No. NITS/PS-548/EE/PSA/CORRIGENDUM/18   Date: 22-03-2018

CORRIGENDUM

Sub. : Amendment in technical specification of tendered item.

Ref. : Tender No. NITS/PS-548/EE/Power System Analysis/18, Dated: 06.03.2018, LOS-27.03.2018

1. The last date of submission of tender document is hereby extended for 7(seven days) i.e. up to 06 / 04 /2018

2. The details updated technical specification is as given in ANNEXURE-A

3. All other terms & condition of the tender shall remain UNCHANGED.

Registrar,
NIT Silchar-788 010
REGISTRAR
N.I.T.
SILCHAR   10

Copy to: HOD, EE NIT Silchar for information.

Power System Analysis Software (updated Specification)

User – 10 User LAN

Buses – 50 Bus (During AC and DC network operation (combining) 25buses in AC and 25 buses is DC can be operated.

Basic Features:
- The software should be compatible with 64 bit and run with local SQL Database Platform.
- The software should compatible to .OTI format and database should compatible to .MDF format only.
- Software should have Built-in intelligent graphics, Automatic equipment connection mode, Network nesting, Multiple generators & grid connections, Customizable font types, styles, & colors, Graphical display of equipment grounding, Customizable display of ratings & results, Customizable output reports via Crystal Reports, Switching Device Interlock Enforcer, Theme Manager, One line Diagram Templates, Built-In Calculators, Output Report Comparator, Project Management, Multi-Dimensional Database, Configuration Manager, Cable Manager.
- **One-Line Diagram :** High-resolution graphics, Alignment tools, Graphical symbol selection, Graphical contouring based on results, Circuit Tracing
- **Auto-Build:** Rule-Based creation of one-line, Automatic spacing & alignment rules, automated voltage assignment, Spacing & voltage rule book.
- **Data block:** Customize input data & study results, Display results, input, and/or tags, User-friendly options to display, User-defined templates, and share deliverables across organization.
- **Theme Manager:** User-defined result format, Display / hide based on etc.
- **Composite Network:** Image presentation, unlimited connections, internal one-line, Customizable size.
- The software should have capability for automated creation of SLD, alignment of SLD, automated voltage assignment
- The software should have capability to customize input data & study results, display results, tags and/or properties in single line diagram
- The software should have provision to import RAW/IEEE/ CSV files, ground grid plans from AutoCAD, Import electrical data & protective devices, export to AutoCAD using DXF format

1. Base Package

The software module shall be capable of providing the following functions:
- Intelligent One-Line Diagram
- System Elements
- Configuration Manager
- Cable Ampacity & Sizing - IEEE, ICEA, NEC
- Multiple Language Support in English, Spanish, Chinese, Japanese, Portuguese & German
- Report Manager
- Project and Study Wizards
- Multi-Dimensional Database
- Theme Manager
- Data Exchange
- User Access Management

- Engineering libraries provide complete verified and validated data based on equipment manufacturer's published data.
- Comprehensive library: ANSI & IEC devices
- Verified & Validated (V&V) library data
- V&V locked data
- Add, copy, merge, & delete capabilities
- User-defined & controlled libraries
- User-access control & security
- Edited-by & checked-by with date stamping
- User-controlled library merge
- The software should be compatible with 64 bit and run with local SQL Database Platform.

The software has built-in intelligent graphics, Automatic equipment connection mode, Network nesting, Multiple generators & grid connections, Customizable font types, styles, & colors, Graphical display of equipment grounding, Customizable display of ratings & results, Customizable output reports via Crystal Reports, Switching Device Interlock Enforcer, Theme Manager, One line Diagram Templates, Built-In Calculators, Output Report Comparator, Project Management, Multi-Dimensional Database, Configuration Manager, Cable Manager.

