

SECTION -PROJECT

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SECTION- PROJECT

1 GENERAL

1.1 Preamble

Power Grid Corporation of India Ltd. (POWERGRID), a Govt. of India Enterprise is responsible for bulk Power transmission of electrical energy from various Central Govt. Power Projects to various utilities/beneficiaries and interconnecting regional grids, operating and maintaining the National electrical grid of India. It is established with mandate of "We will become a Global Transmission Company with Dominant Leadership in Emerging Power Markets with World Class Capabilities by:

1. World Class: Setting superior standards in capital project management and operations for the industry and ourselves.
 2. Global: Leveraging capabilities to consistently generate maximum value for all stakeholders in India and in emerging and growing economies.
 3. Inspiring, nurturing and empowering the next generation of professionals.
 4. Achieving continuous improvements through innovation and state of the art technology.
 5. Committing to highest standards in health, safety, security and environment." as its mission.
- 1.2 POWERGRID is retrofitting the conventional control and protection system of 400/220kV Hissar S/s and Ballabhgarh S/s Substations with IEC 61850 Process Bus based Substation Control, Protection and Automation System.
- 1.3 It is the intent of this specification to describe primary features, materials, and design & performance requirements and to establish minimum standards for the work. The specification is not intended to specify the complete details of various practices of manufactures/ bidders, but to specify the requirements with regard to performance, durability and satisfactory operation under the specified site conditions.
- 1.4 The work to be done under this specification shall include all labour, plant, equipment, material and performance of all work necessary for the complete installation and commissioning. All apparatus, appliances, material and labour etc. not specifically mentioned or included, but are necessary to complete the entire work or any portion of the work in compliance with the requirements implied in this specification is deemed to be included in the scope of contractor.
- 1.5 The bidders are advised to visit the substation sites and acquaint themselves with the topography, infrastructure and also the design philosophy prior to bid. Also, before proceeding with the construction work the Contractor shall fully familiarize himself with the site conditions and General arrangements & scheme etc. Though the Employer shall endeavour to provide the information, it shall not be binding for the Employer to provide the same. The bidder shall be fully responsible for providing all equipment, materials, system and services specified or otherwise

which are required to complete the scope of work and successful commissioning, operation & maintenance of the substation in all respects. Complete design (unless specified otherwise in specification elsewhere) and detailed engineering shall be done by the Contractor.

The following sections would cover the scope of work and other relevant details.

2 SCOPE OF WORK

2.1 The broad scope of this specification covers Retrofitting of Conventional Control & Protection System with IEC61850 based Process Bus based System at following substations:

Sl.no	Scope
1	<p>Retrofit of the conventional control and protection system of 400/220kV Hissar Substation with IEC 61850 Process Bus based Substation Control, Protection and Automation System.</p> <p>400 kV System:</p> <ul style="list-style-type: none"> • Three (03) Nos. 400KV ICT Bays • Three (03) Nos Bus Reactor Bay • Eleven (11) Nos. Tie Bays • Thirteen (13) Nos. Line Bays • Three (3) Nos Non Switchable Line reactor bays <p>220 kV System:</p> <ul style="list-style-type: none"> • Three (03) Nos. 220kV ICT Bays • One (01) Nos. 220kv TBC Bays • One (01) Nos. 220kv BC Bays • Six (06) Nos. Line Bays
2	<p>Retrofit of the conventional control and protection system of 400/220kV Ballabgarh Substation with IEC 61850 Process Bus based Substation Control, Protection and Automation System.</p> <p>400 kV System:</p> <ul style="list-style-type: none"> • Four (04) Nos. 400KV ICT Bays • One (01) Nos Bus Reactor • One (01) Nos Series Bus Reactor

	<ul style="list-style-type: none"> • Twelve (12) Nos. Tie Bays • Eleven (11) Nos. Line Bays • Four (4) Nos Non Switchable Line reactor bays <p>220 kV System:</p> <ul style="list-style-type: none"> • Four (04) Nos. 220kV ICT Bays
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2.1 The detailed scope of work of the substation package is brought out in subsequent clauses of this section.

