

TRANSMISSION CORPORATION OF ANDHRA PRADESH LIMITED
(APTRANSCO)

EXPRESSION OF INTEREST (EOI)

for

Establishment of State Transmission Asset Management Centre (STAMC) with Reliability Centered Maintenance (RCM) Framework and Operationalisation of Unmanned Substations in Andhra Pradesh

EOI Reference Number	APTRANSCO/SLDC/ 02 /2025
Issuing Authority	Chief Engineer (SLDC), APTRANSCO
Date of Issue	13.03.2026
Last Date of Submission	26.03.2026
Mode of Submission	Email and/or Physical Delivery
Address for Communication	Chief Engineer, SLDC, APTRANSCO, Vidyuth Soudha, Gunadala, Vijayawada – 520004, Andhra Pradesh

1. Background and Context

The Transmission Corporation of Andhra Pradesh Limited (APTRANSCO), established under the AP Electricity Reforms Act, 1998, is the State Transmission Utility (STU) responsible for the planning, construction, operation, and maintenance of the Extra High Voltage (EHV) transmission network in the State of Andhra Pradesh. The transmission infrastructure currently comprises 400 kV, 220 kV, and 132 kV substations along with approximately 31,665 CkM of EHV transmission lines, catering to a peak demand that has risen to approximately 13,712 MW in FY 2024–25.

As the State’s transmission network continues to expand with ambitious targets — APTRANSCO recognises the imperative need to modernise its asset management philosophy. The current maintenance regime, largely time-based and reactive in nature, does not optimally leverage the full potential of modern condition monitoring, predictive analytics, and digital substation automation technologies.

Globally, leading transmission utilities have transitioned from conventional Time-Based Maintenance (TBM) to Reliability Centered Maintenance (RCM), an approach that systematically identifies the most efficient and cost-effective maintenance strategies by analysing failure modes, their consequences, and the optimal intervention tasks. In India, the Power Grid Corporation of India Limited (PGCIL) has successfully established the National Transmission Asset Management Centre (NTAMC) at Manesar, Haryana, along with Regional Transmission Asset Management Centres (RTAMCs), enabling remote monitoring and unmanned operation of about 280 Nos. substations. This architecture has resulted in significant operational efficiencies, reduced manpower dependency, enhanced asset reliability, and

early fault detection through technologies such as online Dissolved Gas Analysis (DGA) monitoring of transformers and reactors.

Drawing inspiration from proven NTAMC/RTAMC models and global best practices in asset management (aligned with ISO 55001), APTRANSCO intends to establish a State Transmission Asset Management Centre (STAMC) to progressively convert its existing substations into fully unmanned, digitally-enabled facilities. The objective is to migrate from reactive and time-based maintenance to a data-driven, RCM-based predictive maintenance paradigm.

2. Objective

APTRANSCO invites Expression of Interest (EOI) from experienced, qualified, and financially sound firms/consortia for providing consultancy and implementation services for the following interlinked objectives:

- 1. Adoption of Reliability Centered Maintenance (RCM) Framework:** Design and implement a comprehensive RCM framework, aligned with IEC 60300 standards, for APTRANSCO's transmission assets. This shall include Failure Mode, Effects, and Criticality Analysis (FMECA), development of optimised maintenance task packages, and establishment of a Computerised Maintenance Management System (CMMS) to transition from time-based to condition-based and predictive maintenance.
- 2. Establishment of State Transmission Asset Management Centre (STAMC):** Establish a centralised STAMC with a multi-tier architecture (similar to PGCIL's NTAMC/RTAMC model) for real-time remote monitoring, supervisory control, asset health analytics, and predictive maintenance decision support for all APTRANSCO EHV substations across the State.
- 3. Operationalisation of Unmanned Substations:** Upgrade existing conventional and SAS-equipped substations to fully unmanned operation through deployment of IEC 61850 compliant Substation Automation Systems (SAS), advanced physical security systems, fire detection and suppression systems, and comprehensive visual monitoring.
- 4. Preparation of Detailed Project Reports (DPRs):** Prepare comprehensive DPRs, including technical specifications, bill of quantities, cost estimates, and implementation roadmaps for each of the above components.

