

TERMS OF REFERENCE (TOR)

A. BACKGROUND

- i. THDC India Ltd is at the forefront of a groundbreaking data revolution, embarking on an expansive data transformation initiative. The company is embracing cutting-edge Integrated Data sources and access methodologies, revolutionizing its assets through the deployment of a state-of-the-art Real-time Centralized Monitoring System and Plant Asset Management system. THDC India Ltd intended to amplify operational data accessibility across the entire fleet and also empowers dynamic business decision-making by harnessing the power of advanced historical and real-time data analytics, and spearheading a new era of technology-driven excellence in data management and utilization.
- ii. The Objectives of implementation of the **Real-time Centralized Plant Information System** at THDC India Ltd are as follows:
 - Establishment of a secured **Real –Time Centralized Plant Information System** for comprehensive fleet access, Collecting, Storing, Analyzing, Visualizing, Integrating, sharing data for overall performance improvement, Cost Control, business insights, fostering data driven decision culture and facilitating internal and external stakeholders.
 - System should be capable for tracking/monitoring plant Key Performance Indicator(KPI).
 - Creating Operational and Business Intelligence System designed to provide real-time contextual insights, which helps in improvement of operation and process efficiency.
 - Conduct Root Cause Analysis, Performance Comparison, Simple and Complex Arithmetic & Logical operations and Event driven Calculations.
 - User friendly –Self Service, Mobile compatible display, web-based tools, simple drag-and drop interface, customized dashboards, easy to share and facilitate collaboration within team and external stakeholders etc.
 - Securely share and transfer data across the business, easy to integrate with business and operational intelligence tools, AI and Machine Learning Algorithm etc. Analyze large data with tools e.g. Power BI, Tableau, ERP/SAP, any tool that access data using Open Database Connectivity or SQL /Oracle Database.
 - Seamless integration with organizational Data Sources i.e. Plant data - SCADA, DCS System, ABT Server, PLC, RTU, IOT, Sensors, recorders etc, and other associated Systems viz Inflow Forecasting, Instrumentation, Discharge Measurement, Seismology, ERP/SAP etc for unification of data at THDC India Ltd.
 - The system should support standard Industry Protocols – OPC-DA, OPC-HDA, OPC-A&E, OPC-UA, MODBUS TCP/IP, MODBUS RS-485, DLMS, IEC 61850, IEC 104/101, DNP3, RDBMS, BACNet etc.
 - Data can be shared through API and SDKs internal users and external stakeholders for custom application and advanced analysis system.

- Optimization of asset performance through leveraging existing/historical operational data for swift decision-making and creating a data driven foundation.
 - Notifications and alerts via secure and efficient IT media (mobile or email) to designated individuals.
 - Establishment of a central operational data historian and standardized analytical framework across the fleet.
 - The System shall be compatible/similar to the Plant Information System of its holding company so that data can be shared seamlessly and securely.
 - Applicable regulations, guidelines and policies of CERT-In, NCIIPC, MEitY and CEA related to cyber security at the time of installation and amendment thereof shall be complied by the executing agency.
- iii. Expression of Interest is therefore invited from reputed and experienced (individuals/organizations) entity for “Implementation of Real Time Plant Information System at THDCIL.” the qualifying requirements are given at SI No C. Selection Criteria.
- iv. The purpose of inviting this EOI is to identify the firms/applicants, who are interested in Implementation of Real Time Plant Information System at THDCIL as per the scope of work.
- v. The aim of this EOI is to empanel the eligible firms/applicants for Implementation of Real Time Plant Information System at THDCIL.
- vi. The Application (EOI) of those firms/applicants shall be considered for empanelment who meets the pre-qualifying requirements.
- vii. It is mandatory that interested parties/bidder/OEM shall submit Implementation Strategies/ Methodologies in line with objective and scope of works. The implementation strategies shall include architecture, Security compliances, Hardware & software etc.
- viii. Interested parties/Bidder/OEM may visit at OMS Dept, Corporate Office THDCIL, for clarification and understanding of proposed system, if required, before the due date of submission.
- ix. After submission of EOI, THDCIL may ask the interested bidder to depute their representative to deliver the presentation of their proposal.

B. SCOPE OF WORK

Supply, Deployment and Implementation of Real Time Centralized Plant Information System

The Bidder shall provide a Secured **Real Time Centralized Plant Information System** with complete hardware and software with lifetime (perpetual) licenses, network equipment for the complete fleet-wide monitoring of THDCIL Plants and Industrial Assets.