2.1.1 Retrofit at Hissar Substation

Design, engineering, manufacture, testing at manufacture's work, supply including transportation & insurance, unloading at site, storage, erection, testing and commissioning at site of following equipment and items complete in all respect:

a. Substation Automation System:

400/220kV Hissar Substation is to be equipped with substation Automation system based on IEC 61850 based process bus under present scope for bays mentioned in the Cl 2.1 above.

Hissar Substation have 400 and 220kV Switchyards. Presently all 400kV and 220kV bays are having non automation convention control panel based system. Under present scope, all 400kV and 220kV bays shall be retrofitted with new Process bus based control, protection and automation system.

The communication between process level IEDs and Bay level IEDs is proposed to be with high-speed optical bus (Process bus). In the present scope, bidder shall include BCUs required for present scope bays including all necessary hardware and software to integrate with the Substation Automation System including preparation of system database, displays, and development of additional displays and reports as per requirement. The necessary interface equipment at Hissar substation for transferring data to RCC & RSCC, etc. on OPGW link is also under present scope. No work at remote end is envisaged under present scope.

As the instrument transformer and switchgear under present scope are of conventional type, for exchange of information between switchgear and instrument transformers, "Merging Units & Switchgear Controller IEDs", as applicable, for Process Bus based SAS shall be considered under the scope of the contract. Switchgear Controllers (SGCs) shall be used as digital interfaces between switchgear and bay level IEDs. Similarly Merging Units & Digital Interface for Transformers/Reactors IEDs as applicable for Process Bus based SAS shall also be considered for the Transformers and reactors under present scope.

Two Nos. of Redbox shall be provided for integrating Transformer and Reactor Monitoring equipment and digital RTCC relays with station bus. Integration of existing IEC 61850 compliant Transformer and Reactor Monitoring equipment (like DGA, ODS, FOTS etc.) and Digital RTCC relays with New SAS shall be covered under present scope.

Integration of existing Station Auxiliary BCU to new SAS is also under present scope. The above mentioned redbox shall be used for Aux BCU also.

b. CONTROL, RELAY & PROTECTION SYSTEM:

Complete control, relay and protection system as per Section–Control and Relay panels for the bays covered under present scope. IEDs shall suitable for process bus based substation based automation system as per section of TS “Section-Sub-station Automation-Revision-04A” and Section - Control and Relay panels- Revision-09A”.

400 kV Bus Bar Protection: - New process bus based Busbar shall be provided for 400kV bays.

220 kV Bus Bar Protection: - New process bus based Busbar shall be provided for 220kV bays.

The Control and Protection panels shall be placed in the existing control room building. The SGMU panels shall be placed in the switchyard close to the primary equipment.

c. MODIFICATION OF EXISTING CRP:

This item of BPS covers following scope of work:

- i. Presently the energy meters of bays under present scope are placed in control panel of respective feeders. Under present scope, the existing energy meters shall be dismantled, shifted and commissioned to new SGMU panel provided for respective bay. The metering core from the CTs shall be wired to the energy meters in the SGMU panel.
- ii. As detail provided in Annexure-IV, Existing CSD device shall be shifted from the CRP panels placed in the control room building to respective SGMU panels for the bay. The bay CT shall be directly wired to the CSD device and shall be integrated with SGMU IEDs as per requirement of the control and protection scheme.
- iii. For bays under present scope, PMU IEDs are already existing in a separate panel. Refer Annexure IV for Existing PMU details. Required modification in wiring of analog and digital signals to existing PMU is included under present scope.

No supply item is envisaged in BPS for above mentioned works. In case minor supply items are required to complete scope mentioned above, same shall be included in the service item of “modification of existing CRP” of BPS.

d. 1.1kV grade Power & Control cables (and special cables, if any) along with complete accessories. The colour of cable outer sheath for Power and Control cable shall be Yellow and Blue respectively. Cables mentioned below shall be covered under present scope:

- i. Supply, laying, and termination of new control cables from all primary equipment to SGMU Panels, DIT Panels, DIR Panels, and BMKs, as well as from PLCC to CRP
- ii. Supply, Laying & termination of new DC power cables from DCDB to New Control, Protection & Automation Panels, DPC/PLCC and from the new Control Protection Panels to the SGMU/DIT/DIR/BMKs.