1. One-Line Diagram
- Unlimited one-line diagram presentations
- Educational 50 Bus System
- Single-phase system (2 and 3 wires)
- Unlimited status configurations/scenarios (switching devices, motors, loads, etc.)
- Multiple engineering properties (base and revision data)
- Three-dimensional (3-D) database
- Multiple loading categories (conditions) with individual percent loading
- Unlimited one-line diagram nesting for sub-systems, MCCs, etc.
- Simultaneous view of one-line diagram presentations
- Simultaneous view of system configurations

- Simultaneous view of different study results
- Phase adapters to convert from three phase to mixed single phase networks
- One-Line Templates
- Automatic bus/node insertion
- Find elements from editors or the project window
- Graphical Auto Select
- Grouping/ungrouping of elements
- Change size, symbol, color, orientation, and alignment of elements and text, individually and globally
- Themed color schemes provide the flexibility to customize each one-line presentation independently
- Symbol Library
- ActiveX (programmable objects)
- Graphically fault/clear fault from buses
- Selectable zoom-to-fit
- State-of-the-art built-in graphic user interface
- Drag and drop, cut and paste, undo and redo, zooming, etc.
- Built-in CAD system
- XML data exchange
- Export one-line diagrams to third party CAD systems via dxf and metafile formats
- Customizable graphical display of results annotations
- Customizable graphical display of nameplate data annotations
- Interchangeable ANSI and IEC element symbols
- Multiple sizing and rotation of element symbols
- Multi-color symbols and annotations
- Supports True Type fonts
- Hide and show protective devices per presentation
- Remote connectors for better one-line diagram layout
- Graphical operation (open/close) of switching devices in edit or study modes
- Dynamic continuity check shows deenergized devices as "semi-transparent" images and graphically displays current system configuration
- Configuration manager to easily compare open/close status for all switching devices
- Display of fixed tap and load tap changer (LTC) positions on the one-line diagram
- Direct device coordination from the one-line diagram
- Build elementary diagrams within the same project and integrate with one-line diagram
- Comprehensive printing/plotting capabilities
- Individual and global section of elements, objects, and composites
- Schedule manager for system components (input data)
- Customizable output reports (Crystal Reports) with find functionality
- Categorized output report manager for Crystal Reports
- Access database output reports
- Crystal Reports for library data
- Comprehensive summary reports
- Customizable output plots
- Report status of loads and protective devices for all configurations
- System dumpster with unlimited cells for storage and retrieval of deleted components
- Resizable, floating/attachable toolbars for each study
- Keyboard Shortcuts

2. Printing/Plotting of One-Line Diagram

The following options are available for each presentation including composite motors and composite networks:

- Print options
- Printer setup
- Zoom level for print size
- Print coordinates and scrolling
- Customizable print preview
- Batch printing

3. Libraries

Libraries: The software should have comprehensive library for both ANSI & IEC devices, which should be verified and validated. The software allow to customize the library with control & security.

a) 1000+ protective device models
b) Quick pick tabular views
c) Induction Machine Circuit Model
d) Multi-Function Relay
e) Low Voltage Solid State Trip, LVSST

4. PV Array & Wind Turbine Generator

- User-defined solar panel library with P-V and I-V characteristics
- Solar irradiance calculator to determine irradiance in watts per square meter based on specified date, time and location
- Simulate solar irradiance changes and its effect on the solar farm output
- Create multiple solar irradiance categories for predictive "what if" studies & scenarios
- Built-in inverter model eliminates the need for unnecessary node connections
- Model behaviour of Maximum Peak Power Tracking (MPPT) Controller for Inverters
- The Wind Energy Analysis module gives you the ability to model unlimited wind turbine generators individually or in groups
- Detailed modelling of turbine dynamics including aerodynamics & power coefficients
- Fully integrated with User-Defined Dynamic Model (UDM) Builder and Compiler
- Model wind turbine technologies defined by WECC such as conventional induction generator, variable slip induction generator, and doubly-fed induction generators with pitch & converter controller characteristics and full scale power converter models.
- Simulate transient wind conditions with ramp, gust, & noise disturbances & calculate dynamic impact on wind machines
- Create multiple wind categories for predictive "what if" studies & scenarios
- User-defined wind turbine manufacturer and model library
- Perform transient stability analysis with individual or zone-based disturbances

