           | Scenario-Based Simulations        | Enables users to input hypothetical conditions and observe projected impacts on network stability and revenue |

| AI-Suggested Follow-Up Questions          |                                 |                                                                                                                                                                                                                  |
|-------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ML-Driven Query Expansion                 | ML-Driven Query Expansion       | Uses NLP and machine learning to predict and suggest contextually relevant follow-up questions based on the user's current query. Enhances user engagement and helps officials explore data more efficiently.    |
|                                           | Context-Aware Follow-Ups        | Dynamically adjusts follow-up suggestions based on conversation history and user role (e.g., field engineer vs. management). Example: After querying outage data, suggests "Compare outage frequency by region." |
|                                           | Use-Case Examples               | Predefined prompts for common DISCOM tasks (e.g., "Compare current month's energy consumption to last month" or "Show a heatmap of high-loss areas"). Reduces training time for new users.                       |
|                                           | Historical Data Comparisons     | Enables side-by-side analysis of current and past performance (e.g., demand patterns, outage rates). Supports trend identification and decision-making.                                                          |
| AI-Driven Data Export & Report Generation |                                 |                                                                                                                                                                                                                  |
| Structured Data Extraction                | Structured Data Extraction      | Extracts and formats data from chatbot interactions for further analysis. Supports multi-format exports (CSV, Excel, JSON, PDF) for integration with other tools.                                                |
|                                           | Custom Export Formats           | Allows users to define export templates (e.g., preformatted regulatory compliance reports). Ensures compatibility with DISCOM's existing reporting systems.                                                      |
|                                           | User-Defined Parameters         | Enables filtering and subsetting data before export (e.g., "Export only high-priority outages from the last quarter"). Supports dynamic field selection for tailored reports.                                    |
| Automated Email-                          | Automated Email-Based Reporting | Scheduled Reports: Sends periodic summaries (daily/weekly/monthly) to stakeholders via email. Configurable for metrics like energy loss, billing efficiency, or outage frequency.                                |

|                                                      |                                |                                                                                                                                                                                                                                                      |
|------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Based Reporting                                      | Anomaly Alerts & Notifications | Triggers automated alerts when KPIs deviate from thresholds (e.g., sudden voltage fluctuations or unexplained energy losses). Integrates with DISCOM's alerting systems (SMS/email).                                                                 |
| DISCOM-Specific AI Model                             |                                |                                                                                                                                                                                                                                                      |
| Fine-Tuned GPT Model                                 | Fine-Tuned GPT Model           | Custom LLM trained on DISCOM's historical data, regulatory documents and operational logs. Ensures responses align with organizational policies and technical jargon.                                                                                |
|                                                      | Context-Aware Responses        | Leverages real-time grid data (e.g., SCADA inputs) and past incidents for accurate, situational answers. Example: "Transformer X failed twice in the last 6 months; recommend preventive maintenance."                                               |
| Domain-Specific Reasoning                            | Regulatory Compliance          | Hardcodes regional regulations (e.g., tariff rules, safety standards) into response logic. Flags non-compliant actions suggested by users.                                                                                                           |
|                                                      | Domain-Specific Reasoning      | Operational Process Knowledge: Understands workflows like outage management, load forecasting and maintenance scheduling. Incident Response Insights: Recommends actions based on past resolutions (e.g., "Follow Protocol B for substation fires"). |
| Machine Learning-Based Query Refinement & Adaptation |                                |                                                                                                                                                                                                                                                      |
| User Behavior Learning                               | Personalized Suggestions       | Adapts responses based on user interaction history and frequently accessed data                                                                                                                                                                      |
|                                                      | Preferred Report Formats       | Learns from user preferences for visual and tabular outputs                                                                                                                                                                                          |
|                                                      | Adaptive Question Refinement   | Guides users towards more precise queries by rephrasing unclear or ambiguous inputs                                                                                                                                                                  |
| Query History Analysis                               | Pattern Recognition            | Analyzes past queries to anticipate future data needs                                                                                                                                                                                                |
|                                                      | Enhanced Accuracy Over Time    | Improves response relevance through continuous learning                                                                                                                                                                                              |
| Feedback-Based System Improvement                    | User Ratings & Corrections     | Allows users to rate AI-generated responses to refine accuracy                                                                                                                                                                                       |
|                                                      | Iterative Model Enhancement    | Continuously updates models based on real-time operational feedback                                                                                                                                                                                  |

**RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.**

|                              |                           |                                                                                                             |
|------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------|
|                              | Usage Analytics &         | Admin Insights                                                                                              |
|                              | Dashboard                 |                                                                                                             |
|                              | Customizable KPI Tracking | Allows management to define monitor and adjust AI performance benchmarks                                    |
| User Engagement Enhancements |                           |                                                                                                             |
| Quick Replies & Buttons      | Pre-Configured Responses  | Enables quick action buttons for frequently asked queries reducing typing effort                            |
|                              | Interactive Buttons       | Provides UI elements like filters navigation shortcuts and query refinements for ease of use                |
|                              | Rich Media Support        | Allows responses to include images charts videos and other multimedia formats to improve user understanding |
|                              | Adaptive UI Elements      | Adjusts UI elements based on user behavior device type and query complexity for an optimized experience     |

#### 4. Digital Single-Line Diagrams

Description: An AI-supported module designed to generate and maintain accurate, editable single-line diagrams (SLDs) representing the electrical network topology of the DISCOMs. Leveraging data from the one-time digitization effort, SCADA, RMS and Mobile Application inputs, this feature provides a dynamic, user-friendly interface for visualizing grid connectivity, asset relationships and operational statuses. The module enables engineers to edit network configurations, simulate changes and ensure alignment with physical grid updates, supporting fault analysis, planning and operational decision-making.

- a. Automated SLD Generation:
  - i. Automatically construct SLDs using digitized asset data and network topology from the one-time digitization effort, depicting buses, transformers, feeders and protective devices.
  - ii. Integrate real-time SCADA/RMS data to reflect current grid states.
  - iii. Employ AI to validate topology accuracy against physical grid rules, flagging inconsistencies for correction.
- b. Editable Diagram Interface:
  - i. Provide an intuitive drag-and-drop interface for engineers to modify SLDs, adding or reconfiguring assets or updating connections.
  - ii. Support versioning and audit trails for changes, syncing edits with the Asset Management module and field updates from the Mobile Application.
  - iii. Enable export of SLDs in standard formats for reporting and collaboration with executive engineers and above.

- iv. Option to move/shift a complete circuit downward by moving source equipment with proper validations.
- v. Option to insert a node between two already existing nodes irrespective of their order.
- vi. Facility to rotate asymmetric equipment like transformers.
- vii. The record history (undo record) should persist even after closing a session.
- viii. Option to rotate circuit from its source with any degree of rotation.
- c. Visually Showcasing Availability of Integrated DISCOM Data and Sensors
  - i. Illustrates static network topology data combined with high-frequency SCADA/RMS inputs for 33kV and 11kV networks.
  - ii. Displays historical power transformer records and line data from DISCOM databases, integrated into editable SLD layouts.
  - iii. Highlights gaps in availability / integration of high-frequency data from SCADA/RMS and protection system sensors.
- d. Integration with Analytics and Simulations:
  - i. Link SLDs to Network Analysis outputs, overlaying AI-calculated metrics on the diagram.
  - ii. Support “what-if” simulations by allowing temporary SLD edits, visualizing impacts on load flow and protective device statuses.
  - iii. Use AI to suggest optimal device placements or settings adjustments based on historical fault data and load growth trends.
- e. Performance Specifications:
  - i. Ensure SLD rendering completes within 4 seconds, including flashing device indicators, with updates syncing based on SCADA/RMS data refresh rates.
  - ii. Support complex queries with results displayed on the SLD within 30 seconds, leveraging AI caching for efficiency.
  - iii. Maintain compatibility with GIS-based Map Visualization, allowing seamless toggling between spatial and schematic views.

## 5. Asset Management and Data Repository

Description: A centralized, AI-enhanced repository for storing, retrieving and proactively managing digitized grid asset collected via the Mobile Application and field operations. This module serves as the backbone for asset lifecycle management, consumer billing (based on existing DISCOM data systems), grid connectivity tracking, maintenance planning and regulatory compliance, integrating both physical infrastructure and consumer-related datasets into a unified system.

- a. Required Features:
  - i. Store AI-validated asset details: Asset ID, geospatial coordinates, technical specifications, tender details and maintenance logs
  - ii. Enable AI-powered search and filtering: by asset type, location, status or custom criteria.
  - iii. Support bulk data operations: upload/download in formats like CSV, Excel, or JSON, with AI-driven validation and standardization.
  - iv. Track asset edits with version control: log changes, maintain historical versions and enable rollback.
  - v. Present one-time digitized data and historical maintenance records from DISCOM databases for substations, transformers and feeders.
  - vi. Reflect partial SCADA/RMS integration with latest breaker status updates alongside static feeder and busbar connectivity data.
  - vii. Indicate absence of sensors, integration or data source for high-frequency data from SCADA/RMS, protection device settings, capacitor bank status, etc.
  - viii. Provide asset health dashboards: status overview, condition ratings and lifecycle tracking.
  - ix. Integrate with GIS for geospatial queries and SCADA/RMS for high-frequency updates.
  - x. Store consumer data: Consumer ID, name, address, meter number, billing status and load category.
  - xi. Display consumer-to-transformer connections with editing capabilities, including geospatial validation.
  - xii. Track billing history: monthly readings, payment status and consumption trends.
  - xiii. Flag AI-detected discrepancies: unbilled usage, meter tampering or load mismatches.
  - xiv. Sync with Unified Billing System via APIs: real-time updates, with error handling and two-way reconciliation.
  - xv. Provide AI-generated consumer profiles: usage patterns, payment reliability and load forecasts.
  - xvi. Offer data integrity checks with automated correction suggestions.
  - xvii. Generate reports with export options.

- xviii. Use ML to predict asset degradation based on load history, environmental factors and maintenance records.
- xix. Leverage AI to recommend maintenance schedules with cost estimates.
- xx. Employ ML to identify consumer anomalies with peer benchmarking.
- xxi. Integrate NLP for unified queries with natural language processing of asset and consumer datasets.
- b. Additional features for compliance:
  - i. Provide facilities for expanding the standard library and also creating user specific libraries of symbols, design data, equipment data, operating limits and standards, cost data for equipment / material, cost data for power and energy losses and necessary data for carrying out economic analysis for the operating lifetime of the system.
  - ii. Update actual networks basis job order processes meant to update changes to the network.
  - iii. Feature to tag/identify/code the equipment / network component as existing, new, proposed etc

## 6. Alerts and Notifications

- a. Description: The Alerts and Notifications module for the AI-Native Web Application (Control Centre App) enables engineering staff, from operators to senior management, to monitor and manage grid operations strategically. It delivers real-time and predictive alerts derived from network modelling and AI-driven Remote Monitoring System (RMS) data analysis, providing detailed analytics, visualizations and decision-support tools. Alerts are tailored to user roles within the DISCOM hierarchy, supporting proactive grid management and financial optimization.
- b. Functional Requirements
  - i. Alert Generation: The module generates alerts from network modelling and AI-driven RMS data analysis, offering comprehensive insights for control room operations. Alerts are designed for strategic oversight and include:
    - 1. Load Imbalance Alerts:
      - a. Description: Generated for phase imbalances exceeding predefined thresholds.
      - b. Details: Provides feeder ID, load data, trend analysis and mitigation options.
      - c. Delivery: Dashboard notification with interactive load flow analysis.
    - 2. Voltage Violation Alerts:
      - a. Description: Triggered for voltage deviations beyond acceptable limits.
      - b. Details: Includes node, voltage data, duration and mitigation options.
      - c. Delivery: Pop-up with visualization and simulation-based recommendations.

