



JAMIA MILLIA ISLAMIA
Jamia Nagar, New Delhi-110 025
Ph: 011-26982759

Notice Tender Enquiry

RE- NIT-09/FIST(RTDS-1)/Electrical Engg/JMI/2017

Date:- 09/11/2017

Online bids are invited from reputed companies/authorized distributors/dealers for the supply of Equipment for D/o Electrical Engg., JMI. **Manual bids shall not be accepted.** Bid document with other terms & conditions can be downloaded from JMI Website: www.jmi.ac.in (for reference only) and CPP website: <https://eprocure.gov.in/eprocure/app> as per the schedule as given in CRITICAL DATE SHEET as under and be submitted with notified EMD as per following:

Published Date	09.11.2017 at 05.30 p.m
Bid Document Download / Sale Start Date	09.11.2017 at 06.00 p.m
Bid Submission Start Date	09.11.2017 by 06.00 p.m
Bid Submission End Date	23.11.2017 Till 01.00 p.m
Bid Opening Date	24.11.2017 at 3.00 p.m

EMD (Refundable)	Last Date for submission of bids/ Time	Venue and Time of opening of Bids
Rs.3,0,0000/-	As per critical date-sheet	Purchase & Inventory Control Office As per critical date-sheet

Eligibility Criteria:

1. The Bidder should be a reputed and an authorized firm/supplier having after sales service agreement with the OEM (Proof for the same to be enclosed alongwith address, phone nos. & E-mail etc. of the Service Centre).
2. If ISO certified Company, enclose documentary proof.
3. The bidder should have experience of more than five years in execution and maintenance of equipments quoted (A certificate of establishment to be provided).
4. The Original Copy of EMD, Registration Certificate, GST No. complete in all respect should reach the Purchase & Inventory Control Office, Jamia Millia Islamia, Jamia Nagar, New Delhi-110 025 as per critical date-sheet. No bids after the last date shall be entertained.

Sequence of documents to be provided/enclosed in each copy of the bid documents:

1. Balance sheet with auditor's report for the last three years.
2. Latest Income Tax Clearance Certificates.
3. GST no.
4. Proof of the authorized agent/distributors/supplier.
5. Sole Proprietary/sole manufacturer certificate for proprietary item.
6. List of Similar equipments supplied by the firm with addresses and phone numbers of customers with satisfactory completion certificate/satisfactory working certificates.

7. Name and address of registered office, Head Office and Regional office of the company with name and phone numbers of key persons.
8. Format of Schedule of Requirements at Annexure-I
9. Self-declaration at Annexure-II
10. Format for Supplier/Distributor information at Annexure-III
11. Contract Form at Annexure-IV
12. Technical Bid at Annexure-V
13. Financial Bid at Annexure VI
14. Acceptance of all clauses of bids specification duly signed page-wise.
15. Tender Acceptance Letter duly filled by the bidder at Annexure-VII

Registrar, JMI

Conditions of Contract

Terms & Conditions:

1. The bidder shall be required to deposit Rs.3,00,000/- **Earnest Money** of estimated value of goods to be procured through Bank Draft/Fixed Deposit Receipt/Bank Guarantee drawn in favour of '**The Registrar, Jamia Millia Islamia.**' No bid shall be accepted without the Earnest Money.
2. The successful supplier will submit a Bank Guarantee equivalent to 10% of the total value of purchase order at the time of installation which would remain valid for a period of 60 days beyond the date of completion of all obligations of the supplier including warranty obligation. EMD will be released to successful bidder after submission of Bank Guarantee. JMI shall forfeit Bank Guarantee in the event of a breach of contract by the successful supplier.
3. Bids would be rejected for award if it determines that the bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive or coercive practices in competing for the contract in question.
4. The JMI may, at its discretion, extend the deadline for submission of bids by amending the bid documents in accordance with clause relating to Amendment of Bidding documents in which case all rights and obligations of the JMI and Bidders previously subject to the deadline will thereafter be subject to the deadline as extended.
5. The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by the bidder or a person or persons duly authorized to bind the bidder to the Contract. All pages of the bid, except for un-amended printed literature, shall be authorize by the person or persons signing the bid. Further, over-writings on documents, if any should be supported by signatures.
6. The bidders may submit their bid online not later than the time and date specified therein.
7. Issuance of bid documents should not automatically be construed that the bidder is considered qualified. The JMI Authority has the right to reject any bids on technical grounds without assigning any reason.
8. Jamia Millia Islamia shall not be responsible for any delay, loss or non-receipt of original mentioned documents.
9. Prices shall be quoted in Indian Rupees for offers received for supply within India and in US dollars as per the Financial Bid format in case of offers received for supply from foreign countries. The prices quoted should be CIF or FOR, JMI destination.
10. The JMI may decide to open a letter of Credit or Wire Transfer in cases where it so decides. Any variation in price from the importer and manufacturer be indicated well in advance.
11. The imported equipments should be quoted by the authorized supplier/dealer. In this case, commitment of after sales service with the period applicable should be clearly mentioned.
12. Payment shall be made after delivery, successful installation, commissioning & submission of Bank Guarantee.
13. All taxes, if applicable, should be quoted separately, otherwise it would be presumed that the quoted prices are inclusive of taxes (please see Financial Bid format).
14. Prices quoted should be CIF/FOR, JMI, New Delhi inclusive of all charges required to make the equipment functional to the satisfaction of JMI, otherwise it would be presumed that the quoted prices are inclusive of all charges, if applicable.

15. In case price for imported goods are quoted in FOR, the JMI will provided customs duty exemption certificate, if the import is made in the name of JMI and the supplier should submit original Bill of Entry in the name of the Registrar, JMI.
16. Delivery should be within specified days mentioned in Purchase Order. If the equipment/instruments are not delivered within the stipulated time, the supplier shall be liable to pay a penalty of 1% of the total order value for each delay of 10 days or part thereof and the amount will be deducted from the payment on account of purchase.
17. The suppliers will undertake warranty of equipment/instruments from the date of installation and shall have to mention clearly the period of warranty in financial bid.
18. The quotations must be valid for 180 days (six months) from the date of opening of the technical bids. No change in prices and change in terms and conditions will be permitted.
19. All quoted items may carry brochure/catalogue/Pamphlets/Technical Literature and related documents.
20. The supplier further warrants that the goods shall be free from defects arising from any act or omission of the supplier or arising from design, materials, and workmanship, under normal use in the conditions prevailing in India.
21. Installation, testing, commissioning of the equipments should have to be carried out by Technical experts of the company/supplier up to the satisfaction of user department of JMI.
22. Free training shall be imparted to faculty/technical staff for operation, maintenance and troubleshooting at the user department of JMI.
23. The bidder may submit the proprietary certificate for the item(s), if applicable.
24. In a bid, either the Indian agent on behalf of the Principal/OEM or Principal/OEM itself can bid but both cannot bid simultaneously for the same item/product in the same bid.
25. If an agent submits bid on behalf of the Principal/OEM, the same agent shall not submit a bid on behalf of another Principal/OEM in the same bid for the same product.
26. Jamia Millia Islamia reserves the right to purchase varying quantity of material, less or more.
27. In the process of evaluation, comparison of bids, Jamia Millia Islamia reserves the right to reject any or all bids.
28. In case replacement of a part becomes necessary during warranty period, the parts of the same make and same or better configurations as were originally there in the equipments shall be used. The supplier/vendor shall maintain details of the replacements and repairs carried out, if any, in any equipment/instrument in a separate document and produce the details as and when required by the user department of JMI. The cost of the parts will be borne by the supplier.
29. In case of complaint regarding repairing/replacement of equipment/instrument within the warranty period, the supplier will provide repair/replacement immediately. In case of non-compliance or delayed compliance, supplier will be penalized with an amount mutually agreed upon and it would be deducted from the Bank Guarantee.
30. The technical specification wherever given in the items' specification format is basic. The equipments/instruments may also be evaluated as per additional provisions and facilities.
31. All corrigenda will only be notified on the JMI website and CPPP website.

