NOTICE INVITING EXPRESSION OF INTEREST FOR SCADA/DMS

EOI REFERENCE NUMBER EDN/EOI/SCADA-DMS/2015/01

This document contains 20 pages

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BHEL also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Applicant upon the statements contained in this EOI.

The issue of this EOI does not imply that BHEL is bound to select and shortlist Applicants for next stage or to enter into any technology tie-up agreements with shortlisted Applicants for the Project.

The Prospective Business Partner shall bear all costs associated with the preparation, technical discussion / presentation and submission of EOI, BHEL shall in no case be responsible or liable for these costs regardless of the conduct or outcome of the EOI process.

BHARAT HEAVY ELECTRICALS LIMITED

ELECTRONICS DIVISION,

MYSORE ROAD, BANGALORE-26 (INDIA)

INVITES EXPRESSION OF INTEREST FROM OEMs FOR

BUSINESS SHARING AGREEMENT (BSA) / TECHNICAL COLLABORATION AGREEMENT (TCA)

FOR SCADA / DMS

CONTACT PERSON AND SCHEDULE OF EVENTS

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Schedule of Events

Last date for receipt of responses from prospective technology partners:	16:30 HRS Indian Standard Time, 30th November 2015
All corrigenda, addenda, amendments, clarifications, time extensions etc. related to this EOI will be hosted on	www.bhel.com and www.bheledn.com
Mode of Submission of Documents	In sealed cover to the contact person / mail to the e-mail ID so as to reach on or before 30th November 2015. Hard copy (printout) of the mail & all the attachment documents shall be sent to the contact person so as to reach on or before 30th November 2015.

EXPRESSION OF INTEREST FOR BSA / TCA FOR DESIGN, SUPPLY, TESTING, COMMISSIONING, MAINTAINING AND TRAINING FOR SCADA / DMS

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SECTION - 1

EXPRESSION OF INTEREST

1.1 ABOUT BHEL

BHEL is India's largest engineering and manufacturing company of its kind engaged in the design, engineering, manufacture, construction, testing, commissioning and servicing of a wide range of products, systems and services for the core sectors of the economy, viz. Power, Transmission, Industry, Transportation, Renewable Energy, Oil & Gas and Defence.

The company has established capability to deliver 20,000 MW p.a. of power equipment to address the growing demand for power generation equipment. BHEL has 1,57,568 MW of Power Generating Equipment installations worldwide upto March 2015. In India, out of total Power Generating Equipment installations of 2.41 GW, 1.32 GW (55%) of equipment have been installed by BHEL. BHEL manufactured power plants have also been installed across 21 countries including Malaysia, Oman, Iraq, the UAE, Bhutan, Egypt and New Zealand. Details about the entire range of BHEL's products and operation and other details can be accessed by visiting our website www.bhel.in.

1.2 ABOUT ELECTRONICS DIVISION

Electronics Division (EDN) (www.bheledn.com) along with its Electronics Systems Division (ESD) situated in Bangalore is a leading supplier of new generation power plant, automation and control systems. EDN has also emerged as a leading player in the field of power transmission and distribution, industry, transportation and renewable energy sources. The state of the art equipment and systems manufactured meet the demanding requirement of both the national and international markets in terms of technical specifications and quality.

This Division has established references both in India and overseas by successful installation of power plant automation and photo voltaic systems. Besides providing unified solutions for various control systems application, EDN proudly holds the largest market share for power plant automation systems in India. Further, it has been accredited with Quality Management Systems (ISO 9001), Environmental Management Systems (ISO 14001), Occupational Health & Safety Management Systems (OHSAS 18001) and ISMS (ISO 27001) certifications.

1.3 BHEL's EXPERIENCE IN SCADA

Since 2000, the SCADA group at EDN has supplied Switchyard / Substation SCADA for Power Plants in Generation Segment. SCADA systems are designed on inhouse maxDNA platform and supplied to more than 50 installations in India & Abroad. The main functions of SCADA supplied are acquiring status, alarms, events and analog parameters from switchyard equipment, issuing control commands to switchyard equipment, interfacing to Load Despatch Center, Numerical Relays, Multi Function Meters on various communication protocols and generation of various reports viz shift reports etc. In addition to supplying SCADA systems for switchyards and substations, the group has actively involved in design, supply and commissioning of Energy Management Systems, Electrical Control Systems, Photo Voltaic SCADA systems.