3. High Upstream DER Power Flow Alerts:
  - a. Description: Triggered when DER power exceeds local demand, causing upstream flow and financial impact.
  - b. Details: Includes DER asset ID, power flow analytics, financial impact estimate and control options. Offers simulation results.
  - c. Delivery: High-priority pop-up with financial impact dashboard and control analytics.
4. Predictive Maintenance Alerts:
  - a. Description: Predicts asset stress based on modelling and AI.
  - b. Details: Includes asset ID, stress metrics, failure timeline and prioritized maintenance schedules.
  - c. Delivery: Dashboard alert integrated with roster management.
5. Load Trend Alerts:
  - a. Description: Detects abnormal load changes over a defined period.
  - b. Details: Includes asset ID, trend graph, anomaly score and root cause analysis.
  - c. Delivery: Dashboard alert with interactive trend visualization.
6. Generation Trend Alerts:
  - a. Description: Identifies DER generation anomalies.
  - b. Details: Includes DER asset ID, trend data, confidence score and control adjustments.
  - c. Delivery: Dashboard alert with updated forecasts.
7. Voltage Trend Alerts:
  - a. Description: Detects persistent voltage anomalies.
  - b. Details: Includes node ID, trend chart, severity score and mitigation options.
  - c. Delivery: Dashboard alert with trend analysis and simulation tools.
- ii. Notification Delivery and Management
  1. Role-Based Delivery: Alerts target engineers/supervisors based on hierarchy and responsibility.
  2. Priority Levels: Critical, High, Medium, Low, with distinct visual cues.
  3. Escalation Workflows: Unacknowledged Critical/High alerts escalate to senior management via email/SMS after 15 minutes.
  4. Acknowledgment Tracking: Engineers acknowledge alerts in-app; unacknowledged alerts trigger reminders after 5 minutes.
  5. Multi-Channel Delivery: Pop-ups, email, SMS for critical alerts during outages.
  6. User Customization: Configurable notification settings within admin constraints.
  7. Audit Logs: Tracks alert delivery, acknowledgment and actions for compliance.
- c. Service Levels:
  - i. Delivery of alerts and associated insights within 2 minutes of issue identification

1. Predictive Maintenance alerts to be generated daily
- ii. Accuracy to meet operational standards.
- d. Integration Requirements:
  - i. Real-time RMS and Relay sensor API data feeds with low latency.
  - ii. AI model retraining with historical/real-time data.
  - iii. SCADA/DMS: Validates alerts with telemetry.
- e. Deliverables
  - i. Alerts Module: Analytics-driven module with dashboards and simulations.
  - ii. Configuration Interface: Admin portal for alert thresholds/rules.
  - iii. Documentation: Manuals, API specs, alert workflow diagrams.
  - iv. Training Materials: Tutorials/videos for engineering staff.
  - v. Test Reports: Validates alert accuracy, latency and reliability.

| Alert Type                   | Priority Levels | Delivery Method                |
|------------------------------|-----------------|--------------------------------|
| Fault Detection              | Critical/High   | Pop-up, GIS/SLD                |
| Load Imbalance               | Medium          | Dashboard, Load Flow Analysis  |
| Voltage Violation            | High/Medium     | Pop-up, Visualization          |
| High Upstream DER Power Flow | High            | Pop-up, Financial Dashboard    |
| Predictive Maintenance       | Medium/Low      | Dashboard, Roster Integration  |
| Load Trend                   | Medium          | Dashboard, Trend Visualization |
| Generation Trend             | Medium          | Dashboard, Forecast Update     |
| Voltage Trend                | Medium          | Dashboard, Trend Analysis      |

## 7. Integration with Existing Systems

Description: An AI-enhanced module ensuring seamless connectivity and data harmonization with DISCOM's IT infrastructure, maximizing the utility of existing investments while enabling advanced functionalities.

- a. Feeder Monitoring System (FMS)
  - i. Live Feeder Performance Dashboard: GIS overlays real-time feeder metrics such as voltage, interruptions, AT&C loss and load factor. Each feeder is color-coded by performance.
  - ii. Event-Based Fault Tracking: When FMS detects a voltage anomaly or feeder tripping, the system maps it to the corresponding network topology, suggesting probable failure points or theft-prone areas.
  - iii. Feeder Reconfiguration Support: During feeder splitting/merging, GIS updates consumer re-tagging and communicates new feeder topology to RMS, MDMS and CCC in real-time.
- b. Energy Accounting / Energy Audit
  - i. Energy Balance: Integrates SCADA, MDMS and RMS data to compute energy inflow vs. billed consumption across feeders, DTs and consumer groups.
  - ii. Audit Trail Generation: Automatically creates monthly audit reports with loss breakdown (technical, commercial) and compliance status for regulatory reporting.
  - iii. Loss Cluster Identification: GIS-based heatmaps highlight loss-prone pockets (urban slums, high-theft zones), helping target enforcement and infrastructure investments.

## 8. User Management and Security

Description - The User Management and Security module is a comprehensive access control and data protection system designed to safeguard grid infrastructure, consumer data and DISCOM's critical operational information. This module ensures that only authorized personnel can access specific datasets and functionalities, mitigating security threats, unauthorized access and compliance risks. By

incorporating advanced authentication mechanisms, encryption protocols and real-time monitoring, it fortifies grid and consumer data against cyber threats while maintaining regulatory compliance with cybersecurity frameworks.

- a. Role-Based Access Control (RBAC) with Dynamic Permissions
  - i. Implements granular access control mechanisms, assigning permissions based on user roles, hierarchy and function-specific needs.
  - ii. Enables custom role definitions (e.g., System Admin, Field Engineer, Grid Operator, Billing Manager) with restricted access to specific modules, datasets and operational functions.
  - iii. Supports dynamic permission updates, allowing administrators to modify access rights in real time as organizational roles evolve.
  - iv. Provides context-aware access policies, ensuring users can only interact with data relevant to their designated responsibilities.
  - v. Includes temporary access mechanisms, enabling secure, time-limited access for third-party vendors, consultants, or auditors without permanent privileges.
- b. Multi-Factor Authentication (MFA) and Session Security
  - i. Enforces multi-layered authentication, combining passwords, biometric verification (fingerprint/face ID), OTP-based login and hardware token authentication.
  - ii. Uses adaptive authentication, increasing security measures based on risk factors (e.g., login from a new device or unusual location).
  - iii. Implements session timeout policies, automatically logging out idle users to prevent unauthorized access due to unattended terminals.
  - iv. Supports single sign-on (SSO) integration, allowing secure authentication across multiple DISCOM platforms without redundant logins.
- c. End-to-End Encryption for Data Protection
  - i. Encrypts sensitive operational and consumer data both at rest (stored data) and in transit (during transmission) using AES-256 and TLS 1.3 standards or higher standards.
  - ii. Ensures secure communication channels, preventing man-in-the-middle attacks and unauthorized data interception.
  - iii. Implements hashed and salted credential storage, preventing password leaks and brute-force attacks.
  - iv. Supports public-key infrastructure (PKI) for certificate-based authentication and digital signatures on critical transactions.
- d. Comprehensive Audit Trails with Detailed Logs
  - i. Maintains tamper-proof logs of user activities, system modifications, access attempts and security events.
  - ii. Tracks who accessed what data, when, from where and any modifications made, ensuring full traceability.
  - iii. Generates real-time log reports, enabling security teams to monitor and review system usage for compliance verification.

- iv. Integrates with Security Information and Event Management (SIEM) systems for proactive threat detection and forensic analysis.
- v. Security Dashboards for Real-Time Monitoring
- vi. Provides interactive security dashboards, visualizing:
- vii. User activity metrics (e.g., active sessions, login frequency, system usage patterns).
- viii. Unauthorized access attempts, highlighting potential security breaches.
- ix. Compliance status indicators, ensuring adherence to ISO 27001, NERC CIP and government-mandated cybersecurity policies.
- x. System vulnerabilities and patching status, helping DISCOM IT teams address security gaps proactively.
- xi. Supports custom security alerts and analytics, enabling incident response teams to react swiftly to security threats.
- e. Real-Time Anomaly Detection & Auto-Lockout Mechanism
  - i. Utilizes AI-driven behavior analysis to detect suspicious login patterns, unauthorized access attempts and data extraction anomalies.
  - ii. Automatically flags high-risk activities, such as:
  - iii. Multiple failed login attempts from different locations within a short period.
  - iv. Unusual data export requests that exceed normal operational behavior.
  - v. Access to restricted modules by unauthorized personnel.
  - vi. Implements auto-lockout policies, temporarily disabling accounts showing suspicious activity, preventing insider threats and external breaches.
  - vii. Notifies system administrators and cybersecurity teams in real time, ensuring immediate investigation and mitigation.

| S. No | IDAM Specifications                    | Description                                                                                                                                                                                                                                                            |
|-------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A     | User ID Management                     |                                                                                                                                                                                                                                                                        |
| A.1   | User ID Creation/Modification/Deletion | Enables creation, modification and deletion of user identities either manually, automatically, or event-driven (e.g., joining, transfer, exit) using predefined workflows, APIs, or scripts. Includes onboarding and offboarding integration with HRMS or ERP systems. |
| A.2   | User ID Lock/Unlock                    | Provides functionality to lock or unlock user accounts individually or in bulk, either manually or automatically based on events (e.g., failed login attempts, policy violations) or workflows. Includes temporary lockouts and scheduled unlock mechanisms.           |

|      |                                                    |                                                                                                                                                                                                                                                                     |
|------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A.3  | Functional/Support ID                              | Functional or support IDs (shared, system-level, or batch-processing users) can be created manually or automatically based on business rules, workflows, or system scripts. Permissions and expiry policies can be configured separately for these IDs.             |
| A.4  | De-Duplication of User IDs                         | Ensures uniqueness of user IDs across the system. Validates incoming user creation requests to prevent creation of duplicate identities based on attributes such as employee ID, Aadhaar, email ID, or mobile number.                                               |
| A.5  | User ID Merging                                    | Supports merging of multiple user identities belonging to the same individual, including consolidating roles, entitlements and historical audit logs while preserving integrity and traceability.                                                                   |
| A.6  | Delegated User Administration                      | Allows identity lifecycle tasks (e.g., create, modify, disable) to be performed by authorized non-admin users (e.g., department managers or HR) with scoped permissions. Enables tiered, granular control based on roles or business units.                         |
| A.7  | Delegation of Authority                            | Permits users to assign delegates for acting on their behalf (e.g., during leave). Includes temporary delegation with time-bound validity, visibility of delegated actions and automatic revocation post-delegation period.                                         |
| A.8  | Single User ID Repository                          | Centralized identity store that maintains all user accounts, access permissions, group memberships and role assignments across the organization. Eliminates fragmented ID management across applications by integrating via directory services or federated access. |
| A.9  | User ID Provisioning/De-Provisioning (Event-based) | Automatically provisions or revokes access across connected systems based on predefined business events (e.g., onboarding, transfer, exit, promotion) or approval workflows. Ensures timely and accurate access assignment or revocation across systems.            |
| A.10 | Group Management                                   | Enables creation, modification and deletion of user groups. Supports static and rule-based group membership. Allows assigning access permissions or roles to entire groups, simplifying user administration.                                                        |

|                       |                                    |                                                                                                                                                                                                                                                                           |
|-----------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A.11                  | Delegated Group Management         | Permits designated non-admin users (e.g., department heads) to manage group memberships and configurations with limited administrative privileges, reducing load on central IT teams while maintaining control.                                                           |
| A.12                  | Dynamic Groups                     | Supports rule-based group memberships where users are added or removed from groups automatically based on defined criteria (e.g., department, job title, location), facilitating scalable access governance.                                                              |
| B Password Management |                                    |                                                                                                                                                                                                                                                                           |
| B.1                   | Password Policy & Account Lockout  | Enforces password complexity and lifecycle rules, including minimum length, special character requirements, expiry duration, reuse history and account lockout thresholds after failed login attempts. Supports configurable lockout duration and account unlock options. |
| B.2                   | Self-Service Password Reset        | Enables users to reset their passwords without IT intervention using multi-factor authentication (MFA), challenge-response questions, or OTP verification. Enhances user experience and reduces helpdesk dependency.                                                      |
| B.3                   | Password Synchronization           | Ensures automatic synchronization of passwords across multiple integrated systems (e.g., Windows AD, email, ERP) to provide a unified credential experience and reduce password fatigue.                                                                                  |
| B.4                   | Administrative Password Resets     | Allows authorized administrators or helpdesk agents to securely reset user passwords. Includes options to notify the user and enforce password change at next login.                                                                                                      |
| C Authentication      |                                    |                                                                                                                                                                                                                                                                           |
| C.1                   | Password Authentication            | Supports basic password-based authentication using LDAP/AD integrations. Includes brute-force protection, session timeouts and security alerts for failed login attempts.                                                                                                 |
| C.2                   | Risk-Based Authentication          | Incorporates contextual risk signals (device fingerprinting, IP reputation, time-of-day patterns, geo-location anomalies) to dynamically evaluate login risk and enforce additional authentication or restrictions accordingly.                                           |
| C.3                   | Token/Biometric/OTP Authentication | Enables multifactor authentication (MFA) using time-based OTP (TOTP), biometric authentication (e.g., fingerprint, facial recognition) and token-based methods (hardware, software, or SMS/email OTPs). Configurable per user, role, or system sensitivity.               |

|     |                                            |                                                                                                                                                                                                                                                                                                 |
|-----|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C.4 | Role Lifecycle Management (Approval-based) | Supports role-based access control (RBAC) with full lifecycle management — including role creation, modification, deletion, assignment and de-assignment based on user requests, approvals, or events (e.g., role expiry or department change). Includes role recertification and SoD policies. |
| D   | Audit & Compliance                         |                                                                                                                                                                                                                                                                                                 |
| D.1 | Sign-On/Sign-Off Logging                   | Captures all login and logout events with timestamps, user IDs, IP addresses, device types and session durations for audit purposes.                                                                                                                                                            |
| D.2 | Account Lifecycle Audit                    | Logs all user account changes (creation, updates, deletion, disabling) with initiator details, timestamps and justification (workflow traceability).                                                                                                                                            |
| D.3 | Role Lifecycle Audit                       | Records all role changes (create, assign, remove) and tracks who approved, modified, or revoked role access.                                                                                                                                                                                    |
| D.4 | Password Change & Challenge-Response Audit | Maintains logs of all password-related activities, including password changes, resets, failed attempts and challenge-response question updates.                                                                                                                                                 |
| D.5 | Synchronization Events Logging             | Logs all synchronization events across systems with status (success/failure), timestamps and system-specific traceability for troubleshooting.                                                                                                                                                  |
| D.6 | User Log Activity Monitoring               | Tracks all user interactions with the IAM system, including login success/failure, access requests, self-service actions and policy violations. Provides dashboard-based analytics for administrators and auditors.                                                                             |
| E   | Other Features                             |                                                                                                                                                                                                                                                                                                 |
| E.1 | Reporting                                  | Provides built-in and customizable reports on user access, role usage, policy violations, inactive accounts, password expiry, failed login attempts and audit logs. Supports scheduling and export in multiple formats (PDF, XLSX, CSV).                                                        |
| E.2 | High Availability                          | Designed for 99.9% uptime with support for load balancing, failover clusters, redundant components and disaster recovery. Ensures business continuity even during node or service failures.                                                                                                     |

|     |                    |                                                                                                                                                                                                                                                                |
|-----|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E.3 | Backup and Restore | Supports automated and on-demand data backups with full system and configuration restore capabilities. Includes encryption, retention policies and cross-site replication options.                                                                             |
| E.4 | Encryption         | Supports encryption of sensitive identity attributes and credentials at rest and in transit. Compliant with AES-256, TLS 1.3 and other industry-grade encryption standards. Allows selective attribute-level encryption based on data classification policies. |

## 9. Training and Knowledge Base

Description - The primary objective of the training is to achieve 100% user adoption through both technical and behavioral competencies, ensuring all end users are proficient in the system functionalities. The training will be provided in both English and the local language, with a focus on field staff who predominantly use the local language.

