

RFP No.: 6/ISA-MDTF/2026-ISA

Issued on: 10/08/2026

Request For Proposal

**For Appointment of a System Integrator (SI) for AI-Enabled
Interoperable Utility Intelligence Platform for Network Planning, Grid
Analytics and DER Integration**



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RFP Notice

1. International Solar Alliance invites proposal for Appointment of a System Integrator (SI) for AI-Enabled Interoperable Utility Intelligence Platform for Network Planning, Grid Analytics and DER Integration
2. The content of this RFP (6/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.
3. 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. 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.
4. 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 before 13.09.2026, by 11:59 PM (IST) addressed to: MDTF Procurement, International Solar Alliance (ISA) at mdtf_procurement@isa.int with subject line "RFP for Appointment of a System Integrator (SI) for AI-Enabled Interoperable Utility Intelligence Platform for Network Planning, Grid Analytics and DER Integration".
5. 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	10.08.2026	ISA Website
b)	Pre-Bid Meeting	24.08.2026	3:00 PM (IST) Meeting link: https://teams.microsoft.com/meet/418385297756200?p=9uipQ4F9xV8VquFfCv Registration Link: Registration for Pre-Bid Meeting – Fill out form
b)	Last date for Submission of query through e-mail: mdtf_procurement@isa.int	26.08.2026	05:00 PM (IST)

c)	Last date for receipt of documents as per RFP	13.09.2026	11:59 PM (IST) to be submitted to mdtf_procurement@isa.int
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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
- 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, 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 clarification, 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.

Section 2. Instructions to Bidders

GENERAL PROVISIONS	
1. <i>Introduction</i>	1.1 Bidders shall adhere to all the requirements of this RFP, including any amendments in Writing by ISA. 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.
2. <i>Fraud & Corruption, Gifts and Hospitality</i>	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. 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. 2.3 In pursuance of this policy, ISA (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; (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. 2.4 All Bidders must adhere to the ISA Supplier Code of Conduct, which may be found at ISA Supplier Code of Conducts.pdf
3. <i>Eligibility</i>	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. 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.
4. <i>Conflict of Interests</i>	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: 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; b) Were involved in the preparation and/or design of the programme/project related to the services requested under this RFP; or c) Are found to be in conflict for any other reason, as may be established by, or at the discretion of ISA. 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. 4.3 Similarly, the Bidders must disclose in their proposal their knowledge of the following: 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 b) All other circumstances that could potentially lead to actual or perceived conflict of interest, collusion or unfair competition practices. Failure to disclose such an information may result in the rejection of the proposal or proposals affected by the non-disclosure. 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, 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.
PREPARATION OF PROPOSALS	
5. <i>General Considerations</i>	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. 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

<i>6. Cost of Preparation of Proposal</i>	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.
<i>7. Language</i>	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.
<i>8. Documents Comprising the Proposal</i>	8.1 The Proposal shall comprise of the following documents: c) Documents Establishing the Eligibility and Qualifications of the Bidder; d) Technical Proposal; e) Financial Proposal; f) Proposal Security, if required by BDS; g) Any attachments and/or appendices to the Proposal.
<i>9. Documents Establishing the Eligibility and Qualifications of the Bidder</i>	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.
<i>10. Technical Proposal Format and Content</i>	10.1 The Bidder is required to submit a Technical Proposal using the Standard Forms and templates provided in Section 6 of the RFP. 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. 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 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.
<i>11. Financial Proposals</i>	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. 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. 11.3 Prices and other financial information must not be disclosed in any other place except in the financial proposal.

<i>12. Proposal Security</i>	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. 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. 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. 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. 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: a) If the Bidder withdraws its offer during the period of the Proposal Validity specified in the BDS, or; b) In the event that the successful Bidder fails: i. to sign the Contract after ISA has issued an award; or 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.
<i>13. Currencies</i>	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: 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 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.
<i>14. Joint Venture, Consortium or Association</i>	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. 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. 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. 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. 14.5 A JV, Consortium or Association in presenting its track record and experience should clearly differentiate between: a) Those that were undertaken together by the JV, Consortium or Association; and b) Those that were undertaken by the individual entities of the JV, Consortium or Association. 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. 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.
<i>15.Only One Proposal</i>	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. 15.2 Proposals submitted by two (2) or more Bidders shall all be rejected if they are found to have any of the following: h) they have at least one controlling partner, director or shareholder in common; or i) any one of them receive or have received any direct or indirect subsidy from the other/s; or j) they have the same legal representative for purposes of this RFP; or 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; 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

	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.
<i>16.Proposal Validity Period</i>	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. 16.2 During the Proposal validity period, the Bidder shall maintain its original Proposal without any change, including the availability of the Key Personnel, the proposed rates and the total price.
<i>17.Extension of Proposal Validity Period</i>	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. 17.2 If the Bidder agrees to extend the validity of its Proposal, it shall be done without any change in the original Proposal. 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.
<i>18.Clarification of Proposal</i>	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. 18.2 ISA will provide the responses to clarifications through the method specified in the BDS. 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.
<i>19.Amendment of Proposals</i>	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. 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.
<i>20.Alternative Proposals</i>	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 award a contract based on an alternative proposal. 20.2 If multiple/alternative proposals are being submitted, they must be clearly marked as “Main Proposal” and “Alternative Proposal”
<i>21.Pre-Bid Conference</i>	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.
SUBMISSION AND OPENING OF PROPOSALS	
<i>22.Submission</i>	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. 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. 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. ISA GTBs.pdf
<i>Email Submission</i>	22.4 Email submission, if allowed or specified in the BDS, shall be governed as follows: a) Electronic files that form part of the proposal must be in accordance with the format and requirements indicated in BDS; b) The Technical Proposal and the Financial Proposal files MUST BE COMPLETELY SEPARATE. The financial proposal shall be encrypted with password and clearly labeled. The files must be sent to the dedicated email address specified in the BDS. 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 provide correct password may result in the proposal being rejected.
<i>23.Deadline for Submission of</i>	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

<i>Proposals and Late Proposals</i>	date and time that the bid was received by ISA 23.2 ISA shall not consider any Proposal that is submitted after the deadline for the submission of Proposals.
<i>24. Withdrawal, Substitution, and Modification of Proposals</i>	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. 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" 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.
<i>25. Proposal Opening</i>	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.
EVALUATION OF PROPOSALS	
<i>26. Confidentiality</i>	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. 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.
<i>27. Evaluation of Proposals</i>	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 Financial Proposals. 27.2 Evaluation of proposals is made of the following steps: • Preliminary Examination • Minimum Eligibility and Qualification (if pre-qualification is not done) • Evaluation of Technical Proposals • Evaluation of Financial Proposals
<i>28. Preliminary Examination</i>	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.
<i>29.Evaluation of Eligibility and Qualification</i>	1. Eligibility and Qualification of the Bidder will be evaluated against the Minimum Eligibility/Qualification requirements specified in the Section 4 (Evaluation Criteria). 2. In general terms, vendors that meet the following criteria may be considered qualified: i. They are not included in the UN Security Council 1267/1989 Committee's list of terrorists and terrorist financiers. ii. They have a good financial standing and have access to adequate financial resources to perform the contract and all existing commercial commitments, 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; iv. They are able to comply fully with ISA General Terms and Conditions of Contract; v. They do not have a consistent history of court/arbitral award decisions against the Bidder; and vi. They have a record of timely and satisfactory performance with their clients. 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.
<i>30.Evaluation of Technical and Financial Proposals</i>	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 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. 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.

	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. 30.4 When the BDS specifies a combined scoring method, the formula for the rating of the Proposals will be as follows: <u>Rating the Technical Proposal (TP):</u> TP Rating = (Total Score Obtained by the Offer / Max. Obtainable Score for TP) x 100 <u>Rating the Financial Proposal (FP):</u> FP Rating = (Lowest Priced Offer / Price of the Offer Being Reviewed) x 100 <u>Total Combined Score:</u> Combined Score = (TP Rating) x (Weight of TP, e.g. 70%/100) + (FP Rating) x (Weight of FP, e.g., 30%/100)
31. Due Diligence	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 the following: a) Verification of accuracy, correctness and authenticity of information provided by the Bidder; 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; 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; 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; e) Physical inspection of the Bidder's offices, branches or other places where business transpires, with or without notice to the Bidder; f) Other means that ISA may deem appropriate, at any stage within the selection process, prior to awarding the contract.
32. Clarification of Proposals	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.

	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. 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.
<i>33.Responsiveness of Proposal</i>	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. 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.
<i>34.Nonconformities, Repairable Errors and Omissions</i>	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 deviation. 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. 34.3 For Financial Proposal that has been opened, ISA shall check and correct arithmetical errors as follows: 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; 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 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. 34.4 If the Bidder does not accept the correction of errors made by ISA, its Proposal shall be rejected.

AWARD OF CONTRACT	
<i>35.Right to Accept, Reject, Any or All Proposals</i>	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.
<i>36.Award Criteria</i>	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.
<i>37.Right to Vary Requirements at the Time of Award</i>	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.
<i>38.Contract Signature</i>	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.
<i>39.Performance Security</i>	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.
<i>40.Bank Guarantee for Advanced Payment</i>	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.
<i>41.Liquidated Damages</i>	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.
<i>42.Payment Provisions</i>	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.
<i>43.Other Provisions</i>	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. 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. 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.
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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.

BDS No.	Ref. to Section.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	August 24, 2026, 3:00 PM – 3:30 PM (IST) Pre-Bid Meeting Link: https://teams.microsoft.com/meet/418385297756200?p=9uipQ4F9xV8VquFfCv Registration Link: Registration for Pre-Bid Meeting – Fill out form
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: a. Where the contractor fails to fulfill the performance of the deliverables in accordance with the specified timelines in the approved strategy document or 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 weekly charge of 5% (five percent) of the total contract sum, for each week of the weekly 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.
9	40	Performance Security	NIL
10	18	Currency of Proposal	US Dollars/Indian Rupees 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: https://treasury.un.org/operationalrates/OperationalRates.php
11	31	Deadline for submitting requests for clarifications/ questions	August 26, 2026, 5:00 PM (IST)
12	31	Contact Details for submitting clarifications/questions	Focal Person in ISA: MDTF In charge, ISA E-mail: mdtf_procurement@isa.int
13	18, 19 and 21	Manner of Disseminating Supplemental Information to the RFP and responses/clarifications to queries	Direct communication to prospective Proposers by email E-mail: mdtf_procurement@isa.int
14	23	Deadline of Submission	September 13, 2026 (11:59 PM IST)
14	22	Allowable Manner of Submitting Proposals	☐ Submission by email
15	22	Proposal Submission Address	E-mail: mdtf_procurement@isa.int
16	22	Electronic submission (email) requirements	▪ Format: PDF files only ▪ File names must be maximum 60 characters long and must not contain any letter or special character other than from Latin alphabet/keyboard. ▪ All files must be free of viruses and not corrupted. ▪ Password for financial proposal <u>must</u> not be provided to ISA until requested by ISA ▪ Max. File Size per transmission: 5 MB

17	27 36	Evaluation Method for the Award of Contract	Combined Scoring Method, using the 70%-30% distribution for technical and financial proposals respectively The minimum technical score required to pass is 70%.
18		Expected date for commencement of Contract	November 2026
19		Maximum expected duration of contract	The project deliverables shall be completed within nine months from the commencement of the contract.
20	35	ISA will award the contract to:	One or more Proposers. ISA reserves the right to award the Contract, in whole or in part, to more than one successful Proposer based on the outcome of the evaluation and ISA's requirements.
21	39	Type of Contract	Services contract
22		Other Information Related to the RFP	<i>[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]</i>

Section 4. Evaluation Criteria

4.1 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. 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 ¹	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

¹ 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.

4.2 Minimum Eligibility Criteria (Pre-Requisite)

Criteria	Requirements	Supporting Documents	Max Points		
Technical Requirements					
Years of Operation	The Sole/ Lead Bidder must demonstrate prior experience in the technology or power sector. Points will be awarded based on the number of completed years of relevant operation as of the bid submission date.		Certificate of Incorporation, Company Profile	15	
	Years of Operation	Marks			
	up to ≤ 5 years	10			
	> 5 years	15			
Relevant Project Experience	The Sole Bidder/Lead Bidder/any Consortium Member should have successfully implemented Eligible Projects involving AI-enabled Digital Utility Platforms, Digital Twin solutions, network analysis, predictive models using AI/ML, utility IT/OT system integration, Large Language Model (LLM)-based applications, Agentic AI, AI copilots, multi-agent AI systems, utility-scale AI/ML solutions, interoperable utility data platforms for any Power Distribution/Generation/Transmission Company, Renewable Energy Utility, or other Critical Infrastructure Sector within the last three (3) years executed or under execution from the date of issuance of this RFP: Aggregate project value across eligible engagements		References along with requisite contract/ Purchase Order (PO)/ Work Order (WO). The references should indicate client name, scope of work, Project start date.	20	
	Aggregate Project Value (USD, excl. taxes)				Marks
	≤ \$100,000				7
	>\$100,000 and < \$500,000				13
	>\$500,000				20
	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. The implementation should have covered technical asset modeling and software integration of power grid systems.				

Criteria	Requirements	Supporting Documents	Max Points		
Demonstrated Experience in Multi-Software Integration for Unified Dashboard	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): No prior experience in integrating multiple software systems into a common dashboard. → Not eligible / zero marks General experience in integrating multiple heterogeneous software applications / platforms into a single unified / common dashboard using APIs (REST/SOAP) 5 marks: 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 - SCADA / EMS - GIS / network mapping tools - AMI / Meter Data Management (MDM) - OMS / ADMS / SMS - ERP / CIS / billing systems - Asset management / CMMS systems	BOM/BOQ	10		
Availability of COTS Software Solution	Sole/ Lead Bidder/ any other Consortium Member - No demonstrated COTS-based AI-enabled solution for the Power Sector – 0 - Demonstrated COTS software solution with AI-enabled web-based applications for the Power Sector – 5 - Demonstrated COTS software solution with operational AI-enabled web applications for digitised and geotagged power utility asset management, monitoring, analytics, forecasting, or decision-support dashboards in the Power Sector – 10	Work Order / Completion Certificate / Client Certificate and citations	10		
Key Personnel	Professionals with qualifications in computer science, Solution Architect, AI/ML Expert ,Electrical, GIS Expert , Cybersecurity, Data Architect or related fields, and experience in building software applications, project management and other relevant areas.		CVs of Key Personnel	15	
	No. of Full-Time Professionals				Marks
	< 5				5
	≥ 5 and ≤ 10				10
	> 10				15

Criteria	Requirements	Supporting Documents	Max Points								
Quality Certification	1. The Sole/ Lead Bidder should have ISO 9001 certificate – 10 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 <table><tr><th>Turnover (USD)</th><th>Marks</th></tr><tr><td>< \$100,000</td><td>5</td></tr><tr><td>≥ \$100,000 and ≤ \$500,000</td><td>10</td></tr><tr><td>> \$500,000</td><td>15</td></tr></table> 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:

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

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

4.3 Technical Evaluation Criteria

S. No.	Requirements	Max. Marks	Supporting Documents
1.	AI-enabled Utility Analytics, Integration and Grid Intelligence Capability: Demonstration of bidder's capability and prior experience in utility data integration, electrical network understanding for power utilities, as per RFP requirements. Utility Infrastructure Understanding and Integration Capability (max 20 points): • Demonstration of understanding of electrical network hierarchy including substations, feeders, DTs, switches, meters, Distributed Energy Resources (DERs) and associated electrical connectivity : 5 points • Demonstration of integration capability for data ingestion from existing DISCOM IT/OT systems (minimum two systems such as GIS, SCADA, MDMS, AMI, OMS, ERP, Billing, Outage Management, or Asset Management Systems) into the proposed platform: 5 Points • Demonstration of bidirectional integration capability by publishing AI insights, alerts, recommendations, or analytics back to existing DISCOM IT/OT systems (minimum two systems such as GIS, SCADA, MDMS, AMI, OMS, ERP, Billing, Outage Management, or Asset Management Systems): 5 Points • Demonstration of real-time data ingestion, synchronization and operational analytics capability for utility infrastructure : 5 points	20	Evidence of capability (Technical Presentation / Minimum Viable Product Demonstration / Work Orders / Completion Certificates / Client Certificates)
2.	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 RFP requirements. Map Visualization (5 points if all below sub- features are demonstrated): • The SI must demonstrate a Geographic Information System (GIS)-based tool capable of visualizing grid assets and associated data with high accuracy and interactivity. • Interactive Map Rendering: Showcase zoomable maps with accurate geospatial asset placement (e.g., substations, feeders) and toggle-able layers for assets or load metrics. Load Flow Analysis & Digital Single-Line diagram (max 10 points if all below sub- features are demonstrated): • Comprehensive load flow analysis incl. accurate voltage profiles, line-wise power flow, power losses and power source-wise consumption tracking on each asset • Power Flow Metrics: Calculate and display voltage profiles, power losses and capacity loading for buses and lines, with results visualized in time-series plots.	35	Evidence of capability (Technical Presentation / Minimum viable product demonstration)

S. No.	Requirements	Max. Marks	Supporting Documents
	- RMS Data Overlays: Visualize RMS data (e.g., voltage) as color-coded overlays, updating dynamically with clickable asset details. - The SI must demonstrate a module for generating and editing digital single-line diagrams representing the electrical network topology. - Editable Interface: Demonstrate drag-and- drop editing of SLDs (e.g., reconfiguring connections) with real-time validation against grid rules and versioning support. Agentic AI Solutions for Utility Operations (Max. 10 Points if all below sub-features are demonstrated): - Demonstration of Agentic AI capable of autonomously executing utility workflows, orchestrating multi-step tasks, and providing context-aware decision support across utility operations. - Demonstration of Large Language Model (LLM)-powered AI Copilots supporting natural language interaction, retrieval of enterprise knowledge, report generation, and intelligent query resolution using utility data. - Demonstration of multi-agent AI architecture capable of coordinating specialized agents to collaboratively solve complex utility use cases. - Demonstration of secure, explainable, and governed AI with human-in-the-loop approvals, audit trails, role-based access control, and integration with enterprise IT/OT systems through APIs and tool calling. Natural Language based Querying (max 10 points if all below sub-features are demonstrated): - 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. - The SI must demonstrate different output formats (Tables, Bar charts, Line charts) autogenerated using the natural language queries as requested. - The interface must support follow-up queries while saving context on previous queries and data shared.		

S. No.	Requirements	Max. Marks	Supporting Documents								
3.	Experience in implementing network intelligence, demand forecasting, or load analysis applications, evaluated by the total annual energy input or peak demand capacity successfully modeled or any other quantifiable uses cases: <table><tr><td>Total Energy Volume Under Management:</td><td>Score</td></tr><tr><td>≥ 2,000 MU (Million Units) per annum OR ≥ 500 MW Peak Demand</td><td>5</td></tr><tr><td>≥ 5,000 MU per annum OR ≥ 1,200 MW Peak Demand</td><td>10</td></tr><tr><td>≥ 10,000 MU per annum OR ≥ 2,500 MW Peak Demand</td><td>15</td></tr></table>	Total Energy Volume Under Management:	Score	≥ 2,000 MU (Million Units) per annum OR ≥ 500 MW Peak Demand	5	≥ 5,000 MU per annum OR ≥ 1,200 MW Peak Demand	10	≥ 10,000 MU per annum OR ≥ 2,500 MW Peak Demand	15	15	Work Order / Completion Certificate / Client Certificate
Total Energy Volume Under Management:	Score										
≥ 2,000 MU (Million Units) per annum OR ≥ 500 MW Peak Demand	5										
≥ 5,000 MU per annum OR ≥ 1,200 MW Peak Demand	10										
≥ 10,000 MU per annum OR ≥ 2,500 MW Peak Demand	15										
4.	Proposed Solution Demonstration (30 Marks): • <i>Live Demonstrations of solutions – 20 Marks</i> • <i>Understanding of the scope of work & Approach & Methodology – 5 Marks</i> • <i>Work Plan – 5 Marks</i> [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.]	30	The SI shall present and live demonstrate the proposed solution submitted as part of its technical credentials, connecting its relevance with RFP scope of work plan, proposed methodology Approx. Time – 60 mins)								
Maximum Marks		100									

1. Maximum 100 marks shall be awarded under Technical Evaluation and marking for the same is defined in the Technical Evaluation Criteria above.
2. 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.
3. The marks scored by the SI in the presentation/ demonstration shall become a part of the technical evaluation criteria of total 100 marks.
4. 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 Proposal (TP):

TP 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

Total Combined Score:

Combined Score = (TP Rating) x (Weight of TP, e.g. 70/100) + (FP Rating) x (Weight of FP, e.g., 30/100)

Section 5. Terms of Reference

AI-Enabled Interoperable Utility Intelligence Platform for Network Planning, Grid Analytics and DER Integration works Service Level Agreements for 1 year Subscription² post Go-Live (Subscription for the next 4 years on satisfactory performance and budgetary provisions of APEPDCL)

Interpretations

- a. DER (Distributed Energy Resources): “DER” shall mean Distributed Energy Resources and shall include all distributed and decentralized energy generation, storage and flexible energy assets connected within the distribution network, including but not limited to solar power systems, wind energy systems, biomass-based generation systems, Battery Energy Storage Systems (BESS), Electric Vehicle (EV) charging infrastructure and any other distributed energy resources integrated with the DISCOM network.
- b. SI (System Integrator): “SI” shall mean the System Integrator and shall refer to the selected bidder responsible for end-to-end implementation, integration, deployment, commissioning, interoperability and support of the proposed solution under this RFP. In case of a consortium, the SI shall mean the Lead Bidder/Lead Consortium Member who shall act as the single point of responsibility and contractual interface for execution of the project obligations under the contract.

Introduction

India’s power systems, particularly at the state level, reflect a scale and complexity that make digitalization and Artificial Intelligence (AI) highly relevant. Andhra Pradesh Eastern Power Distribution Company Limited (APEPDCL) exemplifies this, serving a diverse urban, rural, agricultural, and industrial consumer base with a projected electricity demand of ~30,159 MU, a total power purchase requirement of ~33,220 MU, and an estimated availability of ~34,622 MU. This immense scale, compounded by distribution losses, demand variability, and the rising penetration of distributed energy resources, underscores the critical need for digital solutions to enhance data visibility, improve interoperability, and strengthen cybersecurity for proactive grid management.

Capitalizing on APEPDCL’s existing digital infrastructure, which includes comprehensive GIS mapping from feeder to consumer level integrated with ERP systems, the selected System Integrator (SI) shall be responsible for developing a thorough understanding of the DISCOM’s IT architecture as well as the underlying electrical infrastructure. The SI shall deploy qualified manpower at both corporate and field levels to ensure successful project implementation. Further, the SI shall design, develop, and operationalize the core AI platform for grid simulation, network analysis, and other functionalities covered under the RFP, while ensuring seamless integration with the existing GIS platform to enable updated as-built network visibility, intelligent analytics, and automated operational alerts.

Finally, SI shall provide continuous analytical support throughout the contract period, dynamically adapting the platform to process data from current integrations as well as any new, diverse data sources that may emerge over the course of the project.

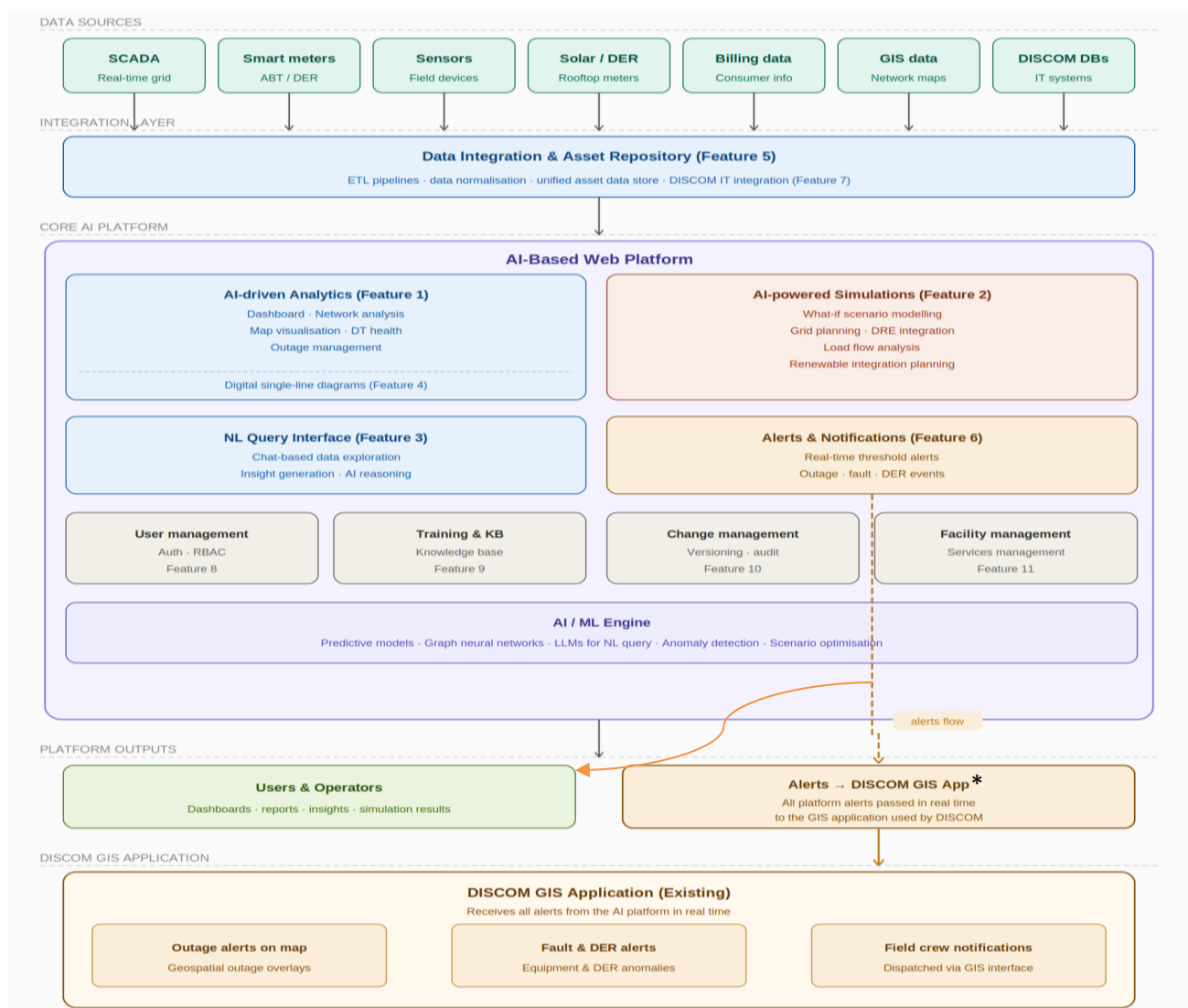
² Refer to the note in Form G of the RFP

All technical specifications for the underlying assets and infrastructure to be modeled within these regions are detailed in the below table, serving as the baseline. However, it should be noted that the underlying data may vary at the time of actual execution

Project Area covering 7 Circles/Districts of APEPDCL:

Sl. No.	Asset Type	UoM	ANAKAPALLI	DR.B.R.AMBEDKAR KONASEEMA	EAST GODAVARI	ELURU	KAKINADA	VIZIANAGARAM	WEST GODAVAR
	Circles	Nos	1	2	3	4	5	6	7
1	Divisions	Nos	3	2	3	2	3	4	3
2	Sub-Divisions	Nos	13	5	10	10	8	9	9
3	33/11 kV Substations	Nos	86	58	149	147	103	100	97
4	33 kV Feeders	Nos	72	38	92	88	70	61	67
5	33 kV Feeders (APTRANSCO SCADA)	Nos	69	31	87	65	62	54	56
6	11 kV Feeders	kM	7517	4361	10453	12137	7024	7038	6308
7	DTs (11/0.4kV)	Nos	28924	22452	56478	70891	37387	25357	34510
8	DTs (11/0.4kV) (with Smart meters)	Nos	4649	2725	4931	3459	4612	4825	5067
9	LT Feeders (415 V / 230 V)	kM	8815	3899	5404	3892	4173	6516	4037
10	Consumer Meters (415 V or 230 V)	Nos	704091	548129	912295	620966	804249	724416	759366
11	Consumer Meters (415 V or 230 V) (with smart meters)	Nos	102796	73997	112068	89486	131533	71021	88376
12	Roof Top SPG (415 V to 230 V)	Nos	8514	5198	12304	11071	12016	9154	9433
13	Total Energy Under Management (Input)	MU	3798	1373	2826	1688	2550	3032	3107

System Architecture



*Discom GIS App is the same app as in “DATA Sources”

The architecture flow illustrated above is indicative and has been provided solely for conceptual understanding of the proposed integrated AI-native operational ecosystem envisaged under the project. The proposed framework is to demonstrate the broad functional integration between the AI-based analytics platform, DISCOM data sources, network intelligence modules and the existing DISCOM GIS/mobile application utilized for field operations, workforce management and operational coordination.

The proposed framework further envisages the establishment of a unified operational portal/ecosystem wherein control centre operators, engineers, supervisors and field personnel operate through an integrated digital environment with role-based access to functionalities relevant to their operational responsibilities. Under this approach, the existing DISCOM GIS/mobile application may continue to function as the field execution interface for linemen and field crews, while the AI-native platform acts as the centralized intelligence, analytics and decision-support layer. Alerts, analytics and operational

insights generated through AI-driven network modelling, load flow analysis and RMS-based analytics shall be communicated in near real time to the existing DISCOM GIS/mobile application for field-level action, verification and coordination.

However, the final architecture, deployment topology, unified portal design, integration methodology, interoperability framework, communication protocols, cybersecurity controls, infrastructure sizing, application layering and technology stack shall be comprehensively assessed, designed and proposed by the selected System Integrator (SI) during the implementation phase, based on detailed assessment of the DISCOM's existing IT/OT systems, operational workflows, scalability requirements and field-level deployment considerations and as per the scope, functional requirements and implementation objectives defined under this RFP.

Scope of Work

Requirements for AI-Powered Web & Mobile 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 Management
2	AI-powered What-If Simulations - Grid planning, DRE & SRT 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
7	Integration with Existing DISCOM IT Infrastructure
8	User Management and Security
9	Training and Knowledge Base
10	Change Management
11	Facility Management Services

Detailed Requirements:

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. Web and Mobile Application Development:

The System Integrator (SI) shall design, develop, deploy, test, commission, and maintain web-based and mobile-based (Android and iOS, wherever applicable) applications as part of the AI-powered platform for delivering the functionalities and services specified under this RFP. The applications shall comply with all applicable technical, functional, integration, performance, cybersecurity, and security requirements specified elsewhere in this RFP.

b. 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.

c. Scalability for Network expansion:

The System Integrator (SI) shall ensure that the proposed platform is inherently scalable and capable of supporting continuous expansion of the distribution network throughout the contract period. The solution shall automatically accommodate newly added substations, feeders, Distribution Transformers (DTs), poles, switches, consumer connections, smart meters (AMI), rooftop solar (SRT), Battery Energy Storage Systems (BESS), EV charging infrastructure, etc., and other Distributed Energy Resources (DERs) without requiring software redesign, database restructuring, or interruption of services. All AI models, electrical connectivity, Digital Twin, load flow analysis, dashboards, analytics, and reports shall dynamically incorporate newly connected assets and maintain data integrity and network topology.