2. Load Flow Analysis

- Calculate power flows & Voltage drop analysis following below iterative methods
- Adaptive Newton-Raphson Method
- Newton-Raphson Method
- Fast-decoupled Method
- Gauss-Seidel Method
- Power factor correction
- Calculate Real & reactive Power, bus voltages, currents, & power factors
- Bus/transformer/cable/generator overload warnings
- Two-winding & three-winding transformer LTC actions
- Real & reactive power losses
- Extensive violation alerts and reporting
- Multi-report power flow result analyzer
- Auto Run Load Flow based on system changes
- Power flow simulation with multiple loading & generation conditions
- Multiple loading & generation categories
- Multiple demand factors
- Different model of lumped loading
- Compare & analyze multiple reports using **Load flow result analyzer**
- Include effect of phase-shifting transformers
- Evaluate critical & marginal limit violations
- Conduct unlimited "what-if" studies within one database
- Five levels of automatic error checking
- Power Factor and Efficiency at no-load & over-load conditions
- Isolated single-phase source modeling

3. Short-Circuit Analysis

- Complete compliance with ANSI/IEEE C37 series
- Complete compliance with IEC 60056, 60282, 61363, 60781, 60909, 60947
- IEEE Standard 141 and 399, UL 489
- Arc Flash Analysis module (NFPA 70E-2000) for determining incident energy and flash protective boundary (ANSI and IEC)
- Extensive manufacturer data for fuses, LV and HV breakers
- Automatic crest and interrupting duty comparison
- Automatic peak and breaking duty comparison
- Alert view to display critical and marginal limit violations
- 3-phase, line-line, line-ground, and line-line-ground faults
- Single Phase System Duty
- ½ cycle to 30 cycle faults including 2, 3, 5, and 8 cycle breakers
- Generator Circuit Breaker IEEE Standard C37.013
- Breaking duty as a function of breaker time delay
- Interrupting duty as a function of breaker cycle time
- Fault impedance (Z1 and Z0)
- User-definable voltage c factor for IEC analysis
- Complete grounding modeling for motors, generators and transformers
- CB duty calculation based on the maximum-through fault current (ANSI)
- Phase-shifting transformer for ANSI unbalanced faults
- Check making and breaking capabilities of protective devices against fault currents
- Cable temperature adjustment
- User-selected bus faulting
- Report fault current contributions (IA and 3 I0) and voltage profiles (va, vb, and vc)
- User-selected fault current contribution level reporting
- Option to include motor delays
- Option to include feeder and overload heater elements
- Option to set pre-fault voltages (fixed values or load flow results)
- Option to use different X/R methods and c factors
- Option to consider motor contributions based on loading categories
- Updates directly to device coordination
- Calculation of Tie PD current
- Load Terminal short-circuit Calculation

4. Protective Device Coordination & Sequence of Operation

- AC & DC Overcurrent protective device coordination & selectivity
- Integrated database and embedded analysis capabilities
- Graphically adjustable device settings
- Equipment damage curve plotting
- Sequence-of-operation fault analysis
- Verified & validated protective device library
- ANSI & IEC coordination & protection standards
- Relay & Breaker device coordination analysis
- Phase & Ground overcurrent coordination evaluation modes
- Graphically adjustable device settings and tools
- Comprehensive verified and validated protective device libraries
- One-line diagram integration
- Automatic detection of protection zones
- Protection & coordination zone viewer
- Intelligent alert view for troubleshooting
- Detailed device setting reports
- Embedded short circuit analysis
- Virtual animation of sequence-of-operation playback
- Multi-axis time current curves
- Adjustable magnifying-glass zoom view
- Time difference calculator
- Multi-function / level relays
- Embedded motor acceleration analysis
- Modeling of multi-function & multi-level relays
- Normalized plots shifted based on fault contributions
- Extensive damage curve modeling & plotting