- The system shall possess the capability to manage organizational data, gathering from any data sources of THDCIL which includes SCADA, DCS, ABT Server, PLC, Controllers, Databases, Instruments, IoT devices, sensors, legacy and proprietary assets etc. The system shall have the ability to seamlessly integrate and retrieve data from diverse sources, specifically including but not limited to SCADA, DCS, PLC, Controllers, Databases, Instruments, IoT devices, and any other relevant data sources identified by the organization.
- The system shall be utilized exclusively for business purposes related to organizational functions. These business uses include, but are not limited to, Asset Performance Monitoring, Asset Reliability Enhancement, Enterprise Resource Planning (ERP), SAP integration, Computerized Maintenance Management System (CMMS), Energy Management System, Information Management System (IMS), Planning & Scheduling, Business Intelligence (BI) Tools, Analytics Platforms, and any other uses explicitly defined by the organization.
- The system should be scalable and flexible enough to adapt to changes in organizational data sources and business requirements.
- The system should be capable to provide the insights which enable to improve asset availability, performance and reducing maintenance costs.
- The system shall include a Graphical User Interface (GUI) employing graphics, plots & trends, KPI based dashboards and an easy user interface, displaying actionable information and validity of data, diagnostics, workflow support, and knowledge capture, details of which have been elaborated in the further sections / clauses of the technical specifications.
- The interpretation of THDCIL in respect of the scope, details and services to be performed by the Successful Bidder shall be binding, unless specifically clarified otherwise by THDCIL in writing, during the bidding stage.

Supply of Interfaces

There shall be two interface nodes in redundant configuration, individually located in each of the THDCIL plants- Hydro, Thermal, Wind, Solar, Small Hydro, PSP etc capable of fetching data from the Servers, available in each plant or Server of O&M Partner of THDCIL, through a firewall.

These data from the interface redundant nodes shall be connected to the Server system through firewall using the THDCIL-WAN network. The Interface Nodes shall also be

installed with latest versions of OS and Node Interface license (Lifetime (perpetual) Licenses).

i. IT Network Connectivity

Multiprotocol Label Switching (MPLS) Connectivity shall be provided for interconnection of Plants and Units with Corporate & Regional Offices of THDCIL

ii. System Integration

All operational plants, upcoming plants, Associated System viz Inflow Forecasting, Seismological Network etc shall be connected, in addition to this, system shall be capable to integrate the Data of Other Business Application and Legacy Software etc of THDC India Limited. The List of Operational Plants and Upcoming plants are as follows:

Sr. No	Plants/ Projects	Location	Units	Capacity (MW)	Estimated Tags
01	Tehri HPP	Tehri, Garhwal, Uttarakhand	Unit#01	250	250
			Unit#02	250	250
			Unit#03	250	250
			Unit#04	250	250
02	Koteshwar HEP	Koteshwar, Tehri Garhwal, Uttarakhand	Unit#01	100	250
			Unit#02	100	250
			Unit#03	100	250
			Unit#04	100	250
03	Patan WPP	Patan , Gujarat	25 Nos WTG	2MW	250
04	Dwarka WPP	Devbhoomi Dwarka, Gujarat	30 Nos WTG	2.1MW	250
05	Kasargod SPP 50 MW	Kasargod, Kerala	50MW		250
06	Dhukwan SHEP	Dhukwan , Jhanshi, UP	Unit#01	8	100
			Unit#02	8	100
			Unit#03	8	100
07	Tehri PSP	Tehri, Garhwal, Uttarakhand	Unit#01	250	250
			Unit#02	250	250
			Unit#03	250	250
			Unit#04	250	250
08	Khurja STPP	Khurja, Bulandshahr, UP	Unit#01	650	2000
			Unit#02	650	2000
Sr No	System				Estimated Tags
09	Inflow Forecasting				250
10	Early Warning				100
11	Seismological Network				100
12	Strong Motion Accelerograph				100

13	Other Business Application and Legacy Software	-
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- a. Expandability of Associated Systems in future and new data sources.
- b. Estimated numbers of tags are provisional and include both analog and digital type. However, Actual number of tags shall be decided during implementation.
- c. Bidder should consider the provision of ERP/SAP integration proposed in future.
- d. The system must feature effective exception reporting and utilize efficient data storage methods for optimal performance. Additionally, feature for monitoring the healthiness of information carrying tags may be provisioned
- e. The system shall support any number of user –defined sampling rates for analog signal, and it shall be such as 1sec/5 sec/15sec/30sec/1min/5min/15min etc and utilize state change detection (edge detection) for digital signal to optimize storage.