- a. Training Types and Scope
  - i. Professional Training (Implementation Team)
    1. This training is for the core implementation team of the Utility, consisting of IT professionals and technical staff. Each member will be trained in their respective modules to ensure seamless operations.
    2. Approximate number of trainees: 90-100 personnel per Discom.
    3. The training will cover software and hardware solutions and network configurations, preferably conducted by the OEM partner or OEM-certified training partner.
  - ii. End-User Training
    1. End-user training focuses on operational staff handling day-to-day system tasks. It ensures that employees can efficiently use the deployed system and its features.
    2. Approximate number of trainees: 750 personnel per Discom.
    3. The SI must ensure that all users are adequately trained in their relevant system modules.
  - iii. Train-the-Trainer Approach
    1. Upon instruction and approval from the Nodal Officer, the SI will adopt a train-the-trainer model, where select personnel from the Utility will receive advanced training to further train other employees.
    2. Certified functional, technical, system administration and database management training for the core team should be arranged by the SI directly from OEM/OEM-certified trainers.
    3. The training will be mapped with the Software Products for a comprehensive learning experience.

- b. Training Needs Analysis
  - i. Description - Before execution, a Training Needs Analysis (TNA) will be conducted to determine role-based training requirements. The SI and OEM consultants will collaborate with key business users to create a Training and Development Plan, which includes:
    - 1. Identifying training needs for each user group.
    - 2. Recommending the most effective delivery methods and channels.
    - 3. Establishing criteria for training success.
    - 4. Developing training materials including guides, videos and FAQs.
    - 5. Creating a knowledge-sharing strategy to enable internal capability-building.
- c. Content Development
  - i. Description - Training materials will be customized based on user roles and business processes, developed collaboratively by the OEM, SI and Utility Core Team. The materials will include:
    - 1. Instructor-led training guides with exercises based on 'Day in the Life' scenarios.
    - 2. Media-based training simulations for interactive learning.
    - 3. Context-sensitive online help and self-paced modules
    - 4. All training materials, including manuals, FAQs and videos, will be uploaded to the system for easy reference.
- d. Train-the-Trainer Program
  - i. Training core team members on customized system functionalities.
  - ii. Knowledge-sharing on best practices and process improvements.
  - iii. Instruction on classroom management, communication techniques and engagement strategies.
  - iv. Practical guidance on non-verbal communication, questioning techniques and presentation skills.
- e. Training for Higher Management of Utility
  - i. Description - Targeted training sessions designed specifically for the higher management of the Utility will be conducted, ensuring they are well-informed and empowered to oversee and support the implementation and operation of the deployed systems.
  - ii. Sensitization Workshop
    - 1. Description - A structured sensitization workshop exclusively for the senior leadership of the Utility will be conducted. This session will provide a high-level overview of the functionalities, strategic value and expected outcomes of the proposed systems. This workshop will also address:
      - a. The rationale and need for system integration
      - b. Key performance indicators and system outputs
      - c. Governance expectations from senior stakeholders
- f. Training Locations and Infrastructure

- i. The training sessions for higher management will be conducted at the Utility's Corporate Office and relevant Site Offices, as designated.
- ii. The Utility will provide the necessary training spaces, including seating and furniture.
- g. Ongoing Training and Capacity Building
  - i. Conduct refresher training and re-trainings for identified groups
  - ii. Provide training staff at Utility offices as needed.
  - iii. Ensure access to OEM training platforms and data repositories.
  - iv. Implement a staged training approach (before, during and post-implementation).
  - v. Facilitate competence development and internal capacity building.
- h. Comprehensive Tutorial Library: Video Modules, Step-by-Step Guides and FAQs
  - i. Interactive Learning Materials:
    - 1. High-quality video tutorials with voiceovers, animations and real-world case demonstrations.
    - 2. Hands-on, scenario-based learning modules for practical skill application.
    - 3. Offer varied range of tool tip help, with important parameters/ attributes can be seen with balloon help.
  - ii. Step-by-Step Walkthroughs for Critical Workflows:
    - 1. Grid Asset Digitization and Updates: Training on survey methods, GIS data integration and real-time updates.
    - 2. Field Data Validation and Integration: Guidelines for verifying, correcting and syncing data from mobile applications.
    - 3. Consumer Data Linkage and Billing Insights: Procedures for integrating consumer records with the grid for accurate billing.
    - 4. Incident Reporting and Resolution Tracking: Instructions for logging and resolving technical and operational issues.
  - iii. Contextual FAQs:
    - 1. Intelligent, keyword-driven FAQs providing instant solutions to common queries.
    - 2. Embedded links to in-depth training materials and troubleshooting guides.
  - iv. Downloadable Reference Materials:
    - 1. Quick-start guides, workflow diagrams and best practices for offline access.
    - 2. Printable checklists for field personnel operating in low-connectivity environments.
- i. Searchable Knowledge Base with Contextual Relevance
  - i. Centralized Documentation Repository:
    - 1. A structured digital library containing all technical documentation, troubleshooting guides and compliance best practices.
  - ii. Search Engine for Instant Access to Information:
    - 1. Context-aware search results based on keywords, role-based queries and issue types.

2. Adaptive indexing that prioritizes frequently accessed topics and recently updated materials.
- iii. Recommendation Engine:
  1. Suggestions for related topics based on user search behavior.
  2. Personalized learning pathways guiding users through progressive training levels.
- iv. Version Control and Update Tracking:
  1. Automated version tracking, ensuring users access the latest materials aligned with software updates and policy changes.
  2. Change logs documenting modifications in training content to maintain transparency.
- v. By integrating structured tutorials, search capabilities and interactive learning materials, the Training and Knowledge Base module will empower DISCOM personnel with the knowledge and resources needed to optimize grid management operations effectively.

## 10. Change Management

Description - The successful transition of the digital utility platform from the System Integrator (SI) to the DISCOM for full operational ownership necessitates a robust, structured and institutionally anchored Change Management (CM) framework. The digital ecosystem—comprising GIS, Network Analysis, Load Forecasting, and associated analytics—introduces significant shifts in technology usage, business processes and workforce roles. To ensure these changes are internalized across all levels of the organization, a proactive and comprehensive CM strategy must be embedded into the handover roadmap.

The handover shall include detailed requirements for managing the people-side of change, addressing capability development, process adaptation, organizational readiness and cultural alignment, ultimately enabling DISCOM to sustainably operate and continuously improve the new systems.

- a. Given the scale of this transformation, a structured and proactive Change Management (CM) strategy is essential to ensure:
  - i. Smooth Transition: Minimizing disruptions to daily operations.
  - ii. User Adoption: Ensuring employees at all levels understand and embrace new systems.
  - iii. Sustainability: Building long-term competency to maximize ROI.
  - iv. Stakeholder Alignment: Securing buy-in from leadership, field staff and external partners.
  - v. Ensure Business Continuity: Minimize operational disruption during and after transition.

- vi. Enable Capability Absorption: Equip DISCOM staff to independently operate, manage and scale the platform.
- vii. Embed Long-Term Ownership: Institutionalize governance and continuous improvement mechanisms within DISCOM.
- viii. Align Stakeholders: Facilitate buy-in and accountability across departments and management layers.
- ix. Continuous Asset Lifecycle Support: Provide ongoing updates to the Line Man App and backend systems to integrate new digitized assets, GIS updates, and data processing requirements post-Go-Live.
  - b. A phased approach to Change Management, covering HR readiness, operational adjustments, communication strategies and continuous improvement mechanisms will be followed to achieve this.
  - c. Responsibilities of the Change Management Teams

The Change Management initiative will be jointly owned by the SI and DISCOM leadership. Key responsibilities include:

- i. Conducting a capability gap assessment to evaluate readiness.
- ii. Developing staff capability to effectively implement and manage the new systems.
- iii. Providing continuous backend support to the DISCOM for the digitization of newly added assets/augmented assets and the digital twin platforms
- iv. Preparing departmental heads and their teams for new operational and reporting responsibilities.
- v. Implementing tailored training programs for varied user groups.
  - vi. Ensuring every employee understands their role in the new ecosystem.
  - vii. Providing ongoing support to users transitioning into updated or redefined job functions.
  - viii.
- d. Human Resources (HR) Plan
  - a. Capacity Building and Training Segmentation: All employees will be categorized based on their current roles, competencies and familiarity with digital systems. Customized training modules will be developed for each group – from operational staff to senior management.
  - b. Orientation Workshops: Introductory workshops will familiarize employees with the objectives and benefits of the new systems. These will cover how business processes are transforming and what new responsibilities individuals will undertake.
  - c. Skill Appraisal Workshops: Diagnostic sessions will assess the current understanding of field and office staff regarding system workflows and data flows. These will inform refinements in the training approach.
  - d. Mentorship Programs: Each trainee will be paired with a mentor (senior trainer or internal champion). Through the shadow and reverse- shadow method, users will observe mentors using the systems, followed by hands-on practice while being observed and guided.
  - e. Training Evaluations: Post-training quizzes and feedback forms will be administered

to measure knowledge transfer and retention. Evaluation results will inform targeted refresher sessions.

- f. Feedback Mechanism: Anonymized, structured questionnaires will help gather user feedback on the training experience, pain points during adoption and readiness gaps. These will feed into the continuous improvement of the change strategy.

- e. Operational Plan

- a. Team Formation: Identify and designate trained Process Leaders and System Leaders from among Utility staff to act as internal change lead.

- b. Phased Implementation:

- i. Phase I: Develop training content, communication material and identify the Change Team.
      - ii. Phase II: Release official communications, commence structured training and facilitate exposure visits.
      - iii. Phase III: Monitor implementation, conduct appraisal workshops and organize feedback sessions.

- c. Functional, operational and maintenance support

- i. Functional enhancements, defect resolution and configuration changes.
      - ii. Management of user roles, access controls and support for technical and procedural queries.
      - iii. Administrative services for user lifecycle, password resets and authorization controls.
      - iv. Performance tuning of application, middleware and database layers.
      - v. Redeployment and migration support during system upgrades or hardware transitions.
      - vi. Detailed tracking and documentation of all configuration changes and enhancements.

- f. Communication Plan

- a. Weekly Project Status Meetings: Track milestones, risks and action items.
      - b. Internal Project Meetings: Resolve ongoing issues and escalate bottlenecks.
      - c. Change Control Board (CCB) Meetings: Evaluate and approve scope-related changes.
      - d. Communication material includes newsletters, infographics, FAQs and process briefings.

- g. Feedback, Data Collection and Continuous Improvement

- a. Change adoption will be tracked using a data-driven approach. Regular feedback will be collected through:

- i. Training effectiveness evaluations
        - ii. Post-implementation usage audits
        - iii. Periodic surveys on user confidence and challenges
        - iv. Based on this feedback, iterative improvements in training, processes and communication will be rolled out to address bottlenecks and support smoother transitions.

- h. Help Desk

- i. Centralized Support Hub: Acts as the single point of contact for GIS,

- Network Analysis, and Load Forecasting systems. Includes phone, email and call-tracking mechanisms.
- ii. Issue Management: Supports queries on software, network, configuration, connectivity and security. Tickets are tracked, classified, escalated and resolved per SLA priorities.
- iii. Problem Classification: Issues prioritized based on impact and affected users; Utility can modify priority levels.
- iv. ITIL Compliant Operations: Implements incident, problem, change management processes; integrates with EMS/NMS systems.
- v. Solution Database: Maintains searchable knowledge base with cause, symptom and resolution details; supports updates and user access for self-resolution.
- vi. Level One Support: Logs incidents, dispatches support personnel, sends system status updates, initiates PMRs and monitors issue resolution.
- vii. Operational Management: Ensures end-to-end resolution, tracks performance (call volumes, resolution time, trends) and provides MIS to Utility.
- viii. User Services: Supports user requests (ID creation, password changes, address updates), MAC requests and offers advisory for data backups.
- ix. Vendor Management: Manages vendor coordination, tracks SLAs, maintains vendor databases and provides performance MIS and renewal alerts.
- x. Anti-Virus & Security: Handles virus detection, eradication and synchronization across servers, maintaining required security levels.
- xi. SD-WAN Monitoring: Provides continuous network availability monitoring, SLA performance reporting, outage escalation, latency tracking, configuration logs and SLA violation alerts.