32. The Vice-Chancellor, JMI shall be the final Authority for settlement of any dispute and his interpretation of any Clause/term/condition(s) of this document shall be final and binding and the jurisdiction for Court of Law shall be Delhi/New Delhi.

Authorize Signature of the firm:

Name:

Designation:

Bid Submission:

Bidders are advised to visit this website regularly to keep themselves updated as any change/ modification in the tender will be intimated through this website only.

Bids shall be submitted online only at CPPP website: <https://eprocure.gov.in/eprocure/app>.

Tenderer/Contractor are advised to follow the instructions “Instructions To Bidder for Online Bid Submission” provided for online submission of bids -

Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.

4. Tenderer who has downloaded the tender from the JMI website and Central Public Procurement Portal (CPPP) website <https://eprocure.gov.in/eprocure/app>, <https://eprocure.gov.in/epublish/app> **shall not tamper/modify the tender form including downloaded price bid template in any manner.** In case if the same is found to be tempered/modified in any manner, tender will be completely rejected and EMD would be forfeited and tenderer is liable to be banned from doing business with JMI.

5. Intending tenderers are **advised to visit again** JMI Website: www.jmi.ac.in (Reference only) and **CPPP website <https://eprocure.gov.in/eprocure/app> regularly till closing date of submission** of tender for any corrigendum / addendum/ amendment.

6. Applicant contractor must provide demand draft as EMD for Rs 3,0,0,000/- (Rupees Three Lakhs only) in favour of the Registrar, JMI and payable at New Delhi. From any Nationalized/ scheduled Bank valid for three months with their application/downloaded tenders. The all applicable bank charges shall be born by the applicant and he shall not have any claim what so ever on this account on Government. In case of re-tendering, the firms which have submitted the DD in earlier calls will require to submit DD along with their tender/application in subsequent calls also.

7. Bids will be opened as per date/time as mentioned in the **Tender Critical Date Sheet**. After online opening of Technical-Bid the results of their qualification as well Price-Bid opening will be intimated latter.

Submission of Tender

The tender shall be submitted online in **Two part, viz., technical bid and price bid.**

All the pages of bid being submitted must be signed and sequentially numbered by the bidder irrespective of nature of content of the documents before uploading.

The offers submitted by Telegram/Fax/email shall not be considered. No correspondence will be entertained in this matter.

Technical Bid

The following documents are to be furnished by the Contractor along with **Technical Bid** as per the tender document:

- i) Signed and Scanned copy of **Earnest Money Deposit**
- ii) Signed and Scanned copy Certificates like Registration certificate, PAN No, TIN No, Service Tax registration, Sales Tax, Trade Tax Regn, GST No.
- iii) Signed and Scanned copy of Proof of Balance Sheet with Auditor's Report for the last three.
- iv) Signed and Scanned Copy of **Tender Acceptance Letter & Letter of authorization to submit bid.**
- v) An undertaking (self-certificate) that the **agency hasn't been blacklisted** by a Central / State/UT Government institution and there has been no litigation with any government department on account of IT services.
- vi) Signed and Scanned Copy of **Technical data sheet** as per Annexure V.
- vii) Signed & scanned copy of the authorized agent/distributors/supplier
- viii) Signed & scanned copy of Sole Proprietary/sole manufacturer certificate for proprietary item.
- ix) Signed & scanned copy of List of Similar equipments supplied by the firm with addresses and phone numbers of customers with satisfactory completion certificate/satisfactory working certificates.
- x) Signed & scanned copy of Name and address of registered office, Head Office and Regional office of the company with name and phone numbers of key persons.
- xi) Singed & Scanned copy of Annexure, I, II, III, IV, V & VII.

PRICE BID

Schedule of price bid at Annexure VI dully filled by the bidder in figure as well as in words.

Instructions for Online Bid Submission:

The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.

More information useful for submitting online bids on the CPP Portal may be obtained at: <https://eprocure.gov.in/eprocure/app>.

REGISTRATION

- 1) Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL: <https://eprocure.gov.in/eprocure/app>) by clicking on the link “**Online bidder Enrollment**” on the CPP Portal which is free of charge.
- 2) As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.
- 3) Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.
- 4) Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / nCode / eMudhra etc.), with their profile.
- 5) Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSC’s to others which may lead to misuse.
- 6) Bidder then logs in to the site through the secured log-in by entering their user ID / password and the password of the DSC / e-Token.

SEARCHING FOR TENDER DOCUMENTS

- 1) There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, Organization Name, Location, Date, Value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as Organization Name, Form of Contract, Location, Date, Other keywords etc. to search for a tender published on the CPP Portal.
- 2) Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective ‘My Tenders’ folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.
- 3) The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

PREPARATION OF BIDS

- 1) Bidder should take into account any corrigendum published on the tender document before submitting their bids.
- 2) Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.

- 3) Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF/JPG formats. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.
- 4) To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use “My Space” or “Other Important Documents” area available to them to upload such documents. These documents may be directly submitted from the “My Space” area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

Note: My Documents space is only a repository given to the Bidders to ease the uploading process. If Bidder has uploaded his Documents in My Documents space, this does not automatically ensure these Documents being part of Technical Bid.