BHEL intends to expand its business operations by supplying SCADA / DMS (Distribution Management System) to Distribution segment.

1.4 EXPRESSION OF INTEREST (EOI)

BHEL proposes to address the present and future SCADA / DMS requirements from its Electronics Division (EDN) located on Mysore Road, Bangalore. This EOI is published for seeking responses from Original Equipment Manufacturers (OEMs) who are willing to be associated with EDN to enable it to offer solution in SCADA / DMS segment, through a Business Sharing Agreement (BSA) OR Technical Collaboration Agreement (TCA).

1.5 A COLLABORATIVE APPROACH

BHEL intends to have a long term association (10 years) with the prospective technology partner to enable it to promote and bid for SCADA / DMS tenders.

1.6 BUSINESS MODEL

BHEL proposes to have an association with the Prospective Business partner, who shall be responsible to the End Client (End User) jointly with BHEL for the design, procurement of components and sub-systems, overall system integration, testing (Functional & Type Tests), commissioning and also shall be responsible for the successful Acceptance (including field trials), guarantee and warranty obligations & long term support.

1.6.1 **Business Sharing Agreement (BSA)**

In the BSA model, the Prospective Business Partner shall offer / develop / customize SCADA / DMS in association with BHEL to meet Client requirements. All the information related to design, inspection, testing, commissioning, trouble shooting, servicing, maintenance, quality assurance methods, training, etc., for the complete SCADA / DMS will be shared with BHEL. No separate charges / fees / cost shall be payable for sharing this

information / association. BHEL and the prospective OEM shall mutually agree on a work share for each business opportunity / tender / project based on each other's strengths in system design / software / hardware / manufacturing / testing / installation / commissioning/post-sales support etc.

1.6.2 Technical Collaboration Agreement (TCA)

In the TCA model, the Prospective Business partner shall provide all software modules related to SCADA / DMS to BHEL on a fixed charges / fees / cost for technical collaboration. All the information related to design, inspection, testing, commissioning, trouble shooting, servicing, maintenance, quality assurance methods, training, etc., for the complete SCADA / DMS including hardware and software will be provided to BHEL.

The Prospective Business partner shall consider the following for the first 2 projects:

a) Design the SCADA / DMS software modules as per the project requirements jointly with BHEL
b) Provide all support to BHEL for testing, inspection and quality assurance methods at BHEL works
c) Provide commissioning, trouble shooting, servicing, maintenance and quality assurance methods at Client locations.
d) Training to BHEL engineers to be provided at all stages i.e during design, testing, inspection, commissioning, trouble shooting, servicing, maintenance and quality assurance.

For the subsequent projects during the TCA period, the Prospective Business partner shall provide need based support for the following:

a) During design stage
b) During testing, inspection and quality assurance methods at BHEL works
c) During commissioning, trouble shooting, servicing, maintenance and quality assurance methods at Client locations.

During the TCA period, the Prospective Business partner shall provide to BHEL the following:

- Any updates in SCADA / DMS software modules as part of continuous improvement
- Any updates in SCADA / DMS software modules due to changes in operating systems

1.7 TYPICAL REQUIREMENTS

Indicative Typical requirements of SCADA / DMS are covered in Section – 2. However, the Prospective Business partner is requested to provide detailed specifications to achieve the objective of BSA / TCA.

1.8 METHODOLOGY OF BUSINESS ARRANGEMENT

SCADA / DMS systems comprise of 3 types of items:

A. Items in the Products / Services range of the prospective business partner (OEM) and available at their works or at their sub-contractors' works, either at a single location or at multiple locations for which technology has to be provided for the entire product life cycle to BHEL to enable BHEL to provide long term product support.

B. Items other than (A) above to be procured by BHEL-EDN. The specifications for these items are to be given by the prospective technology partner.