#### 11. Facility Management Service

Description - Facility Management Services shall be provided for the GIS, Network Analysis, and Load Forecasting systems deployed across the Utility. These services are to ensure maximum availability and performance of the systems, aligned with Utility's business objectives.

- a. Patch Management and Configuration
  - i. Timely application of patches and updates to system software, applications and firmware.
  - ii. Maintenance of configuration baselines and rollback points for critical components.
  - iii. Documentation and impact analysis of all patch cycles.
  - iv. Automated patch compliance monitoring as per defined policies.
- b. Performance Management
  - i. Continuous system monitoring to assess uptime, response time and throughput.

- ii. Generation of reports and dashboards to evaluate KPIs and SLA compliance.
- iii. Performance tuning recommendations based on telemetry and usage data.
- iv. Root cause analysis and preventive action planning for recurring issues.
- v. Support for Third-Party Audits: To facilitate third-party audits mandated by Utility or any designated authority, the following shall be ensured:
  - 1. Comprehensive system logs across all infrastructure layers (network, server, storage, database, applications) shall be enabled, securely stored and made accessible in accordance with the defined audit policies.
  - 2. Detailed reports, including but not limited to incident logs, performance reports, backup status and configuration changes, shall be generated and shared in formats prescribed by the auditing body.
  - 3. All relevant documentation, including standard operating procedures (SOPs), compliance records, access logs and configuration baselines, shall be made available to support compliance verification.
  - 4. Adequate support shall be extended to audit teams during audit planning, execution, validation and post-audit follow-ups, including the facilitation of interviews, system access, walkthroughs and verification of controls.
  - 5. Remediation activities based on audit observations shall be tracked and documented, with status reports submitted periodically as per Utility's governance requirements.
- vi. Incident Management
  - 1. Creation of incident records to document deviations from expected standards of operation shall be supported.
  - 2. Capability shall exist to generate other tickets (such as service requests, problems, or work orders) from an incident, if such actions are required for resolution.
  - 3. Incidents shall be auto-generated from integrated sources such as email and system-monitoring tools.
  - 4. Use of ticket templates containing pre-defined data shall be supported, enabling agents to insert standard information into high-volume records efficiently. Templates shall include, but not be limited to, details such as Owner, Service Group, Service, Classification, Internal Priority, Activities, Labor Requirements and Activity Owners.
  - 5. Templates shall support modifiable information fields, including:

- a. Ticket-level fields: Priority, Owner or Owner Group, Service Group or Service, Classification
  - b. Activity-level fields: Activity, Sequence, Job Order, Site, Organization, Description, Owner or Owner Group, Priority, Vendor, Classification
- 6. Assignment of ownership of an incident shall be possible to either an individual or a group responsible for managing the associated work.
- 7. Ownership assignment shall also be executable via workflow or escalation mechanisms.
- 8. Assets shall be associable with incident records where the issue pertains to a specific asset.
- 9. A global view shall be provided to display a list of related records and their respective work and communication logs within a single interface.
- 10. Creation of a service request from an incident shall be supported, with relationships between the two records maintained.
- 11. Functionality shall exist to initiate a problem record from the incident application, to log an unidentified underlying cause affecting one or more incidents.
- 12. Release records shall be creatable from the incident application when the resolution involves deployment of bundled changes to users.
- 13. Relationships between multiple incidents shall be definable to maintain reference and traceability.
- 14. Identification and designation of a global incident (root cause or widespread issue) shall be supported.
- 15. SLA(s) shall be automatically assigned based on workflow or escalation logic defined by SLA criteria.
- 16. Incident templates shall include predefined activities that are editable post-application.
- 17. Capability shall exist to attach existing solution records containing resolution guidance to an incident record.
- 18. Solution records capturing the Symptom, Cause and Resolution shall be creatable directly within the incident application.
- 19. Draft solutions may be submitted from the incident application, which can later be reviewed and approved for broader reuse.
- 20. Communication logs shall maintain a record of all inbound and outbound communications and attachments exchanged between users and agents.
- 21. Communication entries associated with a record shall be viewable directly from the record.
- 22. Communication templates shall be usable to populate default

message content during communication exchanges.

vii. Ticketing Management : A robust Ticketing Management system shall be provisioned with the following capabilities:

1. Ownership details, including Owner, Owner Group, Service Group, or Service, shall be assignable for each ticket.
2. Classification of tickets shall be supported to enable appropriate routing and prioritization.
3. Provision shall exist to specify both Reported Priority (as per user input) and Internal Priority (as per internal operational assessment).
4. Related assets shall be linkable to individual tickets for traceability and context.
5. Time tracking functionality shall be enabled for monitoring the effort spent on resolving each ticket.
6. One or more Service Level Agreements (SLAs) shall be applicable to tickets, with automatic assignment based on predefined conditions.
7. A Self-Service Service Request module shall be made available to end-users, allowing submission and status tracking of service requests.
8. Capability shall be provided to generate related tickets

ii. Evaluation Criteria

1. Accuracy: Data and AI predictions with <1% error rate across all features .
2. Usability: Intuitive navigation, <5-minute task completion for 90% of actions.
3. AI Effectiveness: >90% accuracy in analytics, simulations, chat responses and predictive tasks.
4. Integration: Robust connectivity with DISCOM systems, <2-second API latency, >99% sync reliability.
5. Scalability: Performance under full deployment load.
6. Security: Compliance with cybersecurity standards, no breaches in penetration tests.

## 12. Statutory Compliance for All Personnel (Permanent & Temporary)

The bidder agrees to operate strictly on a principal-to-principal basis for the purpose of this engagement. All responsibilities, obligations, and liabilities—whether statutory, contractual, financial, or otherwise—shall rest exclusively with the bidder. Under no circumstances shall the authority/client be held liable for any act, omission, default, or non-compliance on the part of the bidder or its personnel, subcontractors, agents, or representatives.

## 13. Intellectual Property (IP) and Rights

- i. Ownership of Insights: All processed data, derived insights, and trained ML models resulting from Utility data remain the exclusive property of the Utility.

- ii. Right to Re-Platform: The Utility maintains a perpetual, royalty-free right to modify, enhance, and share all exported schemas, code, and model architectures with any third-party successor for the purpose of re-platforming the Digital Twin services.

## 06. Deliverables

The System Integrator is expected to deliver a fully Functional Mobile Application for Field Data Collection. A field-ready mobile application enabling linemen to digitize, validate and manage DISCOM assets with real-time data capture and AI-driven insights. Features include:

- a. Network Data Capture: GPS-tagged recording of substations, transformers, feeders and poles.
- b. Asset Editing & Linkage Updates: Interactive modification of asset details and network topology with AI-suggested corrections.
- c. AI-Based Data Validation: Automated anomaly detection, cross-referencing with GIS and billing systems and real-time error flagging.
- d. Photo & Video Capture for Asset Identification: AI-powered image recognition and OCR-based meter reading extraction.
- e. Alerts and Notifications: Fault detection, high upstream DER power flow alerts and AI-driven trend notifications
- f. Scalable AI/ML Model: Continuous learning from field corrections, adaptable from pilot (5 substations) to full deployment (400 substations).
- g. AI-Native Web Application for Grid Intelligence and Operational Optimization
  - i. AI-Driven Dashboard: Centralized analytics for grid health, energy losses and operational KPIs.
  - ii. Load Flow Analysis: AI-powered diagnostics for voltage profiles, power losses and fault detection.
  - iii. GIS-Based Asset Visualization: Interactive map with real-time SCADA overlays, predictive insights and geospatial asset tracking.
  - iv. What-If Simulations: AI-modeled grid expansion, DER integration and load forecasting and EE/DSM planning.
  - v. AI-Chat Interface: Custom GPT-powered assistant for querying grid data and generating actionable insights.
  - vi. Digital Single-Line Diagrams (SLDs): AI-generated, interactive network diagrams for planning and maintenance.
  - vii. Asset & Consumer Data Management: AI-enhanced repository for asset lifecycle tracking, consumer billing validation and anomaly detection.
  - viii. Alerts and Notifications: AI-driven fault, trend and high upstream DER power flow alerts with analytics..
- h. AI-Enabled Data Integration and System Interoperabilities
  - i. Seamless System Integration: The platform will integrate with existing DISCOM infrastructure, including SCADA, RMS, billing systems and energy management tools, ensuring a unified data ecosystem.
  - ii. AI-Driven Data Reconciliation: Automated validation and cleansing of multi-source data to

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- identify inconsistencies, flag discrepancies and ensure accurate reporting.
- iii. Predictive Insights for Operations: AI models will analyze historical and real-time data to generate forecasts for power demand and load balancing strategies.
- iv. Interoperability with Legacy and Emerging Technologies: The system will support API-based communication with external tools, allowing future scalability and adoption of emerging grid technologies.
- v. Real-Time Monitoring & Alerts: AI-powered event detection will continuously track critical grid parameters, flagging issues such as voltage fluctuations, outages and losses with automated escalation workflows.
- i. Preliminary Validated Dataset with Confidence Scores
  - i. Dataset Compilation: A GIS dataset will be compiled, including asset records, geospatial attributes and metadata.
  - ii. Confidence Scoring: Confidence scores (0-100%) will be assigned to each entry.
  - iii. Reliability Categorization: Asset reliability will be categorized into high, moderate and low confidence levels.
  - iv. Anomaly Detection: Discrepancies and anomalies will be automatically classified.
  - v. Validation Metadata: Metadata and audit logs detailing validation methods will be maintained.
- j. Discrepancy Report with Proposed Resolutions
  - i. Discrepancy Identification: A comprehensive list of identified discrepancies in asset records will be generated.
  - ii. Suggested Corrections: Proposed fixes for coordinate mismatches, duplicates and missing data will be provided.
  - iii. Severity Classification: Discrepancies will be categorized by severity level (critical, moderate, low).
  - iv. Resolution Methods: Resolution approaches (GIS-based corrections, manual validation, database merging) will be outlined.
  - v. Validation Summary: A summary of validation checks and error detection metrics will be included.
- k. Supervisor-Approved Dataset with Action Log
  - i. Final Dataset: A dataset with all discrepancies resolved and validated will be delivered.
  - ii. Action Log: A detailed log of modifications, updates and corrective actions will be maintained.
  - iii. Approval Sign-Off: Validation and approval from designated DISCOM authorities will be documented.
  - iv. Confidence Score Comparison: Pre- and post-validation confidence scores will be analyzed.
  - v. Residual Issues Summary: Documentation of remaining data issues requiring future attention will be provided.
- l. Comprehensive Validation Report with Accuracy Metrics & Visual Summaries
  - i. Final Validation Status: The completion status of the dataset validation will be reported.
  - ii. Accuracy Metrics: The percentage of validated data and flagged data for further review will be documented.
  - iii. Geospatial Visualizations: Heat maps comparing original vs. corrected asset locations will be created.

- iv. Correction Breakdown: Graphical analysis of corrections by asset type (substations, feeders, transformers) will be presented.
- v. Audit & Compliance Logs: Validation process records and regulatory compliance documentation will be included.
- m. Deployment, Training & Technical Support
  - i. Scalable Deployment Architecture: On-premise or cloud-based deployment tailored to DISCOM's IT infrastructure, ensuring high availability, security and compliance with regulatory standards.
  - ii. User Training and Capacity Building: Hands-on training sessions, instructional manuals and AI-driven interactive guides to ensure efficient system adoption by field engineers, operational staff and management teams.
  - iii. Continuous Technical Support & Maintenance: Dedicated support for troubleshooting, performance monitoring and software updates to keep the system optimized and up to date.
  - iv. Customization & Future Expansion: Modular architecture allowing customization based on evolving DISCOM needs, with provisions for integrating additional AI-powered analytics and automation capabilities.

## 07. Project Management

- a. The implementation of the AI-powered grid digitization, network modeling, load flow analysis, grid simulation and expansion planning solution is envisaged to be completed within a period of 9 months, followed by a subscription of 1 year which may be extended by an additional 4 years on the same terms and conditions basis performance evaluation and DISCOM's budgetary provisions.
- b. Implementation Framework
  - i. All project activities shall be executed as per the schedule indicated below. Each activity is to be accompanied by a formal presentation of the associated deliverables.
  - ii. A deliverable shall be deemed complete only upon submission of both hard and soft copies, followed by the corresponding presentation to the ISA.
  - i. A detailed Project Implementation Schedule is to be submitted, covering but not limited to the key milestones and deliverables outlined in the indicative timeline table below. This schedule is to include a comprehensive list of all proposed activities and deliverables for each phase of the project lifecycle.
  - ii. The following timeline is indicative in nature and provides a high-level view of the anticipated project phases and durations. The selected agency is expected to develop and submit a detailed activity-wise implementation plan, inclusive of post-implementation phases and ongoing support arrangements.
  - iii. All software licenses for the GIS, Network Analysis, and Load Forecasting system shall be procured and supplied. The quoted price must cover the entire lifecycle of the contract, including:

1. License and subscription procurement,
  2. Updates and renewals
  3. Change requests
  4. Periodic updates for mobile applications.
- iv.** The schedule of activities and associated timelines (in months) is provided in the table below. All references are with respect to “T0”, which denotes the date of Letter of Award (LoA).