SUBMISSION OF BIDS

- 1) Bidder should log into the site well in advance for bid submission so that they can upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.
- 2) The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
- 3) Bidder has to select the payment option as “offline” to pay the tender fee / EMD as applicable and enter details of the instrument.
- 4) Bidder should prepare the EMD as per the instructions specified in the tender document. The original should be posted/couriered/given in person to the concerned official, latest by the last date of bid submission or as specified in the tender documents. The details of the DD/any other accepted instrument, physically sent, should tally with the details available in the scanned copy and the data entered during bid submission time. Otherwise the uploaded bid will be rejected.
- 5) Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. If the price bid has been given as a standard BoQ format with the tender document, then the same is to be downloaded and to be filled by all the bidders. Bidders are required to download the BoQ file, open it and complete the white coloured (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BoQ file is found to be modified by the bidder, the bid will be rejected.
- 6) The server time (which is displayed on the bidders’ dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.
- 7) All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done. Any bid document that is uploaded to the server is subjected to symmetric encryption using a system generated symmetric key. Further this key is subjected to asymmetric encryption using buyers/bid openers public keys. Overall, the uploaded tender documents become readable only after the tender opening by the authorized bid openers.
- 7) The uploaded tender documents become readable only after the tender opening by the authorized bid openers.
- 8) Upon the successful and timely submission of bids (ie after Clicking “Freeze Bid Submission” in the portal), the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

- 9) The bid summary has to be printed and kept as an acknowledgement of the submission of the bid. This acknowledgement may be used as an entry pass for any bid opening meetings.

ASSISTANCE TO BIDDERS

- 1) Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.
- 2) Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk.

Number: **0120-4200462, 0120-4001002,**

Mobile Number: 91 8826246593, `

In Office Hour only: 8804377070

E-Mail : support-eproc[at]nic[dot]in

- 3) For Tender related Query may please contact:
Tel: 26982759(Dir), 26981717#1240, 1242

FORMAT OF SCHEDULE OF REQUIREMENTS
(All Columns to be filled by the supplier)

Sl. No.	Name Equipment/Instrument	Unit	Qty.	Delivery Schedule	EMD in Rupees
				Delivery in _____ weeks at the user department, JMI	

Authorised Signatory:

Name:

Designation:

Name of the firm:

Seal:

Self-Declaration to be given by the bidder

Bid's Reference No. & Date:

Bidder's Name & Address

Person to be contacted:

Designation:

Telephone No.:

Fax No.:

Email:

The Registrar,
Jamia Millia Islamia,
Jamia Nagar, New Delhi-110025.

We, the undersigned Bidder, having carefully read and examined in detail the Terms and Conditions, specifications and all bidding document in regard to the supply of equipments/instruments at Jamia Millia Islamia and accept the same.

We also do hereby declare

1. that we have not been blacklisted/debarred by any Government/Undertaking.
2. that the rates quoted are not higher than the rates quoted for same item to any Government/Undertaking.
3. that the original mentioned documents submitted by us and prepared so as to prevent any subsequent alteration and replacement.

For and on behalf of the firm
(Firms Name & Address)

(Signature of Authorized Signatory)

Name:

Designation

Phone No.:

Seal:

Date:

Place:.....

FORMAT FOR OTHER INFORMATION

(To be filled in by the bidder)

1. Name of the firm:
2. Address:-
3. Telephone/Mobile No.
4. Fax Number:-
5. Email:-
6. GST No.:
7. Firm Registration No.:
(if any)
8. PAN :
(attach photocopy)
9. **Earnest Money (Bids Security)**.....
@ Rs. 3,00,000/-

- a) Bank Draft/Pay Order No .
- b) Date .
- c) For Rs .
- d) Drawn On .

(Signature of the authorized person)

Name of contact person

Name of Firm

Contact No.

Seal

Place

Date.....

CONTRACT FORM
(to be filled by the successful bidder)

THIS AGREEMENT made the day of....., 20..... between the Registrar, Jamia Millia Islamia, New Delhi (hereinafter called "the Purchaser") of the one part and (Name of Supplier) of (City and Country of Supplier) (hereinafter called "the Supplier") of the other part :

WHEREAS the Purchaser is desirous that certain equipment/instrument and after sales services viz., (Brief Description of equipment/instrument and after sales services) and has accepted a bid by the Supplier for the supply of those equipment/instrument and after sales services for the sum of (Contract Price in Words and Figures) (hereinafter called "the Contract Price").

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

06 In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.

2. In consideration of the payments to be made by the JMI to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the JMI to provide the equipment/ instrument and after sales services and to remedy defects therein in conformity with the provisions of the Contract in all respects.

3. The JMI hereby covenants to pay the Supplier in consideration of the supply of the equipment/instrument and after sales services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

Brief particulars of the equipment/instrument and after sales services which shall be supplied/provided by the Supplier are as under:

SL. NO.	BRIEF DESCRIPTION OF EQUIPMENT/ INSTRUMENT AND AFTER SALES SERVICES	QUANTITY TO BE SUPPLIED	UNIT PRICE	TOTAL PRICE	DELIVERY TERMS

TOTAL VALUE:

DELIVERY SCHEDULE:

SIGNATURE OF
AUTHORISED SIGNATORY

Name :

Designation:

Name of the firm:

Seal:

REGISTAR, JMI

NAME

PLACE

SEAL

Specifications and allied Technical Details**List of Equipment**

S. No.	Technical Specifications	<u>Bidder Compliance</u> Complied/Not Complied
1.	<p>“Real Time Digital Simulator” for Power Systems, Power Electronics and Smart Grid studies and Hardware-in-the-Loop Testing capabilities.</p> <p>Note: <i>Technical Specifications As per the attached Specifications.</i></p>	

(Signature of the authorised person)

Name of contact person

Name of Firm

Contact No.

Seal

Place

Date.....

“Technical Specification for the “Real Time Digital Simulator”

The Real Time Simulator must be a Digital system (RTDS) able to perform electromagnetic transient simulations electric power system (frequency range DC to several kHz) continuously in real time. The external hardware to be included in the simulation loop can be a commercial device such as protective relay, FACTS & HVDC controller, generator controller (exciter, stabilizer, etc.), machine drive controller, etc., or any in-house prototype controller. In addition, the simulator will also be used for general power system studies and power system training as well as Power Hardware In-the-Loop (PHIL) testing.

RTDS must be able to simulate the following:

- Power System Analysis with Hydro and Thermal Generation with Renewable (Wind and Solar)
- General AC and DC system Operations
- Interaction of AC and DC systems
- Integrated Protection and Control systems
- Control system for synchronous machines, drives, converters, HVDC, SVC
- FACTS and custom power devices
- Protective relay schemes with analog connections as well as digital communication
- Synchrophasor and Wide Area Monitor and Protection
- Advanced academic research and training

RTDS Hardware:

The simulator must be modular in design to allow future expansion and upgrading of the system.

The basic module of the simulator must perform three functions:

- 1) Computation (i.e. solution) of the power and control system algorithms
- 2) Ethernet communication to allow control of the simulator via a standard Microsoft Windows based computer workstation
- 3) Dedicated, high speed communication to allow expansion of the simulator using additional modules

Computational Units:

The power and control system computation within each module shall be performed by processors (CPU) housed on multiple printed circuit cards. The processor cards shall not be dedicated to simulating specific models and the function of each processor contained in a module shall be completely defined by primary graphical user interface (GUI) software of the simulator. To prevent adverse effects caused by communication restrictions, it shall be possible to connect high accuracy, 16-bit digital to analogue and analogue to digital converters, plus digital input and output, directly to the computational units.