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

d. 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, 11kV & LT networks. This feature should also identify technical and commercial losses as per the methodology defined by the SERC, 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, 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:

- Define / evaluate annual load factor and loss load factor from the load duration details obtained from RMS data.
- Allocate Load by Feeder Demand, DT demand, Power Factor etc from the meter database. Divide Load in proportion to kWh / connected KW.
- 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.
- Compare and analyze power flow study reports in a single consolidated tabular view.
- Compare results of specific information such as the electrical load flow calculation results for

buses, branches, loads, or sources.

- Create a baseline report & quickly identify deviations for all cases
- Facility to export summary view into Microsoft® Excel for maximum data flexibility & visualization.
- 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.
- 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.
- Automated & intelligent detection of protection zones, Automated Overcurrent Protection & Coordination Evaluation.
- Option to store load flow statistics with different names and reload them when required further.
- The proposed solution shall ingest and utilize feeder-wise, Distribution Transformer (DT)-wise, and consumer-wise Energy Audit data, billing data, and Advanced Metering Infrastructure (AMI)/Smart Meter interval data to develop, calibrate, and other data available with the discom. and continuously refine the electrical network model. The load flow engine shall automatically derive realistic load allocation, demand diversity, technical loss estimation, phase loading, and network operating conditions based on actual historical and near real-time consumption patterns rather than solely on connected load or static assumptions. AI/ML algorithms shall continuously reconcile GIS connectivity, SCADA measurements, energy audit results, billing records, and smart meter data to improve the accuracy of network analysis, & demand forecasting.

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 Digitization: - Network topology data: Asset location, Bus specification (type of bus), Total number of buses - 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 Existing DISCOM databases and Sensor data: - Status of the circuit breakers defining whether the bus is active or not, nominal voltage level, desired voltage limit - Load data: Balanced load, unbalanced load (phase wise load required) - 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 - 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 - Aiding engineers in balancing loads and resolving power quality issues.
Percentage capacity loading of every asset	Data from One-time digitization: - Asset specs and ratings - Network topology data Existing DISCOM databases and Sensor data: - historical usage data - RMS latest load data	Identifies the underutilization of an asset, Prevents asset overloading, extends equipment lifespan and supports capacity planning by highlighting assets nearing limits.
Voltage drop calculations across the network	Data from One-time digitization: - Network topology - line lengths & conductor impedance Existing DISCOM databases and Sensor data: - load data per bus (Historical and RMS latest) - voltage per bus (Historical and RMS latest)	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	Data from One-time digitization: - Asset specs and ratings - Network topology data Existing DISCOM databases and Sensor data: - historical usage data - historical overload trends (if available) - RMS latest load data - Temperature data (if available)	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	Data from One-time Digitization: - Network topology: Transformer connectivity, DT load locations Existing DISCOM databases and Sensor data: - DT load profiles - historical voltage data - RMS latest load voltage	Enhances consumer satisfaction by ensuring adequate voltage at load points, guiding targeted interventions to address specific drop issues.
Real and reactive power losses	Data from One-time digitization: - Line impedance, network topology Existing DISCOM databases and Sensor data: - historical load data - historical billing records - RMS latest load data	Pinpoints loss sources for mitigation, increases revenue by reducing unbilled energy and supports loss reduction strategies.
Voltage and current unbalance factors	Data from one-time digitization: Bus and line connectivity, phase wise load distribution, historical unbalance data, load profiles, real-time voltage/current per phase	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	Data from One-time digitization: - Network topology: line/asset specs, Line	Speeds up fault identification and quick restoration by identifying open-phase
	impedance, line admittance (if applicable), impedance of each asset - System grounding, load type and configuration, sequence impedances information for each applicable asset Existing DISCOM databases and Sensor data: - System voltage level (nominal) - Pre-fault conditions: voltage at each bus, current in each phase, power flow in each phase, fault location, faulted phase - Digital fault recorder data(if applicable), relay settings, relay operation (if applicable)	issues, reducing downtime and improving reliability for affected consumers.

Single-year and multi-year load growth analysis	Data from one-time digitization: - Asset locations Existing DISCOM databases and Sensor data: - historical and latest RMS load data - historical load growth trends - consumer expansion records	Supports long-term planning by forecasting demand growth, ensuring infrastructure scalability and avoiding future capacity shortages.
Solar/Wind farm annual yield and loss estimation	Data from one-time digitisation: - Renewable asset specs, location Existing DISCOM databases and Sensor data: - Weather data (solar irradiance and wind profile) - historical yield/loss records - RMS latest generation	Maximizes renewable energy utilization by estimating output and losses, aiding in investment decisions and grid integration planning, losses can be identified and minimized
Time-series plots	Data from one-time digitization: - Asset and load locations Existing DISCOM databases and Sensor data: - Historical and latest RMS data	Tracks performance trends over time, enabling proactive maintenance and operational adjustments to address emerging issues like demand spikes or loss increases.
Loss calculations at any point in time	Data from one-time digitization: - Network topology, line impedance - asset types and their impedance data Existing DISCOM databases and Sensor data: - historical RMS data - RMS latest power flow	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	Data from one-time digitisation: - 33kV line/transformer specs, Network topology Existing DISCOM databases and Sensor data: - historical and latest RMS data	Targets loss reduction at high voltage level, improving efficiency and revenue at critical network levels (33kV and 33/11kV).
Sankey diagram showing energy balance	Data from one-time digitisation: - Network topology Existing DISCOM databases and Sensor data: - Load/consumer data - Energy supply/billing records - RMS latest power flow data	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	Data from one-time digitization: - Asset specs - Network topology, Existing DISCOM databases and Sensor data: - Historical records of maintenance, faults - Asset/device specific RMS latest and historical metrics & technical data - THD data (if available) - Asset/device specific sensor data	Predicts maintenance needs, reducing unexpected failures and downtime and optimizing maintenance budgets through early anomaly detection.
Trend analysis of voltage fluctuations, outages, losses	Data from one-time digitization: - Network topology Existing DISCOM databases and Sensor data: - Historical voltage, outage, loss records - RMS latest load data	Identifies recurring issues for root cause analysis, improving reliability and reducing outage frequency through data-driven insights.
System's short circuit capacity estimation	Data from one-time digitization: - Network topology, asset impedance, short circuit ratings Existing DISCOM databases and Sensor data: - Historical fault data - RMS latest current data - Impedance data of each source unit connected at a bus	Ensures system resilience by assessing fault withstand capacity, guiding upgrades to handle short circuits and maintaining stability.
Symmetrical/unsymmetrical short circuit fault	Data from one-time digitization: - Line impedance - line admittance (if applicable)	- 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	Data from One-time Digitization: - Relay location, CT ratio Existing DISCOM Databases and Sensor Data: - Steady state, nominal/rated current - minimum and maximum fault current (historical) - neutral grounding resistance - residual current - acceptable current unbalancing - circuit breaker (CB) data (type, operating time) - recloser setting Inputs for Scenario Building: - Desired overloading setting/factor - Coordination time interval (CTI) required Derived from Network Analysis: - Fault current at each relay location (if real-time data unavailable)	- Increases revenue by minimizing feeder downtime with optimal coordination - Protects assets by reliably isolating faulted sections
Transformer Overload & Earth fault relays and coordinates them to avoid maloperation	Data from One-time Digitization: - Transformer rating, winding connection - CT ratio Existing DISCOM Databases and Sensor Data: - Steady state, nominal/rated current, inrush current, minimum fault current (historical) - Neutral grounding resistance - Residual current, acceptable current unbalancing - CB data (type, operating time) - Recloser setting Inputs for Scenario Building: - Desired overloading setting/factor - CTI required	- Increases transformer lifespan by preventing maloperation of relays

Power Transformer fuse protection on HT side, Overload & Earth fault relay on LT side	Data from One-time Digitization: - Transformer rating, winding connection - CT ratio - Nominal voltage, rated current - Type of fuse, breaking capacity Existing DISCOM Databases and Sensor Data: - Steady state, nominal/rated current, inrush current, minimum fault current (historical) - Neutral grounding resistance - Residual current, acceptable current unbalancing Inputs for Scenario Building: - Desired overloading setting/factor	- Increases transformer lifespan; minimizes power downtime
Power Transformer Sequence - of - operation fault analysis	Data from One-time Digitization: - Transformer ratings (MVA, kV) - HT side fuses (rating, breaking capacity), CT ratios (HT and LT side) Existing DISCOM Databases and Sensor Data: - Transformer Percentage or pu impedance, vector group, tap changer details, rated current - Fault type, location, minimum and maximum fault current, fault recorder data - CB operating time, recloser setting - Differential protection settings (bias and operating current) - Overcurrent & earth fault relay settings	- Minimal disruption through precise fault sequence analysis
	(pickup, time dial, characteristic curve) - Restricted earth fault relay settings - Overflux protection settings Derived from Network Analysis: - Sequence of operations based on fault analysis	

Power Transformer Equipment damage curve plotting	Data from One-time Digitization: - Transformer ratings (MVA, kV), percentage or pu impedance, vector group, tap changer details, rated current Existing DISCOM Databases and Sensor Data: - Transformer percentage or pu impedance, vector group, tap changer details, rated current - Minimum and maximum fault current - Thermal time constant (from manufacturer datasheet) - Overload limits (continuous and short-term) - Mechanical withstand current - Thermal withstand current - Differential protection settings - Overcurrent protection settings - Earth fault protection settings - Overfluxing protection settings - Thermal overload protection settings	- Prevents transformer damage due to excessive current or prolonged overloading
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e. 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.
3. 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.
 - 4. 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 digitized 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	- Interactive maps with scalable granularity showing asset locations via precise coordinates. - Customizable layers toggled via AI recommendations with role-based prioritization. - Intelligent layering for scale-specific visibility and manual control, with drag-and-drop layer management.
Latest Sensor Data Overlay	- Integrate SCADA, RMS, LFA and IoT data with color-coded visuals. - Anomaly overlay with high-frequency updates and predictive overlays based on AI forecasts. - Cross-source data validation with severity alerts.
AI-Generated Heatmaps	- Heatmaps for congestion, losses and demand with gradient scales and interactive zoom. - Layered combinations with adjustable opacity and AI-suggested focus areas.
Spatial Queries	- Spatial queries with polygon selections and buffer zones for custom area analysis. - AI-optimized visualized results with export options. - Dynamic query refinement with instant map updates.

AI-Driven Power Flow Tracing	- Visualize energy paths with flow metrics from latest Sensor data in color-coded format. - Highlight bottlenecks and fault propagation with AI diagnostics. - Predictive tracing with optimization suggestions for infrastructure adjustments.
Clickable Asset Details	- Pop-ups with maintenance history and status indicators from the latest Sensor data. - Historical and predictive trends visualized graphically, with annotation options.
Historical Map Views with Playback	- Display past states with time-slider and version comparison. - Animated playback with controls, event markers and AI insights. - Exportable snapshots of specific historical views.
Multi-Circuit and Multi-Cable Visualization	- Display multi-circuit lines with clickable configuration details. - Visualize multi-cable layouts with trench cross-sections and toggling options.
Land Base Representation	- Intelligent land base with clickable entities and topology overlay. - Zoomable topographic/administrative overlays for context. - Import satellite imagery in formats like GeoTIFF and JPEG for enhanced visuals.
Navigation and Interaction Tools	- GUI-based zooming, panning and highlighting with toolbar icons. - Locator tools for entity-specific zooming and mode switching. - Pan-and-scan for smooth map traversal.
Customizable Symbology and Scaling	- Attribute-based symbol customization for elements. - Automatic symbol scaling across zoom levels with user-defined defaults. - Symbology updates based on the latest Sensor data for dynamic conditions.
Versioning for Map Data	- Track visualization changes with versioning and timestamps. - Manage versions for historical comparison and animated transitions. - Preserve baseline maps with update logs.
Data Editing for Visualization Accuracy	- Edit network relationships with compatibility validation using the latest Sensor data. - GUI-based graphical/textual editing with security controls and instant visualization. - Annotate edits for traceability and operational accuracy.

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 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 ,Distributed Energy Resources (DER).
- iii. Provide AI-visualized results: impact analysis, load flow changes and cost estimates.
- iv. Forecast AI-driven demand: short-term and long-term with recommended parameters.
- v. Use machine learning (ML) to suggest optimal parameters and predict outcomes based on historical load data, weather patterns and asset performance metrics.

- vi. 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.
- vii. Strategically place shunt capacitors: identify optimal locations and bank sizes for voltage support and power factor correction, minimizing costs and releasing branch capacity.
- viii. Perform Volt/VAR Optimization (VVO): manage voltage levels and reactive power flow to reduce losses and peak demand using Conservation Voltage Reduction (CVR).
- ix. Integrate Distributed Energy Resources (DER) with power flow analysis for optimal placement.
- x. Provide for at least one slack bus for simulations.
- xi. Facility to merge two studies in order to work in a distributed environment.
- xii. Export whole or part of a network to a new study via selecting transformers and feeders.

c. AI Agent Builder & Autonomous Task Execution

Description:

The platform shall provide a configurable AI Agent framework enabling authorized DISCOM officials to create, configure and deploy domain-specific AI agents that can autonomously analyse enterprise data, execute multi-step analytical workflows, retrieve information from integrated systems and assist users in operational and planning activities.

i. Agent Creation

- The platform shall enable authorized users to create multiple AI agents without software development.
- Users shall be able to configure an agent's name, description, objective, operating instructions and business rules.
- Users shall be able to create agents for different business functions such as Network Analysis, Planning, Asset Management, Outage Management analysis, Revenue Protection, Consumer Analytics, Renewable Energy Integration analysis and Regulatory Report generation.

ii. Knowledge & Data Access

- AI Agents shall securely access and analyze enterprise data available through the integrated AI platform. The platform shall consolidate and harmonize data from multiple DISCOM IT/OT systems, including but not limited to GIS, SCADA, ADMS, OMS, MDMS, AMI, ERP, CIS/Billing, Asset Management Systems, IoT devices, historical databases, documents and other integrated enterprise applications. AI Agents shall leverage this unified data layer to perform analytics, reasoning, decision support and task execution in accordance with user authorization and role-based access controls.
- Responses shall be grounded on enterprise data through Retrieval-Augmented Generation (RAG) or equivalent architecture.
- AI-generated responses shall provide references to the underlying enterprise documents or datasets wherever applicable.

iii. User Document Ingestion & Contextual Analysis

- The platform shall allow authorized users to upload documents including but not limited to PDF, Word, Excel, CSV, PowerPoint, GIS files, technical reports, policy documents, regulatory orders, planning studies and other structured or unstructured data sources for use strictly as context for the specific query or chat window in which they are uploaded. Uploaded documents shall not be retained or reused as part of the broader enterprise knowledge base beyond that query or chat window.
- AI Agents shall extract, interpret and utilize relevant information, assumptions, constraints and parameters from uploaded documents and securely combine them with authorized enterprise data available through the integrated platform.
- AI Agents shall perform integrated reasoning and analytics by correlating uploaded documents with operational, planning and historical enterprise datasets to generate recommendations, forecasts, scenario analyses and decision support.
- Uploaded documents may be used as inputs for analytical workflows including but not limited to Load Flow Analysis, What-if Simulation, Demand Forecasting, Renewable Energy Integration, Hosting Capacity Assessment, Asset Planning, Financial Analysis and Regulatory Impact Assessment.
- AI-generated outputs shall clearly distinguish between assumptions derived from uploaded documents and enterprise data, and shall provide traceable references to the underlying documents and datasets.

iii. Tool Execution

- AI Agents shall be capable of invoking approved analytical tools and platform modules including Network Analysis, Load Flow Analysis, What-if Simulation, GIS visualization, Digital SLD, dashboards and reporting modules.
- The framework shall support multi-step reasoning where an agent may automatically combine outputs from multiple modules before generating its final response.

iv. Long-running Tasks

- AI Agents shall support execution of long-running analytical tasks in the background.
- Users shall be able to continue other work while the agent performs analysis.
- Upon completion, users shall receive notifications and the generated outputs shall be available within the application.

v. Scheduled Execution

- Users shall be able to schedule AI agents to automatically execute predefined analyses or reports at configurable intervals or based on predefined business conditions.
- Scheduled outputs shall support automatic notification and distribution to authorized stakeholders.
- AI Agents shall autonomously decompose high-level business objectives into executable multi-step plans, dynamically determine the required analytical workflow, invoke appropriate enterprise tools, monitor execution progress and adapt the execution strategy based on intermediate results.
- AI Agents shall orchestrate multiple enterprise applications and analytical engines as part of a single autonomous workflow without requiring manual intervention between individual execution steps.