C. Items bought-out by the prospective technology partner for integration: For these items, complete technical details to be provided by the partner including acceptance criteria and type tests specifications etc.

In all the above cases, any customization required has to be mutually worked out on case to case basis.

1.8.1 Typical Arrangement

The prospective business partner shall be the Technology leader and shall indicate in their response to this EOI the proposed arrangement for information sharing to BHEL-EDN along with the milestones and time frame.

This shall however be mutually discussed considering the long term support implications at the time of entering into a final agreement.

1.8.2 Information Sharing

In response to the EOI, the prospective technology partner shall clearly state his willingness to share the following with BHEL-EDN.

a. Provide marketing support and assist in the bidding process to receive maximum business
b. Engineering information and selection criteria of all bought-out components (Recommended third party vendors database).

c. Complete Technical documentation of various SCADA / DMS software modules, interface modules and processes employed, testing methods & flow chart shall be provided to BHEL as required by the Client. The software must have provision for fine-tuning and customization to suit the end user's requirements.

d. Training, deputation of OEM's experts and assistance in system design and testing of the SCADA / DMS solution, know-how and know-why to enable BHEL to provide long term product support.

e. Support for commissioning, deputation of OEM's experts and training of BHEL-EDN engineers and Client Engineers for operating, maintaining and troubleshooting the SCADA / DMS at site.

f. Technology upgrades including addressing of obsolescence issues covering all the above for a mutually agreed period.

g. A commitment has to be given by the prospective BSA / TCA partner for long-term association with BHEL-EDN. The prospective BSA / TCA partner shall forward details regarding methodology and duration for which they can provide support.

h. Exclusive rights to be given to BHEL to use software beyond partnership period, on no charge basis.

i. The prospective technology partner shall provide details of all the standards followed for the software used in their products. Up to date Compliance certificates for the standards followed shall be provided for the entire period of BSA / TCA.

j. Trouble-shooting procedures, database of failures, User/Operator manual, maintenance and engineering Manuals to be provided so as to enable BHEL to provide product support to Client.

k. Any other best practices followed by Technology partner for easy, trouble free execution during design, testing and commissioning stages shall be shared with BHEL.

1.9 RESPONSE TO THE "EXPRESSION OF INTEREST" – (EOI)

BHEL-EDN will analyze the responses received towards this EOI to shortlist prospective Business partners. During this period of short listing, details discussions will be held with prospective Business Partners, to bring more clarity.

Short listed Prospective Business Partners will be requested to submit the commercial offer based on the agreed Business Model.

1.9.1 Qualifying Requirements

Only OEMs meeting the Qualifying Requirements (QR) as described in Section–3 may respond to this Expression of Interest and will be considered for further evaluation.

1.9.2 Checklist of Documents

The information required to be submitted along with the EOI by the interested OEMs are given in Section–5.

SECTION - 2

TYPICAL REQUIREMENTS FOR SCADA / DMS:

2.1 SCADA Functions:

- Data Acquisition from Remote Terminal Units (RTUs) at Substations, Field RTUs at Ring Main Units (RMUs) / sectionalizer & Fault Passage Indicators (FPIs)
- Time synchronization of RTUs, FRTUs & FPIs(if time synch is supported in FPI)
- Data Exchange among SCADA/DMS system, IT system (in specified format (OPC / CIM-XML / ICCP / ODBC Format) Model & Data Exchange over IEC 61968-1 Enterprise SOA Based BUS), State load dispatch centre.
- Data Processing
- Continuous real-time data storage and playback
- Sequence of event processing
- Supervisory Control
- Fail soft capability
- Remote database downloading ,diagnostics & configuration
- CIM compliance IEC61968
- GIS adaptor (GIS Landbase data, network model using GIS engines/adaptors supporting Native Adapters , CIM/XML Model for Distribution / Power System, using Model Exchange & Data Exchange over IEC 61968-1 Enterprise SOA Based BUS)
- Information Storage & Retrieval (ISR)
- Data recovery (DR)

The SCADA system shall have capability to accept data from the following sources:

(a) Telemetered data received from RTUs, FRTUs & FPIs
(b) Data received from IT system.
(c) Data exchange
(d) Calculated data
(e) Pseudo-data (Manually entered data)

(f) GIS land base data, network model using GIS engines/adaptors

2.1.1 Communication protocol

SCADA system shall use the following protocols to communicate

a) For RTU – DNP/IEC 870-5-104 protocol also 101 to communicate when acting as data concentrator with slave devices
b) For FRTU- IEC 870-5-101 /104/DNP protocol
c) For FPIs - IEC 870-5-101 /104/DNP protocol
d) For Multi Function Transducers (MFTs) – MODBUS
e) For DR & Other any other SCADA system - ICCP/TASE.2 in specified format (OPC / CIM-XML / ICCP / ODBC Format) Model & Data Exchange over IEC 61968-1 Enterprise SOA Based BUS)
f) For IT Systems - (in specified format (OPC / CIM-XML / ODBC Format) Model & Data Exchange over IEC 61968-1 Enterprise SOA Based BUS)

The protocol considerations shall be made in accordance to the system/ device to be interfaced. However, system shall have capability to interface using all necessary protocols as specified above for the devices that may be interfaced in future

2.1.2 Data Acquisition

Digital status data and Analog values except energy values shall be reported by exception from RTUs / FRTUs & FPIs. Time skew and latency shall comply with IEEE C37.1. In order to meet this requirement, network delay shall be taken into consideration while designing the system so that the update time in normal & peak level of activities are met.

In case of telemetry failure with a RTU, SCADA shall have facility to display against each affected point of that RTU, with a TELEMETRY FAILED QUALITY CODE.

SCADA shall have provision to distinguish between three acquisition modes of RTU viz Enabled, Disabled and Test/Maintenance mode.

SCADA/DMS control centre shall also exchange data using ICCP with State Load Despatch Centre (SLDC) of the state. Data exchange shall also allow other information to be transferred report by exception but also configurable periodically, or on demand. It shall be possible to exchange at least the following data:

- real-time telemetered data of the interconnected network,
- non-telemetered data of the interconnected network,
- calculated data of the interconnected network
- SOE data of the interconnected network
- historical data of the interconnected network
- scheduling data

- Operator messages.
- Event /alarm lists

It is envisaged that the utility shall get the load forecasting & drawl schedules from SLDC & versa in order to execute planning of load distribution. In addition, status /measurement of interconnected network shall be able exchanged in both directions.

In addition to the above, the following features shall be supported by SCADA:

- For data exchange between SCADA/DMS control centres & Data Recovery centre ,
- Data Processing including Analog Data Processing, Digital Input Data processing, Calculated Data processing, Substation Topology Processing, Alternate source for data, Quality Codes
- Continuous Real-time data storage and playback
- Sequence-of-Events data
- Supervisory Control including Digital Status Control, Breakers, Capacitor Banks, Tap Changing Transformers, Set point Control, Auto execution sequence /Group control, Control Inhibit Tag, Control Permissive interlocks, Control Action Monitor,
- Failsafe capability
- Remote database downloading ,diagnostics & configuration
- CIM & IEC61850 , SMART GRID interface, requirements
- Information Storage and Retrieval
- Circuit breaker status Table
- Real-time Database Snapshot Tables
- Hourly Data tables including Missed Hourly Data Storage, Hourly Data Calculations
- Daily Energy Data table
- Load priority table
- SOE data table
- Data exchange with Billing system (Data centre & DR centre)
- Data Exchange with Customer Care System
- Data Exchange with GIS system
- Historical Information (HI) Data Retrieval
- System Message Log Storage and Retrieval
- Mass storage of data/files
- Data recovery function (DR)

2.2 SCADA Hardware:

The OEM of servers shall be member of TPC/SPECMARK. The servers can be broadly classified into the following categories:

A) Application server

- SCADA/DMS
- ISR
- NMS
- Web server

B) Communication server

- Front –End server (Communication Front End) FEP(CFE)
- ICCP /Inter control centre communication server

C) De –militarized server (DMZ)

- web server with load balancing

D) Training & development system server

- DTS
- Developmental server

E) Data recovery

- DR/ Communication server

2.3 DMS Functions:

The DMS applications shall utilize the data acquired by the SCADA application.