3. Detailed Scope of Work

The scope of work is organised into four integrated modules as described below. The selected firm(s) shall be expected to deliver end-to-end consultancy and, where applicable, turnkey implementation services across all modules.

Module A: RCM Framework Development and Predictive Maintenance Strategy

This module forms the foundational layer upon which the entire asset management transformation will be built. The selected firm shall:

- 1. Asset Criticality Assessment:** Conduct a comprehensive asset inventory and criticality ranking of all APTRANSCO EHV substations and their major equipment (ICTs, PTRs, circuit breakers, bus bars, CTs, PTs, surge arrestors, control and protection panels, etc.) based on consequence of failure, probability of failure, and operational context.

2. **FMECA Studies:** Perform detailed Failure Mode, Effects, and Criticality Analysis (FMECA) for all critical asset classes in accordance with IEC 60812 standards, including identification of dominant failure modes, failure consequences (safety, environmental, operational, economic), and determination of P–F intervals.
3. **RCM Task Selection and Optimisation:** Apply the RCM decision logic to determine the most appropriate maintenance task for each failure mode: on-condition monitoring (predictive), scheduled restoration, scheduled discard, failure-finding, or run-to-failure. Develop optimised maintenance task packages with recommended periodicities.
4. **Condition Monitoring Strategy:** Design a comprehensive condition monitoring regime including, but not limited to:
 - Online Dissolved Gas Analysis (DGA) for transformers and reactors
 - Partial Discharge (PD) monitoring for GIS / Transformers
 - Bushing healthiness monitoring (tan delta, capacitance)
 - Thermal imaging and infrared monitoring
 - Circuit breaker condition monitoring (timing, travel, contact wear)
 - Battery monitoring systems
 - Oil quality monitoring (moisture, acidity, dielectric strength)
5. **CMMS Implementation:** Design and implement a Computerised Maintenance Management System (CMMS) integrated with the STAMC for automated work order generation, spare parts management, maintenance history tracking, KPI dashboards, and continuous improvement analytics.
6. **Predictive Analytics Platform:** Develop and deploy AI/ML-based predictive analytics models for equipment health indexing, remaining useful life estimation, and proactive alert generation, utilising real-time data feeds from condition monitoring sensors and SCADA systems.

Module B: Upgradation of Conventional Substations to Unmanned Operation

This module covers the preparation of DPRs and subsequent implementation for upgrading existing conventional substations (about 170 Nos. 132 kV & 70 Nos. 220 kV) (without SAS) to fully unmanned, remotely operable facilities. The scope includes:

1. **Substation Automation System (SAS):** Design, supply, installation, testing, and commissioning of IEC 61850 compliant Substation Automation System including station-level, bay-level, and process-level equipment. This shall include RTUs/gateway servers, bay controllers, protection relays with IEC 61850 communication capability, merging units (where applicable), and Human Machine Interface (HMI) systems.
2. **Communication Infrastructure:** Establishment of a robust, redundant communication network within the substation (Ethernet switches, fibre optic cabling, time synchronisation using PTP/IEEE 1588) and to the STAMC/ZTAMC (using APTRANSCO's existing OPGW/fibre backbone or alternative MPLS/VPN links with adequate bandwidth and redundancy).
3. **Condition Monitoring Equipment:** Supply and installation of all online condition monitoring sensors and systems as determined under Module A for enabling predictive maintenance.

