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Bhutan Power Corporation Limited
(An ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified Company)
Registered Office, Thimphu
Procurement Services Department
Thimphu: Bhutan

BPC/PSD/Additional 2019 Materials/2019/02/ 55 February 04, 2019

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Subject: Addendum No. 1

Reference: Tender No: BPC/PSD/Additional 2019 Materials/2019/02/ dated January 29, 2019

Dear Sir(s),

This is with reference to above mentioned tender whereby BPC would like to issue an addendum no. 1 as given below:

1. Lot 11 (Ring Main Unit): An additional of 33kV RMU, 630 A, 4 ways (4 VCB) has been added under Lot No. 11 (Ring Main Unit). Please find the revised price schedule for the Lot in ***annexure 1***.

2. The technical specification and GTP for bidders to submit are brought out as ***annexure 2 and 3 respectively***. Please refer ***annexure 2*** for Technical Specification and ***annexure 3*** for GTP.

3. Due to the inclusion of 33kV RMU, the bid security for Lot No. 11 (Ring main Unit) shall be as follow:

Lot Description	Amount (Nu.)
Lot No. 11 (Ring Main Unit)	**202,000.00**

However, due to the above inclusion and additional information, no time extension shall be granted and the submission date and time shall remain the same.

Thanking you.
Yours sincerely,

(Tshering Choden)
Offtg. General Manager

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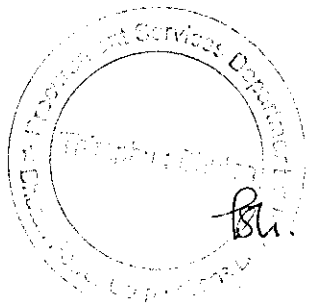
Annexure 1

Revised Price Schedule

Lot 11 (Ring Main Unit)

Sl. No.	BPC Item Code	DESCRIPTION	Unit	Qty	Offered Brand and Country of Origin	Unit Rate DDP (Nu.)	Amount DDP (Nu.)
1	1456	RMU, 11 kV, 630 A, 4 ways (4 VCB)	SET	9			
2	5344	RMU, 33 kV, 630 A, 4 ways (4VCB)	SET	4			



Technical Specification of 33kV Ring Main Unit (RMU)

1. Scope

1.1 This technical specification specifies the minimum requirement for design, manufacturer, inspection and testing of Ring Main Unit (RMU) to be installed at 33 kV junction points to have continuous supply by isolating faulty sections. The RMU shall be extensible type and shall consist of circuit breaker feeders. The number of ways (feeders) of RMU shall be mentioned in BOQ. The RMU shall be of single bus bar SF6 gas insulated outdoor metal enclosed type and shall be suitable for installation in severe outdoor environment conditions.

1.2 SCADA compatibility of RMUs: The RMUs shall be suitable for remote operation i.e. it shall be possible to have motorized operation of the Circuit Breakers. The RMU should be provided with provision of necessary terminal blocks which shall be used for connecting the RTUs/FRTUs for automations. The RMU should have compatibility with IEC – 104 SCADA system and suitable to indicate ON/OFF position of CB, Earth Switch, Gas pressure, RMU door open, common power supply healthy, spring charges status.

Broadly, all the digital meters/relays/smart devices supplied in the RMU should be capable of communicating its analog values to the DMS system in appropriate protocol (standard/open protocol viz. T104/ T103 and MODBUS). Also, all digital input and digital output supplied in the RMU should have all contact points made available as potential free contacts for adaptation to the FRTU/DMS system.

2. Applicable Codes and Standards

2.1.1 Applicable Standards:

Unless otherwise specified elsewhere in this Specification, the RMU, Switchboard (Switchgear), Instrument Transformers and other associated accessories shall conform to the latest revisions and amendments thereof of the following standards.

		IEC Standard
Switchgear		IEC62 271- 1 or equivalent
		IEC 62 271-200 or equivalent
Devices	Circuit Breakers	IEC 62 271-100 or equivalent
	Earthing switches	IEC 62 271-102 or equivalent
	Voltage detecting systems	IEC 61 243-5 or equivalent
	Switch-disconnectors	IEC 60 265-1 or equivalent
Degree of Protection	-	IEC 60 529 or equivalent
Insulation		IEC 60 071 or equivalent
Instrument Transformers	Current Transformers	IEC 60 044-1 or equivalent
	Voltage Transformers	IEC 60 044-2 or equivalent
Installation, Erection	-	IEC 61 936-1 or equivalent

3. Service Condition

- The general operating temperature shall be from -10°C to +40°C.
- Manufacturer shall declare whether the RMU is able to operate in air temperature higher than +40 °C and confirm that current de-rating is not necessary.
- The RMU shall be capable of being exposed to high relative humidity and ambient air pollution.