- **Power flow**: Calculation of the distribution network state (Voltage phasors of all node, current phasors of all sections and transformers , active and reactive power losses in all sections and transformers etc), for specified network configuration, magnitudes of voltages of network roots and load.
- **Network Connectivity Analysis**
- **Voltage VAR control**: Provides control of voltage profile or keeping of voltage on all nodes of the network inside specified (lower and upper) limits. Resources used are "Under-load" tap changing transformers and voltage regulators and "Off-voltage" tap changing transformers and buck/boost transformers. Reduces losses, reactive power flows and reactive power demands from the transmission network. Capacitor banks and reactors, static and synchronous generators and compensator are employed for this purpose.
- **Fault Management and System Restoration**
- **Feeder Reconfiguration, Loss minimization, load balancing**
- **Outage Management**: Deals with Fault location, Fault isolation
- **Load shed & restoration**: Provides the optimal plan of switching operations for supply restoration of the feeder part that remained de-energized, after a fault location and isolation
- **Load Flow**

- **State Estimator:** Provides assessment of loads of all network nodes, and all other state variables (daily load profiles, peak loads etc)
- **Calculation of performance indices (SAIDI, SAIFI, CAIFI etc):** Detection of violations, alarm states, reports of the overall performances of the network state (power injection, losses, consumption, voltage situation, deviations, overloads etc)
- **Topology Processing**
- **Temporary Modifications**
- **Switching Operations**: Under Load switching, Load shedding etc
- **Network Optimizer**: Determines the optimal radial distribution network configuration. It reports about improvement of operation performances and reduction of losses are provided, as well as switching sequence for transfer from existing to optimal state
- **Network Simulator / Dispatcher Training Simulator**
- Study Mode
- Outage Management system with the following features like:

    I. **Incident management**, providing flexible workflows matching the utilities' business procedures for planned and unplanned work, including safety management/hazards, and integrating tightly with SCADA/DMS outage processing, switching and work order management;
    II. **Call management**, tracking customer trouble calls and utility customer service representative callbacks, integrating with a variety of call sources and using calls to predict the outage location;
    III. **Customer data management**, storing the customer personal data used by call management and directly by the operators, designed specifically for a secure storage of a large amount of sensitive textual data and providing high performance search tools;
    IV. **Crew management**, tracking the mobile crews and providing workflows around their dispatching, integrates with job/incident management and 3rd party mobile workforce and GPS navigation systems.

Note: The functionalities above are indicative. The Prospective Business partners who are into SCADA / DMS product development and have implementation experience have more knowledge in the requirements of SCADA / DMS functions and their implementation, problems associated with the software modules and hardware items. The Prospective Business partners are encouraged to provide products meeting and exceeding the above functional requirements.

SECTION - 3

QUALIFYING REQUIREMENTS

3.1 Technical Capability

The Prospective Business Partner shall be an OEM who has designed, supplied and commissioned SCADA / DMS as per the specifications / features given in Section-2 to any city electrical power distribution company of major countries. The Prospective Business Partner shall indicate the Type & Quantity of such systems supplied in the last 5 years against commercial orders. This data may be furnished as per the format below:

PROFORMA FOR PROSPECTIVE TECHNOLOGY PARTNER'S QUALIFYING EXPERIENCE

Sl. No	Customer name, Order Ref & date	Item Description	Client contact details • Name • Designation • Phone no • Address • E-mail ID	Date of Supply / Commissioning	Performance certificate from customer regarding satisfactory performance

3.2 Information Transfer

Prospective Business Partner should be willing to transfer the information/software related to sourcing, inspection, testing, commissioning, trouble shooting, servicing, maintenance, and quality assurance methods etc., for the systems. Specific confirmation on the points listed in Section–1, Cl. 1.8 are to be furnished.