- AI Agents shall support event-driven execution by automatically initiating predefined workflows in response to operational events, alarms, threshold violations or enterprise business triggers.
- AI Agents shall support configurable human approval checkpoints before executing predefined enterprise actions, generating regulatory submissions or initiating operational workflows.
- AI-generated recommendations shall include confidence scores, reasoning summaries, supporting evidence, assumptions, invoked tools and referenced enterprise datasets to ensure transparency and auditability.
- AI Agents shall be capable of generating, assigning, tracking and managing actionable tasks arising from AI-generated analyses, recommendations or predefined business rules, through approved enterprise communication and collaboration platforms, subject to Utility security policies, role-based access controls and organizational workflows.

vi. Persistent Context

- AI Agents shall maintain contextual memory within an authorized workspace, allowing users to continue previous analytical discussions without repeatedly providing background information.
- The platform shall support natural compaction of older context within any chat window as a conversation progresses, so that context is managed efficiently without requiring manual intervention by the user.
- Previous conversations and generated outputs shall be searchable. Beyond user-wise token usage, which shall be tracked and available for audit, no other aspect of chat histories shall be audited.

vii. Security & Governance

- AI Agent creation, modification and execution shall be governed through role-based access control.
- All agent activities, prompts, tool executions and generated outputs shall be logged for audit purposes.
- Administrators shall be able to approve, disable or retire AI agents.

viii. Intelligent Visualization & Dashboard Generation

- AI Agents shall dynamically generate interactive dashboards, charts, maps, tables, heat maps, trend analyses, KPI scorecards and executive visualizations in response to natural language queries without requiring manual dashboard configuration.
- Users shall be able to request customized analytical dashboards by specifying business objectives, geographical areas, asset categories, consumer segments, network hierarchy, time periods, scenarios or performance indicators.
- AI Agents shall automatically determine the most appropriate visualization and analytical presentation based on the user's request and the underlying data.
- AI-generated dashboards shall support drill-down, filtering, comparison, geographic visualization, time-series analysis, layer selection and cross-filtering across multiple enterprise datasets.
- Dashboards shall update dynamically as new enterprise data becomes available or when users modify analytical parameters, uploaded documents or simulation assumptions.
- AI Agents shall automatically generate narrative explanations, key observations, anomalies, trends, recommendations and executive summaries alongside visual dashboards.

- Users shall be able to save, share, publish and export dashboards in standard formats including PDF, Excel, PowerPoint, HTML and image formats.

ix. Multi-Channel Output Delivery

- AI Agents shall generate outputs in multiple formats including interactive dashboards, executive summaries, technical reports, presentations, spreadsheets and machine-readable datasets.
- Subject to Utility security policies and administrator approval, AI Agents shall distribute outputs through approved communication channels including Email, Microsoft Teams, WhatsApp, SMS, mobile applications, web portals and other enterprise collaboration platforms to the discoms officials.
- Users shall be able to configure recipients, delivery schedules, approval workflows and notification preferences.
- Generated outputs shall include links to supporting dashboards, underlying datasets and referenced enterprise documents wherever applicable.

x. GenAI Subscription Flexibility & Interoperability

- The platform shall provide the DISCOM the option to consume its own GenAI subscription(s), by way of an API key, for use by the SI in delivering the AI Agent Builder and associated Advanced AI capabilities, in lieu of the SI's own GenAI subscription.
- The platform shall provide an optional connector to the DISCOM's own GenAI application(s), so that queries traversing the platform's data and capabilities may be asked directly within the chat window(s) of the DISCOM's respective GenAI application, and not solely within the SI's application.

Simulation Scenario	Inputs Required	Utility to DISCOM
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Increase/decrease load levels of a feeder/network (single multiplier)	Data from One-time digitisation: - Feeder/network topology (line segments, buses, switches) Existing DISCOM databases and Sensor data: - Base load data (historical or RMS latest kW/kVA values per node) - Transformer/line thermal ratings Inputs for Scenario building: - Multiplier range - Voltage limits	- Assess overloading risks - Plan capacity upgrades - Optimize load shedding strategies
Increase/decrease load at a selected bus	Data from One-time digitisation: - Bus ID and location in the network - Upstream/downstream network impedance Existing DISCOM databases and Sensor data: - Existing load profile (kW, kVAR, power factor) - Existing transformer tap setting - Circuit breaker, recloser and protection device settings Input for Scenario building: - New load value (absolute or percentage change in kW, kVAR)	- Identify voltage violations - Optimize transformer tap settings - Assess suitability of existing protection assets
Add new loads with additional line sections	Data from One-time digitisation: - Existing network model (with adjacent feeder capacity and utilization factor) Input for Scenario building: - New load locations (GPS coordinates or nearest bus) - Load characteristics (type, phasing) - Line parameters (resistance, reactance, length) - Desired nominal voltage at load end	- Plan cost-effective network extensions - Minimize losses

Increase/decrease conductor size for all/part of a feeder	Data from One-time Digitisation: - Current conductor specs (type, ampacity, R/X values) Existing DISCOM databases and Sensor data: - Load profiles - Thermal limits (ambient temperature, derating factors) - Cost data (material + labor) Input for Scenario building: - Proposed conductor specs	- Reduce technical losses - Defer costly infrastructure upgrades
Reconfigure network topology or reroute feeders	Data from One-time digitisation: - Feeder connectivity map Existing DISCOM databases and Sensor data: - Switch/breaker/bus coupler status (open/closed) - Load distribution (balanced/unbalanced phases) - Regulatory constraints Derived from Network analysis: - Fault current contributions	- Minimize outage times - Improve reliability (SAIDI/SAIFI reduction)
Add new substations/injection points & reconfigure	Data from one-time digitisation: - Upstream transmission capacity Existing DISCOM databases and Sensor data: - Land acquisition costs Input for scenario building: - Load growth projections Derived from Network analysis: - Substation capacity (MVA rating, voltage levels) - Location coordinates (via load density)	- Reduce line losses - Balance load distribution

Add new distribution transformers (DTs) and reconfigure	Data from one-time digitisation: - DT ratings Existing DISCOM databases and Sensor data: - Load clustering data (peak demand per cluster) - Historical DT utilization factor - Failure rate history	- Prevent DT overloading - Optimize service area boundaries
Integrate shunt capacitors, regulators, or BESS	Existing DISCOM databases and Sensor data: - Renewable generation patterns - Tariff structures Derived from Network analysis: - Device specifications (capacitor bank size/MVAR, BESS kWh/kW) - Voltage profiles - Desired voltage profile/power factor - Control strategies	- Improve voltage regulation - Reduce peak demand charges
Forecast electricity demand using historical trends & DRE data	Existing DISCOM databases and Sensor data: - Historical load data (hourly/daily/monthly) - DRE penetration (solar rooftop capacity, feed-in patterns) - Population/economic growth rates - Event calendars	- Accurate capacity planning - Dynamic tariff design
Simulate grid expansion (Solar, BESS, new infrastructure)	Existing DISCOM databases and Sensor data: - Solar irradiance/Wind speed data - Land use/zoning regulations - Cost parameters (capex/opex) - Regulatory targets Derived from Network analysis: - BESS specs (cycle life, efficiency)	- Prioritize cost-effective investments - Maximize renewable hosting capacity

Optimize network with Equivalent Load	Existing DISCOM databases and Sensor data: - Current ampere loading - Year-wise load growth rates - Discount rate of money Derived from Network analysis: - Energy loss calculations	- Improve short-term planning - Balance investment utilization
Switching optimization	Data from One-time digitisation: - Existing switch locations and status Existing DISCOM databases and Sensor data: - Load profiles - Voltage conditions Derived from Network analysis: - Feeder load balance data	- Minimize kW losses - Reduce voltage violations - Balance feeder loads
Volt/VAR Optimization (VVO)	Existing DISCOM databases and Sensor data: - Load profiles - Generator/inverter setpoints - Voltage limits - Transformer tap positions Derived from Network analysis: - Capacitor bank/SVC settings	- Reduce system losses - Lower peak demand via CVR
Fault Management and Service Restoration (FMSR)	Existing DISCOM databases and Sensor data: - SCADA/AMI event/fault data - Feeder connectivity status Derived from Network analysis: - Fault isolation plans - Restoration options	- Minimize customer outages - Optimize restoration speed
Economically viable network options	Existing DISCOM databases and Sensor data: - Technical constraints - Cost models Derived from Network analysis: - Expansion/restructuring scenarios	- Justify network investments - Optimize HT/LT configurations

Distributed Energy Resources (DER) integration	Existing DISCOM databases and Sensor data: - Solar/wind generation patterns - Load flow data Input for Scenario building: - DER specs (solar, wind, BESS) Derived from Network analysis: - Harmonic/time-series analysis	- Optimize DER placement - Enhance grid stability
AI-assisted Hosting Capacity Analysis	As per the Operational requirements of the discoms	AI agent automatically identifies limiting assets, generates reinforcement options and prepares hosting capacity reports.

d. 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 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.

e. 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.

f. 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.

g. 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).

Required Features:

- i. Simulate AI-predicted cost impacts: calculate capital expenditure (CAPEX) for new assets, operational expenditure (OPEX) and lifecycle costs.
- ii. Assess AI-analyzed cost drivers: break down expenses by category, timeframes and scenarios.
- iii. Determine economic and break-even loading limits of conductors and cables.
- iv. Provide AI-driven cost optimization: recommend cost-saving alternatives, phasing options and financing strategies.
- v. Generate AI-visualized cost outcomes: display cost breakdowns, cash flow projections, ROI estimates and sensitivity analyses.
- vi. Integrate with external financial data: incorporate vendor quotes, market trends and DISCOM budget constraints for accurate estimations.
- vii. Monitor AI-analyzed cost metrics: track budget adherence, cost-benefit ratios and savings from optimizations.
- viii. Train ML models on historical project costs, current asset data and external economic indicators to predict costs, optimize spending and refine ROI projections.

h. Intelligent Network Analytics & Decision Support

- i. The platform shall support intelligent indexing and validation of the complete electrical network hierarchy, including Substations, Feeders, Distribution Transformers (DTs), Consumers, Rooftop Solar (RTS), Electric Vehicle (EV) Charging Infrastructure, Battery Energy Storage Systems (BESS), and other Distributed Energy Resources (DERs), by automatically correlating GIS assets, service connections, network topology and enterprise data. This platform capability must be bidirectionally synchronized with the field-ready Mobile Application, enabling linemen to execute on-site verification, resolve inconsistencies, and capture real-time updates using DISCOM-provided field teams.
- ii. The platform shall automatically identify missing, duplicate, disconnected, spatially inconsistent or inaccurate GIS assets and network topology and recommend corrections based on integrated enterprise data, network connectivity analysis and business rules to improve network accuracy, topology integrity and operational reliability. The recommendation engine must produce these AI-assisted corrections with explicit confidence scores and maintain a strict audit trail. The system must also generate a final validation report detailing accuracy metrics, the percentage of validated versus flagged data, before-and-after geospatial heat maps, and a correction breakdown by asset type.
- iii. The platform shall perform automated technical and commercial energy auditing at multiple network levels including feeder, distribution transformer, consumer category and geographical area by utilizing integrated AMI, MDMS, SCADA, GIS, billing and other enterprise datasets. To support auditing at the consumer category level, AMI integration must explicitly capture interval consumption, tamper alerts, and power-quality events, mapping them directly to the consumer's geospatial profile.
- iv. The platform shall analyse technical losses, commercial losses, and explicitly compute Aggregate Technical and Commercial (AT&C) losses as a strictly defined mathematical and regulatory metric. It shall additionally analyze asset health, loading conditions, outage history, consumer behaviour and network constraints, and recommend financially and technically optimal corrective actions, including indicative cost-benefit analysis, expected loss reduction, reliability improvement and implementation priority.
- v. AI-generated recommendations shall prioritize corrective actions based on business impact, investment requirements, expected return, risk, implementation complexity and utility-defined objectives. Any implemented corrections, including AI-generated Single-Line Diagram (SLD) edits, must be versioned and continuously synced with the Asset Management module and field updates from the Mobile Application, ensuring that analytic layers and alerts flow back seamlessly into the existing enterprise GIS.

i. Additional Features, for compliance:

- i. The module should be capable of preparing cost estimates of lines, substations etc. based on the cost data.
- ii. Provision for users to input customized costs for special structures like river crossings, railway crossings.

- iii. Provision to input the cost data of storing the material and associated equipment, erection charges, other standard and non-standard estimate components.
- iv. Preparing project estimates consisting of several lines and substations.
- v. Facility to store the cost data of several areas and more than one version of the project report.
- vi. 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.
- vii. Automatically create cost estimates for study picked up, by selecting the complete details of the lines and equipment proposed.
- viii. Cost / value estimation of any proposal should also include the depreciation
- ix. of "Item recovered".
- x. Provide the commercial feasibility of any technical modification proposed, using cost benefit analysis of any network under various proposed alternatives.
- xi. 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.
- xii. Provide the optimal solution for any given network and shall have provisions for minimization of losses so as to maximize the net benefit.

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.
- iv. 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
- v. system's relevance and accuracy over time.
- vi. Ensures continuous learning, adapting responses based on evolving operational data and user inputs.

Feature	Detailed Aspect	Description
Natural Language Query Processing		
Instant AI Responses	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
	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	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.

ML-Driven Query Expansion	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-Based Reporting	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.
	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
	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

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.
- iv. Facility to rotate asymmetric equipment like transformers.

- v. The record history (undo record) should persist even after closing a session.
 - vi. 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.
 - iv. 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.

Asset Management and Data Repository

Description: A centralized, AI-enhanced repository for storing, retrieving and proactively managing digitized grid asset collected by 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

Alerts and Notifications

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 through AI-driven operational intelligence integrated with the existing DISCOM GIS and field-force mobile application ecosystem. The module delivers real-time and predictive alerts derived from network modelling, load flow analysis and AI-driven Remote Monitoring System (RMS) analytics, providing advanced visualizations, decision-support tools and operational insights. The platform is designed as a unified operational framework wherein control center users access advanced analytics, simulation and system-wide monitoring capabilities, while field personnel and linemen receive geographically filtered, shift-aware alerts and actionable notifications through the existing mobile application platform already deployed by the DISCOM for GPS-based workforce management and network visualization. Alerts are tailored based on user roles, operational jurisdiction and hierarchy within the DISCOM, enabling seamless coordination between control room analytics and field-level execution for proactive grid management, faster fault response, predictive maintenance and financial optimization.