iii. Cyber Security

- **Cyber Security Assessment:** The successful bidder is required to assist in evaluating the cyber security requirements. Support THDCIL in developing a cyber-resilience plan for effective implementation.
- **DCS Connectivity Assurance:** Ensure no cyber-threat to the connected Distributed Control System (DCS) from the newly supplied system.
- **IT & OT Connectivity Guidelines:** Adhere to IT & OT connectivity guidelines provided by the Central Electricity Authority (CEA) as an integral part of system security.
- **Firewall Configuration:** Implement military grade firewalls on the OT and IT sides, each of a different make, with a minimum mid-level security standard.
- **Application Whitelisting and Blacklisting:** Apply whitelisting and blacklisting of applications across all clients and servers, incorporating alert features.
- **Firewall Rule Compliance:** Configure all firewall rules in accordance with the specific requirements outlined by THDCIL.
- **Cyber Security Audit:** Conduct a comprehensive cyber security audit of Hardware and Application Software through auditors empaneled at CERT-In before handing over the system to THDC.
- **Log Retention Provision:** Include a provision for maintaining logs for a period of 180 days for each managed device(s) and application(s), and cold storage for 365 days such as network switches and firewalls.
- **Compliance with applicable Guidelines:** Applicable regulations, guidelines and policies of CERT-In, NCIIPC, MEitY and CEA pertains to cyber security at the time of installation and amendment thereof shall be complied by the executing agency.
- **Testing:** Supplied equipment deployed in plant shall be tested as per Central Electricity Authority (Cyber Security in Power Sector) Guidelines, 2021, amendment, Order etc through designated nodal agency.

iv. IMPLEMENTATION

Implementations activities expected from the bidder

a) Plant level services to ensure data flow from plant systems to main server.

- Install and commission the interface nodes at plant level to give data to Central historian server.
- The buffering with interface/any other interfaces should have a storage capability based on the sampling rates.
- Ensure Cyber security measures as per Central Electricity Authority (Cyber Security in Power Sector) Guidelines, 2021 and amendment.
- Install, configure and commission the Firewall/Data Diode in all the power stations/Interface Nodes.
- Preparation and Creation of Tags in Server / Interfaces.
- The nomenclature of Tags to be standardized across plants.
- Implementing Data transfer from Interface to Server.
- Cable laying (including Fiber Optic/Ethernet or any communication cable) from Plant Servers to interface node in all plants.

b) Corporate Office/Regional Office based Central room services for establishing a system-based data management platform and diagnostic center including data storage, management, analysis, alerts, visualization, deploying Power Plant Performance Management requirements

- Installation, commissioning and configuration of the required Operating System.
- Antivirus, Application Software in servers, Virtual Machines, Clients, and OPC clients etc.
- The Historian Servers at Corporate Office Central room should have sufficient storage of at least 10 years.
- Install and Configure SQL/Oracle/Other Database Server standard.
- Implement Web application server and mobile based application to monitor real-time parameters through displays/KPI dashboards.
- Configure and implement a hierarchical view of the process data.
- Install and configure Dashboards and Data Link tools in machines.
- Uploading of Tags into Server Database.
- Facilitate remote back up of historical data.
- The final list will be prepared at the detailed engineering stage.
- Testing of the entire system for its completeness.

- User Acceptance Test (UAT) shall be conducted within one month after successful installation and commissioning.
- The Successful Bidder shall hand over all the Licenses of all Hardware and Software at the time of handing over the newly supplied system to THDCIL, after the User Acceptance Test (UAT).
- The Successful Bidder shall also submit all the relevant documents, drawings, Installation DVD, Application DVD, Procedures for System Back-up and restoration, etc., after UAT in hard copy and softcopy.

c) Maintenance Contract Services for Three years extendable upto Five Years post warranty

- The technical statement of work (SOW) for the project will be agreed and signed off and success bidder should deliver as per expectations. However, if there are any changes required post sign-off which is not envisaged, the firm should consider those Change Requests to the extent of 50-mandays without any additional charges.
- **50 Man Days** effort post System Design Document (SDD) signoff for additional works during warranty period.
- The Successful bidder shall provide the latest updated versions of software along with required patches during and till the end of the Maintenance Contract period