4. **Fire Detection and Suppression:** Design, supply, and installation of automatic fire detection and suppression systems for ICTs/PTRs, cable galleries, control rooms, and battery rooms, in compliance with relevant IS/NFPA standards.
5. **Physical Security Systems:** Provision of comprehensive physical security including:
 - High-definition CCTV Video Monitoring System (VMS) with PTZ cameras, analytics-enabled NVR, and integration with STAMC
 - Intrusion Detection and Prevention System (IDPS) with perimeter sensors
 - Security Electric Fencing with alarm integration
 - Biometric and RF-based Access Control System for personnel entry
 - Public Address and Emergency Communication System
6. **Environmental Monitoring:** Installation of weather stations and environmental sensors (ambient temperature, humidity, wind speed) for real-time environmental data correlation with asset health parameters.
7. **Civil Works:** All necessary civil modifications including control room upgradation, cable trench rerouting, equipment foundation, and premises improvement to support unmanned operation.
8. **Cyber Security:** Implementation of cyber security measures as per CEA (Cyber Security in Power Sector) Guidelines 2021 and IEC 62351 standards, including network segmentation, firewalls, intrusion detection systems, and secure remote access protocols.

Module C: Upgradation of Existing SAS Substations to Unmanned Operation

This module covers substations (about 70 Nos. 132 kV & 40 Nos. 220 kV) that already have a Substation Automation System (IEC 61850) in place but require additional infrastructure for fully unmanned operation. The scope includes all items listed under Module B except item 1 (SAS), with the following additional considerations:

- Assessment and upgradation of existing SAS to be compatible with the STAMC architecture.
- Integration of legacy SAS data with the new CMMS and predictive analytics platform.
- Retrofitting of additional condition monitoring sensors on existing equipment.
- Gap analysis for communication bandwidth and redundancy, and necessary upgradation.

Module D: Establishment of State Transmission Asset Management Centre (STAMC)

This module entails the design, establishment, and commissioning of a centralised multi-tier Transmission Asset Management Centre ecosystem, modelled on PGCIL's NTAMC/RTAMC architecture. The scope includes:

1. **Architecture Design:** Submission and finalisation of a 2-tier or 3-tier control centre architecture proposal, based on a thorough assessment of APTRANSCO's network topology, geographical spread of substations, and operational requirements. The proposal shall clearly define:
 - State Transmission Asset Management Centre (STAMC) – Central command facility
 - Zonal Transmission Asset Management Centres (ZTAMCs) – Regional nodes for localised monitoring and first-response coordination
 - Disaster Recovery (DR) Centre – A geographically separated DR site for business continuity

2. **Asset Health Monitoring and Analytics:** Deployment of a centralised Asset Health Monitoring System (AHMS) with:
 - Real-time dashboards for equipment health indices across all monitored substations
 - AI/ML-driven predictive analytics for early fault detection and remaining useful life prediction
 - Automated alarm prioritisation, fault correlation, and root cause analysis
 - Integration with CMMS for automated maintenance work order generation
 - Historical trending and benchmarking analytics
3. **Video Wall and Operator Console:** State-of-the-art control room fit-out including LED video wall displays, operator consoles, CCTV monitoring terminals, and ergonomic design for 24×7 operations.
4. **Communication Backbone:** Design and establishment of a high-availability, low-latency communication network connecting all substations to the STAMC/ZTAMCs, leveraging APTRANSCO’s OPGW infrastructure with appropriate redundancy and failover mechanisms.
5. **Cyber Security Operations Centre (CSOC):** Establishment of a Cyber Security Operations Centre co-located with the STAMC for continuous monitoring of OT network security, threat detection, incident response, and compliance with CEA cyber security guidelines.
6. **Mobile Workforce Management:** Implementation of a mobile application-based field workforce management system (similar to PGCIL’s Android-based patrolling application) for field maintenance crews, enabling real-time task assignment, GPS-based asset patrolling, field data capture, and integration with the CMMS.