Multi-user Access:

The basic simulator module shall have ability to connect directly to a 10/100BaseT or higher speed Ethernet Local Area Network (LAN) so that it can be accessed remotely by a large group of users. It shall also be possible via the simulator software and the Ethernet communication to control, monitor and interact with simulations during execution. This is a key aspect of the simulator, allowing the user to “operate” the simulated power system in a manner similar to that of a real power system (i.e. the simulator operator must have continuous communication with and control of the simulator during real time simulations).

Global Time Synchronization:

It shall be possible for the simulation timestep to be synchronized to a 1 Pulse Per Second (1PPS), IEEE 1588 or IRIG-B time reference signal provided by an external device (i.e. GPS clock).

Synchronization of the simulation timestep to an external time reference is necessary for Phasor Measurement Unit (PMU) benchmark testing and it is advantageous for IEC 61850-9-2 sampled value output. The simulation of a constant phase angle shall not drift whatsoever over time with respect to the external GPS reference signal and shall exhibit a jitter not larger than 1 microsecond. Utilizing this GPS capability, multiple modules running two or more independent simulations shall be able to start and operate in synchronism. One of the applications this feature is end-to-end testing of protection/control systems consisting of physically remote schemes.

Expandability: It shall be possible to expand the simulator by adding more modules to the system. Dedicated communication shall be used between simulator modules so that the simulation time step is not affected in a negative way. Additionally, if

multiple modules are used in the simulator, a precision optical communication channel shall be used to ensure absolute synchronization of computation in all modules. To facilitate future expansion for larger scale real time simulations, it shall be possible to extend the simulator capacity to accommodate a minimum of one thousand three-phase buses (equivalent to approximately three thousand single-phase nodes) along with a number of transmission lines, transformers, composite loads, and generators existing in a typical transmission grid.

Input / Output Capabilities:

The simulator should provide the following minimum input/output capabilities:

1) Analogue Output (high resolution / optically isolated) - a minimum of 12, 16-bit analogue output channels shall be available on the simulator to facilitate connection to external devices. These outputs shall meet the following minimum specifications: usable dynamic range ~ 400:1 (based on 100kHz BW limited signal & 28db SNR) output voltage and current range +/- 10 Volts & 5 milli Amps max. resolution 305 micro Volts For standard simulations operating with time steps in the range of 50 microseconds, the analogue output signal shall be oversampled at a rate of 1 microsecond. The analogue output shall be equipped with a "watch dog" circuit to ensure the output voltage is set to zero within 1 millisecond of a simulation being stopped. The zeroing of the d/a output shall be within 1 millisecond regardless of how the simulation is terminated, either intentional or accidental.

SIMULATION REQUIREMENTS

Simulator Capacity and Simulation Time step

Depending on the purpose of the study being conducted, the simulator should be capable of modeling systems of various sizes, application, and levels of detail and time step resolutions. The capacity is specified on a per *module* basis as the description of *module* given in the Hardware section. Such modularity of the simulator capacity is very important in our mode of use and should not be overlooked by satisfying overall capacity and not the modular capacity. For example, **NxM Buses** means N modules with each module capable of simulating at least M buses in an independent simulation and at least NxM buses when all N modules are used in one large simulation. It should be possible to have any number of modules (up to N) in one simulation and the capacity shall be linearly proportional to the number of modules.

The size of the power system that can be modelled should meet the following minimum requirement in a typical power system and power electronic network context for hardware in the loop (controller and power HIL) real-time simulation.

- 1) Detailed medium to large scale systems with three-phase **buses** and **synchronous generators** with their detailed controls such as exciters, governors, etc. represented in a fully *dynamic model* to accurately represent slow dynamics of rotor swings, fault currents, frequency deviations, etc. and operating with a time step in the range of 50µs. The

simulator should be capable of representing, in real time with a digital time step of less than 30 microseconds, the power system defined in Appendix 1.

- 2) Fast transient simulations that include **three-phase buses**, HVDC, FACTS devices, generators, motors, transformers, transmission lines, loads, harmonic filters, faults, etc. running with a time step in the range of 30-50 μ s. The buses mentioned here are the observable and controllable grid buses such as substation bus and load bus. Embedded buses internal to a device/system/model such as branch buses of filter banks, fault bus inside machines/transformers, non-interface nodes of a converter/drive and embedded breakers are not been included in this count. Please keep in mind that purpose of number of buses here is to determine the size of the power system network and not necessarily the complexity of the devices being modeled. Hence, only interface bus to the network should be counted here.
- 3) Entire networks with up to **1x10 three phase buses** constructed with a simulation time step in the range of 1 – 4 μ s to include power electronic systems with in power system network including drives.
- 4) The simulator should be able to run real-time HIL simulation studies using combinations of all the capabilities mentioned above whereby very detailed FACTS models running at 1-4 μ s can be represented together with slower dynamics of the power system network running with time steps in the order of 30-50 μ s for conducting a range of applications summarized in subsequent sections below.
- 5) The *power system simulator* should provide a facility to interface prototype controllers (student projects developed using D-Space, Nation Instruments (NI) or Texas Instruments (TI) Boards) or commercial power system devices such as relays, PMUs, drives, FACTS controller, etc. to the power system modeled in the simulator. For this purpose, the simulator should have both analog and digital inputs and outputs. Following is a minimum number requested.
 - i. 1x12 analog outputs, high precision (16 bits), optically isolated, modular.
- 6) The simulator should have overall capability for Ethernet protocol based communications (GOOSE, sampled values, PMU, DNP3, playback etc.). IEEE C37.118 PMU output, IEC 61850 GOOSE messaging, IEC 61850-9-2 Sampled Values, and DNP3 protocols should all be included in the scope of supply. All protocols must be able to be operated simultaneously in a single real time simulation. All other available protocols should be listed as options.
- 7) Required accessories (e.g. Networkable computing/GUI workstations/Terminals, cables, hubs/switches if needed) must be supplied so that RTDS laboratory may be functional.
- 8) The simulator should be capable of representing, in real time with a digital time step in the range of 40-60 microseconds, the medium sized real world power systems.
- 9) Processor Allocation Details: It shall be possible to view the processor allocation details showing loading of processors or cores with various component used in the simulation case. The allocation chart or table should show control system components and power system component separately.
- 10) Testing of Physical PMUs: The software should be equipped with tools or utilities for testing hardware PMUs based on according to the IEEE C37.118 or IEC 61850-90-5. The tools or utilities shall gather measurements made by the hardware PMU, (i.e.Total Vector Error, Frequency Error, Rate of Change of Frequency Error, and Rate of Change of Frequency) and compare them to theoretical values.

Numerical Stability

The simulator should be capable of simulating the systems continuously in real time for a *minimum* duration of twelve (12) hours. The operator shall manually apply faults at random times during the test to ensure the numerical stability and continuous operation of the system.