5. Optimal Power Flow

- Comprehensive objectives and constraints
- Determine all control settings
- Ensure all controls are within limits
- Ensure all objectives are met
- Minimize system operating cost
- Minimize real and reactive power losses and circulating reactive power
- Minimize real power exchange with other systems (utilities or power grids)
- Maximize voltage security index
- Maximize branch loading security index
- Minimize series and shunt compensation
- Minimize load shedding
- Minimize control movements/actions
- Minimize generation fuel cost
- Generator fuel cost minimization
- Utility electricity cost minimization
- Advanced load forecasting
- Transmission line flow constant

6. Transient Stability Analysis

- Embedded Newton-Raphson initial load flow
- Complete synchronous & induction machine models
- Comprehensive excitation system models
- Comprehensive turbine/engine-governor models
- Standard Power System Stabilizer (PSS) models
- Integrated with User-Defined Dynamic Models (UDM) Program
- Unlimited sequence of events & actions
- Simulate typical & common disturbances & operations
- 3-phase & line-to-ground fault actions
- branch segment fault
- protective device open and close
- generator start-up
- generator input power adjustment
- generator voltage set point adjustment
- generator isoch./droop mode changes
- generator filed winding fault
- power grid voltage drop/raise
- motor acceleration/reacceleration
- motor acceleration using conventional starters
- motor acceleration using conventional soft-starters
- motor acceleration using conventional VED
- motor load adjustment
- and many others
- Automatic relay actions based on relay settings & system responses
- Auto-sync check action
- Short-time & long-time transient simulations
- Variable total simulation time & simulation step
- Tie CB closing with auto synch-check action
- Embedded Newton-Raphson and accelerated Gauss Siedel initial load flow methods
- Faster calculation time by skipping tabular plots
- Frequency dependent network modelling
- Frequency dependent modelling for synchronous machines (sub-transient models) and induction machines
- Set & adjust exciter & AVR parameters
- Set & adjust turbine or engine parameters
- Set speed governor parameters
- Set & adjust control relays
- Simulate loss of excitation
- Induction motor acceleration/re-acceleration
- Synchronous motor acceleration
- MOV starting
- Motor load impact & ramp change
- Relay-controlled actions
- Automatic load shedding
- User-controlled simulation parameters
- Handle multiple subsystems and islanding systems

- Power system static var compensator (SVC) model
- High voltage direct current transmission (HVDC) model
- Advanced numerical methods
- High voltage direct current transmission (HVDC) model
- Calculate Critical Fault Clearing Time (CFCT)
- Calculate Critical Separation Time (CST)
- Fast load transferring
- Load Shedding
- Rotor Angle Responses

7. Harmonic Analysis

- IEEE 519a Standard
- Harmonic load flow
- Harmonic resonance and frequency scan
- Model harmonic sources using harmonic library
- Model harmonic sources using converter firing angle and commutation reactance
- Filter overloading
- Filter design
- User-definable frequency range (0 to 6000 Hz)
- Generator and transformer saturation
- Phase-shifting transformer
- Harmonic distortion limits
- Total Root Mean Square Value (RMS)
- Total Arithmetic Summation Value (ASUM)
- Total Harmonic Distortion (THD)
- Telephone Influence Factor (TIF)
- I*T Index (I*T)
- User-customizable plots with option to overlay
- Customizable output reports using Crystal Reports format
- Graphical display of harmonic characteristics for components
- Harmonic-slider toolbar for display of harmonics on the one-line diagram
- Frequency-slider toolbar for display of frequency scan results on the one-line diagram
- Long line model for transmission line and cable.

