

The Power Grid Company of Bangladesh Limited (PGCB)

IFB No. 27.21.0000.101.07.123.19.5084 dated 17 September, 2019

Design, Supply, Erection, Testing & Commissioning of Upgradation of the Existing 132kV Madunaghat Substation to 230kV GIS substation on Turnkey Basis

Contract No. PGCB/DCMPGSP/Madunaghat/SS/03

ICB No. PGCB/DCMPGSP/Madunaghat/SS/03

Pre Bid meeting was held on 10th October 2019 at 11:00 o'clock at the PGCB Headquarter
All comments, queries and requests for clarification, regarding the Tender documents, received from prospective Bidders, and relevant replies and clarifications prepared by PGCB, and associated addendums (if any), are part of Tender documents

Clarification-3

No.	Volume / Section / Clause / Item / Page	Bidder's comment / Query / Clarification	PGCB's Reply / Clarification
1	VOLUME 2 OF 3 (Part 1) SECTION 4 : POWER TRANS- FORMERS Page 135 4.3.6 Impedance	The value of impedance measured on various tapplings shall be as stated in the Schedule and minimum and maximum values where stated in the Schedule A of Requirements shall be guaranteed by the Contractor. The required positive sequence impedance between HV-LV at 75 deg with 100% rating is 13% with +/- 10 % error ratings. The Tertiary short-circuit capacity shall not be exceed 1500 MVA, accordingly, the impedance between HV-TV and between LV-TV shall be designed. a) Please confirm the required impedance % for HV-TV, LV-TV. b) And please let us know whether it is possible to use Series Reactor or not, in order to meet the Impedance requirement. c) Our proposal is using ABB OLTC. Please confirm that it is acceptable or not.	It shall be se per bid document.

W. Samir

No.	Volume / Section / Clause / Item / Page	Bidder's comment / Query / Clarification	PGCB's Reply / Clarification
2	Clarification-1, Item no.31	"As per clarification, we can offer composite polymer type insulators in place of disc insulators. However, in BOQ schedule the spare items are for disc insulators. Please confirm the quantity of composite insulators spares parts if the bidder chooses composite polymer insulators.	It shall be equivalent to the number of spare disc insulators.
3	Clarification-1, Item no.45	"As per the clarification, the length of spare cable is included in the total cable length. However, the quantity of cable terminations of the spare cables are not included in BOQ. Please kindly provide the quantity of cable terminations for the spare cable.	Bidder shall refer to Clarification-2, item no.10.
4	Clarification-1, Item no.61	Please clarify whether the cable conductor material is copper or aluminum when the cable cross-sectional area is 1600sqmm	It is Copper as per Section 18.10.2 of technical specification, Volume 2 and Volume 3 Appendix A3
5	Clarification-1, Item no.86	From the clarification we understand that the 230kV system fault level is 50KA/3s. However, the fault level of fault generated within in substation & feeding to the substation would not be the same as the system fault level. Please kindly confirm the fault level for choosing earthing conductor.	As Clarification-1, Item no.86
6	General - CCTV	CCTV In the specification, it mentioned about CCTV, however, it is not included in BOQ schedule, please clarify if CCTV is in the scope or not. If yes, please clarify the detail scope.	CCTV is not required.
7	Vol2, Part1 Section 06, Auxiliary power and control cables	In 6.5.1, it required that All cables shall have a black flame retardant low smoke PVC oversheath material, however, in 6.6.2.4, it mentioned cables shall have a low smoke, zero halogen over-	It shall be as per bid document.

V. Senthil

No.	Volume / Section / Clause / Item / Page	Bidder's comment / Query / Clarification	PGCB's Reply / Clarification
		sheath, this means the material should be XLPE, this is contradict with clause 6.5.1, we assume that the material should be XLPE, please confirm.	
8	Vol3, LV AC DISTRIBUTION SCHEME	It shows that new ACDB should connect to existing main ACDB through ACBs, from drawings in Addendum-1, it shows the rated current of ACB in existing ACDB is 400A, therefore, we assume that the rated current of ACB in new ACDB should be 400A, please confirm.	Bidder shall follow bid drawing DCMFGSP/PKSS-3/MAD/06 and select ACB according to ACDB load requirements for current and future substation bays.

15/02/20

POWER GRID COMPANY OF BANGLADESH LIMITED
BIDDING DOCUMENT

FOR

Design, Supply, Erection, Testing & Commissioning of Upgradation of the Existing
132kV Madunaghat Substation to 230kV GIS substation on Turnkey Basis
(Bid Identification No.: PGCB/DCMPGSP/BD-P81/SS/03)

Addendum No. 2

Following revisions/changes are made in the bidding documents which will form part of the bidding documents:

1. Volume 2 of 3 (Part 1)

a) Clause No. 4.16 – Fire Protection System

The requirement for fire protection system for transformers has been revised.