Power Electronic Simulation

AC-DC grid simulation with different variety of generators including wind and photovoltaic and complex loads.

Line Commutated Power Electronic Converters

The simulator shall be capable of representing line commutated power electronic converter (i.e. HVDC, SVC, TCSC) with an effective firing accuracy of 1 microseconds or better. The accuracy shall be maintained at all

times and regardless of whether the firing pulses are generated internally by a simulated controller or externally by a physical controller. Furthermore, it is required that these converters be solved as embedded parts of the main network solution and not as isolated subsystems. This is important to ensure maximum numerical stability and the proper representation of harmonics. These models shall also allow the representation of internal faults.

Voltage Source Converter (VSC) Based Power Electronic Schemes:

VSC based power electronic schemes typically operate with higher frequency switching, particularly when driven by Pulse Width Modulation (PWM) control. Depending on the power level and application, PWM frequencies typically range from approximately 1 – 10 kHz and the dynamics of these schemes cannot be accurately represented using a time step in the range of 50-70 micro seconds. Therefore, the simulator shall have the ability to represent the VSC schemes as special subnetworks that operate with time steps in the range of 1-4 microseconds.

It shall be possible to connect the subnetworks containing the VSC schemes to the main simulation through a numerical interface so that the interaction of the VSC with a large scale network can be represented and studied.

The subnetworks containing VSC's shall be freely configurable and able to include a minimum of 30 nodes and 36 switching devices (an IGBT – Back Diode pair shall count only as one device). The subnetworks containing the VSC's are required to represent switching for PWM frequencies in the order of 1-1.5 kHz for 3-level converters and <10 kHz for 2-level converters.

The subnetworks containing the VSC's shall also be able to represent Multi-Module Converters (MMC or also known as cascaded H-bridges). For the full-bridge configurations a minimum of 40 levels must be represented per leg and a minimum of 48 levels per leg for half-bridge configurations. It shall further be possible to expand the MMC valve representation using FPGA based models to a minimum of 500 submodules per valve (i.e. 1500 submodules for a STATCOM configuration and 3000 submodules for an HVDC terminal). It must be possible to connect each valve to the external control via no more than two duplex optical fibres. The fibre optic connections will carry the firing pulse information from the controller to the valve model and the capacitor voltages, valve current, etc. from the valve to the controller using an industry standard protocol (e.g. Aurora serial protocol).

The VSC converter models shall be capable of testing the firing pulse controllers (i.e. averaging models are not acceptable) for 2- and 3-level bridges as well as MMC. Therefore, the simulators analogue output and digital input hardware must be respectively capable to send out and read new values every sub-network time step (i.e. in the range of 1-4 microseconds).

In addition to the VSC components, it shall also be possible to include the following elements in the sub-networks; transformers, transmission lines, cables, permanent magnet synchronous machines, double fed induction machines, breakers, filters, etc., and it shall be possible to freely interconnect any of these to form the circuit.

It shall also be possible to interconnect the sub-networks via traveling wave transmission line or cable models. Travel times as low as the sub-network time step (i.e. 1-4 microseconds) shall be allowed.

Applications

The simulator should be equipped with up-to-date software and hardware to facilitate real-time HIL simulation of *electrical and power electronic networks* including but not limited to the following applications. The simulator should include complete range of digital and analog input and output capabilities for HIL simulation.

1. Protection System Testing

- Internal faults for transmission lines, transformers, synchronous machines, etc.
- Detailed CT, PT and CVT models including saturation, hysteresis, etc.

- IEC 61850 Capability with the following minimum number of channels
 - IEC 61850 GOOSE Publish and Subscribe
 - 64 binary input (subscribe) from up to 8 different IED's
 - 64 binary output (publish)
 - 8 analogue input
 - 8 analogue output
 - Typical response time of 3ms or better
 - IEC 61850-9-2 Sample Value Output
 - 80 or 256 samples per cycle for 50/60 Hz
 - Time synchronization / timestamp from 1 PPS or IEEE1588
- Testing Wide Area Protection and Control Based on PMU Data
 - External Time Reference Synchronization
 - Required to provide consistent and reliable phase reference
 - Synchronization to GPS clock via 1 PPS or IEEE 1588
 - IEEE C37.118 or IEC 61850-90-5 PMU communication protocol
 - DNP3 SCADA communication protocol

2. Smart Grid

- Study and integration of renewable sources
 - Wind power with various configurations including Double Fed Induction Generator (DFIG) and Permanent Magnet Synchronous Machine (PMSM)
 - Solar
 - Fuel cell
 - Fly wheel
 - Battery storage
 - Vehicle to grid
 - Configurable converter models and topologies
- Investigation of new operating strategies and protection
- Investigation of coordination of new communication protocols (e.g. IEC 61850)
- Microgrid and distributed generation (DG) studies

3. Power Electronics

- HVDC – conventional and VSC based schemes
 - System design
 - Closed-loop control system design and verification testing
 - AC system impact studies
 - VSC based schemes with 2- and 3-level converts as well as Modular Multi-level Converters (MMC)
- FACTS – SVC, TCSC, STATCOM, UPFC, SSSC, etc.
 - System design
 - Closed-loop control system design and verification testing
 - AC system impact studies
 - VSC based schemes with 2- and 3-level converts as well as Modular Multi-level Converters (MMC)
- Motor drives
 - Closed-loop control system design and verification testing
 - Configurable converter models and topologies
- General Power Electronic Circuits

4. AC system studies

- System security and transient stability investigations
- Electromagnetic transient studies
- Wide area protection and control development and testing

- Black start
 - Islanding and anti-islanding
5. **Power Hardware In the Loop (PHIL)**
- Power amplifiers are not to be included in the scope. However, the simulator must have the I/O capabilities for stable interface with power amplifier
 - Microgrid research
 - Analysis of dynamic load behavior such as air-conditioners
 - Analysis of physical DG such as PV and Fuel Cell systems
 - Power equipment testing
 - Mechanical
 - Electrical
6. *Prototype Controller & Development Testing:*
- Proto type controllers may be developed in-house by researchers using off-the-shelf real-time hardware platforms such as D-Space, National Instruments, Texas Instruments, Mathworks X pc Target Turnkey and FPGA for a variety of applications. Each of these controllers will be programmed using *programming environment* recommended by or provided with the controller platform hardware including such programming environments as MATLAB© to enrich student experience with the variety of tools. The power system simulator *GUI* is not expected to support these third party *software programming environments*. However, the prototype controller is expected to interface to the simulator through hardware analogue/digital Input/output (I/O) interface of the simulator in most instances. Hence, please treat simulator GUI features/capabilities independent of the GUI facilities of prototype controller development environment. This distinction has been done deliberately to provide flexibility and verity to range of tools available to the students.