4. System Parameters

Description	Parameters
Network	Three phases – Three wires
Rated Voltage	36kV
Service Voltage	33kV
System Frequency	50Hz
Lightning Impulse withstand Voltage:	
Phase to phase, phase to earth	170 kV
Across the isolating distance	110kV
Power Frequency withstand voltage	70 kV
Rated Normal Current:	
Line switch	630 A
Circuit-breaker transformer feeder	200A
Branch circuit breaker feeder	630A
Rated Short time current withstand (3 sec)	25kA

Note: The lightning impulse and power frequency voltage shall be corrected to 2400 meters.

5. RMU Outdoor Enclosure

The RMU enclosure must be a metallic suitable for outdoor installation and operation on three phase three wire 33 kV, 50 Hz system with short time current rating of 25 kA for 3 sec with panels. The enclosure shall be IP 54 rating for outdoor application and type tested for weather proof at international lab. Protection of personnel against internal arc is of utmost importance, since the RMU will be installed outdoor and in public areas. It is mandatory that the enclosure for switchgear and metallic RMU housing shall have a design such that in the event of an internal arc fault, the operator shall be safe. This should be in accordance with IEC 62272-200.

6. Switch Board Requirement

The RMU shall meet the criteria for compact, metal-enclosed indoor switchgear in accordance with IEC 298. It shall include, within the same stainless steel / metallized epoxy enclosure, the number of MV functional units required for connection and power supply, "circuit breaker" feeders and earthing switches.

The switchgear and busbar enclosure shall be filled with SF6 at 0.2 bar to 0.8 bar relative pressure to ensure the insulation and breaking functions. Sealed for life, the enclosure shall meet the "sealed pressure system" criterion in accordance with the IEC 298 standard (appendix GG § 2.3 and 3.3): a system for which no handling of gas is required throughout the 30 years of service life. So, refilling valve is not required. In addition, manufacturer shall confirm that maximum leakage rate is lower than 0.1 % / year.
The switchboards shall have an IP2X protection index. The tank shall be made of at least 2 mm unpainted stainless steel and be able to withstand an accidental internal overpressure of at least 2.6 bars (2600 hPA).

The color for the enclosure shall be discussed during detail engineering. The mimic panel shall be painted with RAL 9005.Each switchboard shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics.
The switchgear and switchboards shall be designed so that the position of the different devices is visible to the operator on the front of the switchboard and operations are visible as well.

The outdoor RMU must be tested for internal arc tests for 25kA for 3 Sec. on front, lateral and rear side for the gas vessel & cable connection compartment.
Suitable temperature rise test on the outdoor RMU shall be carried out & test reports shall be submitted with tender for technical bid evaluation.

7. Dielectric Medium

SF6 gas is the preferred dielectric medium for RMUs. SF6 gas used for the filling of the RMU shall be in accordance with IEC 376. It is preferable to fit an absorption material in the tank to absorb the moisture from the SF6 gas and to regenerate the SF6 gas following arc interruption.

8. Earthing

There shall be continuity between the metallic parts of the switch board and cables so that there is no electric field pattern in the surrounding air, thereby ensuring the safety of people. The substation frames shall be connected to the main earth busbar without dismantling any busbar.

Earthing of the main circuit: The cables shall be earthed by an earthing switch with short-circuit making capacity, in compliance with IEC 129 standard. The earthing switch can only be operated when the switch is open.
The earthing switch shall be fitted with its own operating mechanism and manual closing shall be driven by a fast-acting mechanism, independent of operator action.

Mechanical interlocking systems shall prevent access to the operating shaft to avoid all operator errors such as closing the earthing switch when the switch is closed.