4. Expected Outcomes and Key Performance Indicators

The successful implementation of this initiative is expected to deliver the following transformative outcomes for APTRANSCO:

Expected Outcome	Key Performance Indicator (KPI)
Enhanced asset reliability and availability	Reduction in unplanned outages by ≥50% within 3 years
Transition from reactive to predictive maintenance	At least 75% of maintenance activities to be condition-based/predictive within 3 years
Reduction in operations and maintenance costs	O&M cost reduction of ≥20% through optimised maintenance intervals and reduced manpower at substations
Centralised real-time monitoring of all EHV substations	100% integration of EHV substations with STAMC within the project timeline
Early fault detection and prevention of catastrophic failures	Zero catastrophic transformer / reactor failures attributable to undetected incipient faults
Improved workforce productivity and safety	Reduction in manual site inspections by ≥50%; zero safety incidents during unmanned operations
Compliance with national cyber security standards	Full compliance with CEA Cyber Security Guidelines for all connected substations

5. Eligibility Criteria

Interested firms (including OEMs) or consortia must meet the following minimum technical eligibility criteria. Firms not meeting these criteria may be excluded from the evaluation process at the discretion of APTRANSCO.

1. **Relevant Experience:** The firm shall have minimum 5 years of experience in the relevant field and shall have successfully established at least one Asset Management Centre and/or implemented an unmanned substation project (or a project of similar scope and complexity) for any Transmission Utility or Distribution Company in India/Abroad. Detailed project credentials, including scope, value, timeline, and client testimonials, shall be submitted.
2. **RCM/Predictive Maintenance Experience:** The firm should demonstrate prior experience in implementing Reliability Centered Maintenance frameworks, condition-based monitoring systems, or predictive maintenance analytics platforms Experience with FMECA studies, CMMS implementation, and AI/ML-based asset health analytics will be given due weightage.
3. **Technology Partnerships:** The firm should demonstrate established partnerships or licensing arrangements with OEMs for SAS, condition monitoring equipment, and asset analytics platforms.
4. **Satisfactory Performance:** The firm shall furnish satisfactory performance certificate(s) obtained from past client(s) for projects of similar nature.

Note: Firms who are willing to participate to provide partial scope of work (mentioned at para 3) including consultancy, are also eligible subjected to the compliance of the above.

6. Submission Requirements

Interested parties must submit the following documents as part of their EOI response:

6.1 Company Profile

- Overview of the firm including year of incorporation, registered office, branch offices, organisational structure, total workforce, and key personnel.
- Core competencies and domain expertise relevant to this EOI.
- Quality certifications

6.2 Technical Capability Statement

- Detailed description of experience in Asset Management Centres, unmanned substation projects, RCM framework implementation, SCADA/SAS integration, and predictive maintenance solutions.
- List of relevant projects executed in the last 10 years with details of scope, value, client, project duration, and current operational status.
- Description of proprietary or licensed technologies, tools, and platforms proposed for this engagement.

6.3 Preliminary Approach and Methodology

- A brief (not exceeding 10 pages) preliminary approach paper outlining the firm's proposed methodology for executing the scope of work, including phasing strategy, technology architecture, and key differentiators.

- Proposed multi-tier architecture concept for the STAMC (2-tier vs. 3-tier) with rationale.
- Preliminary views on RCM implementation strategy for APTRANSCO's asset base.

6.4 References

- Contact information of at least two clients from relevant projects, preferably from government or public sector undertakings.
- Satisfactory performance/completion certificates from the said clients.

7. Indicative Project Phasing

The overall project is envisaged to be implemented in the following phases. The selected firm(s) will be expected to propose a detailed implementation roadmap during the RFP stage.

Phase	Description	Indicative Duration	Key Deliverables
I	RCM Framework Development, Asset Criticality Assessment, and DPR Preparation	6–9 months	FMECA reports, RCM task packages, DPRs, STAMC architecture design
II	STAMC/ZTAMC establishment and pilot project of unmanned substations (50 sub-stations)	12–18 months	Operational STAMC, pilot unmanned SS, CMMS deployment
III	Full-scale rollout across all 380 Nos. EHV substations	24–36 months	All SS integrated, predictive analytics operational, mobile workforce app deployed

8. Submission Instructions

Mode of Submission: EOI submissions may be sent via email or delivered physically. Both modes are acceptable. For email submissions, all documents shall be in PDF format with a maximum total size of 25 MB.