Supply of 1.1kV grade Cables:

Supply of 1.1kV grade power and control cables of various sizes shall be as per unit quantities mentioned in BPS.

Installation of 1.1kV grade Cables:

- The quantity of Installation of cables is to be assessed by the contractor for the complete scope of work specified in Section project.
- The installation of 1.1kV grade power and control cables shall be quoted in “LOT” basis.
- Supply and installation of Cable accessories like lugs, glands etc. for entire cabling work shall be deemed to be included in Installation charges of cables quoted by contractor in Bid price schedule.
- No variation shall be admissible on account of Installation of Cables/supply and installation of associated accessories, irrespective of variation (either positive or negative) in supply quantity of Cable specified in BPS.

e. CT and CVT Junction Box

Supply and installation of Junction Boxes/ marshalling Boxes as per BoQ and TS and rewiring the existing cables emanating from CT/CVT secondary boxes.

f. TELE PROTECTION EQUIPMENT:

As details Provided in Annexure-04, Protection couplers for some of the bays under present scope are existing. Same may be integrated with new protection panels being supplied under present scope as per requirement of the scheme. Cost of the same shall be deemed to be included in the cost of the CRP panels.

As details Provided in Annexure-IV, In bays where new digital protection coupler is envisaged as per BPS, Supply, installation, testing and commissioning of the Digital Protection Couplers (DPCs) shall be covered under present scope. **The DPC shall be integrated with process bus through IEC 61850 GOOSE Messages. The new DPCs may be kept in CRP panels of the respective line or associated Tie bays being supplied under present scope. The GOOSE publish and subscribe capabilities of the DPCs shall be similar to those of other protection and control IEDs. Integration of the new DPC with the existing communication channel is also included under present scope.** All converters required to interface DPC with existing channel shall also be part of DPC.

2.1.2 Retrofit at Ballabgarh Substation

Design, engineering, manufacture, testing at manufacture's work, supply including transportation & insurance, unloading at site, storage, erection, testing and commissioning at site of following equipment and items complete in all respect:

a. Substation Automation System:

400/220kV Ballabgarh Substation is to be equipped with substation Automation system based on IEC 61850 based process bus under present scope for bays mentioned in the CI 2.1 above.

Ballabgarh Substation have 400 and 220kV Switchyards. Presently all 400kV bays are having non automation convention control panel based system. Under present scope, all 400kV bays shall be retrofitted with new Process bus based control, protection and automation system.

For 4 nos. of 400/220kV ICTs, 220kV Switchgear is provided at POWERGRID switchyard, however the 220kV Busbar is available at BBMB SAMAYPUR switchyard. Integration of 4 nos of 220kV ICT Bays located at POWERGRID switchyard with new SAS are also envisaged under present scope.

The communication between Process level IEDs to Bay level IEDs is proposed to be with high-speed optical bus (Process bus). In the present scope, bidder shall include BCUs required for present scope bays including all necessary hardware and software to integrate with the Substation Automation System including preparation of system database, displays, and development of additional displays and reports as per requirement. The necessary interface equipment at Ballabgarh substation for transferring data to RCC & RSCC, etc. on OPGW link is also under present scope. No work at remote end is envisaged under present scope.

As the instrument transformer and switchgear under present scope are of conventional type, for exchange of information between switchgear and instrument transformers, "Merging Units & Switchgear Controller IEDs", as applicable, for Process Bus based SAS shall be considered under the scope of the contract. Switchgear Controllers (SGCs) shall be used as digital interfaces between switchgear and bay level IEDs. Similarly Merging Units & Digital Interface for Transformers/Reactors IEDs as applicable for Process Bus based SAS shall also be considered for the Transformers and reactors under present scope.