## **08. Digital Twin Network Protection & Security**

The System Integrator (SI) shall implement robust cybersecurity measures to ensure the integrity of the synchronized data flow between physical assets and their virtual counterparts.

- **Secure Access Controls:** Implementation of enterprise-grade authentication (password complexity, aging, and multi-factor authentication) for accessing the DT simulation environment and visualization dashboard.
- **Authorization & Least Privilege:** Users (Administrators, Operators, Analysts, and Viewers) shall only access specific twin layers, simulation parameters, or historical datasets for which they are explicitly authorized.
- **Comprehensive Logging:** The system must log all successful/unsuccessful logins, configuration changes to the twin model, privilege escalations, and manual overrides of automated synchronization processes.

### **8.1 Platform & Software Standards**

To ensure long-term viability and integration with IoT sensors and enterprise systems:

- **Open Standards:** Software must comply with industry-accepted standards (OSF, X/Open) to ensure the "Open Twin" objective, facilitating interoperability between the DT and third-party ERP applications.
- **Interoperability:** The DT shall remain hardware-agnostic, supporting integration with various RDBMS (Oracle, MS SQL, MySQL) and standard high-level programming languages (ISO/ANSI).
- **System Hardening:** The virtual environment's OS must be hardened, with application logic and twin state data stored on separate disk partitions to prevent cross-contamination during a breach.

### **8.2 Cloud Security & Infrastructure**

Where the Digital Twin is hosted on a Cloud Service Provider (CSP), the following managed services are mandatory:

- **Data Protection:** Implementation of Key Management Services (KMS) and Certificate Managers for SSL/TLS to secure data-in-transit (sensor-to-twin) and data-at-rest.
- **Threat & Edge Protection:** Utilization of Web Application Firewalls (WAF) and Managed DDoS protection to ensure high availability of the digital model.
- **Security Assessment:** Automated security scanning to identify vulnerabilities in the DT application code and cloud configuration.

### **8.3 Governance & Incident Management**

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- **Framework Adoption:** The project shall follow the NIST Framework for Cyber-Physical Systems (CPS), acknowledging the unique risks of mapping physical infrastructure to digital models.
- **Incident Response:** A five-step management process (Prepare, Identify, Assess, Respond, Learn) must be documented specifically for "Twin-specific" threats, such as data injection attacks or unauthorized model manipulation.
- **Vulnerability Testing:** Annual penetration testing and vulnerability assessments by certified third parties are required for both the live twin and its staging environment.

#### 8.4 Data Privacy & "Privacy by Design"

The Digital Twin must treat physical asset data and associated telemetry with strict confidentiality:

- **Custodian Rights:** The Utility remains the sole custodian of all data. The DT provider has limited, need-based access only.
- **Anonymization Protocols:** The "Privacy by Design" document must detail how the twin handles three data levels:
  1. **Aggregated Data:** For high-level system load and performance modeling.
  2. **Anonymized Data:** Asset performance data stripped of specific location or consumer identifiers.
  3. **Personal Data:** Tagged telemetry used only when explicit consent or operational necessity is met.
- **Auditability:** Annual third-party data privacy audits must be conducted to ensure the DT platform complies with the IT Act and prevailing data protection regulations.

### 09. Scalability, Interoperability, and Transition Support

The System Integrator (SI) shall design and implement the solution with a scalable, modular, and vendor-neutral architecture, ensuring that the system can be extended to additional circles and/or integrated with solutions developed by other agencies in the future.

1. **Open Interfaces & Interoperability**  
The SI shall provide well-documented APIs (REST/JSON or equivalent) and adhere to open standards to enable seamless integration with third-party systems and future vendors.
2. **Documentation & Knowledge Transfer**  
The SI shall maintain comprehensive documentation, including system architecture, data models, APIs, configurations, and workflows. The SI shall conduct structured knowledge transfer sessions for DISCOM personnel and any third-party agency nominated by the DISCOM.
3. **Transition & Handover Support**

In the event of project scale-up or onboarding of a new agency for additional circles, the SI shall provide reasonable transition support , including:

- a. Data handover/transfer in usable formats
- b. Technical support for integration
- c. Clarifications on system design and workflows

4. No Vendor Lock-in

The SI shall ensure that the solution does not impose any vendor lock-in, and all components (including software, data, and configurations) shall remain accessible and usable by the DISCOM or its appointed agencies.

## 10. Payment terms and conditions

| Milestone | Phase                         | Key Deliverables                                                                                                                                                                                                                                                                                                                                                                                                                                             | Timeline      | Payment % | Payment Condition                                                                 |
|-----------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------|-----------------------------------------------------------------------------------|
| M1        | Project Initiation & Planning | Project kick-off, charter finalization, governance & escalation matrix, communication plan, team mobilization and onsite setup. Detailed project plan with WBS, project templates, field survey strategy, license requirement mapping, network feasibility study, change readiness assessment. Data digitization plan, training & OCM roadmap, SLA monitoring design, risk assessment, QA plan, methodology standards, As-Is documentation and gap analysis. | T0 + 2 Months | 10%       | Upon approval of project charter, governance framework, and detailed project plan |
| M2        | Business Blueprinting         | Requirement workshops for functional & technical specifications, Business Process Master List (BPML), Business Process Re-engineering (BPR), HLD/LLD documentation, updated BoM/BoQ, integration mapping (interfaces,                                                                                                                                                                                                                                        | T0 + 3 Months | 10%       | Upon approval of the Business Blueprint and design documentation                  |

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

| Milestone | Phase                                               | Key Deliverables                                                                                                                                                                                                                                                                                                                                                                                                                   | Timeline       | Payment %      | Payment Condition                                                                                            |
|-----------|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|--------------------------------------------------------------------------------------------------------------|
|           |                                                     | conversions, enhancements), FRS, Technical Requirement Specifications, RTM, Non-functional requirements, business solution design document, utility organogram and role-based user listing, authorization matrix, cybersecurity framework, and business blueprint closure report.                                                                                                                                                  |                |                |                                                                                                              |
| M3        | Environment Setup & Hosting                         | Establish Development, Test and QA environments. Deploy application servers and database instances. Baseline system configuration documentation, customization/configuration documentation, OEM audit report (draft and final), and initial user profile and role documentation.                                                                                                                                                   | T0 + 3 Months  | 5%             | Upon successful setup of environments and approval of infrastructure readiness                               |
| M4        | Mobile Application Deployment                       | Mobile application UI/UX design tailored for field users. Integration with GIS maps, asset information modules and performance dashboards. Offline data capture functionality, synchronization protocol setup, field testing and iterative feedback incorporation.                                                                                                                                                                 | T0 + 6 Months  | 10%            | Upon successful demonstration and acceptance of the mobile application                                       |
| M5        | Field Survey, Data Digitization & Change Management | Field survey planning and execution, mobile survey deployment, pilot survey training, asset data collection with GPS tagging, QA/QC validation of collected datasets and DISCOM sign-off. Digitization of field data and publishing of digitized asset records. Change Management & Capacity Building: training of linemen and field engineers on mobile application usage, asset reporting workflows, and operational procedures. | T0 + 6 Months  | 20% (Pro-Rata) | Paid circle-wise upon validated dataset submission and training completion certified by DISCOM nodal officer |
| M6        | Core Modules Deployment                             | System design, configuration and deployment of GIS, Network Analysis, and Load Forecasting modules. Integration with legacy systems and internal                                                                                                                                                                                                                                                                                   | T0 + 12 Months | 20%            | Upon successful deployment and functional                                                                    |

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

| Milestone | Phase                         | Key Deliverables                                                                                                                                                                                                                                                                                                                               | Timeline                                  | Payment %                       | Payment Condition                                               |
|-----------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------|-----------------------------------------------------------------|
|           |                               | platforms. Functional testing cycles, directory setup with organizational hierarchy mapping, user access controls, and search/filter functionality.                                                                                                                                                                                            |                                           |                                 | demonstration of core modules                                   |
| M7        | Advanced AI & Digital Modules | Implementation of Chat-based Natural Language Querying module, predictive analytics models for asset performance and load forecasting, configurable dashboards, alerts and notification workflows, DER/high upstream fault alert design, AI analytics data pipeline validation and system performance testing.                                 | T0 + 12 Months                            | 5%                              | Upon acceptance of advanced AI modules and analytics dashboards |
| M8        | Testing, UAT & Pilot Rollout  | Load, stress, integration and performance testing reports, test plans, scripts, logs and issue resolution documentation. RICEFW customization documentation, data archiving plan, pilot rollout including hardware inspection, system deployment (mobile and web), UAT completion, pilot report, and stabilization support at pilot locations. | T0 + 12 Months                            | 15%                             | Upon successful UAT completion and pilot Go-Live acceptance     |
| M9        | Enterprise Go-Live            | Full rollout of all modules including mobile app across all DISCOM circles. Final training sessions, user handholding, system acceptance including GIS maps, network analysis, and load forecasting system validation.                                                                                                                         | T0 + 12 Months                            | 5%                              | Upon enterprise-wide Go-Live and final system acceptance        |
| M10       | Subscription & O&M            | Long-term operations and maintenance including support for GIS, Network Analysis, Load Forecasting systems and mobile app. Includes licenses, upgrades, enhancements, SLA monitoring, system support across locations and exit management plan.                                                                                                | 1–5 Years<br>Post Go-Live<br>Post Go-Live | Quarterly Payment <sup>##</sup> | Based on annual subscription cost subject to SLA compliance     |

# % of the price quoted for digitization and digital twin development

## On basis of the quoted subscription cost

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

*Note: The Project timelines and schedule mentioned above is indicative and will be finalized based on discussion and agreement between ISA/AVVNL and the SI. Initially, a draft schedule will be provided with respective deliverables to ISA/AVVNL for their review and feedback within stipulated timelines. ISA/ AVVNL will provide feedback within the agreed timelines to make necessary changes, corrections, if required. A revised schedule document will be resubmitted. Feedback and revision of documents and deliverables will be an iterative process.*

a. Roles and Responsibilities

1. Responsibilities of the System Integrator (SI)
  - 1.1. Development, Deployment and Maintenance of Digital Solutions
    - 1.1.1. Design, develop and deploy a fully functional mobile and web-based platform for real-time grid intelligence, asset mapping and consumer data validation.
    - 1.1.2. Ensure robust cloud-native or on-premise deployment, optimized for scalability, high availability and seamless user experience.
    - 1.1.3. Implement automated software updates, security patches and performance optimizations to maintain system reliability.
  - 1.2. Comprehensive Grid Digitization and Data Accuracy Assurance
    - 1.2.1. Conduct an exhaustive, one-time digitization of DISCOM's grid infrastructure, ensuring accurate mapping of transmission and distribution assets, substations, transformers, feeders.
    - 1.2.2. Validate and reconcile existing GIS layers, asset records and power flow data to eliminate discrepancies and ensure a high-fidelity digital twin of the grid.
    - 1.2.3. Establish a data governance framework to ensure data accuracy, consistency and regular updates in alignment with network modifications.
  - 1.3. End-to-End Technical Support for Ongoing Grid Updates
    - 1.3.1. Provide continuous technical assistance for capturing, updating and integrating changes in the grid infrastructure, such as new asset installations, maintenance activities
    - 1.3.2. Implement automated workflows for real-time data updates, ensuring the digital representation of the grid remains current and reflects all modifications.
  - 1.4. Seamless System Integration with DISCOM's Existing IT Ecosystem
    - 1.4.1. Ensure interoperability with DISCOM's IT landscape, including SCADA, RMS, billing systems and energy management platforms, facilitating unified data access.
    - 1.4.2. Develop and manage secure APIs and data pipelines for real-time information exchange across legacy and modern grid management systems.
    - 1.4.3. Leverage AI-driven data harmonization to standardize and reconcile information from multiple sources, enhancing decision-making accuracy.
  - 1.5. Training and Knowledge Transfer for Operational Readiness
    - 1.5.1. Design and execute structured training programs for DISCOM personnel, including field engineers, control room operators and administrative staff, ensuring efficient system adoption