Email Addresses for Submission:

- k.srinivas@aptransco.gov.in
- anuradha843@aptransco.gov.in
- dev.ksk@aptransco.gov.in
- vdvprasad.teki@aptransco.gov.in

Physical Submission Address:

Chief Engineer, SLDC, APTRANSCO, Vidyuth Soudha, Gunadala, Vijayawada – 520004, Andhra Pradesh.

Deadline: All submissions must be received within 2 weeks from the date of publication of this EOI. Late submissions shall not be considered.

Subject Line (for email): "EOI Submission – APTRANSCO/SLDC/02/2025 – [Name of Firm]"

9. General Terms and Conditions

1. This EOI is a request for information only and does not constitute a solicitation, tender, or a guarantee of any future contract. APTRANSCO is not bound to shortlist any applicant or to proceed with the issuance of a Request for Proposal (RFP).
2. APTRANSCO reserves the right, at its sole discretion, to accept or reject any or all submissions, to annul the EOI process at any stage, or to modify the scope, timelines, or evaluation criteria without prior notice and without incurring any liability to the applicants.
3. Shortlisted firms will be invited to submit a detailed technical and financial proposal following the EOI evaluation. The detailed terms and conditions of engagement shall be specified in the subsequent RFP.
4. Participation in this EOI process is entirely at the applicant's own cost and risk. No claims for reimbursement of expenses or costs incurred in relation to the preparation and submission of the EOI shall be entertained by APTRANSCO.
5. All information submitted by applicants shall be treated as confidential by APTRANSCO, subject to disclosure requirements under applicable laws and regulations.
6. APTRANSCO reserves the right to verify any information furnished by the applicant and to seek additional information or clarifications as deemed necessary during the evaluation process.
7. APTRANSCO reserves the right to alter, modify, or revise any specifications, features, designs, or other elements of its products or services without prior notice. Such changes may be made to improve functionality, performance, or compliance with regulations.
8. Any disputes arising out of or in connection with this EOI shall be subject to the exclusive jurisdiction of courts in Vijayawada, Andhra Pradesh.

10. Contact Information

For any enquiries or clarifications regarding this EOI, please contact:

Name	Designation	Email	Phone
K. Srinivas	Chief Engineer/SLDC	k.srinivas@aptransco.gov.in	+919440811166
V. Anuradha	Superintending Engineer/Grid Operation	anuradha843@aptransco.gov.in	+918330938607
K. Sri Kameswar Dev	Executive Engineer/SCADA	dev.ksk@aptransco.gov.in	+918500200106
T V V D V Prasad	Dy. Executive Engineer/SCADA	vvdvprasad.teki@aptransco.gov.in	+919494096736

Sd/-
CHIEF ENGINEER
SLDC / APTRANSCO

Vidyuth Soudha, Gunadala, Vijayawada – 520004

Annexure A: Abbreviations and Definitions

Abbreviation	Full Form
AHMS	Asset Health Monitoring System
CMMS	Computerised Maintenance Management System
CSOC	Cyber Security Operations Centre
DGA	Dissolved Gas Analysis
DPR	Detailed Project Report
EHV	Extra High Voltage
FMECA	Failure Mode, Effects, and Criticality Analysis
GIS	Gas Insulated Switchgear
HMI	Human Machine Interface
ICT	Inter-Connecting Transformer
IEC	International Electrotechnical Commission
IED	Intelligent Electronic Device
MPLS	Multiprotocol Label Switching
NTAMC	National Transmission Asset Management Centre (PGCIL)
OPGW	Optical Ground Wire
P–F Interval	Potential Failure to Functional Failure Interval
PD	Partial Discharge
PGCIL	Power Grid Corporation of India Limited
PTR	Power Transformer / Reactor
PTP	Precision Time Protocol (IEEE 1588)
RCM	Reliability Centered Maintenance
RTU	Remote Terminal Unit
SAS	Substation Automation System
SCADA	Supervisory Control and Data Acquisition
SLDC	State Load Despatch Centre
STAMC	State Transmission Asset Management Centre
STU	State Transmission Utility
VMS	Video Monitoring System
ZTAMC	Zonal Transmission Asset Management Centre