SECTION – 4

COMPANY PROFILE

4.1	**GENERAL INFORMATION:**
4.1.1	NAME OF COMPANY (ownership details for the last 5 years):
4.1.2	DETAILS OF HEAD OFFICE: ADDRESS: TELEPHONE: FAX: E-MAIL: WEB SITE: NO. OF COUNTRIES OPERATING FROM:
4.1.3	DETAILS OF FACTORY / WORKS: ADDRESS: TELEPHONE: FAX: E-MAIL:
4.1.4	DETAILS OF MARKETING AGENT (OUTSIDE INDIA, IF ANY): ADDRESS: TELEPHONE: FAX: E-MAIL:
4.1.5	DETAILS OF INDIAN AGENT, IF ANY: ADDRESS: TELEPHONE: FAX: E-MAIL:
4.1.6	CHIEF EXECUTIVE:

4.1.7	CONTACT PERSON(S) FOR PRODUCT OFFERED: NAME(S): DESIGNATION: ADDRESS: TELEPHONE: FAX: E-MAIL:
4.1.8	YEAR OF ESTABLISHMENT:
4.1.9	Manpower in design, R&D, testing, QC and after sales support
4.1.10	PARTICULARS OF PRODUCT INCLUDING SPECIFICATION AND RANGE: (ATTACH BROCHURES AND CATALOGUES) Compliance to international standards such as ISO, IEEE,
4.2	**COUNTRY OF ORIGIN FOR OFFERED PRODUCTS AND TECHNOLOGY**
4.3	**FINANCIAL INFORMATION:**
4.3.1	ANNUAL TURNOVER AND PROFIT-AFTER-TAX FOR LAST 3 YEARS: (attach copies of audited Balance Sheet and Profit& Loss Account) YEAR – 2013: YEAR – 2014: YEAR – 2015: (Break-up of overall revenue and revenue from SCADA / DMS)
4.3.2	DUNN AND BRADSTREET REPORT FOR THE COMPANY
4.4	**QUALITY AND ENVIRONMENTAL MANAGEMENT SYSTEM:**
4.4.1	IS THE COMPANY ISO: 9001 OR EQUIVALENT CERTIFIED: YES / NO. IF YES, ENCLOSE COPY OF CERTIFICATE
4.4.2	IS THE COMPANY ISO: 14001 OR EQUIVALENT CERTIFIED: YES / NO. IF YES, ENCLOSE COPY OF CERTIFICATE
4.4.3	IS THE COMPANY OHSAS 18001 OR EQUIVALENT CERTIFIED: YES /

	NO. IF YES, ENCLOSE COPY OF CERTIFICATE
4.4.4	IS THE COMPANY ISO 27001 OR EQUIVALENT CERTIFIED: YES / NO. IF YES, ENCLOSE COPY OF CERTIFICATE
4.5	**EXPERIENCE LIST FOR OFFERED/SIMILAR ITEMS**
4.6	**LIST OF SOFTWARE COMPLIANCE STANDARDS FOR DEVELOPMENT, DESIGN, TESTING AND LIFE CYCLE MANAGEMENT**
4.7	**ANY OTHER INFORMATION**

SECTION – 5

CHECKLIST OF DOCUMENTS TO BE SUBMITTED AS RESPONSE TO EOI

Information/documents to be provided along with response to Expression of Interest:

Sl. No.	Information / Document	Compliance
1	Covering Letter signed by an Authorized Signatory on Company letterhead, listing clearly the Enclosures.	Yes / No
2	Catalogue of SCADA / DMS	Yes / No
3	Technical Write-up describing features for SCADA / DMS	Yes / No
4	Reference list of systems supplied/commissioned	Yes / No
5	Acceptance for Business Sharing Agreement (BSA) , Technical Collaboration Agreement (TCA)	Yes / No
6	Organization Chart	Yes / No
7	Details required in Section–1 – Clause 1.8.1	Yes / No
8	Details required in Section–1 – Clause 1.8.2 – a to k	Yes / No
9	Filled-up Qualifying Criteria Format – Section–3	Yes / No
10	Filled-up Company Profile – Section–4	Yes / No