Two Nos. of Redbox shall be provided for integrating Transformer and Reactor Monitoring equipment and digital RTCC relays with station bus. Integration of existing IEC 61850 compliant Transformer and Reactor Monitoring equipment (like DGA, ODS, FOTS etc.) and Digital RTCC relays with New SAS shall be covered under present scope.

Integration of existing Station Auxiliary BCU to new SAS is also under present scope. The above mentioned redbox shall be used for Aux BCU also.

b. CONTROL, RELAY & PROTECTION SYSTEM:

Complete control, relay and protection system as per Section–Control and Relay panels for the bays covered under present scope. IEDs shall suitable for process bus based substation based automation system as per section of TS "Section-Sub-station Automation-Revision-04A" and Section - Control and Relay panels- Revision-09A".

The Line Protection panel shall be provided with Main I and Main II relay as distance Protection. However for 400kV-Ballabhgarh-Tughlaqabad D/C Line, Line protection panel for local and remote end shall be provided as per following:

Name of transmission line	Local end		Remote End
	Main Protection-I	Main Protection-II	
400kV-Ballabhgarh-Tughlaqabad D/C Line	Line Current differential with built-in back-up distance protection	Distance Protection	Matching line current differential relay for Main-I Protection shall be retrofitted in the existing protection panel for the lines. Supply, erection, testing, commissioning, and integration with SAS (M/s NR Electric make) is included under present scope. All Modification required as per requirement of the protection scheme is included in the present scope. Cost of the same is deemed to be included in the cost of differential relay item of BPS.

400 kV Bus Bar Protection: - New process bus based Busbar shall be provided for 400kV bays.

Existing 220kV bus bar protection is installed at BBMB switchyard. All busbar/LBB signals required from 220kV yard for control and protection of 400/220kV Transformer shall be wired upto DIT panel provided for the respective Transformer. Also, all signals required to be wired to 220kV busbar/LBB panels including intertrips etc. shall be made available at DIT panels of the respective ICT and wired upto respective 220kV CRP panels in the BBMB yard. Accordingly, additional cards required for same shall be provided in the DIT Panels of the ICT bay

The Control and Protection panels shall be placed in the existing control room building. The SGMU panels shall be placed in the switchyard close to the primary equipment.

c. MODIFICATION OF EXISTING CRP:

This item of BPS covers following scope of work:

- i. Presently the energy meters of bays under present scope are placed in control panel of respective feeders. Under present scope, the existing energy meters shall be dismantled, shifted and commissioned to new SGMU panel provided for respective bay. The metering core from the CTs shall be wired to the energy meters in the SGMU panel.
- ii. As detail provided in Annexure-IV, Existing CSD device shall be shifted from the CRP panels placed in the control room building to respective SGMU panels for the bay. The bay CT shall be directly wired to the CSD device and shall be integrated with SGMU IEDs as per requirement of the control and protection scheme.
- iii. For bays under present scope, PMU IEDs are already existing in a separate panel. Refer Annexure IV for Existing PMU details. Required modification in wiring of analog and digital signals to existing PMU is included under present scope.

No supply item is envisaged in BPS for above mentioned works. In case minor supply items are required to complete scope mentioned above, same shall be included in the service item of “modification of existing CRP” of BPS.

d. 1.1kV grade Power & Control cables (and special cables, if any) along with complete accessories. The colour of cable outer sheath for Power and Control cable shall be Yellow and Blue respectively. Cables mentioned below shall be covered under present scope:

- i) Supply, Laying & termination of new control cables between all Primary Equipment up to SGMU Panels/DIT Panels/DIR Panels/BMKs and between PLCC upto CRP.
- ii) Supply, Laying & termination of new DC power cables from DCDB to New Control, Protection & Automation Panels, DPC/PLCC and from the new Control Protection Panels to the SGMU/DIT/DIR/BMKs.

Supply of 1.1kV grade Cables:

Supply of 1.1kV grade power and control cables of various sizes shall be as per unit quantities mentioned in BPS.