A. 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.

B. 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.

a. Service Levels:

- i. Delivery of alerts and associated insights within 2 minutes of issue identification
- ii. Predictive Maintenance alerts to be generated daily Accuracy to meet operational standards.

b. 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.

c. 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

Integration with Discoms Data Systems

Description: The platform shall support secure, scalable, and bidirectional integration with the DISCOM's existing IT and OT systems through standard APIs and approved integration mechanisms. It shall be capable of both ingesting data and publishing AI-generated alerts, notifications, insights, analytical outputs, workflow triggers, and status updates to authorized systems in real time or near real time, ensuring seamless interoperability and closed-loop operations.

All insights generated through the above dashboard shall be seamlessly integrated with all APEPDCL's systems (OMS, GIS, EPCCB (URMS) , Mobile applications and SAP/ERP systems e.t.c.,) to facilitate timely field-level action. The field execution status and closure details shall, in turn, be integrated back into the now proposed application to enable continuous learning, regeneration of insights, and optimization of the tool.

The solution shall also integrate with APEPDCL applications to generate feasibility assessments for proposed new Feeders, Distribution Transformers (DTRs), and Substations. Based on network analytics and existing infrastructure, the now proposed system will recommend the optimal asset location and provide feasibility flags to the respective applications. Once the asset is approved and commissioned, the updated asset information shall be integrated back into the now proposed system to refresh the network model and regenerate optimized insights.

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.
- iv. Bidirectional Event & Notification Exchange: The platform shall transmit AI-generated feeder alerts, overload warnings, predicted failures, switching recommendations, outage notifications, restoration confirmations, and workflow status updates back to the FMS and other authorized utility systems

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.
- iv. Audit Findings & Compliance Notifications: The platform shall automatically communicate audit observations, abnormal loss alerts, energy imbalance notifications, compliance status, and corrective action recommendations to the Energy Audit system and other designated enterprise applications.

c. Smart Metering / Advanced Metering Infrastructure (AMI) Integration

- i. Real-Time Consumption & Alert Sync: Seamlessly integrates with the Meter Data Management System (MDMS) to capture interval consumption data, tamper alerts, and power quality events, mapping them directly to the consumer's geospatial profile.
- ii. Outage & Restoration Management (Last Gasp/First Breath): Utilizes 'last gasp' alerts from smart meters to instantly pinpoint individual consumer or localized cluster outages on the GIS map, followed by 'first breath' alerts to verify successful restoration.
- iii. Demand-Side Management & Load Profiling: Correlates smart meter load profiles with network asset capacities (DTs/Feeders) to identify overloading patterns and support localized demand response strategies.
- iv. Data Generalization & Analytics Readiness: Abstracts and generalizes highly granular consumer time-series data (15/30-minute intervals) into clean, uniform, and standardized data blocks based on varying utility analysis requirements.
- v. Bidirectional AI Analytics Synchronization: The platform shall publish AI-generated analytics, back to the MDMS/AMI platform and other authorized operational systems to support monitoring, operational decision-making, and field actions.

d. Solar Rooftop (SRT) Integration

- i. Consumer Net/Gross Metering Mapping: Geo-tags all consumer-end rooftop solar installations, integrating bidirectional meter data from the MDMS to track gross generation, export, import, and net consumption.
- ii. Reverse Power Flow & DT Capacity Tracking: Monitors localized reverse power injection into Distribution Transformers (DTs) from high-density SRT clusters to evaluate grid thermal limits, voltage rise issues, and impact on asset lifespans.
- iii. SRT Generation Analytics: Uses inverter telemetry or billing estimation algorithms to track total green energy generated at the rooftop level, feeding directly into the DISCOM's Renewable Purchase Obligation (RPO) accounting ledger.
- iv. DER Operational Notifications: The platform shall transmit reverse power flow alerts, hosting capacity updates, voltage violation notifications, inverter performance anomalies, DER curtailment recommendations, and other AI-generated operational insights to the relevant DER management systems, MDMS, SCADA, or authorized

utility platforms.

e. PM-KUSUM Scheme Integration

- i. Component-wise Asset & Plant Mapping: Geospatially tracks and categorizes assets under the PM-KUSUM framework, including decentralized ground-mounted solar plants (Component A), standalone solar pumps (Component B), and solarized agricultural feeders/individual pumps (Component C).
- ii. Remote Monitoring System (RMS) Telemetry Data Sync: Integrates via APIs with national/state PM-KUSUM portals and vendor RMS platforms to fetch real-time generation data, pump operational hours, and performance logs for rural/agricultural installations.
- iii. Operational Event Exchange: The platform shall communicate plant performance alerts, equipment health notifications, predictive maintenance recommendations, underperformance events, and operational analytics back to the PM-KUSUM portals, RMS platforms, or other authorized systems through standard integration interfaces.

f. Existing Enterprise GIS Platform Integration & Data Sharing

- i. Bidirectional Database Interoperability: Establish secure, real-time connectivity via REST APIs or open geospatial standards (OGC WFS/WMS) with the utility's existing enterprise GIS platform. This ensures the analytics engine seamlessly fetches up-to-date base maps, consumer indexing data, and electrical network topologies (Substations, Feeders, DTs etc) with GPS and its meta data without creating data silos.
- ii. Real-Time Alert & Event Forwarding: Build an automated data pipeline to push real-time operational alerts, AI-detected grid anomalies, high-theft zone markers, and active outage clusters directly into the existing GIS platform. This enables immediate geo-visualization of events on the utility's legacy engineering and management dashboards.
- iii. Spatial Layer Sharing & Enrichment: Export generated analytic layers—including loss-prone heatmaps, DRE injection capacity constraints, and asset health profiles—back into the existing GIS schema. This enhances the utility's master asset database and provides critical spatial layers to support cross-departmental operations and network planning teams.

g. Data Lakes:

The proposed solution should be capable to secure API-based integration, the bidder shall be capable of integrating with APEPDCL's proposed Data Lake through secure connectivity for datasets involving very large volumes. The solution shall support multiple data integration methodologies, to ensure reliable, high-performance, and scalable data exchange. The bidder shall demonstrate proven expertise in designing and implementing such high-volume data integration mechanisms while ensuring data security, integrity, and compliance with APEPDCL's IT policies.

Note:

1. Throughout the contract period, the System Integrator (SI) must integrate all new or existing systems necessary to achieve the project's scope and objectives. The SI is specifically responsible for bidirectional integration and data sharing with the central servers of MoP, MNRE, and their subsidiary bases on the directions given the APEPDCL. All data sharing must align with current and future policies, schemes or programs instituted by the GoI and GoAP.
2. Prospective bidders may, with prior approval from ISA/APEPDCL, visit the APEPDCL Corporate Office, Visakhapatnam, during office hours to familiarize themselves with the existing IT/OT infrastructure relevant to the scope of this RFP. Any observations from the visit shall not modify the provisions of this RFP.

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, 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.

f) Disaster Recovery (DR) and Business Continuity

The System Integrator (SI) shall design, implement, test, and maintain a Disaster Recovery (DR) environment for all applications, web portals, mobile applications, APIs, databases, middleware, and supporting infrastructure developed and deployed under this project at the APEPDCL Data Centre (DC). The DR environment shall ensure business continuity and enable restoration of all critical services within the agreed Recovery Time Objective (RTO) and Recovery Point Objective (RPO). The SI shall ensure that all future application releases, enhancements, patches, and configuration changes deployed in the Production environment are simultaneously replicated and synchronised with the DR environment.

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.

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

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

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

1. Training core team members on customized system functionalities.
2. Knowledge-sharing on best practices and process improvements.
3. Instruction on classroom management, communication techniques and engagement strategies.
4. Practical guidance on non-verbal communication, questioning techniques and presentation skills.

e. Training for Higher Management of Utility

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.

f. Sensitization Workshop

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:

1. The rationale and need for system integration
2. Key performance indicators and system outputs
3. Governance expectations from senior stakeholders

g. Training Locations and Infrastructure

1. The training sessions for higher management will be conducted at the Utility's Corporate Office and relevant Site Offices, as designated.
2. The Utility will provide the necessary training spaces, including seating and furniture.

h. Ongoing Training and Capacity Building

1. Conduct refresher training and re-trainings for identified groups
2. Provide training staff at Utility offices as needed.
3. Ensure access to OEM training platforms and data repositories.
4. Implement a staged training approach (before, during and post- implementation).

5. Facilitate competence development and internal capacity building.

i. Comprehensive Tutorial Library: Video Modules, Step-by-Step Guides and FAQs

- a. **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.
- b. **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.
- c. **Contextual FAQs:**
 1. Intelligent, keyword-driven FAQs providing instant solutions to common queries.
 2. Embedded links to in-depth training materials and troubleshooting guides.
- d. **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.

j. 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.

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.

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.

a. **Continuous Asset Lifecycle Support:** Provide ongoing updates to the App and backend systems to integrate new digitized assets, GIS updates, and data processing requirements post-Go-Live. A phased approach to Change Management, covering HR readiness, operational adjustments, communication strategies and continuous improvement mechanisms will be followed to achieve this.

b. 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.

c. Human Resources (HR) Plan

- i. **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.
- ii. **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.
- iii. **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.
- iv. **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.
- v. **Training Evaluations:** Post-training quizzes and feedback forms will be administered to measure knowledge transfer and retention. Evaluation results will inform targeted refresher sessions.
- vi. **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.

d. Operational Plan

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

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.

e. Functional, operational and maintenance support

- viii. Functional enhancements, defect resolution and configuration changes.
- ix. Management of user roles, access controls and support for technical and procedural queries.
- x. Administrative services for user lifecycle, password resets and authorization controls.
- xi. Performance tuning of application, middleware and database layers.
- xii. Redeployment and migration support during system upgrades or hardware transitions.
- xiii. Detailed tracking and documentation of all configuration changes and enhancements.

f. Communication Plan

- i. **Weekly Project Status Meetings:** Track milestones, risks and action items.

- ii. Internal Project Meetings: Resolve ongoing issues and escalate bottlenecks.
- iii. Change Control Board (CCB) Meetings: Evaluate and approve scope- related changes.
- iv. Communication material includes newsletters, infographics, FAQs and process briefings.

g. Feedback, Data Collection and Continuous Improvement

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 Help desk logs and issue patterns
- 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 w 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 PM 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.

Facility Management Service

Description - Facility Management Services shall be provided for the 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.

- i. **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.

ii. 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.

iii. Support for Third-Party Audits:

To facilitate & conduct 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.

iv. 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.

v. 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

vi. 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.

vii. Platform Maintenance, Upgrades & Continuous Improvement

The Facility Management Services shall also include the ongoing maintenance and continuous improvement of the complete AI platform throughout the contract period. Without any additional cost to the Utility, the System Integrator shall provide:

1. All platform software releases, version upgrades and maintenance updates issued during the contract period.
2. AI model improvements, prompt orchestration enhancements, reasoning engine optimizations and performance improvements required to maintain or improve solution effectiveness.
3. Updates to Large Language Model (LLM) connectors, AI frameworks, orchestration engines, vector databases, Retrieval-Augmented Generation (RAG) components, embedding models and supporting AI infrastructure as required for continued platform functionality.
4. API upgrades, SDK updates, middleware updates and connector enhancements necessary to maintain interoperability with integrated Utility systems and supported third-party platforms.
5. Updates to software libraries, operating system dependencies, container platforms, databases and runtime components required for security, compatibility and vendor support.
6. Security updates, vulnerability remediation, cybersecurity hardening and critical bug fixes released by OEMs or open-source communities during the contract period.
7. Implementation of platform performance optimization updates including database tuning, AI inference optimization, application optimization, indexing improvements and resource utilization enhancements.
8. Compatibility updates required due to changes in supported browsers, operating systems, cloud infrastructure, virtualization platforms or Utility IT infrastructure.
9. Periodic health assessment of the deployed platform, including recommendations for preventive maintenance, capacity optimization and technology refresh wherever applicable.
10. The above activities shall be considered part of the Facility Management Services and no additional payment shall be admissible for implementation of such updates during the contract period.
11. Any new functional module, business capability, workflow or feature that materially expands the scope of work beyond the requirements defined in this RFP shall be treated as a Change Request and shall be implemented only after written approval of the Utility under mutually agreed commercial terms.

viii. AI Operations (AIOps)

1. Continuous monitoring of AI model performance, latency and response quality.
2. Monitoring of LLM API availability, token consumption and inference failures.
3. Monitoring of RAG index health, vector database synchronization and embedding quality.
4. Detection and remediation of AI hallucination risks, prompt failures and degraded model performance.
5. Monitoring of AI agent execution success rates and autonomous workflow completion.

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.

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: Subject to the procedures outlined in the Exit Management clause, 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

Deliverables

The System Integrator shall deliver a fully configured, integrated and operational AI-Native Utility Platform for Network Analysis, Load Forecasting, DER Integration and Grid Intelligence. The platform shall be deployed, commissioned and made operational across the Utility, incorporating all functional modules specified under this RFP. The solution shall provide AI-driven analytics, advanced visualization, decision support, enterprise data integration for bidirectional data flow, autonomous AI capabilities and operational intelligence to support planning, operation and management of the distribution network. The deliverables shall include, but not be limited to, the following:

- a. **Alerts and Notifications:** Fault detection, high upstream DER power flow alerts and AI-driven trend notifications
- b. **Scalable AI/ML Model:** Continuous learning from field corrections, adaptable from pilot to full deployment.
- c. **AI-Native Web Application & mobile for Grid Intelligence and Operational Optimization**
 - AI-Driven Dashboard:** Centralized analytics for grid health, energy losses and operational KPIs.
 - i. **Load Flow Analysis:** AI-powered diagnostics for voltage profiles, power losses and

fault detection.

- ii. **GIS-Based Asset Visualization:** Interactive map with real-time SCADA overlays, predictive insights and geospatial asset tracking.
- iii. **What-If Simulations:** AI-modeled grid expansion, DER integration and load forecasting and EE/DSM planning.
- iv. **AI-Chat Interface:** Custom GPT-powered assistant for querying grid data and generating actionable insights.
- v. **Digital Single-Line Diagrams (SLDs):** AI-generated, interactive network diagrams for planning and maintenance.
- vi. **AI Agent Builder & Autonomous Task Execution Framework:** AI-powered framework for creating, deploying and managing autonomous agents capable of workflow automation, scheduled execution, live artifact generation and enterprise tool orchestration.
- 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.

d. AI-Enabled Data Integration and System Interoperability

- 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 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.
- vi. Approval of the High-Level Design (HLD) and Low-Level Design (LLD) milestones is contingent upon the SI providing a comprehensive "Integration Architecture Blueprint." This blueprint must explicitly detail all API gateways, data exchange formats, and integration patterns, and must be certified by the Architecture Governance Forum (AGF) as compliant with the Utility's open-platform, no-vendor-lock-in objectives.
- vii. **Third-Party Integration & Connector Framework:** The System Integrator shall design, develop, configure, test, deploy and maintain API-based connectors, plugins, adapters and middleware required for integration with Utility systems and approved third-party applications. The solution shall support secure standards-based integration (including REST APIs, webhooks, message queues and other industry-standard protocols), along

with connector configuration, authentication, documentation, testing and ongoing support throughout the Contract Period.