SOFTWARE

Graphical User Interface

All aspects of the simulator operation, from construction of simulation cases, to operation of the simulator, to post analysis of results must be controlled by a single Graphical User Interface (GUI). The GUI shall consist of modules for the following functions:

- 1) Circuit Construction - a module to allow the construction of simulation circuits. It shall be possible to use predefined modules from a library of components to assemble new simulation cases. It shall be possible to construct the diagram in either three-line or single-line diagram format and it shall be possible to toggle between the two different views of the same circuit.
- 2) Transmission Line and Cable Constants – a module to calculate the traveling wave and pi-section parameters for transmission lines and cables. It shall be possible to input the physical parameters of transmission lines and cables to calculate the parameters. Alternatively, for overhead transmission lines it shall be possible to input positive and zero sequence data for 3 and 6 conductor transmission lines to calculate the parameters.
- 3) Simulator Operation – a module for operation of the simulator and the retrieval of simulation results. This module shall allow simulation cases to be started and stopped, operation of the power system (i.e. changing of set-points and breaker operations), fault applications, monitoring of system status (e.g. RMS voltages and currents), and the retrieval of details simulation results (similar to a fault recorder).
- 4) Storing of Results - it shall be possible to save simulation results directly from the GUI in ASCII, jpg, emf (vector format), pdf or COMTRADE format.
- 5) Post analysis of simulation results

Batch Mode Operation

Software shall be provided to allow the user to program a series of simulations to run automatically (i.e. batch mode). The batch mode software shall be capable of nested looping (e.g. if, for and while) to allow adaptive algorithms to be used during automatic operation. The batch mode software shall also be capable of recording key results in ASCII format and selectively printing or storing simulation results.

The batch mode software shall have the ability to embed text and simulation results (in jpg or emf format) directly into Microsoft® Word™ documents.

The batch mode software will be used to conduct automated relay testing where many hundreds or thousands of cases may be simulated during a day.

Power System Models

A minimum of the following power system models shall be available for the simulator:

- 1) Traveling wave and pi-section multi-phase (max. 12 conductors), coupled transmission line and cable models. It shall be possible to embed breakers in each end of the transmission line models with a maximum of 6 conductors. The nodes introduced by the breakers shall be solved by the transmission line model and shall not count as part of those solved by the main network solution. Additionally a phase domain frequency dependent model shall also be available to represent a minimum of 6 coupled conductors.
- 2) Transformers with 2 or 3 windings and autotransformers with an optional tertiary winding, including saturation and hysteresis, online tap changer and internal fault representation
- 3) Synchronous machines (standard and permanent magnet). The synchronous machine models must be solved as part of the main network and are not allowed to be numerically interfaced to the network solution. The synchronous machine model shall optionally allow the unit transformer to be embedded as part of the model so the transformer secondary nodes do not reduce the number available in the network solution (i.e. only the transformer primary nodes need be counted as solved by the network solution). Additionally, a phase domain synchronous machine model must be available with a true stator-ground fault. The phase domain machine must also be solved as part of the main network and in not permitted to be interfaced or decoupled from the network solution.
- 4) Inductions machines (squirrel cage and double fed)
- 5) Voltage sources with definable equivalent impedances, source magnitude, frequency and phase
- 6) Passive Resistive, Inductive and Capacitive components (including various filter configurations)
- 7) Circuit breakers & fault switches
- 8) Bus arrestors
- 9) Series capacitors with ZnO arrestors and bypass switches
- 10) Thyristor Controlled Series Capacitors (TCSC)
- 11) HVDC valve groups for transmission and back-to-back schemes. The HVDC valve groups shall include 6-pulse and 12-pulse configurations. The 12-pulse configurations shall be fed from a 3-winding transformer with an option to include a 4th winding for the freely configurable connection of filters and or reactive power compensation. The valve group models shall support internal valve faults and shall be solved as part of the main network solution. It is not acceptable that the valve groups are numerically decoupled from the network solution or interfaced. The switches representing thyristor valves must be embedded in the main network solution and NOT solved as independent subsystems.
- 12) Filter bank model to allow multiple banks of up to 12 switchable filters to be added to simulations without reducing the number of switches or nodes available in the main network solution

- 13) Static VAR Compensators (SVC) including TCR and TSC branches. The switches representing thyristor valves must be embedded in the main network solution and NOT solved as independent subsystems.
- 14) Instrument transformers including current transformers (CT), inductive voltage transformers (PT), and capacitive voltage transformers (CVT) with full support for saturation and hysteresis loop modeling
- 15) Voltage Source Converters: STATCOM, UPFC, SSSC, VSC-based HVDC, DFIG wind generation
- 16) COMTRADE and ASCII Playback. It shall be possible to playback COMTRADE, or ASCII, data files as large as 4 GB.

Control System Models

A minimum of the following control system components shall be available for the simulator in the control system module:

- User-Input - Slider, switch, button, dial, etc.
- Constants – integer, floating point, PI
- Data conversion- deg-rad, rad-deg, int-float, float-int
- Math functions – gain, exp, log, ln, e^x , x^y , sqrt, inverse, abs, sum, multiply, divide, max, min, etc.
- Complex math functions – multiply, divide, add, subtract, etc.
- Trigonometric functions – sin, arcsin, cos, arcos, tan, arctan, arctan2
- Standard control blocks - deadband, pulse generator, edge detector, time, counter, ramp, ramp limits, limiters, phase-locked loop (PLL), flip-flops, fourier transform, integrator, lead-lag, wash-out, lookup table, non-linear gains, etc.
- Logic functions – and, or, nor, bit shift functions, bit -> word, if-then-else, etc.
- Sequencer functions – wait, apply fault, close breaker, ...
- Meters – real and reactive power, RMS (single- and three-phase), angle difference, frequency
- Signal processing – sample & hold, down sampler, moving average, FIR, DFT, ABC-DQ0, DQ0-ABC, ABC- $\alpha\beta$, $\alpha\beta$ -ABC, vector rotator, etc.
- Generator controls – exciters (IEEE Type 1 to 5, AC1 to 4, ST1 to 3, X1, X2, 2A, SCR, DC2, IVO, etc.), governors (IEEE Type 1-3, IVO, European BBGOV1, Gas turbine, steam turbine, hydro turbine, etc.), power system stabilizers (PSS2A, IEEEEST, IEE2ST)
- Relay models – line distance protection (mho & quad), transformer, differential, generator, overcurrent, etc.
- Phasor Measurement Unit (PMU) – model which will operate in a manner similar to PMU devices typically found in power systems to allow the development of wide area protection and control based on PMU data.

User Defined Models

It shall be possible for the user to create power and control system models for the simulator to run in real time together with standard models provided by the supplier. The facility provided shall allow custom icon graphics and input menus to be created for the new component. Furthermore, the facility shall allow high level programming (for example C code) of the real time simulation algorithm and include all necessary compilers.

Load Flow Initialization

The software shall include a load flow calculation which can be used to initialize the simulation components before the real time electromagnetic transient simulation is begun.