Installation of 1.1kV grade Cables:

- The quantity of Installation of cables is to be assessed by the contractor for the complete scope of work specified in Section project.
- The installation of 1.1kV grade power and control cables shall be quoted in “LOT” basis.
- Supply and installation of Cable accessories like lugs, glands etc. for entire cabling work shall be deemed to be included in Installation charges of cables quoted by contractor in Bid price schedule.
- No variation shall be admissible on account of Installation of Cables/supply and installation of associated accessories, irrespective of variation (either positive or negative) in supply quantity of Cable specified in BPS.

e. CT and CVT Junction Box

Supply and installation of Junction Boxes/ marshalling Boxes as per BoQ and TS and rewiring the existing cables emanating from CT/CVT secondary boxes.

f. TELE PROTECTION EQUIPMENT:

As details Provided in Annexure-IV, Protection couplers for some of the bays under present scope are existing. Same may be integrated with new protection panels being supplied under present scope as per requirement of the scheme. Cost of the same shall be deemed to be included in the cost of the CRP panels.

As details Provided in Annexure-04, In bays where new digital protection coupler is envisaged as per BPS, Supply, installation, testing and commissioning of the Digital Protection Couplers (DPCs) shall be covered under present scope. **The DPC shall be integrated with process bus through IEC 61850 GOOSE Messages. The new DPCs may be kept in CRP panels of the respective line or associated Tie bay being supplied under present scope. The GOOSE publish and subscribe capabilities of the DPCs shall be similar to those of other protection and control IEDs. Integration of the new DPC with the existing communication channel is also included under present scope.** All converters required to interface DPC with existing channel shall also be part of DPC.

2.1.3 The work to be done under this specification shall include all labour, plant, equipment, material and performance of all work necessary for the complete installation and commissioning of switchyard. All apparatus, appliances, material and labour etc. not specifically mentioned or included, but are necessary to complete the entire work or any portion of the work in compliance with the requirements implied in this specification is deemed to be included in the scope of contractor.

2.1.4 Before proceeding with the work for this project, the Contractor shall fully familiarize himself with the site conditions and General arrangements & scheme etc. Though the Employer shall endeavour to provide the information, it shall not be binding for the Employer to provide the same. The bidders are advised to visit the substation sites and acquaint themselves with the topography, infrastructure and also the design philosophy. The bidder shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the successful commissioning, operation & maintenance of this project in all respects. All materials required for the Civil and construction/installation work shall be supplied by the Contractor. The cement and steel shall also be supplied by the Contractor.

- 2.1.5 The complete design (unless specified otherwise in specification elsewhere) and detailed engineering shall be done by the Contractor based on conceptual tender drawings, enclosed in the bidding document.
- 2.1.6 The Contractor shall also be responsible for the overall co-ordination with internal/external agencies, project management, training of Employer's manpower, loading, unloading, handling, moving to final destination for successful erection, testing and commissioning of the system.
- 2.1.7 Any other items not specifically mentioned in the specification but which are required for erection, testing and commissioning and satisfactory operation of this system are deemed to be included in the scope of the specification unless specifically excluded elsewhere.
- 2.1.8 The contractor shall arrange all T&P (such as necessary supports, cranes, ladders, platforms etc.) for erection, testing & commissioning of the system at his own cost. Further, all consumables, wastage and damages shall be to the account of holder.
- 2.1.9 Employer has standardized its technical specification for various equipment and works for different voltage levels. Items, which are not applicable for the scope of this package as per schedule of quantities described in BPS, the technical specification for such items should not be referred to.

3 SPECIFIC EXCLUSIONS

For Hissar Substation

- a. Auxiliary system
- b. Civil works
- c. Earthing of the Panels.
- d. Cable Trays
- e. Cable Sealings
- f. LT Switchgear

For Ballabgarh Substation

- a. Auxiliary system
- b. SAS for 220kV Bays
- c. Construction of new Auxiliary control room building including Illumination and Airconditioning.
- d. Civil works
- e. Earthing of the Panels.
- f. Cable Trays
- g. LT Switchgear

4 LOCATION OF THE SUBSTATION

The location of sub-stations is as under:

S. No.	Name of substation	Name of State	Nearest rail Station
1.	400/220 kV Hissar, Sub Station,	Haryana	Hisar Junction

2.	400 kV Ballabgarh, Sub Station,	Haryana	Faridabad
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For design purposes, ambient temperature shall be considered as 50 degrees centigrade.