9. Circuit-breaker

The circuit breakers shall be of the maintenance-free, low pressure SF6 gas or vacuum type. The position of the power and earthing contacts shall be clearly visible on the front of the switchboard. The position indicator shall provide positive contact indication in accordance with relevant standard.
The circuit breakers shall have 3 positions: open-disconnected, closed and earthed and shall be constructed in such a way that natural interlocks prevent all unauthorized operations. Closing and opening operation of the Circuit Breaker shall be done from remote by using shunt trip coil. Spring charging shall be done with motorized spring operating mechanism. The circuit breaker shall be fitted with a mechanical indicator on the panel front facia for indicating VCB ON/OFF positions.
It shall be fitted with a local system for manual tripping by an integrated push button. There will be no automatic reclosing.
The circuit shall be associated with an integrated protection unit that will operate without any auxiliary power supply and shall include:

a) Three toroid transformers incorporated in the transformer tee-off bushings;
b) Any electronic relay supplied should be compatible to communicate to FRTU/SCADA equipment on appropriate protocol (standard/open protocol viz. T104/ T103 and MODBUS);
c) A low energy release;
d) A "fast-on" test receptacle for protection testing (without CB tripping);
e) The protection system will ensure circuit breaker tripping as of a minimum operating current (Is) which is the rated current of the underground network to be protected and maybe set to following ratings from 8 to 600 A.
Following settings shall be available:

Range 1 - 10 to 50 A
Range 2 - 40 to 200 A
Range 3 - 63 to 312 A
Range 4 - 250 to 600 A

f) The phase and earth fault protection shall have two separately adjustable settings;
g) Interlocking of RMU panels i.e. for breaker panel and cable compartments must be designed according to IEC 62271-200

10. Cable Compartment

The ring main units must be equipped with the outer cone connection bushings in compliance with DIN 47 636, part 6 with M-16 inside thread.
The cable connection compartment must be dimensioned in a way that – Fully insulated and / or metal enclosed connection systems, partially insulated connection systems, earth cables and parallel cables can be installed behind the closed cable front covers.

The connection points of each outgoing feeder must be horizontally situated in one level at a height of approximately 700mm starting from the bottom of the unit.
Connecting possibilities for angle plugs and T plugs shall be provided. Cable brackets inside the cable connecting compartments must be vertically and horizontally adjustable.

11. Cable Bushings

The units shall be fitted with the standardized bushings that comply with EN 50181 standards. All the bushings shall be at the same height from the gland plate and shall be protected by a cable boot tested for partial discharge of <5Pc, 95kV BIL level. The cable boots to be supplied along with the RMU should be used during the type test as well. The necessary report for the same should be provided. Cable boots not tested along with the RMU and supplied shall not be accepted.

12. Voltage indicator lamps and phase comparators

Each function shall be equipped with a fixed type voltage indicator box on the front of the device to indicate whether or not there is voltage in the cables. The capacitive dividers will supply low voltage power to the lamps. Three inlets can be used to check the synchronization of phases. This device shall be in compliance with IEC 1958 standard.

13. Front plate

The front plate shall have an IP2X degree of protection. The front shall include a clear mimic diagram which indicates the different functions. The position indicators shall give a true reflection of the position of the main contacts. They shall be clearly visible to the operator. The lever operating direction shall be clearly indicated in the mimic diagram. The manufacturer's plate shall include the switchboard's main electrical characteristics.

14. RMUs Motors

a) RMUs must be fitted with motors to operate line-switch and branch circuit-breaker functions. The motors shall be provided in the RMU and shall be rated single phase, 24 V, DC Motor (with smooth mechanical operation/ prefer electrical operation);
b) Installation on site shall be possible with the RMU fully energized and manufacturer should provide detailed instructions for installation to the control mechanism. Auxiliary contacts for remote indication of switch status are also required;
c) The fitting of the motors to the mechanism must not in any way impede or interfere with the manual operation of the switches. An auxiliary contact to prevent motorized operation of the mechanism while the operating handle is inserted into the operating point must also be provided;
d) A 24V battery (2 nos. 12V battery) shall be provided with at least 1 hour backup;
e) The RMU shall be provided with potential-free contacts and control contacts for DI/DOs to be interfaced with FRTU so that the RMU is capable of being monitored and controlled by SCADA/DMS.

15. Battery Charger

The battery charger shall have input voltage of 230V AC, 50Hz and output voltage of 24V DC. Battery shall be sealed maintenance free, lead acid 12V batteries of two numbers.

16. HT Protection CT

The RMU shall be provided with HT cast resin/ring type, 3 nos. single phase CTs. CT class and burden shall be 5P10 for overcurrent and earth fault, and 5VA respectively. CT ratio shall be 150-75/1A.