8. DC Load Flow

- IEEE Standard 946
- Integrated AC & DC systems
- Newton-Raphson method
- Voltage drop
- Power losses
- Battery auto-activation
- Charger/UPS current limit
- Charger/UPS mode auto-switching
- DC converter modelling

9. Reliability Assessment

- System reliability
- Customer oriented indices
- Energy (cost) indices
- Sensitivity analysis
- Single & double contingency
- Model reliability characteristics of each component
- Implement user-defined parameters & settings
- Calculate bus and load point reliability indices
- Calculate system reliability indices
- Calculate reliability energy (cost) indices
- Rank element contributions to energy (cost) indices
- Calculate effect of simultaneous faults
- Select types of components for plotting
- Availability & quality of power assessment
- Long-term planning & redundancy
- Single & double contingency studies
- Model reliability characteristics of each component
- Implement user-defined parameters & settings
- Calculate bus and load point reliability indices
- Calculate system reliability indices
- Calculate reliability energy (cost) indices
- Rank element contributions to energy (cost) indices
- Calculate effect of simultaneous faults
- Select types of components for plotting
- Long-term planning & redundancy

AMC /UUC Renewal and Warranty Details:
- Warranty of the software is for a period of **three years (36 months)** from the date of delivery. The warranty period covers any error in software DVD and hardware keys. Free technical support through telephone / fax /e-mail will be provided during the warranty period, if called for by the client, all in pursuant to the terms of License Grant & Agreement.
- The above price includes the first year software support and engineering support. In addition to the user support, one full year of program upgrades is included in the Upgrade and User-Support Contract (UUC). You will receive all upgrades that are released for supplied system during your UUC period - at no additional charge.
- Follow-up user support and program upgrades for the Single License will be provided at 12% of the prevailing integrated price annually.

Quality Assurance Standards

The Software Quality Assurance Program is specifically dedicated to meeting the requirements of the following standards:

United States Code of Federal Regulation, Title 10 CFR Part 50, Appendix B
Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
United States Code of Federal Regulation, Title 10 CFR Part 21
Reporting of Defects and Noncompliance
United States Code of Federal Regulation, Title 10 CFR Part 50.55
Condition of Construction Permits, Early Site Permits, Combined Licenses, and Manufacturing Licenses
ANSI / ASME N45.2 - 1977
Quality Assurance Program Requirements for Nuclear Facilities
ASME NQA-1 (includes Subpart 2.7) 1994, 2000, 2008, NQA-1a 2009 addenda
Quality Assurance Requirements for Nuclear Facility Applications
IEEE 730.1 - 1995
IEEE Guide for Software Quality Assurance Planning
CAN / CSA-Q 396.1.2 - 1989
Quality Assurance Program for Previously Developed Software Used in Critical Applications
ANSI N45.2.2 - 1972
Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants.
ISO 9001:2015
Quality Management Systems - Requirements
Model for Quality Assurance in Design, Development, Production, Installation and Servicing - ISO 9001:2015
Verification & Validation Process
Software comply with U.S. Code of Federal Regulations as well as other quality assurance standards. The Software Quality Assurance Program should strictly enforces policies and specific procedures that ensure the reliability of all Analysis software.

For nuclear - high impact facilities, all releases of software should go through an intensive Verification & Validation (V&V) process throughout the revision life cycle. Verification is the process of determining whether or not the products of a given phase of the revision life cycle fulfill the requirements established during the previous phase. Validation is the process of evaluating software at the end of the revision life cycle to ensure compliance with software requirements.

The V&V method for software should be extensive, consisting of thousands of test cases that encompass each and every calculation module, user interface, persistence, reports, plots, library data, etc. The test cases include a comprehensive comparison of study results and system performance against hand calculations, field measurements, industry standards (ANSI / IEEE, IEC, UL, etc.), and other established methods in order to ensure and verify the technical accuracy and performance stability of software. The V&V process for the software engineering libraries should allows for 0% error in the library data based on published manufacturer data.