3 SCHEDULE OF QUANTITIES

The requirement of various items /equipment are indicated in Bid price Schedules.

All equipment/items and for which quantities has been given in the BPS shall be payable on unit rate basis. During actual execution, any variation in such quantities shall be paid based on the unit rate under each item incorporated in the letter of award.

Wherever the quantities of items/works are indicated in Lot/Set/LS, the bidder is required to estimate the quantity required for entire execution and completion of works and incorporate their price in respective Bid price schedules. For erection hardware items, Bidders shall estimate the total requirement of the works and indicate module-wise lump sum price bay wise and include the same in relevant Bid price schedules. Any material/works for the modules not specifically mentioned in the description in BPS, as may be required shall be deemed to be included in the module itself.

No cost compensation shall be considered on account of “Set/LOT/LS” items in any case of number of bays specified in section project remains unchanged

Bidder should include all such items in the bid proposal sheets, which are not specifically mentioned but are essential for the execution of the contract. Item which explicitly may not appear in various schedules and required for successful commissioning of substation shall be included in the bid price and shall be provided at no extra cost to Employer.

4 BASIC REFERENCE DRAWINGS

400/220kV Hissar and Ballabgarh Substation has Air Insulated Substation bays. Single line diagrams are enclosed with the bid documents, which shall be referred to by the bidder during engineering.

5 DIFFERENT SECTIONS OF TECHNICAL SPECIFICATION

For the purpose of present scope of work, technical specification (Vol. II) shall consist of following sections and they should be read in conjunction with each other.

S. No.	Description	Revision
1	Section – Project	Rev 00
2	Section – General Technical Requirement	Rev 15
3	Section – Power & Control Cable	Rev 06
4	Section – Switchyard Erection	Rev 10
5	Section – Control & Relay Panel	Rev 09A
6	Section – Substation Automation System	Rev 04A

In case of any discrepancy between Section-PROJECT, Section-GTR and other technical specifications on scope of works, Section-PROJECT shall prevail over all other sections.

In case of any discrepancy between Section-GTR and individual sections for various equipment, requirement of individual equipment section shall prevail.

6 MANDATORY SPARES

The prices of mandatory spares shall be given by the Bidder in the relevant schedule of BPS and shall be considered for evaluation of bid. It shall not be binding on the Employer to procure all of these mandatory spares.

The bidder is clarified that no mandatory spares shall be used during the commissioning of the equipment. Any spares required for commissioning purpose shall be arranged by the Contractor. The unutilized spares if any brought for commissioning purpose shall be taken back by the contractor.

Wherever spares in BPS/Technical Specification has been specified as “each type/each rating/each type & rating”: If the offered spare/spares is sufficient to replace the respective main equipment of all types/ratings, then such offered spare/spares shall be acceptable. It implies that common spare/spare set fulfilling the spare requirement of all types/ratings shall also be acceptable, provided it is configurable at site itself without special assistance of OEM.

Mandatory Spares, wherever mentioned, are envisaged for the equipment/items being supplied under the main equipment heads under present scope meeting the requirements of Technical Specifications. The component/sub-component of an equipment/item specified in BPS under Mandatory Spare, which is not applicable as per the offered design of respective main equipment, shall not be referred to.

7 SPECIFIC REQUIREMENT

1. Detailed break-up of Mandatory spares, for those line items whose *Unit* is *LS/Lot* in BPS, shall be as per *Annexure-I*.
2. Before commencing the replacement of the existing system, the new IEC 61850 Process Bus based Control & Protection system shall be installed and commissioned with all Process Level IEDs and will be subjected to testing, validation & verification. Once the overall system is found to be satisfactory, the replacement process shall be started.
3. Extra Consumption of 1.1 kV Power and control cables.
4. The Contractor shall make every effort to minimise wastage of the cables during installation. The Permitted Overall scarp/wastage shall be limited to 0.50% of actual supplied quantity for each size of cables. Any wastage more than the above limit shall be recovered from the contractor. All balance unused cables shall be returned to the employer by rewinding in separate drums for each size with discrete markings on drums.