PSS/E Conversion

It shall be possible for the simulator to import and convert PSS/E data for simulation in real time. Once converted, the PSS/E system must also be available in picture format for modification.

PSCAD Compatibility

It shall be possible for the simulator to import and convert PSCAD network data for simulation in real time.

Software Modules

The simulator should include all the software modules currently available for power system and power electronics simulation including but not limited to the following modules. Clearly identify modules not available as well as those that are available but not included.

- Graphical circuit drawing module
- Interactive run control module
- Transmission line and cable constants solver module
- Post processing module for reporting & curve calculations of saved output
- User defined component builder module with Compiler
- Power flow solver and network initialization
- Powerflowimporterfornetworkinitializationandre-initializationformulti-scenariostudies
- Transient stability data importer such as PSS/E and BPA programs
- FrequencyDependentNetworkEquivalentcalculationandinterfacemodule
- Transient Fault Recorder(TFR)
- Batch scripting recorder and editor

Software Licensing

The software shall be provided with a site license so that it is possible to install the simulator software on any number of desktop or laptop computers. The proposal should include University wide site license for the entire suite of software and hardware with unlimited number of licenses/seats. Simulator supplied should include the cost of *new and independent* software licenses for all the modules without any assumption of existing licenses at the University. If any necessary software is not included or has a restriction on number of seats (as opposed to unlimited site license), please itemize the additional cost for license/seat.

Communication protocols

The simulator will be utilized to model modern Smart Grid and Distributed Generation scenarios and as such must be able to provide high level Ethernet based communication as a medium via the protocols described below. It should be possible to run an application which requires the use of these protocols simultaneously. While all these protocols should be available (and demonstrated if needed) as add-on, only a subset or none may be ordered with the simulator purchase.

IEC 61850 GOOSE Messaging

The simulator shall be capable of providing IEC 61850 GOOSE formatted messages for binary signals (e.g. trip and breaker status). A minimum of 64 digital inputs and 64 digital outputs shall be provided using the IEC protocol to as many as 8 different IED's. It shall be possible to manipulate the quality bits, "test" bit and "needs commissioning" bit of the GOOSE messages to test the response of the external protection and control devices.

To ensure compliance with the standard and to ensure multi-vendor interoperability, the IEC 61850 implementation shall be certified by an independent UCA International Users Group recognized test lab (e.g. KEMA).

IEC 61850-9-2 Sampled Value Messaging

The simulator shall be capable of providing a minimum of two IEC 61850-9-2 sampled value data streams (i.e. two sets of 4 x voltage and 4 x current channels) to protection and control equipment. The sampled values shall be provided at 80 or 256 samples per cycle for a single data stream. It shall be possible to manipulate the quality bits of the sampled value messages to test the response of the external protection and control devices.

It shall also be possible to subscribe to a minimum of one IEC 61850-9-2 sampled values data stream at 80 or 256 sample per cycle as input to a simulation.

C37.118 PMU Data Stream Output

The simulator shall be capable of simulating and providing data stream output for a minimum of eight (8) Phasor Measurement Units (PMU's) with individually assignable frame-rates of up to 240 frames per second.

SCADA Interface

The simulator shall be capable of acting as a slave unit for communication with SCADA equipment using the DNP 3.0 or IEC 60870-5-104 protocol. The system shall communicate with one DNP/ IEC 60870-5-104 master and accommodate the following minimum communication capacity:

- Binary simulation status (i.e. breaker position)
1024 (scan rate 1000 Hz)
- Binary simulation control (i.e. breaker commands)
512 (scan rate 1000 Hz)
- Analogue status (i.e. output from simulator)
500 (scan rate 4 Hz)
- Analogue control (i.e. input to simulator)
100 (scan rate 4 Hz)

AVAILABILITY AND MAINTAINABILITY

The real time simulator will be a combination of both hardware and software, but for the purpose of the specification it shall be considered one entity. Furthermore, to ensure fast and comprehensive support, the entire simulator shall be designed and manufactured by one supplier.

It shall be possible for the customer to remove and replace individual printed circuit cards (CPU processor boards as well as individual type of I/O boards) in order to guarantee maintainability and a high level of availability. Hence, it is desirable if the CPUs/cores are divided into multiple processor boards. Each type of I/O (analogue input, analogue output, digital input and digital output) shall be on separate boards for the same purpose. Furthermore, the manufacturer shall offer a maintenance program to extend the hardware warranty and provide software updates. The manufacturer must further guarantee to provide maintenance, including replacement components, for the system for a minimum of 5 years.

Installation and Training

The proposal should include on-site installation and one week training conducted by experienced engineers and should accommodate staff, faculty and students). The training should encompass all hardware and software modules including third party modules, if any, supplied as part of the simulator. If this cost is not included with the supply, please itemize the additional cost or clearly state non-availability of the service and the reason for the same.

Application Notes and Examples

As part of the installation and training the vendor should install all the application notes and ready-made example cases available. All example applications developed by the vendor during the extended maintenance period (up to 5 years) should be made available to the University as part of the maintenance program without any exclusions or additional charge.

Technical Support

The simulator should include unlimited technical support on hardware and software for at least 5 years. The technical support should cover all the software and hardware supplied as part of the simulator irrespective of whether the software or hardware was manufactured by the simulator vendor or purchased from third parties. If this cost is not included with the supply, please itemize the additional cost or clearly state non-availability of the service and the reason for the same. The simulator vendor shall demonstrate their expertise for supporting third party software and hardware, now and in the future.

Software Maintenance and Upgrade

The simulator should include unrestricted upgrade(all releases including major and minor releases) and maintenance (patches and fixes) for the lifetime of the simulator at no extra cost. The upgrade and maintenance should cover all the software modules supplied as part of the simulator whether the software module was manufactured by the simulator vendor or purchased from third parties. Please identify third party software/module and provide details (such as transferable contracts from original manufacturer) to support vendor's ability to offer maintenance, upgrade coverage and guarantee compatibility for the requested period. The Institute shall request contact information of existing clients to verify the history of satisfactory execution of such extended maintenance on vendor developed and third party products. If this cost is not included with the supply, please state non-availability of the service and the reason for the same.