- 1.5.2. Deliver customized learning modules, including hands-on workshops, instructional videos and AI-powered interactive guides, to enhance user proficiency.
  - 1.5.3. Provide train-the-trainer sessions to develop in-house expertise within DISCOM for system maintenance and troubleshooting.
- 1.6. Real-Time Monitoring, Advanced Analytics and Continuous System Enhancements
  - 1.6.1. Deploy AI-driven analytics dashboards for real-time monitoring of grid performance, energy losses, asset health and operational KPIs.
  - 1.6.2. Implement predictive maintenance models, leveraging AI/ML to anticipate grid failures and optimize asset management.
  - 1.6.3. Offer continuous system improvements, incorporating technological advancements to enhance grid resilience and efficiency.
- 1.7. Ensuring Data Security, Compliance and Cybersecurity Resilience
  - 1.7.1. Implement robust cybersecurity protocols aligned with national and international standards, ensuring protection against cyber threats, unauthorized access and data breaches.
  - 1.7.2. Ensure end-to-end encryption, role-based access control (RBAC) and multi-factor authentication (MFA) to safeguard sensitive DISCOM data.
  - 1.7.3. Conduct periodic security audits, penetration testing and vulnerability assessments to uphold system integrity.
  - 1.7.4. Maintain compliance with regulatory frameworks, including CERC, CEA and DISCOM-specific IT policies for data governance and cybersecurity.
- 2. Responsibilities of the DISCOM
  - 2.1. Provision of Grid Asset Data, GIS Layers and Power Flow Records
    - 2.1.1. Grant comprehensive access to existing asset registries, GIS maps, feeder configurations and power distribution records to enable system integration.
    - 2.1.2. Share historical and real-time data from SCADA, RMS, billing systems and energy meters to facilitate data validation and analytics-driven insights.
  - 2.2. Integration Support for Seamless Data Exchange
    - 2.2.1. Facilitate technical collaboration with IT teams to establish secure API-based integration between the new digital platform and existing DISCOM infrastructure.
    - 2.2.2. Provide comprehensive access to critical grid-related data, including:
      - 2.2.2.1. Static asset registries, GIS layers, feeder configurations and transformer records for one-time digitization and periodic updates to enable network modeling, load flow analysis and asset management
      - 2.2.2.2. High-frequency SCADA/RMS data, relay switch states, circuit breaker statuses and transformer health sensor data to support monitoring, fault analysis and predictive maintenance
      - 2.2.2.3. Consumer billing records, meter data and load profiles updated monthly or hourly for billing accuracy, loss reduction and demand forecasting
      - 2.2.2.4. Distributed Energy Resources (DER) data with high-frequency generation and status updates to ensure effective integration, grid

- stability and simulation capabilities
    - 2.2.2.5. All sources are to be integrated via existing system APIs and supported by adequate network bandwidth to ensure interoperability and synchronization between mobile/web applications and central systems.
  - 2.3. On-Ground Coordination with Field Teams for Data Validation
    - 2.3.1. Enable direct engagement with linemen, field engineers and operational staff for on-site asset verification and real-time data collection.
    - 2.3.2. Ensure that field teams validate and update grid information, resolving inconsistencies between digital and physical records.
  - 2.4. Allocation of IT Infrastructure and Cloud Resources
    - 2.4.1. Provision necessary server capacity, cloud storage and networking resources for hosting and running the new system efficiently.
    - 2.4.2. Ensure sufficient bandwidth and network access for seamless data transmission from remote field locations to the central repository.
  - 2.5. Support for Field Testing, Pilot Runs and Full-Scale Implementation
    - 2.5.1. Assist in pilot deployments, testing system performance in select zones before full-scale rollout.
    - 2.5.2. Provide feedback loops for system refinements, ensuring operational alignment with DISCOM's workflows.
    - 2.5.3. Facilitate progressive deployment, ensuring a smooth transition from legacy processes to AI-powered grid management.
  - 2.6. Appointment of a Nodal Officer for Project Coordination
    - 2.6.1. Designate a single point of contact (SPOC) responsible for coordinating between DISCOM teams and the System Integrator.
    - 2.6.2. Ensure timely decision-making, approvals and issue resolution to streamline project execution.
  - 2.7. Ensuring Adoption and Effective Utilization of the New System
    - 2.7.1. Drive organizational change management, ensuring that personnel across departments effectively adopt the new AI-driven platform.
    - 2.7.2. Establish KPIs for system utilization, monitoring its impact on operational efficiency, revenue protection and loss reduction.
    - 2.7.3. Promote a data-driven decision-making culture, leveraging insights from the system to enhance grid management strategies.

| Sl. No. | Project Activities                                                                                                                                                      | Compliance (Yes/No) |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 1       | Unit testing of all configured modules including GIS, Network Analysis, , Asset Management and Load Forecasting                                                         |                     |
| 2       | Finalization and delivery of customized objects for GIS, Network Analysis, , Asset Management and Load Forecasting systems based on blueprint and design specifications |                     |

|    |                                                                                                                                                     |  |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 3  | End-to-end system integration testing covering module interactions and reporting pipelines                                                          |  |
| 4  | Performance testing including load, stress and backup recovery scenarios across configured systems and mobile app infrastructure                    |  |
| 5  | Installation and provisioning of GIS, Network Analysis, , Asset Management and Load Forecasting applications across pilot sites and field locations |  |
| 6  | AI powered GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration Software Provisioning & Installation                |  |
| 7  | User Acceptance Testing (UAT) conducted post pilot delivery including UAT report and stakeholder sign-off                                           |  |
| 8  | Creation of end-user accounts with mapped roles and authorization matrix based on utility organogram and user structure design                      |  |
| 9  | AI powered GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration System Accessibility to all End Users               |  |
| 10 | Completion of baseline configuration and system customization as per finalized design including documentation.                                      |  |
| 11 | Cutover planning with detailed checklist of tasks, dependencies and timelines for go-live rollout                                                   |  |
| 12 | Execution of structured end-user training sessions with documentation, manuals and helpdesk readiness                                               |  |
| 13 | Final tuning and optimization of deployed modules based on feedback from pilot run and performance testing                                          |  |
| 14 | Completion of stabilization phase post pilot rollout with resolution of initial issues, user support and QA sign-offs                               |  |
| 15 | Demonstrated stable functioning of all key modules for six continuous months including real-time data flow and dashboard updates                    |  |
| 16 | Issue logbook maintained during stabilization including root cause analysis and applied solutions for each problem                                  |  |
| 17 | Readiness of IVR systems, ITSM integration and operational tools required for post-go-live management and service monitoring                        |  |

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

|    |                                                                                                                |  |
|----|----------------------------------------------------------------------------------------------------------------|--|
| 18 | Setup of support helpdesk, ticketing system, contact escalation channels and SLAs                              |  |
| 19 | Finalization of Service Level Agreements covering system uptime, issue resolution timelines, training support. |  |
| 20 | Formal approval for full system go-live post successful stabilization and stakeholder sign-off                 |  |

## 11. Maintenance Support and Service Levels

- a. Monitoring of Performance and Service Levels
  - i. Appropriate tools and processes shall be provisioned and implemented for continuous monitoring of application performance and availability. This shall include:
    1. Availability, uptime and performance monitoring of assigned applications and associated infrastructure components.
    2. Monitoring of application-specific parameters such as request rates, active user sessions and elasticity triggers.
    3. Review and analysis of service level reports to detect deviations from agreed service levels.
    4. Identification and reporting of service-level agreement infringements.
    5. Troubleshooting activities shall be initiated to detect, isolate and mitigate system outages and performance issues.
  - ii. To ensure uninterrupted functioning of mission-critical business processes and ISA operations, a 12x7 support model shall be established, encompassing proactive monitoring, incident resolution and service continuity across all key solution components.
- b. Application Installation & Testing Summary
  - i. Comprehensive Software Deployment
    1. Supply and install the complete suite: application software, database, integration tools and middleware.
    2. Deliver customized source code along with perpetual licenses and documentation for all components.
  - ii. Stakeholder-Centric Design
    1. Incorporate stakeholder feedback into key design elements including:
      - a. User interface and navigation
      - b. Data entry, storage, retrieval methods
      - c. Output formats such as reports, dashboards and query tools

- d. Overall application workflow and usability
- 2. Ensure alignment with the ISA's operational context and future scalability needs.
- 3. The unit system for various parameters envisaged shall be in SI (Metric) units and cost in Indian Rupees.
- iii. Testing Environment & User Acceptance Testing (UAT)
  - 1. Establish a separate Testing environment for UAT, fully equipped and isolated from the Production setup.
  - 2. Populate environment with all necessary:
    - a. Configuration parameters
    - b. Functional rules
    - c. Master data relevant to operations
  - 3. Conduct formal UAT cycles with ISA stakeholders to validate business process compliance and technical robustness.
- iv. Patch Management & Fix Validation
  - 1. Evaluate all patches and fixes first within the Development environment by the support team.
  - 2. Migrate successfully tested updates to the Testing environment for UAT.
  - 3. Ensure production deployment only after formal approval post-UAT completion.
- v. Data Management Standards
  - 1. Propose industry-standard best practices and protocols for:
    - a. Regular data backup and archival
    - b. Secure purging of obsolete data
    - c. Seamless restoration in case of failure or disaster
  - 2. Ensure data integrity, traceability and compliance with ISA's retention policies.
- c. Performance Requirements
  - i. To ensure a seamless and responsive user experience across both the web portal and mobile application, the following performance metrics shall be met for all concurrent users:
    - 1. General Page Load Times
      - a. Static Page Load Time (Web Portal)
        - i. Avg. load time: < 50 ms
        - ii. Applies to all apps, regardless of config/sizing
        - iii. Measured by TTFB via third-party tool (by SI)
      - b. Dynamic Page Response Time (DISCOM Portal)
        - i. Avg. response time: < 1 sec
        - ii. Excludes human input time
        - iii. Measured by TTFB via third-party tool (by SI)
      - c. ISA Business Application Responsiveness

- i. Avg. response time: < 1 sec
  - ii. Excludes human input time
  - iii. Measured by TTFB via third-party tool (by SI)
  - iv. Login page and other primary pages: Must load within 2 seconds.
  - v. Home page with integrated analysis tools: Load time shall not exceed 4 seconds.
  - vi. Full functional screen after login (menu + UI elements): Load time must be ≤ 4 seconds.
  - vii. Page transition on menu selection: Must load within 4 seconds.
- 2. Map and Spatial Data Rendering
  - a. Complete map (with all feature classes) on browser and mobile app: Must load within 4 seconds.
  - b. Background map from the map server: Load time shall be ≤ 15 seconds.
  - c. Zooming into search results: Must complete within 4 seconds.
- 3. Feature and Attribute Management
  - a. Create, delete, or modify a feature: Each operation must complete within 4 seconds.
  - b. Saving a created or deleted feature with all associated attributes: Must complete within 30 seconds..
- 4. File Upload Performance
  - a. Uploading Excel/XML files into the application: Upload process must complete within 30 seconds.
- 5. Spatial Query Processing
  - a. Simple spatial query results on map: Must display within 15 seconds.
  - b. Complex spatial query results on map: Must display within 30 seconds.

*\*Penalty shall be imposed on the total awarded project cost deliverable in each phase as defined in RFP.*

#### Facility Management Phase SLA Overview (Post Implementation)

| Component                    | Definition / Policy                                                                                                      |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Monthly Availability Formula | $\% \text{ Availability} = ((\text{Actual Uptime} + \text{Scheduled Downtime}) / \text{Total Monthly Hours}) \times 100$ |
| Actual Uptime                | Total hours in a month when each equipment or component is available for use.                                            |
|                              | Permitted downtime due to preventive/scheduled                                                                           |

***RFP for Appointment of System Integrators (SI) for AI powered Implementation of GIS based Asset Management, Network Analysis, & Load Forecasting for DER Integration in DISCOMs.***

|                          |                                                                                                                                                               |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Scheduled Downtime       | maintenance or infrastructure issues not attributable to the Service Provider.                                                                                |
| Planned Downtime Limit   | Max 4 hours/month/equipment allowed for preventive maintenance.                                                                                               |
| Maintenance Agreement    | Scheduled maintenance (e.g., patching/upgrades) must be mutually agreed upon; activities should be consolidated to minimize impact.                           |
| Total Monthly Hours      | 24 hours × No. of days in the month.                                                                                                                          |
| Downtime Recording Start | Begins at call registration/notification of issue to SI.                                                                                                      |
| Downtime Recording End   | Ends when issue is resolved and service is restored.                                                                                                          |
| Exclusions from Downtime | - Approved scheduled maintenance; - Failover time ≤ 30 min; - Bugs affecting partial services; - Deferred downtime if DISCOM continues using faulty equipment |
| Failover Grace Time      | Up to 30 minutes allowed in cluster setup; beyond that, treated as downtime with penalties.                                                                   |
| Special Condition        | If DISCOM delays equipment release for repairs, downtime count starts after handover to SI.                                                                   |

#### 1. Typical Response Time Standards for Web Portal and Business Application Performance

| SNO | Service                                                                          | Parameters                                                                                                                                                                                                                                           | Service Level      |
|-----|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 1   | Response time is an important factor from the perspective of End User Experience | Average loading time of Static Page in a Web Portal for all the applications irrespective of the configuration changes made by the user and the respective sizing (such as compute and memory) implications.                                         | < 50 milli seconds |
| 2   | Responsiveness of DISCOM portal would be critical to solution's performance      | Average response time of Dynamic Content Pages in a Web Portal (excluding Human Input time) for all the applications irrespective of the configuration changes made by the user and the respective sizing (such as compute and memory) implications. | < 1 sec            |

|   |                                            |                                                                                 |         |
|---|--------------------------------------------|---------------------------------------------------------------------------------|---------|
| 3 | Responsiveness of ISA Business Application | Average response time for ISA Business Application (excluding Human Input time) | < 1 sec |
|---|--------------------------------------------|---------------------------------------------------------------------------------|---------|