Cut pieces of Cables having length less than following shall be considered for Scrap. The Contractor shall dispose of the scrap (if any), at their own cost :

- 1.) Length less than 20 M
 - a) Control Cable (3C, 5C, 7C & 10 Core)
 - b) Power Cable(2CX 6Sqmm,4CX6Sqmm, 4CX16Sqmm)
- 2.) Length less than 50 M
 - a) Control Cable having more than 10 Cores
 - b) Power Cable of sizes above 16 Sq mm
5. One SGMU panel shall be provided for each bay, which shall mount min Two nos.of SGC and MU IEDs. One DIT/DIR panel shall be provided for each Transformers/Reactors which shall mount min Two nos.of MU and DIT IEDs
6. Relevant/applicable clauses of Specific Requirements as mentioned at C/ENGG/SPEC/SEC-PROJECT/SPECIFIC REQUIREMENT PROCESS BUS is (attached as Annexure-II) shall also be referred for specified scope of work.
7. Erection, Testing and Commissioning of Relay & protection panels and sub-station automation system shall be done by the contractor under the supervision of respective equipment manufacturers. Such supervision charges shall be included by the bidder in the erection charges for the respective equipment in the BPS.
8. All IEDs shall be compliant to IEC 61850 Ed. 2.1
9. All the Merging units shall be capable to publish SV as per IEC 61869-9 and all the IEDs subscribing to SV shall be capable to subscribe to IEC-61869-9 SVs.
10. Additional test cases to be carried out for process bus IEDs is attached as Annexure-V.
11. Clause under Sl. No. 13.9 of GTR (REV NO 15) is modified as follow: -

“For new as well as substation extn packages, the Contractor shall be responsible for making suitable indoor storage facilities, to store all equipment which requires indoor storage.

In case of extn packages wherein vacant indoor facility is existing at Substation premises, same shall be made available to contractor for storage of indoor equipment without any financial implications. Same shall be allowed with approval of Engineer In-charge subject to availability at the time of execution on as and where basis. Notwithstanding the same, sole responsibility of security & upkeep of storage facilities lies with Contractor.”

12. Clause under Sl. No. 13.3 of GTR (REV NO 15) is modified as follow: -

For new as well as substation extn packages, the contractor must ensure that the open storage platform (as per Drawing No. C-ENGG-CVL-STD-PLATFORM-01, Rev.0) is constructed for storage of outdoor type equipment/material prior to commencement of delivery at site. Outdoor equipment shall be stored on open storage platform, properly covered with waterproof and dustproof covers to protect them from water seepage and moisture ingress.

In case of extn packages wherein vacant outdoor facility is existing at Substation premises, same shall be made available to contractor for storage of equipment without any financial implications. Same shall be allowed with approval of Engineer In-charge subject to availability at the time of execution on as and where basis. Notwithstanding

the same, sole responsibility of security & upkeep of storage facilities lies with Contractor.

However, all indoor equipments including control & protection panels, Communication equipments and operating mechanism boxes etc. of outdoor equipments shall be stored indoors.

Storage of equipment on top of another one is not permitted if the wooden packing is used and there is possibility of equipment/ packing damage. Material opened for joint inspection shall be repacked properly as per manufacturer's recommendations. During storage of material regular periodic monitoring of important parameters like oil level / leakage, SF6 / Nitrogen pressure etc. shall be ensured by the contractor.

13. Contractor is responsible for assessment of existing storage facility/space for adequacy and suitability for intended storage of equipment. In case of non-availability of suitable existing storage facility/space in existing substation premises, the contractor shall make his own necessary arrangements at his own cost so that progress of work is not affected and Employer shall in no case be responsible for any delay in works because of non-availability of storage facility.