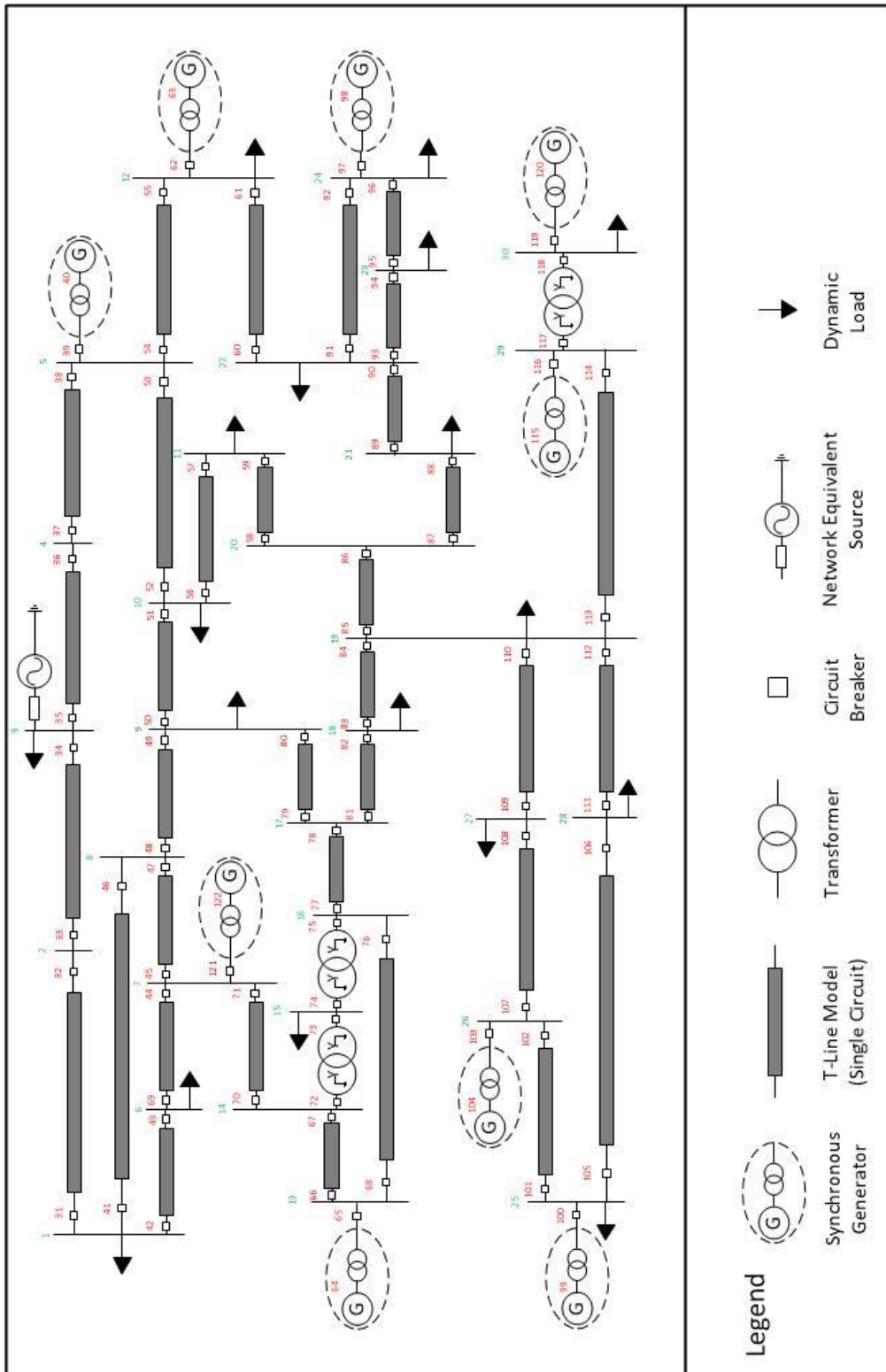
Hardware Warranty

The proposal should include a "repair or replace hardware warranty" that covers parts and labor for atleast 4years with zero deductible. The warranty should cover all the hardware supplied as part of the simulator whether the hardware was manufactured by the simulator vendor or purchased from third parties including off-the shelf process or boards, power supplies, I/O modules, etc. Please identify all third party hardware boards and provide details (such as transferable contracts from original manufacturer) to support simulator vendor's ability to offer the warranty coverage for the requested period. The Institute shall request contact information of existing clients to verify the history of satisfactory execution of such extended maintenance on vendor developed and third party products. If this cost is not included with the supply, please state non-availability of the service and the reason for the same.

Hardware Upgrades and Compatibility

The vendor should provide a clear and demonstrated path for a cost effective hardware upgrade with full backward compatibility. From upgrade cost point, please describe any hardware exchange program offered by the vendor to offset the cost of hardware upgrade including percentage discount offered on exchange and any annual enrolment fee for the *exchange discount program*. In the case of third party components including off-the-shelf processor boards, I/O modules,etc. included with the simulator, please describe insufficient detail, including any limitation, as to how upgrade with full backward compatibility is assured. Considering 4-year maintenance of simulator, this aspect is very important to assess the total cost of operation. The compatibility is also important for effective collaboration with other institutions and sponsors that may have a different version of hardware and/or software. If this cost is not included with the supply, please state non-availability of the service and the reason for the same.

Appendix-1: IEEE 39 BUS POWER SYSTEM



Financial Bid

S.No.	Name of Equipments	Qty.	Price	
			INR	USD
1.	"Real Time Digital Simulator" for Power Systems, Power Electronics and Smart Grid studies and Hardware-in-the-Loop Testing capabilities.	01		
<u>Applicable Taxes/Duties and other charges</u>				
1.	GST, if any			
2.	Excise duty, if any			
3.	Customs duty, if any			
4.	Packaging & forwarding charges, if any			
5.	For Octroi, if applicable, necessary certificate will be issued			
6.	Training cost, if any			
7.	Installation and commissioning cost, if any			
8.	Any other charges, if any			
9.	Grand Total (in figures & words)			

Note:

- Price must be quoted in US\$ for imported equipments.
- The validity of tender shall be 180 days after opening of financial bid.

(Signature of the authorized person)

Name of Contact Person

Name of Firm

Contact No.

Seal

TENDER ACCEPTANCE LETTER
(To be given on Company Letter Head)

Date:

To,

Sub: Acceptance of Terms & Conditions of Tender.

Tender Reference No: _____

Name of Tender / Work: -

Dear Sir,

1. I/ We have downloaded / obtained the tender document(s) for the above mentioned 'Tender/Work' from the web site(s) namely:

as per your advertisement, given in the above mentioned website(s).

2. I / We hereby certify that I / we have read the entire terms and conditions of the tender documents from Page No. _____ to _____ (including all documents like annexure(s), schedule(s), etc .), which form part of the contract agreement and I / we shall abide hereby by the terms / conditions / clauses contained therein.

3. The corrigendum(s) issued from time to time by your department/organization too have also been taken into consideration, while submitting this acceptance letter.

4. I / We hereby unconditionally accept the tender conditions of above mentioned tender document(s) / corrigendum(s) in its totality / entirety.

5. I / We do hereby declare that our Firm has not been blacklisted/ debarred by any Govt. Department/Public sector undertaking.

6. I / We certify that all information furnished by the our Firm is true & correct and in the event that the information is found to be incorrect/untrue or found violated, then your department/ organisation shall without giving any notice or reason therefore or summarily reject the bid or terminate the contract, without prejudice to any other rights or remedy including the forfeiture of the full said earnest money deposit absolutely.

Yours Faithfully,

(Signature of the Bidder, with Official Seal)