2. Typical Facility Management Services (FMS) availability & duration of their requirement

| Support Category | Criteria                                                                                                                                                                | Maximum Response Time | Maximum Resolution time |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------|
| High             | There is a problem with a part of the system, which impacts on DISCOM's decision making. No viable workaround is available.<br>There is a likelihood of financial loss. | 1 Hour                | 6 Hours                 |
| Medium           | The efficiency of users is being impacted but has a viable workaround.                                                                                                  | 2 Hours               | 24 Hours                |
| Low              | A fault, which has no particular impact on processing of normal business activities.                                                                                    | 8 Hours               | 48 Hours                |
| Note:            | Financial loss means inability to bill or collect revenue from the system                                                                                               |                       |                         |

## Service Delivery & Performance Monitoring

| S. No. | Service                                                                                  | Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Service level                                                                                                         | Validation                                                                                                                           | Penalty                                                                                        |
|--------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| 1      | Availability Management                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                       |                                                                                                                                      |                                                                                                |
| 1.1    | Business Applications Software (Core GIS, Network Analysis, and load forecasting system) | <p>A Fault Scenario is defined as an application outage that meets ALL of the following conditions:</p> <ol style="list-style-type: none"> <li>1. Application is NOT under planned maintenance – Scheduled maintenance windows communicated to users do not count as fault scenarios</li> <li>2. Fault is NOT relating to server hardware issues provided by DISCOM – Where DISCOM provides the physical servers, hardware failures on those servers are excluded from this SLA</li> <li>3. <math>\geq 20\%</math> of concurrent active users unable to access the</li> </ol> | Fault scenarios should not cover more than 0.5% of the total available period for the quarter (~8 hours per quarter). | Availability & Downtime Reports measured using Management Tool. Measured 24*7 Basis and Validated by Monthly SLA Performance Report. | 0.5% of quarterly subscription cost per hour of fault scenarios in excess of SLA, capped at 4% |

|     |                                                    |                                                                                                                                                                                                                                                                                                                             |                                                                      |                                                                                                                                                                                                              |                                                                                                                                                                                                         |
|-----|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     |                                                    | application                                                                                                                                                                                                                                                                                                                 |                                                                      |                                                                                                                                                                                                              |                                                                                                                                                                                                         |
| 1.2 | Problem Management                                 | <ul style="list-style-type: none"> <li>• SI shall submit a comprehensive Problem Management Report every quarter covering all incident types with more than 10 occurrences in that quarter</li> <li>• SI shall implement corrective and preventive actions within the quarter in which the problem is identified</li> </ul> | 100% timely submission covering all incidents logged in that quarter | <ul style="list-style-type: none"> <li>• Root Cause Analysis Report and Incident Register for the quarter</li> <li>• Evidence of Corrective and Preventive Actions implemented during the quarter</li> </ul> | <ul style="list-style-type: none"> <li>• 0.5% of Quarterly Subscription Cost if SI does not submit complete Problem Management Report for the quarter or 100 % non coverage of the incidents</li> </ul> |
| 1.3 | Implementation of Audit/Regulatory Recommendations | Implementation of audit recommendations given by ISA or its auditor/regulator which have been agreed by SI to be implemented.                                                                                                                                                                                               | 100%                                                                 | Completion within agreed timeline and Reports                                                                                                                                                                | 0.1% per day of delay on an incremental basis, capped at 1% of Quarterly Subscription Cost                                                                                                              |
| 1.4 | Change Management                                  | Resolution of Change Management ticket                                                                                                                                                                                                                                                                                      | 99%                                                                  | Monthly Reports                                                                                                                                                                                              | 0.5% of Quarterly Subscription Cost if SI does not submit complete Change Management Report for the quarter or service level performance is below 99%                                                   |
| 2   | Helpdesk Service Levels support                    |                                                                                                                                                                                                                                                                                                                             |                                                                      |                                                                                                                                                                                                              |                                                                                                                                                                                                         |

|                                                                                                                                                                                                                                                                                                                                      |                                         |                       |                                    |                                                                        |                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------|------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------|
| 2.1                                                                                                                                                                                                                                                                                                                                  | Batch Operation Completion              | High priority         | Should be resolved within 6 hours  | The high impact problem with effect on the efficiency of users.        | Penalty (if not met) 0.25% per incident, max 5% per quarter |
| 2.2                                                                                                                                                                                                                                                                                                                                  | Critical Incident – Business Disruption | Medium priority       | Should be resolved within 24 hours | The low impact problem with effect on the efficiency of users.         |                                                             |
| 2.3                                                                                                                                                                                                                                                                                                                                  | Partial System Impact                   | Low priority incident | Should be resolved within 48 hours | A fault, which has no particular impact on normal business activities. |                                                             |
| Remarks: <ol style="list-style-type: none"> <li>1. The total cumulative penalty shall be limited to a maximum of 7% of the quarterly invoice amount</li> <li>2. The Successful Bidder shall submit the reporting formats asked in the SLA and obtain their joint approval from ISA and DISCOM prior to the Go-Live stage.</li> </ol> |                                         |                       |                                    |                                                                        |                                                             |

## Section 6: Returnable Bidding Forms / Checklist

This form serves as a checklist for preparation of your Proposal. Please complete the Returnable Bidding Forms in accordance with the instructions in the forms and return them as part of your Proposal submission. No alteration to format of forms shall be permitted and no substitution shall be accepted.

Before submitting your Proposal, please ensure compliance with the Proposal Submission instructions of the BDS 22.

### Technical Proposal Envelope:

|                                                                                                             |                          |
|-------------------------------------------------------------------------------------------------------------|--------------------------|
| Have you duly completed all the Returnable Bidding Forms?                                                   |                          |
| ▪ Form A: Technical Proposal Submission Form                                                                | <input type="checkbox"/> |
| ▪ Form B: Bidder Information Form                                                                           | <input type="checkbox"/> |
| ▪ Form C: Joint Venture/Consortium/ Association Information Form                                            | <input type="checkbox"/> |
| ▪ Form D: Qualification Form                                                                                | <input type="checkbox"/> |
| ▪ Form E: Format of Technical Proposal                                                                      | <input type="checkbox"/> |
| ▪ [Add other forms as necessary]                                                                            | <input type="checkbox"/> |
| Have you provided the required documents to establish compliance with the evaluation criteria in Section 4? | <input type="checkbox"/> |

### Financial Proposal Envelope

(Must be submitted in a separate sealed envelope/password protected email)

|                                              |                          |
|----------------------------------------------|--------------------------|
| ▪ Form F: Financial Proposal Submission Form | <input type="checkbox"/> |
| ▪ Form G: Financial Proposal Form            | <input type="checkbox"/> |

Form A: Technical Proposal Submission Form

|                 |                               |       |             |
|-----------------|-------------------------------|-------|-------------|
| Name of Bidder: | [Insert Name of Bidder]       | Date: | Select date |
| RFP reference:  | [Insert RFP Reference Number] |       |             |

We, the undersigned, offer to provide the services for [Insert Title of services] in accordance with your Request for Proposal No. [Insert RFP Reference Number] and our Proposal. We are hereby submitting our Proposal, which includes this Technical Proposal and our Financial Proposal sealed under a separate envelope.

We hereby declare that our firm, its affiliates or subsidiaries or employees, including any JV/Consortium /Association members or subcontractors or suppliers for any part of the contract:

- a) is not under procurement prohibition by the United Nations, including but not limited to prohibitions derived from the Compendium of United Nations Security Council Sanctions Lists;
- b) have not been suspended, debarred, sanctioned or otherwise identified as ineligible by any UN Organization or the World Bank Group or any other international Organization;
- c) have no conflict of interest in accordance with Instruction to Bidders Clause 4;
- d) do not employ, or anticipate employing, any person(s) who is, or has been an ISA staff member within the last year, if said ISA staff member has or had prior professional dealings with our firm in his/her capacity as ISA staff member within the last three years of service with the ISA;
- e) have not declared bankruptcy, are not involved in bankruptcy or receivership proceedings, and there is no judgment or pending legal action against them that could impair their operations in the foreseeable future;
- f) undertake not to engage in proscribed practices, including but not limited to corruption, fraud, coercion, collusion, obstruction, or any other unethical practice, with the ISA or any other party, and to conduct business in a manner that averts any financial, operational, reputational or other undue risk to the ISA and we *embrace the principles of the ISA Supplier Code of Conduct* [https://isolaralliance.org/images/ISA%20Supplier%20Code%20of%20Conduct\\_14.4.2023.final%20version.pdf](https://isolaralliance.org/images/ISA%20Supplier%20Code%20of%20Conduct_14.4.2023.final%20version.pdf)

*We declare that all the information and statements made in this Proposal are true and we accept that any misinterpretation or misrepresentation contained in this Proposal may lead to our disqualification and/or sanctioning by the ISA.*

*We offer to provide services in conformity with the Bidding documents, including the ISA General Conditions of Contract and in accordance with the Terms of Reference [https://www.isolaralliance.org/images/ISA\\_GTB.pdf](https://www.isolaralliance.org/images/ISA_GTB.pdf)*

*Our Proposal shall be valid and remain binding upon us for the period of time specified in the Bid Data Sheet.*

We understand and recognize that you are not bound to accept any Proposal you receive.

*I, the undersigned, certify that I am duly authorized by [Insert Name of Bidder] to sign this Proposal and bind it should ISA accept this Proposal.*

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

*[Stamp with official stamp of the Bidder]*

## Form B: Bidder Information Form

|                                                                                                                                                  |                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Legal name of Bidder                                                                                                                             | [Complete]                                                                                                                                                                                                             |
| Legal address                                                                                                                                    | [Complete]                                                                                                                                                                                                             |
| Year of registration                                                                                                                             | [Complete]                                                                                                                                                                                                             |
| Bidder's Authorized Representative Information                                                                                                   | Name and Title: [Complete]<br>Telephone numbers: [Complete]<br>Email: [Complete]                                                                                                                                       |
| Are you a UNGM registered vendor?                                                                                                                | <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, [insert UGNM vendor number]                                                                                                                           |
| Are you an ISA vendor?                                                                                                                           | <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                                               |
| Countries of operation                                                                                                                           | [Complete]                                                                                                                                                                                                             |
| No. of full-time employees                                                                                                                       | [Complete]                                                                                                                                                                                                             |
| Quality Assurance Certification (e.g. ISO 9000 or Equivalent) <i>(If yes, provide a Copy of the valid Certificate):</i>                          | [Complete]                                                                                                                                                                                                             |
| Does your Company hold any accreditation such as ISO 14001 related to the environment? <i>(If yes, provide a Copy of the valid Certificate):</i> | [Complete]                                                                                                                                                                                                             |
| Does your Company have a Written Statement of its Environmental Policy? <i>(If yes, provide a Copy)</i>                                          | [Complete]                                                                                                                                                                                                             |
| Contact person ISA may contact for requests for clarification during Proposal evaluation                                                         | Name and Title: [Complete]<br>Telephone numbers: [Complete]<br>Email: [Complete]                                                                                                                                       |
| Please attach the following documents:                                                                                                           | <ul style="list-style-type: none"> <li>Company Profile, which should <u>not</u> exceed fifteen (15) pages, including printed brochures and product catalogues relevant to the goods/services being procured</li> </ul> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>▪ Certificate of Incorporation/ Business Registration</li> <li>▪ Tax Registration/Payment Certificate issued by the Internal Revenue Authority evidencing that the Bidder is updated with its tax payment obligations, or Certificate of Tax exemption, if any such privilege is enjoyed by the Bidder</li> <li>▪ Trade name registration papers, if applicable</li> <li>▪ Local Government permit to locate and operate in assignment location, if applicable</li> <li>▪ Official Letter of Appointment as local representative, if Bidder is submitting a Bid in behalf of an entity located outside the country</li> <li>▪ Power of Attorney</li> </ul> |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Form C: Joint Venture/Consortium/Association Information Form**

|                 |                               |                       |             |
|-----------------|-------------------------------|-----------------------|-------------|
| Name of Bidder: | [Insert Name of Bidder]       | D<br>a<br>t<br>e<br>: | Select date |
| RFP reference:  | [Insert RFP Reference Number] |                       |             |

To be completed and returned with your Proposal if the Proposal is submitted as a Joint Venture/Consortium/Association.

| No | Name of Partner and contact information ( <i>address, telephone numbers, fax numbers, e-mail address</i> ) | Proposed proportion of responsibilities (in %) and type of services to be performed |
|----|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1  | [Complete]                                                                                                 | [Complete]                                                                          |
| 2  | [Complete]                                                                                                 | [Complete]                                                                          |
| 3  | [Complete]                                                                                                 | [Complete]                                                                          |

|                                                                                                                                                                            |            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Name of leading partner (with authority to bind the JV, Consortium, Association during the RFP process and, in the event a Contract is awarded, during contract execution) | [Complete] |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|

We have attached a copy of the below document signed by every partner, which details the likely legal structure of and the confirmation of joint and severable liability of the members of the said joint venture:

☐ Letter of intent to form a joint venture agreement      OR      ☐ JV/Consortium/Association

We hereby confirm that if the contract is awarded, all parties of the Joint Venture/Consortium/Association shall be jointly and severally liable to ISA for the fulfillment of the provisions of the Contract.