- viii. **Extensible Integration Framework:** The platform shall provide an extensible plugin and connector framework enabling the Utility to securely integrate future enterprise applications, AI services and third-party solutions with minimal custom development.

e. Preliminary Validated Dataset with Confidence Scores

- i. **Data Quality Assessment:** AI shall analyze the GIS and enterprise datasets provided by the Utility to identify inconsistencies, missing attributes, duplicate records and network connectivity anomalies.
- ii. **Confidence Scoring:** AI-generated recommendations shall be assigned confidence scores to assist Utility users in prioritizing review and validation.
- iii. **Anomaly Classification:** Identified anomalies shall be categorized based on severity and potential operational impact & validate and update grid information, resolving inconsistencies between digital and physical records.
- iv. **Recommendation Engine:** The platform shall generate AI-assisted recommendations for correcting data inconsistencies, topology errors and attribute mismatches.
- v. **Audit Trail:** All AI-generated recommendations, user decisions and modification history shall be maintained for traceability.
- vi. **AI-Based Network Connectivity Validation:** The platform shall leverage AI/ML to transform and maintain GIS data as a connected electrical network model supporting electrical tracing, routing, and network analysis, validate connectivity from Substation–Feeder–DT–Consumer–DER, detect topology and connectivity anomalies, and generate confidence-scored alerts and corrective recommendations.
- vii. **Data Migration and Network Transformation:** The SI shall be perform comprehensive extraction, transformation, and loading (ETL) of the Utility’s existing, unformatted GIS data into the required target network data model (e.g., Utility Network or equivalent). This scope includes full responsibility for schema mapping, initial topology creation, and converting raw point/line data into a fully structured, connected, and routable electrical network format prior to executing any analysis or SLD generation.

f. 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.

g. Supervised-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.

h. 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.

i. 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.

Project Management

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.

a) 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.
- ii. 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.
- iii. 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.
- iv. 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.

v. 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).

b) Development of AI/ML Logic

The AI/ML models, business rules, prompts, workflows, feature engineering logic, training methodologies, and analytical algorithms developed under this project shall be fully documented and shared with ISA and APEPDCL. No proprietary or black-box AI logic that prevents understanding, validation, modification, or future enhancement by ISA or APEPDCL shall be incorporated into the solution without prior written approval. The SI shall conduct periodic workshops, technical discussions, model review sessions, and knowledge transfer programmes, either in-person or through online collaboration platforms, as mutually agreed with ISA and APEPDCL as per convenience, to jointly validate the problem statements, modelling approach, assumptions, datasets, feature selection, model outputs, and acceptance criteria.

Network Protection & Security

The System Integrator (SI) shall design, implement, operate, and maintain a secure network architecture for the Platform to ensure the confidentiality, integrity, availability, and resilience of all communications between physical assets, Operational Technology (OT), Information Technology (IT), cloud infrastructure, and Digital Twin components. The following requirements are mandatory:

- i. **Secure Access Controls:** Implement enterprise-grade Identity and Access Management (IAM) with strong password policies, Multi-Factor Authentication (MFA), Single Sign-On (SSO) where applicable, Role-Based Access Control (RBAC), and least-privilege access for all users, administrators, service accounts, APIs, and system components.
- ii. **Authorization & Least Privilege:** Access to Digital Twin models, simulation parameters, dashboards, APIs, historical data, configuration settings, and administrative functions shall be granted strictly on a need-to-know basis using RBAC and, where applicable, Attribute-Based Access Control (ABAC). Privileged access shall be controlled through a Privileged Access Management (PAM) solution.
- iii. **Secure Communications:** All communications between sensors, field devices, gateways, applications, APIs, cloud services, and Digital Twin components shall be protected using TLS 1.3 (or higher), mutual TLS (mTLS) where applicable, IPsec VPNs for remote connectivity, and industry-standard cryptographic algorithms.
- iv. **Comprehensive Logging & Monitoring:** The system shall generate tamper-evident audit logs for successful and failed authentication attempts, privilege changes, configuration modifications, API access, network security events, synchronization failures, administrative activities, and manual overrides. All logs shall be time-synchronized and integrated with the Utility's Security Information and Event Management (SIEM) platform for continuous monitoring and incident detection.

- v. **Secure API and Service Communication:** All APIs shall require strong authentication and authorization, implement rate limiting, input validation, encryption, and protection against common API security vulnerabilities as identified in the OWASP API Security Top 10.
- vi. **Security Hardening:** All network devices, servers, virtual machines, containers, operating systems, and communication services shall be securely configured in accordance with CIS Benchmarks or equivalent industry standards. Default accounts, default passwords, insecure protocols, and unnecessary services shall be disabled.
- vii. **Vulnerability Management:** The SI shall perform regular vulnerability assessments, secure configuration reviews, and penetration testing of network infrastructure and remediate identified vulnerabilities within timelines approved by the Utility.
- viii. **Regulatory Compliance:** The SI shall mandatorily comply with all applicable cybersecurity, information security, critical infrastructure protection, data governance, and digital infrastructure requirements issued by the Central Electricity Authority (CEA), Central Electricity Regulatory Commission (CERC), Ministry of Electronics and Information Technology (MeitY), Indian Computer Emergency Response Team (CERT-In), National Critical Information Infrastructure Protection Centre (NCIIPC), and all other applicable Government of India authorities. Compliance shall be maintained throughout the contract period, and evidence of compliance shall be provided to the Utility upon request.

Platform & Software Standards

The proposed solution shall be delivered as an open, extensible, secure, vendor-neutral, and interoperable Digital Utility Platform that serves as the foundational layer for hosting, managing, and operating current and future utility applications. The platform shall enable the Utility to continuously enhance its capabilities by deploying independently developed applications, plugins, AI models, analytical engines, workflows, and digital services without requiring modification of the core platform, thereby preventing vendor lock-in and ensuring long-term sustainability. The platform shall support the installation and operation of third-party applications and plugins developed by external vendors, technology partners, startups, research institutions, or the Utility itself, subject to the review, approval, authorization, and governance of the DISCOM. The platform shall provide secure mechanisms for application certification, onboarding, deployment, access control, and lifecycle management to ensure that only DISCOM-approved applications and plugins are installed and granted access to platform resources, data, and services.

a. Open Platform Architecture

- i. The Ai Platform shall function as an application hosting platform (Platform-as-a-Service) providing a common runtime environment for deploying, executing and managing applications developed by the System Integrator, Utility, OEMs, startups, academia and other third-party developers.
- ii. The platform shall support a plug-and-play application framework, enabling applications, plugins, AI services, dashboards, workflows and analytical modules to be installed, upgraded, replaced or removed independently without impacting the operation of the core platform.
- iii. The platform shall provide well-documented Open APIs, SDKs, developer tools and event-driven interfaces to enable rapid development and seamless integration of new applications.
- iv. Applications hosted on the platform may be developed using industry-standard programming languages and frameworks, provided they comply with the published APIs, SDKs and interoperability requirements.

b. Common Data & Analytics Platform

- i. The platform shall provide a shared enterprise data layer based on a common information model to ensure that all hosted applications access a single source of truth rather than maintaining independent databases.
- ii. Applications shall securely share and reuse non exhaustive to Asset and network data, GIS layers and spatial information, Time-series operational data, SCADA/IoT measurements, Consumer and DER information, Simulation outputs, Forecasts and optimization results, Events, alarms and notifications
- iii. Analytics, simulations and recommendations generated by one hosted application shall be reusable by other authorized applications through standard APIs without requiring duplicate data storage or processing. The platform shall support centralized metadata management, data lineage, version control and governance to ensure data consistency and traceability.

c. Application Ecosystem & Marketplace

- i. The platform shall support an extensible ecosystem where new utility applications can be deployed throughout the platform lifecycle without modification of the core platform.
- ii. The platform shall provide a centralized Application Repository/App Marketplace for secure installation, upgrade, configuration, licensing, monitoring and removal of applications and plugins.
- iii. The platform shall support application version management, dependency management and backward compatibility.
- iv. Applications shall declare their required permissions and authorized data access before installation.
- v. Installation, upgrade or removal of applications shall not require shutdown of the core platform.
- vi. The SI shall ensure that upgrades to the core platform do not adversely impact DISCOM-approved third-party applications, plugins, APIs or integrations. Where interface changes are unavoidable, the SI shall maintain backward compatibility or provide migration tools, documentation and technical support to ensure uninterrupted operation of approved applications.

d. Open Standards & Interoperability

- i. The platform shall comply with internationally accepted open standards to support the Open Digital Twin objective and enable interoperability across utility systems.
- ii. The platform shall support industry standards including, where applicable IEC 61968/61970 (CIM), IEC 61850, IEC 60870-5-104, DNP3, OGC Standards (WMS/WFS), REST APIs, GraphQL, MQTT, OPC-UA
- iii. ISO/ANSI compliant interfaces, POSIX/X/Open compliant operating environments (where applicable)
- iv. The platform shall seamlessly integrate non exhaustive but with GIS, SCADA, ADMS, OMS, EMS, MDMS, AMI, ERP, CIS, Billing Systems, Asset Management Systems, DERMS, Renewable Energy Platforms, EV Charging Management Systems, IoT platforms and future enterprise applications. The platform shall remain hardware-, operating system-, database- and cloud-agnostic. The platform shall support industry-standard relational databases including Oracle, PostgreSQL/PostGIS, Microsoft SQL Server, MySQL or equivalent databases.

e. Security, Isolation & System Hardening

- i. The operating system shall be hardened in accordance with internationally recognized cybersecurity best practices and applicable Government of India cybersecurity guidelines.
- ii. Hosted applications shall execute within isolated runtime environments (containers or equivalent sandboxing mechanisms) to prevent interference between applications.
- iii. Application binaries, configuration files, logs and operational databases shall be logically or physically segregated.
- iv. Wherever applicable, application software, operating system files and Digital Twin operational data shall reside on separate storage volumes or disk partitions to minimize the risk of cross-contamination during cybersecurity incidents and facilitate secure recovery.

- v. All APIs shall implement secure authentication, authorization, encryption, audit logging and role-based access control.

f. Platform Evolution, Upgrades & Technology Refresh

- i. The SI shall ensure that the Digital Utility Platform remains technologically current throughout the Contract Period by providing periodic upgrades to the platform software, middleware, APIs, SDKs, databases, application frameworks and supporting components.
- ii. The SI shall periodically upgrade AI/ML models, analytical engines, Digital Twin capabilities and optimization algorithms to leverage advancements in technology and improve prediction accuracy, simulation capability and operational efficiency.
- iii. The SI shall provide all security patches, vulnerability remediation, dependency updates, operating system hardening, encryption upgrades and cybersecurity enhancements necessary to address newly discovered threats and vulnerabilities.
- iv. The platform shall remain compatible with new releases of operating systems, databases, browsers, cloud platforms, mobile operating systems and integrated enterprise applications.
- v. The SI shall support adoption of emerging utility standards, communication protocols and interoperability frameworks released during the contract period.
- vi. All upgrades shall preserve backward compatibility with existing applications, integrations, plugins and historical data unless otherwise approved by the DISCOM.
- vii. Major upgrades shall be tested, documented and deployed only after approval from the DISCOM, with appropriate rollback procedures to ensure business continuity.

g. Vendor-Neutral Extensibility

- i. The Utility shall have unrestricted rights to deploy, operate, replace and integrate applications developed by any vendor throughout the platform lifecycle.
- ii. Future AI models, optimization engines, analytics modules and business applications shall be deployable without requiring redevelopment of the core platform.
- iii. The platform architecture shall support hybrid cloud, private cloud, public cloud and on-premises deployments without functional limitations.

h. Data Portability & No Vendor Lock-in

- i. The Utility shall retain complete ownership of all data, metadata, configurations, Digital Twin models, AI models, simulation outputs, dashboards and analytical results generated during the project.
- ii. All data and application interfaces shall be based on open, documented and non-proprietary standards to ensure unrestricted export, migration and reuse.
- iii. The Utility shall be able to migrate applications, data and analytical assets to another platform or System Integrator without dependency on proprietary technologies.
- iv. No proprietary licensing mechanism shall prevent the Utility from deploying future third-party applications on the platform.

Security & Infrastructure

- a) Where the AI Digital Platform is hosted in the Utility's On-Premises Data Centre, the System Integrator (SI) shall implement the following security controls and infrastructure safeguards:
- b) **Data Protection:** Implementation of enterprise-grade encryption mechanisms for data-at-rest and data-in-transit. The SI shall integrate with the Utility's existing Key Management System (where available) or deploy secure key management mechanisms. SSL/TLS certificates shall be implemented and managed for all web services, APIs, application servers, databases, and communication between physical assets and the Digital Twin platform.

- c) **Threat & Edge Protection:** The SI shall integrate the solution with the Utility's existing security infrastructure, including Web Application Firewall (WAF), Next-Generation Firewall (NGFW), Intrusion Detection/Prevention Systems (IDS/IPS), Anti-Malware solutions, Network Access Control (NAC), Security Information and Event Management (SIEM), Endpoint Detection and Response (EDR), and Managed DDoS protection (where applicable). The solution shall support centralized security monitoring and logging.
- d) **Security Assessment:** The System Integrator shall perform automated and manual security assessments to identify vulnerabilities in the Digital Twin (DT) application, APIs, source code, cloud infrastructure, containers, and configurations. The assessment shall include Static Application Security Testing (SAST), Dynamic Application Security Testing (DAST), Software Composition Analysis (SCA), Infrastructure as Code (IaC) security scanning, container image scanning, cloud security posture assessment, and configuration compliance validation. All identified Critical and High vulnerabilities shall be remediated before deployment, with evidence of remediation and revalidation submitted to the Utility.

Governance & Incident Management

- i. **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.
- ii. **Logging, Monitoring, SIEM and Security Operations:** The solution shall generate comprehensive, tamper-evident security logs (authentication, authorisation, privileged actions, configuration and model changes, data access/export, agent actions, and administrative overrides), time-stamped using NTP synchronised to NIC/NPL sources. Logs shall be centrally aggregated in a SIEM, correlated for threat detection, protected against tampering (write-once/immutable storage), and retained for a minimum of 180 days online and as further required by law/Utility policy. The SI shall integrate with the Utility's existing SIEM and provide 24x7 security monitoring through a SOC (or equivalent managed service), with defined use-cases, alerting, User and Entity Behaviour Analytics (UEBA)/anomaly detection and auto-lockout, and shall forward relevant security events/alerts to the Utility's SOC/monitoring in an agreed format.
- iii. **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.
- iv. **Third-Party Security Audit:** An independent, comprehensive VAPT and security audit of the complete solution and secure source code review (application, APIs, infrastructure configuration, mobile app, integrations and AI/LLM components) shall be conducted by a CERT-In empanelled auditor prior to Go-Live. Closure of all findings is a mandatory close for Go-Live, the clean/closure report shall be submitted to the Utility. The scope, methodology and acceptance criteria for security testing shall be agreed with the Utility in advance; the vague criterion of merely 'no breaches in penetration tests' shall be replaced by these defined, evidenced acceptance criteria.
- v. **Periodic and Event-Triggered Testing:** VAPT and configuration/security audits shall be repeated at least once every six (6) months, and additionally after any major change, new integration, significant model/prompt change, or security incident, throughout the Contract Period, by a CERT-In empanelled auditor, with reports and closure evidence submitted to the Utility.
- vi. **Remediation TIMELINES:** Identified vulnerabilities shall be remediate as per the cert-in guidelines

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

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 not limited to:

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

4. Scalability and Future Network Expansion

- i. The proposed solution shall be based on a secure, scalable, modular, and API-driven architecture, leveraging cloud-native technologies, microservices (or equivalent modular architecture), and interoperable standards to support future expansion, integration, and high system availability.
- ii. The solution shall seamlessly accommodate the addition of new substations, feeders, Distribution Transformers (DTs), consumer connections, AMI/Smart Meters, Rooftop Solar (RTS), Battery Energy Storage Systems (BESS), EV charging infrastructure, and other Distributed Energy Resources (DERs) without requiring major application redesign, database restructuring, or disruption to ongoing operations.
- iii. The solution shall support scalable bidirectional integration with existing and future DISCOM IT/OT systems and automatically synchronize the data of the newly added assets, network topology changes, increasing data volumes, and real-time data streams across the Digital Twin, GIS, network analysis, load flow studies, AI/ML models, dashboards, reports, and decision-support modules while maintaining the prescribed performance and service levels.