Consequently, page no. 4-37 to 4-42 have been replaced with 4-37(Rev-1) to 4-42(Rev-1) which is attached herewith as ATTACHMENT 01.

2. Volume 3 of 3

a) Schedule-1

Short Circuit type test report requirement for power transformers has been revised.

Consequently page no. SI-6(Rev-1) has been replaced by SI-6(Rev-2) which are attached herewith as ATTACHMENT-02.

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4-37(Rev-1)

4.16 FIRE PROTECTION SYSTEM**General**

The new power (auto) transformers shall be provided with Fast depressurization System . General description, design and performance requirements of the FDS is given below. It is not intended to completely specify all details of design and construction. Nevertheless, the system design and equipment shall conform in all respects to high standard of engineering, design and workmanship.

The system design shall also conform to TAC / NFPA norms, NFPA 850. The offered system shall comply with the relevant international standards. Reference standards are listed below. Relevant international standards other than BS standards shall be subject to approval by the Employer:

BS Standards

BS 381 C	Colours for Identification, Coding & Special Purpose
BS 7629-1	Specification for 300/500 V fire resistant electric cables having low emission of smoke and corrosive gases when affected by fire.
BS 8434-1	Methods of test for assessment for power integrity of electric cables
BS 5839-1	Code of practice system design, installation, commissioning and maintenance for fire detection and fire alarm system
BS EN50267-2-1	Common Test Methods for Cables Under Fire Conditions

The fire protection system shall have been in successful operation in for at least last six years for protection of transformers of 230/138/36 kV and higher voltage class. The reference list along with performance certificate from end users of the system shall be submitted with the bid.

The system shall be reliable without making any mal operation. Even if undesirable nitrogen gas injection is made into the transformer tank under normal transformer condition without the internal faults, restoration of transformer by vacuum oil purification up to re-energizing shall complete as soon as possible after the undesired gas injection.

Various equipment to perform the required fire protection shall be provided under this contract.



Fast Depressurization system

Transformer or reactor explosion and fire generally result from a fault inside the tank. This may be caused by overloads, short-circuits, or failure of the associated equipment such as On Load Tap Changer (OLTC), and Oil Cable Box (OCB) / Oil Bushing Cable Box (OBCB) or Bushing Turrets (BT).

For an electrical arc, a huge volume of explosive gas is created during the first millisecond for the first mega joule. This gas generation creates one dynamic pressure peak and the transformer or reactor tank is violently shaken by accelerations. This shockwave is travelling in the tank at a speed of the sound inside oil. The first pressure peak of the resulting shockwave, initial amplitude greater than 10 bars. The transformer needs to be prevented from fire and the tank from permanent deformation. The proposed Transformer Explosion and Fire Prevention system shall be capable of doing the same.

The Contractor has to make necessary provisions for the satisfactory operation of the nitrogen fire-prevention system without affecting the overall performance of the transformer.

The fire protective system shall prevent the explosion of the transformer oil tank and a possible fire in case of internal faults.

Operating Principle

The Fast Depressurization System shall allow the depressurization of the transformer or reactor after a few milliseconds from the time the electric fault has occurred. The Depressurization process shall include taking transformer oil out of transformer tank, take out the dynamic pressure out of tank . In order to avoid delays that will caused a transformer or reactor explosion, the Fast Depressurization System shall not depend on any sensor or electrical actuators coming from other protection. During, the depressurization the system shall inject inert gas, like nitrogen, to avoid fire and to ensure personnel and equipment safety.

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EQUIPMENT DESCRIPTION

The Fast Depressurization System shall be made of several sets, each playing a different role:

- The Depressurization Set (DS) with Rupture Disk (RD) shall prevent a Transformer or Reactor, On Load Tap Changer (OLTC), and Oil Cable Box (OCB) / Oil Bushing Cable Box (OBCB) or Bushing Turrets (BT) explosion following a short circuit. Each Depressurization Set (DS) shall relieve the dynamic pressure within milliseconds and a Decompression Chamber (DC) favors high-speed depressurization.
- The Inert Gas Injection Set (IGIS) is required for personal safety to avoid the bazooka effect caused by the explosive gas in contact with air (oxygen) when the tank is opened after the incident. The IGIS creates a safe environment in the Transformer or Reactor and the On Load Tap Changer (OLTC) after the depressurization process by injecting an inert gas flow, which also cools the tank.
- An Oil-Gas Separation Tank (OGST) shall collect the depressurized oil and explosive flammable gas to dissociate oil from gases. It is recommended to locate the OGST in the transformer or reactor conservator where a slice shall then be devoted for the OGST as often done for the On Load Tap Changer (OLTC) oil conservator. This transformer conservator slice shall have a volume of 0.5 m³ - 17.6 ft³.
- The Explosive Gas Evacuation Pipe (EGEP) shall then channel the gas to a safe and remote area. It is possible to separate the OGST from the transformer. In this case, the top of the OGST must always be located 10 cm - 4 inches above the top of the conservator.
- The Inert Gas Injection shall have both automatic & manual, and including as an option the Inert Gas Injection Quick Connector.