Name of partner:

\_\_\_\_\_

Signature:

\_\_\_\_\_

Name of partner:

\_\_\_\_\_

Signature:

\_\_\_\_\_

Date:

\_\_\_\_\_  
\_\_\_\_\_

Name of partner:

\_\_\_\_\_  
\_\_\_\_\_

Signature:

\_\_\_\_\_

Date:

\_\_\_\_\_  
\_\_\_\_\_

Date:

\_\_\_\_\_  
\_\_\_\_\_

Name of partner:

\_\_\_\_\_  
\_\_\_\_\_

Signature:

\_\_\_\_\_

Date:

\_\_\_\_\_  
\_\_\_\_\_

**FORM D: QUALIFICATION FORM**

|                 |                               |       |             |
|-----------------|-------------------------------|-------|-------------|
| Name of Bidder: | [Insert Name of Bidder]       | Date: | Select date |
| RFP reference:  | [Insert RFP Reference Number] |       |             |

If JV/Consortium/Association, to be completed by each partner.

**Historical Contract Non-Performance**

|                                                                                      |                                   |                                                                         |                                               |
|--------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------|-----------------------------------------------|
| <input type="checkbox"/> Contract non-performance did not occur for the last 3 years |                                   |                                                                         |                                               |
| <input type="checkbox"/> Contract(s) not performed for the last 3 years              |                                   |                                                                         |                                               |
| Year                                                                                 | Non-performed portion of contract | Contract Identification                                                 | Total Contract Amount (current value in US\$) |
|                                                                                      |                                   | Name of Client:<br>Address of Client:<br>Reason(s) for non-performance: |                                               |

**Litigation History (including pending litigation)**

|                                                                     |                             |                         |                                               |
|---------------------------------------------------------------------|-----------------------------|-------------------------|-----------------------------------------------|
| <input type="checkbox"/> No litigation history for the last 3 years |                             |                         |                                               |
| <input type="checkbox"/> Litigation History as indicated below      |                             |                         |                                               |
| Year of dispute                                                     | Amount in dispute (in US\$) | Contract Identification | Total Contract Amount (current value in US\$) |
|                                                                     |                             |                         |                                               |

|        |  |                                                                                                                                                     |  |
|--------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|
| t<br>e |  |                                                                                                                                                     |  |
|        |  | Name of Client:<br>Address of Client:<br>Matter in dispute:<br>Party who initiated the dispute:<br>Status of dispute:<br>Party awarded if resolved: |  |

#### Previous Relevant Experience

Please list only previous similar assignments successfully completed in the last 3 years.

List only those assignments for which the Bidder was legally contracted or sub-contracted by the Client as a company or was one of the Consortium/JV partners. Assignments completed by the Bidder's individual experts working privately or through other firms cannot be claimed as the relevant experience of the Bidder, or that of the Bidder's partners or sub-consultants, but can be claimed by the Experts themselves in their CVs. The Bidder should be prepared to substantiate the claimed experience by presenting copies of relevant documents and references if so, requested by ISA.

| Project name & Country of Assignment | Client & Reference Contact Details | Contract Value | Period of activity and status | Types of activities undertaken |
|--------------------------------------|------------------------------------|----------------|-------------------------------|--------------------------------|
|                                      |                                    |                |                               |                                |
|                                      |                                    |                |                               |                                |
|                                      |                                    |                |                               |                                |

*Bidders may also attach their own Project Data Sheets with more details for assignments above.*

☐ Attached are the Statements of Satisfactory Performance from the Top 3 (three) Clients or more.

#### Financial Standing

|                                      |      |     |
|--------------------------------------|------|-----|
| Annual Turnover for the last 3 years | Year | USD |
|                                      | Year | USD |
|                                      | Year | USD |

|                                                       |  |
|-------------------------------------------------------|--|
| Latest Credit Rating (if any),<br>indicate the source |  |
|-------------------------------------------------------|--|

| Financial information<br>(in US\$ equivalent) | Historic information for the last 3 years |        |        |
|-----------------------------------------------|-------------------------------------------|--------|--------|
|                                               | Year 1                                    | Year 2 | Year 3 |
|                                               | <i>Information from Balance Sheet</i>     |        |        |
| Total Assets (TA)                             |                                           |        |        |
| Total Liabilities (TL)                        |                                           |        |        |
| Current Assets (CA)                           |                                           |        |        |
| Current Liabilities (CL)                      |                                           |        |        |
|                                               | <i>Information from Income Statement</i>  |        |        |
| Total / Gross Revenue (TR)                    |                                           |        |        |
| Profits Before Taxes (PBT)                    |                                           |        |        |
| Net Profit                                    |                                           |        |        |
| Current Ratio                                 |                                           |        |        |

☐ Attached are copies of the audited financial statements (balance sheets, including all related notes, and income statements) for the years required above complying with the following condition:

- a) Must reflect the financial situation of the Bidder or party to a JV, and not sister or parent companies;
- b) Historic financial statements must be audited by a certified public accountant;
- c) Historic financial statements must correspond to accounting periods already completed and audited. No statements for partial periods shall be accepted.

### Form E: Format of Technical Proposal

Please ensure that the information below is adapted in accordance with the technical evaluation criteria included in Section 4. The below sections correspond to the sample criteria included in this template RFP in Section 4]

|                 |                               |       |             |
|-----------------|-------------------------------|-------|-------------|
| Name of Bidder: | [Insert Name of Bidder]       | Date: | Select date |
| RFP reference:  | [Insert RFP Reference Number] |       |             |

The Bidder's proposal should be organized to follow this format of Technical Proposal. Where the bidder is presented with a requirement or asked to use a specific approach, the bidder must not only state its acceptance, but also describe how it intends to comply with the requirements. Where a descriptive response is requested, failure to provide the same will be viewed as non-responsive.

#### SECTION 1: Bidder's qualification, capacity and expertise

- 1.1 Brief description of the organization, including the year and country of incorporation, and types of activities undertaken.
- 1.2 Specific organizational capability which is likely to affect implementation: management structure, financial stability and project financing capacity, project management controls.
- 1.3 Relevance of specialized knowledge and experience on similar engagements for fund-raising done in the region/country.
- 1.4 Quality assurance procedures and risk mitigation measures.
- 1.5 Organization's commitment to sustainability.

#### SECTION 2: Proposed Methodology, Approach and Implementation Plan

This section should demonstrate the bidder's responsiveness to the TOR by identifying the specific components proposed, addressing the requirements, providing a detailed description of the essential performance characteristics proposed and demonstrating how the proposed approach and methodology meets or exceeds the requirements. All important aspects should be addressed in sufficient detail and different components of the project should be adequately weighted relative to one another.

- 2.1 A detailed description of the approach and methodology for how the Bidder will achieve the Terms of Reference of the project, keeping in mind the appropriateness to local conditions and project environment. Details how the different service elements shall be organized, controlled and delivered.

- 2.2 The methodology shall also include details of the Bidder's internal technical and quality assurance review mechanisms.
- 2.3 Description of available performance monitoring and evaluation mechanisms and tools; how they shall be adopted and used for a specific requirement.
- 2.4 Implementation plan including a Gantt Chart or Project Schedule indicating the detailed sequence of activities that will be undertaken and their corresponding timing.
- 2.5 Demonstrate how you plan to integrate sustainability measures in the execution of the contract.
- 2.6 Any other comments or information regarding the project approach and methodology that will be adopted.

#### SECTION 2A: Bidder's Comments and Suggestions on the Terms of Reference

Provide comments and suggestions on the Terms of Reference, or additional services that will be rendered beyond the requirements of the TOR, if any.

#### SECTION 3: Management Structure and Key Personnel

- 3.1 Describe the overall management approach toward planning and implementing the project. Include an organization chart for the management of the project describing the relationship of key positions and designations. Provide a spreadsheet to show the activities of each personnel and the time allocated for his/her involvement.
- 3.2 Provide CVs for key personnel that will be provided to support the implementation of this project using the format below. CVs should demonstrate qualifications in areas relevant to the Scope of Services.

Format for CV of Proposed Key Personnel

|                              |          |
|------------------------------|----------|
| NAME OF PERSONNEL            | [INSERT] |
| POSITION FOR THIS ASSIGNMENT | [INSERT] |
| NATIONALITY                  | [INSERT] |
| LANGUAGE PROFICIENCY         | [INSERT] |

|                                              |                                                                                                                                                                                                                                     |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>EDUCATION/<br/>QUALIFICATIONS</p> <hr/>   | <p><i>[SUMMARIZE COLLEGE/UNIVERSITY AND OTHER SPECIALIZED EDUCATION OF PERSONNEL MEMBER, GIVING NAMES OF SCHOOLS, DATES ATTENDED, AND DEGREES/QUALIFICATIONS OBTAINED.]</i></p> <hr/> <p>[INSERT]</p>                               |
| <p>PROFESSIONAL<br/>CERTIFICATIONS</p> <hr/> | <p><i>[PROVIDE DETAILS OF PROFESSIONAL CERTIFICATIONS RELEVANT TO THE SCOPE OF SERVICES]</i></p> <hr/> <ul style="list-style-type: none"> <li>▪ NAME OF INSTITUTION: [INSERT]</li> <li>▪ DATE OF CERTIFICATION: [INSERT]</li> </ul> |

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>EMPLOYMENT<br/>RECORD/<br/>EXPERIENCE</p> | <p><i>[LIST ALL POSITIONS HELD BY PERSONNEL (STARTING WITH PRESENT POSITION, LIST IN REVERSE ORDER), GIVING DATES, NAMES OF EMPLOYING ORGANIZATION, TITLE OF POSITION HELD AND LOCATION OF EMPLOYMENT. FOR EXPERIENCE IN LAST FIVE YEARS, DETAIL THE TYPE OF ACTIVITIES PERFORMED, DEGREE OF RESPONSIBILITIES, LOCATION OF ASSIGNMENTS AND ANY OTHER INFORMATION OR PROFESSIONAL EXPERIENCE CONSIDERED PERTINENT FOR THIS ASSIGNMENT.]</i></p> <hr/> <p>[INSERT]</p> |
| <p>REFERENCE</p>                             | <p><i>[PROVIDE NAMES, ADDRESSES, PHONE AND EMAIL CONTACT INFORMATION FOR TWO (2) REFERENCES]</i></p>                                                                                                                                                                                                                                                                                                                                                                 |

S

REFERENCE 1:

[INSERT]

REFERENCE 2:

[INSERT]

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe my qualifications, my experiences, and other relevant information about myself.

\_\_\_\_\_  
Signature of Personnel  
(Day/Month/Year)

\_\_\_\_\_  
Date

Form F: Financial Proposal Submission Form

|                 |                               |       |             |
|-----------------|-------------------------------|-------|-------------|
| Name of Bidder: | [Insert Name of Bidder]       | Date: | Select date |
| RFP reference:  | [Insert RFP Reference Number] |       |             |

We, the undersigned, offer to provide the services for [Insert Title of services] in accordance with your Request for Proposal No. [Insert RFP Reference Number] and our Proposal. We are hereby submitting our Proposal, which includes this Technical Proposal and our Financial Proposal sealed under a separate envelope.

Our attached Financial Proposal is for the sum of [Insert amount in words and figures]

*Our Proposal shall be valid and remain binding upon us for the period of time specified in the Bid Data Sheet.*

We understand you are not bound to accept any Proposal you receive.

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

*[Stamp with official stamp of the Bidder]*

## Form G: Financial Proposal Form

|                 |                               |       |             |
|-----------------|-------------------------------|-------|-------------|
| Name of Bidder: | [Insert Name of Bidder]       | Date: | Select date |
| RFP reference:  | [Insert RFP Reference Number] |       |             |

The Bidder is required to prepare the Financial Proposal following the below format and submit it in an envelope separate from the Technical Proposal as indicated in the Instruction to Bidders. Any Financial information provided in the Technical Proposal shall lead to Bidder's disqualification.

The Financial Proposal should align with the requirements in the Terms of Reference and the Bidder's Technical Proposal.

Table 1: Summary of Overall Prices

|                                                                                                                                                                               | Amount(s)                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>Professional Fees</b><br><br>The lump-sum amount to be quoted with the inclusion of all costs associated with the successful completion of this assignment as per the TOR. | All Bidders shall quote only one price for Digitization & Digital twin Deployment |
| Other Costs (Annual Levelized Subscription Cost* for 5 year)                                                                                                                  |                                                                                   |
| Taxes (if applicable)                                                                                                                                                         |                                                                                   |
| Total Amount of Financial Proposal                                                                                                                                            |                                                                                   |

\*The Agency shall quote the annual subscription fee. The subscription shall initially be contracted for a period of one (1) year only. The subscription cost for the first year shall be paid by ISA. Subject to the Agency's satisfactory performance during the first year and the budgetary provisions, the subscription costs for the subsequent next four (4) years, if continued, shall be paid by the respective DISCOMs. For illustration purposes, if the Agency quotes an annual subscription fee of USD 10,000, ISA shall bear the cost for Year 1, and the concerned DISCOM shall bear the same quoted annual cost for Year 2 till Year 5, as applicable.