5. 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.

Maintenance Support and Service Levels

b. 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 **24x7 support model** shall be established, encompassing proactive monitoring, incident resolution and service continuity across all key solution components.

c. 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.
- d. **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.

Payment terms and conditions

Milestone	Phase	Key Deliverables	Timeline	Payment % ³	Payment Condition ⁴
M1	Project Initiation & Solution Design	Project kick-off, governance framework, detailed project plan, requirement validation, solution	T0 + 1 Month	10%	Approval of Project Plan, Solution Design and Architecture Documents

³ Penalty/LD shall be imposed on the invoice deliverable in each milestone as defined in RFP.

⁴ All Milestones deliverables during both development and subscriptions period shall be dully approved by the discom for payment acceptance

Milestone	Phase	Key Deliverables	Timeline	Payment % ^{#3}	Payment Condition ⁴
		architecture, implementation methodology, HLD/LLD, integration strategy, cybersecurity approach, AI implementation roadmap, risk register and project management plans.			
M2	Platform Development & Environment Readiness	Development, Test and Production environments established. Core platform configuration, user management, security framework, API framework, database configuration, initial AI framework setup and development readiness.	T0 + 2 Months	10%	Successful environment setup and platform readiness
M3	Enterprise Data Integration	Integration with Utility IT/OT systems including SCADA, GIS, MDMS, Billing, RMS and other approved systems. API configuration, data ingestion pipelines, interoperability testing and integration validation reports.	T0 + 4 Months	15%	Successful completion of integration testing and acceptance

Milestone	Phase	Key Deliverables	Timeline	Payment %^{#3}	Payment Condition⁴
M4	Core Platform Deployment	Deployment and configuration of AI Dashboard, Network Analysis, Load Flow Analysis, GIS Visualization, Asset & Consumer Data Management, Digital SLD and Alert & Notification modules.	T0 + 6 Months	20%	Functional acceptance of all core platform modules
M5	Advanced AI Capabilities	Deployment of AI-powered Load Forecasting, What-if Simulation Engine, Natural Language Querying, AI Agent Builder & Autonomous Task Execution Framework, AI recommendation engine and enterprise knowledge repository.	T0 + 7 Months	15%	Acceptance of AI modules and successful demonstration of AI capabilities
M6	Testing, UAT & Go-Live Readiness	System Integration Testing (SIT), Performance Testing, Security Testing, User Acceptance Testing (UAT), issue resolution, user training, technical documentation, administrator manuals and Go-Live readiness certification.	T0 + 8 Months	15%	Successful completion of UAT and Go-Live approval by Utility

Milestone	Phase	Key Deliverables	Timeline	Payment % ^{#3}	Payment Condition ⁴
M7	Production Go-Live & Final Acceptance	Production deployment, stabilization support, knowledge transfer, final documentation, acceptance testing, operational handover and project closure report.	T0 + 9 Months	15%	Successful Production Go-Live and Final Acceptance Certificate in both web & mobile applications
M8	Facility Management Services (FMS) ⁵	Facility Management Services including platform support, AI model maintenance, software upgrades, security patches, performance optimization, incident management, SLA compliance, periodic reporting and transition support.	Post Go-Live (Contract Period)	Quarterly ^{##}	Quarterly payment based on SLA compliance and successful delivery of FMS services

% of the price quoted for development of the AI platform

On basis of the quoted subscription cost

Note: The Project timelines and schedule mentioned above are indicative and shall be finalized through mutual discussion and joint acceptance by ISA, APEPDCL and the SI. The SI shall submit a detailed implementation schedule, consistent with the overall Project duration specified in the RFP, for review by ISA & APEPDCL. Following review and incorporation of mutually agreed comments, the finalized schedule shall form the Project baseline. Any subsequent adjustments to the implementation schedule, where warranted, shall be reasonable, proportionate to the underlying circumstances, and limited to the extent necessary to achieve successful completion of the Project.

⁵ Subscription period shall commence post Go live acceptance from the Discom

Roles and Responsibilities

a. Responsibilities of the System Integrator (SI)

a.1. Development, Deployment and Maintenance of Digital Solutions

- a.1.1. Design, develop, configure, test, deploy and commission a fully functional AI-powered web and mobile-based Utility Platform comprising modules such as GIS-based Network Visualization, Digital Single-Line Diagrams (SLDs), Network Analysis, Load Forecasting, AI-powered Natural Language Querying, AI Agent Builder, What-If Simulations, Asset & Consumer Data Management, Alerts & Notifications and other functionalities specified in this RFP.
- a.1.2. Deploy the platform in an on-premise, cloud or hybrid environment, as specified by the Utility, ensuring scalability, high availability, interoperability, reliability and seamless user experience.
- a.1.3. Continuously enhance AI models, analytics capabilities, dashboards and decision-support functionalities based on operational feedback, evolving grid requirements and technological advancements
- a.1.4. The System Integrator (SI) shall be responsible for data collection, integration, preprocessing, cleansing, standardization, validation, transformation, and quality assurance of data received from the DISCOM to establish a consistent, analytics-ready data foundation for implementation of the proposed solution.

a.2. Enterprise Data Integration, AI-Driven Data Quality and Decision Support

- a.2.1. Integrate the platform with the Utility's existing IT and OT systems, including but not limited to GIS, SCADA, RMS, MDMS, AMI, Billing Systems, OMS, DMS/ADMS, Asset Management Systems and other approved enterprise applications to enable a unified operational data environment.
- a.2.2. Implement AI-driven data validation, harmonization, reconciliation and quality assessment capabilities to identify inconsistencies, duplicate records, missing attributes, topology anomalies and other data quality issues across integrated datasets, and provide confidence-based recommendations for review by authorized Utility personnel
- a.2.3. Establish enterprise data governance, metadata management, data lineage, audit trails and synchronization mechanisms to ensure data integrity, consistency, traceability and controlled data exchange across integrated systems

a.3. End-to-End Technical Support for Ongoing Grid Updates

- a.3.1. Provide continuous technical assistance for capturing, updating and integrating changes in the grid infrastructure, such as new asset installations, maintenance activities
- a.3.2. Implement automated workflows for real-time data updates, ensuring the digital representation of the grid remains current and reflects all modifications.

a.4. AI Platform Operations, Administration and Lifecycle Support

- a.4.1. Provide continuous administration, monitoring and lifecycle management of the deployed AI platform, including software modules, AI models, dashboards, workflows, user

- management and system integrations.
- a.4.2. Develop, manage and maintain secure APIs and data pipelines to support reliable real-time information exchange across integrated enterprise system
- a.4.3. Maintain platform configuration management, software version control, release management, technical documentation and operational logs to ensure traceability, auditability and efficient long-term platform management
- a.5. **Training and Knowledge Transfer for Operational Readiness**
 - a.5.1. Design and execute structured training programs for DISCOM personnel, including field engineers, control room operators and administrative staff, ensuring efficient system adoption
 - a.5.2. Deliver customized learning modules, including hands-on workshops, instructional videos and AI-powered interactive guides, to enhance user proficiency.
 - a.5.3. Provide train-the-trainer sessions to develop in-house expertise within DISCOM for system maintenance and troubleshooting.
- a.6. **Real-Time Monitoring, Advanced Analytics and Continuous System Enhancements**
 - a.6.1. Deploy AI-driven analytics dashboards for real-time monitoring of grid performance, energy losses, asset health and operational KPIs.
 - a.6.2. Implement predictive maintenance models, leveraging AI/ML to anticipate grid failures and optimize asset management.
 - a.6.3. Offer continuous system improvements, incorporating technological advancements to enhance grid resilience and efficiency.
- a.7. **Ensuring Data Security, Compliance and Cybersecurity Resilience**
 - a.7.1. Implement robust cybersecurity protocols aligned with national and international standards, ensuring protection against cyber threats, unauthorized access and data breaches.
 - a.7.2. Ensure end-to-end encryption, role-based access control (RBAC) and multi- factor authentication (MFA) to safeguard sensitive DISCOM data.
 - a.7.3. Conduct periodic security audits, penetration testing and vulnerability assessments to uphold system integrity.
 - a.7.4. Maintain compliance with regulatory frameworks, including CERC, CEA and DISCOM-specific IT policies for data governance and cybersecurity.
- b. **Responsibilities of the DISCOM**
 - b.1. **Provision of Grid Asset Data, GIS Layers and Power Flow Records**
 - b.1.1. Grant comprehensive access to existing asset registries, GIS maps, feeder configurations and power distribution records to enable system integration.
 - b.1.2. Share historical and real-time data from SCADA, RMS, billing systems and energy meters to facilitate data validation and analytics-driven insights.
 - b.2. **Integration Support for Seamless Data Exchange**
 - b.2.1. Facilitate technical collaboration with IT teams to establish secure API-based integration between the new digital platform and existing DISCOM infrastructure.
 - b.2.2. Provide comprehensive access to critical grid-related data, including:
 - b.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
- b.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
- b.2.2.3. Consumer billing records, meter data and load profiles updated monthly or hourly for billing accuracy, loss reduction and demand forecasting
- b.2.2.4. Distributed Energy Resources (DER) data with high-frequency generation and status updates to ensure effective integration, grid stability and simulation capabilities
- b.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.
- b.2.2.6. The DISCOM shall facilitate integration with existing third-party applications, OEM systems, and enterprise platforms by providing the System Integrator with access to relevant APIs, interface specifications, database schemas, data dictionaries, communication protocols, authentication mechanisms, sample datasets, and technical documentation, wherever available. The DISCOM shall also specify the availability, format, frequency, quality, and historical retention period of each dataset (e.g., number of years/months of historical data available) to enable the SI to design, configure, and implement the required integration, AI/ML models.
- b.3. **On-Ground Coordination with Field Teams for Data Validation**
 - b.3.1. Enable direct engagement with linemen, field engineers and operational staff for on-site asset verification and real-time data collection.
 - b.3.2. Ensure that field teams validate and update grid information, resolving inconsistencies between digital and physical records.
- b.4. **Allocation of IT Infrastructure and Server/Cloud Resources**
 - b.4.1. Provision necessary server sizing & capacity, cloud storage or on premise and networking resources for hosting and running the new system efficiently.
 - b.4.2. Ensure sufficient bandwidth and network access for seamless data transmission from remote field locations to the central repository.
 - b.4.3. Provision for the expansion of server infrastructure to ensure sufficient capacity for the smooth execution of algorithms & required platform operations.
- b.5. **Support for Field Testing, Pilot Runs and Full-Scale Implementation**
 - b.5.1. Assist in pilot deployments, testing system performance in select zones before full-scale rollout.
 - b.5.2. Provide feedback loops for system refinements, ensuring operational alignment with DISCOM's workflows.
 - b.5.3. Facilitate progressive deployment, ensuring a smooth transition from legacy processes to AI-powered grid management.
- b.6. **Appointment of a Nodal Officer for Project Coordination**
 - b.6.1. Designate a single point of contact (SPOC) responsible for coordinating between DISCOM teams and the System Integrator.

- b.6.2. Ensure timely decision-making, approvals and issue resolution to streamline project execution.
- b.7. **Ensuring Adoption and Effective Utilization of the New System**
 - b.7.1. Drive organizational change management, ensuring that personnel across departments effectively adopt the new AI-driven platform.
 - b.7.2. Establish KPIs for system utilization, monitoring its impact on operational efficiency, revenue protection and loss reduction.
 - b.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 ⁶ , 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	

⁶ The scope of the System Integrator shall be limited to AI/ML-based analysis, Network Analysis and other functionalities/deliverables specified under this RFP, based on the GIS data provided by the Utility

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	
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	

Exit Management and Handover

- a. **Exit Management & Handover:** The System Integrator (SI) must execute a zero-cost Exit Management Plan upon contract expiry, termination, or if APEPDCL does not continue the subscription beyond the first year. The SI must hand over complete, editable documentation, source code, AI/ML models, schemas, and APIs to both APEPDCL and the ISA to enable independent operation.
- b. **Perpetual Software Rights (Dual Ownership):** The perpetual rights shall be jointly owned by ISA and APPEDCL as per details given below
 - i. **ISA's Rights (The Baseline Release):** The ISA holds a perpetual, global, royalty-free, and sub-licensable

license to the "Baseline Release" (all software, development, and configurations completed up to the end of the First Year Subscription). These rights apply even if the contract is terminated or not renewed after the first year.

- ii. **APEPDCL's Rights (Baseline + Future Enhancements):** APEPDCL holds perpetual rights to the Baseline Release *plus* exclusive perpetual rights to all enhancements, modules, and developments made during any subsequent years they continue the platform. Post-Year 1 developments do not fall under the ISA's license without APEPDCL's written consent.
- c. **Data Ownership (APEPDCL Exclusive):** APEPDCL exclusively owns all project data, reports, and insights in perpetuity (this data is strictly excluded from the ISA's software license). Upon exit at any time, the SI must migrate all data to APEPDCL and provide written certification that all SI copies are permanently deleted.
- d. **Licensing & Credentials:** All third-party software, subscriptions, and certificates must be registered in APEPDCL's name. At exit, the SI must hand over all administrative rights, activation keys, credentials, and perpetual licenses so no component relies on the SI.

Facility Management Phase SLA Overview (Post Implementation)

Component	Definition / Policy
Monthly Availability Formula	$\% \text{ Availability} = ((\text{Actual Uptime}^7 + \text{Scheduled Downtime}) / \text{Total Monthly Hours}) \times 100$
Actual Uptime	Total hours in a month when each equipment or component is available for use.
Scheduled Downtime	Permitted downtime due to preventive/scheduled 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.

⁷ Actual Uptime" is measured before or after excluding scheduled maintenance

Special Condition	If DISCOM delays equipment release for repairs, downtime count starts after handover to SI.
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A. 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

B. 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. 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		

C. 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)	A Fault Scenario is defined as an application outage that meets ALL of the following conditions: 1. Application is NOT under planned maintenance – Scheduled maintenance windows communicated to users do not count as fault scenarios 2. Fault is NOT relating to server	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%

S. No.	Service	Parameter	Service level	Validation	Penalty
		hardware issues provided by DISCOM – Where DISCOM provides the physical servers, hardware failures on those servers are excluded from this SLA 3. $\geq 20\%$ of concurrent active users unable to access the application			
1.2	Problem Management	• SI shall submit a comprehensive Problem Management Report every quarter covering all incident types with more than 10 occurrences in that quarter • SI shall implement corrective and preventive actions	100% timely submission covering all incidents logged in that quarter	• Root Cause Analysis Report and Incident Register for the quarter • Evidence of Corrective and Preventive Actions implemented during the quarter	• 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

S. No.	Service	Parameter	Service level	Validation	Penalty
		within the quarter in which the problem is identified			
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%

S. No.	Service	Parameter	Service level	Validation	Penalty
1.5	AI Model Accuracy & Performance	Accuracy of AI predictions, recommendations and analytics for use cases covered under the RFP.	AI outputs shall meet the acceptance criteria and accuracy thresholds approved during UAT and maintained throughout the Contract Period.	Periodic validation reports, benchmark datasets and UAT records.	0.5% of Quarterly Subscription Cost for each validated failure to maintain agreed performance, capped at 2% per quarter.(The first six (6) months from Go-Live shall constitute the Warranty/Stabilization Period. No SLA penalties shall be levied under this KPI during this period)
1.6	Third-Party Integration Support	Availability and operational continuity of APIs, connectors and integrations developed under the Contract.	99.5% successful API/connect or availability excluding failures attributable to third-party systems or Utility infrastructure.	API monitoring reports, integration logs and incident reports.	0.25% of Quarterly Subscription Cost per breach, capped at 2% per quarter.(Applicable only when discom allows for third party integration as per the scope of RFP)
1.7	Plugin & Connector Maintenance	Support for plugins, adapters, SDKs and connectors supplied under the Contract, including compatibility updates following changes in integrated applications	Critical compatibility issues to be resolved within 5 Business Days; all other issues within mutually agreed SLA timelines.	Release notes, compatibility reports and change records.	0.25% of Quarterly Subscription Cost per breach, capped at 2% per quarter. (Applicable only when discom allows for third party integration as per the scope of RFP).