v. Supply of Hardware and Software

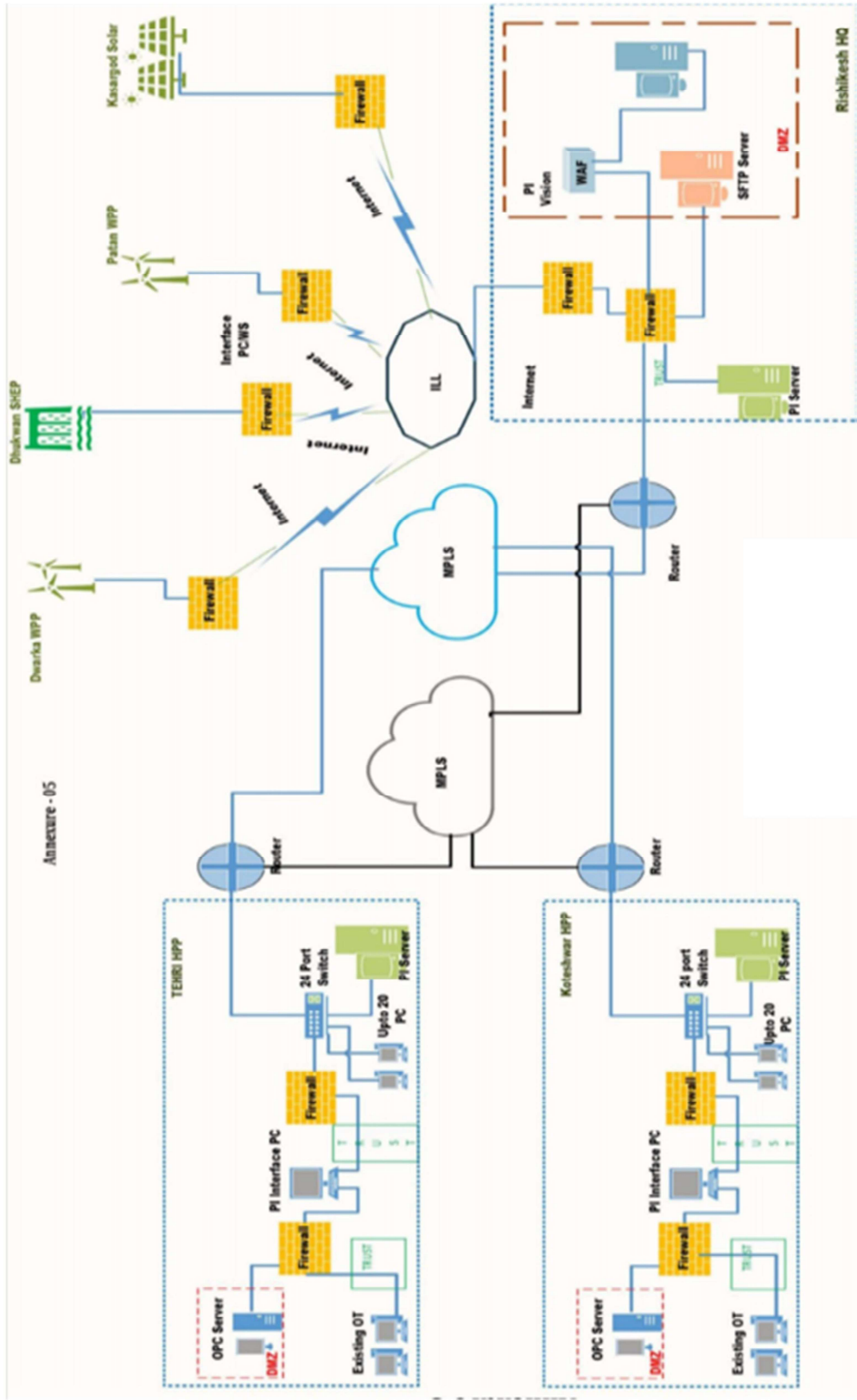
(i) Supply of Hardware as per Proposed System Architecture

- Required Server / workstation / Storage device with minimum **Five years** (05) warranty/support (24x7) from the date of supply shall be consider.
- Each server shall have sufficient storage for storing process data for at least 10 years.
- Supply shall also include all necessary OS, antivirus, software & Licenses for the Servers, Clients, and Interface Nodes.
- Supply & installation of the facility for Remote backup of archived historical data.
- Item (Software & Hardware any other items) supplied, it should be of “reputed” Make and brand and shall be finalized during detailed engineering/ approval of data sheet.
- Required Network hardware shall be consider based on the system architecture

(ii) Supply of System Software

- Licenses for the new system software
- Latest Interface and Connectors suite should be supplied.
- Any other hardware, software, licenses, Keys, tools etc. for the successful implementation.
- All the software licenses shall be in the name of THDC India Ltd.

vi. Proposed System Architecture:



Remarks:

- This is an indicative architecture for conceptual purpose, however, bidder may propose in line with Scope of Works
- ONE-WAY connectivity i.e. from OT to IT shall be ensured.

vii. Annual Maintenance Contract

Comprehensive Annual Maintenance Contract (AMC) for newly supplied System including software, firewalls, workstations, all centralized servers including replica servers, Network switches, storage, NAS etc. shall be provided after the completion of warranty period. All necessary warranty/support (24x7)/subscription etc. from OEM shall be taken by the bidder during AMC period. AMC covers each & every component, items, software of newly supplied system to maintain good working condition including full replacement, if required.

Proposed Duration for AMC support: 05 Years