For the vendors with customized solution, the equipment component requirement may be relaxed provided they must serve the same function of FDS.

Requirement

To avoid Transformer or Reactor, On Load Tap Changer (OLTC), and Oil Cable Box (OCB) / Oil Bushing Cable Box (OBCB) or Bushing Turrets (BT) explosion and fire, the supplier shall have specified likely locations of dielectric failure and subsequent arcing events inside the oil-filled tank. Using a physical model capable of describing a multi-phase compressible fluid, quantitative predictions should be made for the gas volume generation as a function of arc energy, the resultant pressure waves' speed and amplitude, and the subsequent increase in static, or average, pressure throughout the tank prior to the activation of the Fast Depressurization System.

The physical model should accurately model the opening of the Rupture Disks (RD), the oil-



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gas mixture outflow, the time-dependent transformer tank pressure drop, and the resultant stresses and deformations on the transformer tank.

The Fast Depressurization System supplier shall provide Computerized Fluid Dynamic (CFD) and Fluid Structure Interactions (FSI) simulations for the transformer most probable low impedance energy fault (Mega Joule).

The Fast Depressurization System must comply with the description for all Power Plants and Substations of the National Fire Protection Association, Code NFPA 850, 2015 edition. Therefore, the Fast Depressurization System must be “passive – mechanical” and activated without sensors or electrical actuator

Automation Requirement

The FDS must be integrated with the SAS to check the functional status of the system. Necessary works to facilitate the monitoring of major component and/or activation status shall be performed at site.

EXPERIENCE and TESTS

The supplier shall prove that the Fast Depressurization System:

- 10 years of experience with increased sales to 1,000 units.
- A Test Certificate showing a campaign of at least 20 successful live tests of electric arcs events inside the transformer or reactor tank closed and full with oil, from which at least 5 have been done with arcs of more than 1 Mega Joule.

This Test Certificate must be granted by a recognized and independent high voltage laboratory from a country different than the country of manufacture of the explosion and fire prevention system.

- Evidence that the explosion and fire prevention system has prevented the explosion of at least 2 transformers or reactors over 50MVA in 2 different countries with 2 Certificates of Successful Activation signed by the transformer or reactor owner
- Insurance Policy over USD 10 million dollars to cover damages in case of transformer or reactor Explosion/Fire with the Fast Depressurization System installed.



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Site Tests

Commissioning of the system shall be performed in supervision of OEM of the transformer Protector system. Detailed layout drawings, equipment drawing along with 4 sets of the operation and maintenance manual along with soft copies (on CDs) shall be submitted by the Contractor.



4.16.3 Fire Wall

The fire wall having suitable height shall be installed between transformers to prevent the health transformer from the spread fire. The wall shall be constructed by the reinforced concrete.

(i) Power Transformer (230kV)

- (a) Temperature rise test.
- (b) Dielectric tests (Induced over voltage test, Lightning impulse voltage withstand test, Separate source voltage withstand test).
- (c) Short circuit withstand test (special test) *.

* short circuit test certificates/reports for 230kV transformer shall be of minimum 220kV, 225MVA three phase Power Transformer.

(ii) GIS Switchgear

(a) On one Complete Switchgear (for 230 kV)

Sl No	IEC 62271-203 Clause	Test Name
i.	6.2	Dielectric tests:
		- Lightning impulse voltage tests
		- Power-frequency voltage tests
ii.	6.4	Measurement of the resistance of circuits
iii.	6.5	Temperature-rise tests
iv.	6.6	Short-time and peak withstand current tests
v.	6.104	Pressure test on partitions
vi.	6.105	Test under conditions of arcing due to an internal fault
vii.	6.106	Insulator tests

(b) Circuit Breaker (for 230 kV)

Sl No	IEC 62271-203 Clause	Test Name
ii.	6.101	Mechanical and environmental tests
iii.	6.103	Test circuits for short circuit making and breaking tests
iv.	6.108	Single-phase and double-earth fault tests
v.	6.109	Short-line fault tests
vi.	6.110	Out-of-phase making and breaking tests

(c) Disconnecter & Earthing Switch (for 230 kV & 132kV)

Sl No	IEC 62271-203 Clause	Test Name
ii.	6.101	Tests to prove the short-circuit making performance of earthing switches
iii.	6.102	Operating and mechanical endurance tests
iv.	6.106	Bus-transfer current switching tests
v.	6.107	Induced current switching tests