S. No.	Service	Parameter	Service level	Validation	Penalty
		.			
1.8	Agentic AI Performance	Availability, responsiveness and successful execution of AI Agents, autonomous workflows and AI-assisted services covered under the Contract.	AI services and configured AI workflows shall remain operational throughout the Contract Period. AI responses and workflow execution shall be completed within reasonable operational timelines under normal operating conditions, excluding delays attributable to third-party systems, external AI services or Utility infrastructure.	System logs, workflow execution logs, audit trails, performance reports, UAT records and monthly FMS reports.	0.25% of Quarterly Subscription Cost per validated breach, capped at 2% per quarter.(The first six (6) months from Go-Live shall constitute the Warranty/Stabilization Period. No SLA penalties shall be levied under this KPI during this period.)

S. No.	Service	Parameter	Service level	Validation	Penalty
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: 1. The total cumulative penalty imposed for applicable SLA breaches shall be limited to a maximum cap of 18% of the quarterly invoice amount 2. The successful bidder shall arrange SLA measurements through system generated reports 3. 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. 4. SLA Measurement and Validation: Unless otherwise specified, all SLA parameters shall be measured using logs, reports, audit trails, incident records, application/server logs, health-check records, or equivalent monitoring mechanisms implemented as part of the solution. The monitoring mechanism shall be proposed by the SI and approved by ISA & DISCOM prior to Go-Live. All SLA assessments & measurements shall be jointly reviewed and validated by the SI and DISCOM through the Monthly SLA Performance Report.					

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	☐
▪ Form B: Bidder Information Form	☐
▪ Form C: Joint Venture/Consortium/ Association Information Form	☐
▪ Form D: Qualification Form	☐
▪ Form E: Format of Technical Proposal	☐
▪ [Add other forms as necessary]	☐
Have you provided the required documents to establish compliance with the evaluation criteria in Section 4?	☐

Financial Proposal Envelope

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

▪ Form F: Financial Proposal Submission Form	☐
▪ Form G: Financial Proposal Form	☐

Annexures

Annexure 1 Must be submitted in a separate sealed envelope/password protected email

▪ Annexure 1 Cost break ups	☐
▪ Annexure 2 Server Capacity requirements	☐

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*.

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

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] Telephone numbers: [Complete] Email: [Complete]
Are you a UNGM registered vendor?	☐ Yes ☐ No If yes, [insert UNGM vendor number]
Are you an ISA vendor?	☐ Yes ☐ No
Countries of operation	[Complete]
No. of full-time employees	[Complete]
Quality Assurance Certification (e.g. ISO 9000 or Equivalent) (If yes, provide a Copy of the valid Certificate):	[Complete]
Does your Company hold any accreditation such as ISO 14001 related to the environment? (If yes, provide a Copy of the valid Certificate):	[Complete]
Does your Company have a Written Statement of its Environmental Policy? (If yes, provide a Copy)	[Complete]
Contact person ISA may contact for requests for clarification during Proposal evaluation	Name and Title: [Complete] Telephone numbers: [Complete] Email: [Complete]
Please attach the following documents:	▪ Company Profile, which should <u>not</u> exceed fifteen (15) pages, including printed brochures and product catalogues relevant to the goods/services being procured ▪ Certificate of Incorporation/ Business Registration ▪ 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 ▪ Trade name registration papers, if applicable ▪ Local Government permit to locate and operate in assignment location, if applicable ▪ Official Letter of Appointment as local representative, if Bidder is submitting a Bid in behalf of an entity located outside the country ▪ Power of Attorney

Form C: Joint Venture/Consortium/Association Information Form

Name of Bidder:	[Insert Name of Bidder]	Date:	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 (address, telephone numbers, fax numbers, e-mail address)	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 **OR** ☐ JV/Consortium/Association agreement

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:

Name of partner:

Signature: _____

Signature: _____

Date: _____

Date: _____

Name of partner:

Name of partner:

Signature: _____

Signature: _____

Date: _____

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

☐ Contract non-performance did not occur for the last 3 years			
☐ 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: Address of Client: Reason(s) for non-performance:	

Litigation History (including pending litigation)

☐ No litigation history for the last 3 years			
☐ Litigation History as indicated below			
Year of dispute	Amount in dispute (in US\$)	Contract Identification	Total Contract Amount (current value in US\$)
		Name of Client: Address of Client: Matter in dispute: Party who initiated the dispute: Status of dispute: 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), indicate the source		

Financial information (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]

EDUCATION/ QUALIFICATIONS _____	<i>[SUMMARIZE COLLEGE/UNIVERSITY AND OTHER SPECIALIZED EDUCATION OF PERSONNEL MEMBER, GIVING NAMES OF SCHOOLS, DATES ATTENDED, AND DEGREES/QUALIFICATIONS OBTAINED.]</i>
	[INSERT]
PROFESSIONAL CERTIFICATIONS _____	<i>[PROVIDE DETAILS OF PROFESSIONAL CERTIFICATIONS RELEVANT TO THE SCOPE OF SERVICES]</i>
	▪ NAME OF INSTITUTION: [INSERT] ▪ DATE OF CERTIFICATION: [INSERT]

EMPLOYMENT
RECORD/
EXPERIENCE

[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.]

[INSERT]

[PROVIDE NAMES, ADDRESSES, PHONE AND EMAIL CONTACT INFORMATION FOR TWO (2) REFERENCES]

REFERENCES	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	Date (Day/Month/Year)

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)(INR/USD)
Professional Fees 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 (Incl of taxes and etc)for development of the AI solution platform and shall give the cost break up mandatorily ⁸ as per the format given in the annexure
Other Costs (Annual Levelized Subscription Cost* for 5 year)	Cost break up to be provided as above
Taxes (if applicable)	
Total Amount of Financial Proposal	

* The Bidder shall quote a single, all-inclusive annual subscription fee, which shall remain fixed and applicable throughout the entire five (5) year subscription period.

The subscription shall initially be contracted for a period of one (1) year from the date of Go-Live. The subscription cost for the initial one (1) year period shall be borne

⁸ Price quotations without cost break up will be liable to be rejected

entirely by ISA, and APEPDCL shall not have any payment or financial obligation towards the subscription during this period. APEPDCL shall, however, reserve the right, at its sole discretion, to continue the subscription for a further period of four (4) years, subject to the satisfactory performance of the Agency during the initial one (1) year period, availability of budgetary provisions, and the continued requirement of APEPDCL. During the extended four (4) year period, the annual subscription fee shall remain the same as the rate quoted by the successful Bidder and shall be borne by APEPDCL. Accordingly, prior to expiry of the initial one (1) year subscription period, APEPDCL shall issue a separate Letter of Award (LoA) to the successful Bidder for the subsequent four (4) year subscription period, incorporating the applicable standard Terms and Conditions of APEPDCL.

The successful Bidder shall submit a Contract Performance Guarantee (CPG) to APEPDCL equivalent to ten percent (10%) of the total subscription value for the subsequent four (4) year period. The CPG shall remain valid for the entire applicable subscription contract period, including the prescribed claim period, as stipulated in the applicable Terms and Conditions of APEPDCL.

Annexure: 1 for Cost Break Up as per Table 1 of the Form G in the RFP

A. Professional Fees (Must be submitted in a separate sealed envelope/password protected email)

Sl. No.	Cost Component	Amount (USD/INR)
1	Solution Design, Project Management & PMO	
2	Web based AI Platform Development, Configuration & Customization	
3	Agentic AI Framework, AI Agents & Workflow Automation Development	
4	AI Copilot, Natural Language Query (NLQ) & LLM Integration	
5	Network Analysis, Load Forecasting, Digital Twin, Hosting Capacity & What-if Simulation Modules	
6	Dashboard Development, Visualization & Reporting	
7	Mobile Application Development & Deployment	
8	Enterprise Integration (SCADA, GIS, MDMS/AMI, FMS, RMS, OMS/DMS, ERP/CIS, Billing, Asset Management, APIs, etc.)	
9	Third-Party Application Hosting, API Gateway, SDK & Integration Framework	
10	System Integration Testing (SIT), User Acceptance Testing (UAT), Performance & Security Testing	
11	AI/ML Model Development, Training, Validation & Model Lifecycle Management (MLOps)	
12	Training, Documentation, Knowledge Transfer & Change Management	
13	Cybersecurity, Identity & Access Management, Audit Logging and Role-Based Access Control (RBAC)	
14	Go-Live Support, Warranty & Facility Management Services (Implementation Period)	
	Grand Total	

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

Sl. No.	Subscription & FMS Line Item	RFP FMS & Service Clause Coverage	USD/INR
1	Core Platform & Infrastructure Maintenance	• Patch Management & Baseline Maintenance: OS, database, middleware, and firmware updates. • Platform Upgrades: Unlimited updates for web and mobile applications without extra cost. • Disaster Recovery (DR): Real-time data replication and failover drills at APEPDCL Data Centre.	
2	AI Operations & Model Lifecycle Management (AIOps)	• AIOps: Continuous monitoring of AI model drift, latency, token consumption, and inference quality. • LLM & RAG Health: Vector database sync, embedding updates, and prompt orchestration tuning. • Model Retraining: Retraining network analysis and demand forecasting models on fresh SCADA/RMS data.	
3	Continuous Asset Lifecycle & Network Topology Updates	• Dynamic Asset Ingestion: Automated backend updates to incorporate newly added/augmented DTs, feeders, rooftop solar, and smart meters into the Digital Twin and GIS without code changes. • Network Topology Sync: Continuous load flow and SLD updates as the grid expands.	
4	API Gateway, Connector & Third-Party Integration Maintenance	• Bidirectional API Maintenance: Operational continuity for SCADA, GIS, MDMS, AMI, FMS, RMS, Billing, and ERP integrations. • Plugin/SDK Maintenance: Updating API adapters when underlying DISCOM IT/OT systems undergo upgrades.	
5	24x7 Helpdesk, Ticketing & SLA Incident Management	• 24x7 Support Hub: Centralized L1, L2, and L3 support (phone, email, web portal). • SLA Compliance: Strict adherence to response/resolution times (High: 6h, Med: 24h, Low: 48h). • ITIL Processes: Incident, problem, and change management with automated ticket tracking.	
6	Cybersecurity, SIEM/SOC Logging & Periodic Audits	• CERT-In Audits: Bi-annual (every 6 months) mandatory VAPT and source code security audits.	

		• IAM & SIEM Operations: User access reviews, tamper-proof logging, SIEM/SOC integration, and auto-lockout security enforcement.	
7	Change Management		
Annual Levelized Subscription Fee			
Applicable Taxes			
All-Inclusive 5-Year Levelized Subscription Fee <i>(Carried to Table 1 of Form G)</i>			

Note: The SI may include additional applicable cost component(s) or exclude non-applicable cost component(s), subject to clear identification and justification in the financial proposal. Such additions or exclusions shall not dilute the scope, functionality, or obligations specified in this RFP.

Annexure: 2 Server CAPACITY SIZING

Bidders shall mandatorily provide the server sizing details in the format specified below for each implementation. Bidders may add additional line items, if required, to justify their proposed sizing. The server sizing requirements have been designed considering the expected quantity of data available from smart meters, DERs, and other integrated systems during each implementation.

The bidders shall refer to the smart meter deployment and data availability details provided in the RFP for APEPDCL. It is anticipated that smart meter penetration at both the consumer and feeder levels, along with other DER integrations, will increase significantly in the coming years. Therefore, the proposed infrastructure shall be scalable and capable of supporting future expansion without requiring major architectural changes. Accordingly, the server sizing and capacity planning have been structured on a basis to ensure optimal resource utilisation, cost-effectiveness, and seamless scalability throughout the project lifecycle.

Submission of the server sizing details in the prescribed format is mandatory. Failure to furnish the required information, or submission of incomplete or non-compliant details, shall render the bid non-responsive and liable for rejection.

SN	Items Description	vCPU/GPU Nos	RAM – In GB	Storage (SSD) – In GB	Justifications for sizing
1	Application Servers				
2	DB Servers				
3	Primary Storage: SSD Drive Storage (SAN/NAS/ Local)				
4	Archive Storage: SSD Drive Storage (SAN/NAS/ Local)				
5	GPU: NVIDIA A100 (40/80GB)				
6	Associated compute for GPU: Server				

Based on the RFP deliverables and SLA, the component-wise sizing of servers

In addition to the overall server sizing specified above, bidders shall provide a detailed server sizing assessment for each major AI-enabled functionality, analytical module, and processing task covered under the Scope of Work of this RFP. While estimating requirements, bidders may make reasonable assumptions about the expected workload, including the number of concurrent users, role-based access patterns, and the simultaneous execution of AI models. All such assumptions shall be clearly justified. The cumulative resource requirements derived from these individual functional assessments shall be consistent with and adequately justify the overall server sizing proposed in the summary table above.

This format allows bidders to fill in the sizing based on their architecture and assumptions. Bidders may remove or add any line item with proper justifications.

Workload Pool	vCPU/GPU No's	RAM – In GB	Storage (SSD) – In GB	Workload Pool Basis / Activities Covered
Ingestion & Stream Processing				Smart meter data ingestion, SCADA telemetry, IoT/DER data ingestion, event streaming, message queue processing, ETL pipelines and real-time data acquisition.
Application / API Tier				Web application services, REST APIs, user authentication, business logic, workflow management, dashboards, report generation and user session management.
GIS / Map & Tile Server				GIS map rendering, vector/raster tile services, spatial visualisation, network maps, feeder/DT/consumer asset visualisation and map-based analytics.
Analytics (OLAP / Time-Series Store)				Time-series analytics, KPI dashboards, historical data analysis, forecasting, trend analysis, BI reporting and analytical query execution.
Network Analysis / Load Flow Engine				Load flow analysis, power system studies, hosting capacity analysis, contingency analysis, voltage profile analysis and network optimisation.
What-if / Simulation Pool				Digital twin simulations, scenario analysis, DER integration studies, outage simulations, AI-assisted planning and predictive operational simulations.
OLTP Database (PostgreSQL/PostGIS)				Transaction database, GIS database, asset registry, consumer records, workflow database, metadata repository and operational data management.
Integration / ESB / API Gateway				Integration with GIS, SCADA, ADMS, OMS, MDMS, AMI, CIS, Billing, ERP, Asset Management, third-party APIs and enterprise middleware.
Cache / Session Tier (Redis)				Session management, query caching, dashboard caching, map tile caching, application acceleration and temporary data storage.
AI Serving Host (CPU Side of GPU Nodes)				LLM serving, Retrieval Augmented Generation (RAG), vector search, AI agent orchestration, prompt processing, model inference coordination and tool execution.
Observability, SIEM & SLA Monitoring				System monitoring, logging, performance analytics, security monitoring, audit trails, SLA monitoring, alerting and health dashboards.

Workload Pool	vCPU/GPU No's	RAM – In GB	Storage (SSD) – In GB	Workload Pool Basis / Activities Covered
Total Logical vCPU				Total logical compute requirement across all workload pools.
Total RAM Requirement (GB)				Total RAM requirement based on workload sizing and bidder's proposed architecture.
Physical vCPU After Over-Commit				Effective physical CPU requirement after applying the proposed over-commit ratio.
GPU Requirement				GPUs required for AI model inference, LLMs, RAG, fine-tuning, computer vision, forecasting and other AI/ML workloads.