17. Protection Relay

Protection relay shall be self-powered microprocessor based numerical relay.

18. Type and Routine Tests

According to the composition of the switchboard, various type test certificates can be supplied:

- Impulse withstand test,
- Temperature-rise test,
- Short-time withstand current test,
- Mechanical operation test,
- Checking of degree of protection,
- Switch, circuit breaker, earthing switch making capacity.
- Switch, circuit breaker breaking capacity.
- Internal arc withstand
- Checking of partial discharge on complete unit

In addition, for switches, test reports on rated breaking and making capacity shall be supplied. For earthing switches, test reports on making capacity, short-time withstand current and peak short-circuit current shall be supplied.

The type test report of RMU should have carried out in the last five years.

The routine tests shall include the following:

- Conformity with drawings and diagrams,
- Measurement of closing and opening speeds,
- Measurement of operating torque,
- Checking of filling pressure,
- Checking of gas-tightness,
- Checking of partial discharges on individual components,
- Dielectric testing and main circuit resistance measurement.

19. Bus bar material

The Bus bars shall be of EC grade tinned copper of rating current 630A.The Short time rating current shall be 25kA for 3 seconds.The Bus bar connections shall be of Anti- oxide greased.The size of the earth bus shall be made of IEC/IS standards with tinned copper flat.

Annexure 3

GUARANTEED TECHNICAL PARTICULARS			
RMU 33kV,630A, 4 Way (4VCB)			
Sr. No.	**Description**	**Units**	**Bidder's to fill up**
1	**GENERAL**		
1.1	Make		
1.2	Type		
1.3	Rated Voltage	kV	
1.4	Service Voltage	kV	
1.5	Rated Lightning withstand voltage	kVp	
1.6	Rated power frequency withstand voltage	kV	
1.7	Rated Frequency	Hz	
1.8	Rated Peak Current	kA	
1.9	Rated short circuit current	kA	
2	**BUS BAR**		
2.1	Make		
2.2	Material & Grade		
2.3	Reference Standard		
2.4	Continuous Current	A	
2.5	Maximum temperature rise over ambient ©	°C	
2.6	Short time current for 3 Sec.	KA rms	
2.7	Bus Bar insulation medium		
3	**VCB CIRCUIT BREAKER**		
3.1	Make		
3.2	Type		
3.3	Reference Standard		
3.4	Rated Voltage	kV	
3.5	Rated Frequency	Hz	
3.6	No. of poles		
3.7	Rated Current	A	
3.8	Maximum temperature rise over ambient °C		
3.9	Rated operating duty		
3.10	Breaking capacity at rated voltage & operating duty		
a	Symmetrical	(kA rms)	
b	Asymmetrical	(kA rms)	
c	Rated making Current (Peak)	kA	
3.11	Short time current		
a	Short time current for 3 sec.	(kA rms)	
3.12	Insulation Level		
a	Impulse voltage withstand on 1/50 full wave	kVp	
b	1 minute 50 Hz. Voltage withstand	kVrms	
3.13	No. of breaker operations		
a	At 100% rated current		
3.14	Type of contacts		
a	Main		
b	Arcing		
3.15	Material of contacts		
a	Main		
b	Arcing		
3.16	Operating mechanism		
a	Closing		

b	Tripping		
3.17	Motor		
a	Rating	Watts	
b	Out put Voltage	V	
4	**ISOLATORS**		
4.1	Make		
4.2	Type		
4.3	Reference Standard		
4.4	Rated Voltage	kV	
4.5	Rated Frequency	Hz	
4.6	Rated Current	A	
4.7	Maximum temperature rise over ambient °C		
4.8	Short time current		
a	Short time current for 3 sec.	(kA rms)	
4.9	Insulation Level		
a	Impulse voltage withstand on 1/50 full wave	kVp	
b	1 minute 50 Hz. Voltage withstand	kVrms	
4.10	Isolator provided with the following Mechanical safety Mechanical ON, OFF, CABLE EARTH indicators Operation counter Manual spring charging facility		
5	**CURRENT TRANSFORMER**		
5.1	Make		
5.2	Type		
5.3	Reference Standard		
5.4	C.T. ratio as specified	A	
5.5	Rated frequency	Hz	
5.6	Insulation class		
5.7	Accuracy class		
5.8	Rated Burden VA	VA	
6	**CABLE TERMINATIONS**		
6.1	Type		
6.2	Materials		
6.3	Size		
6.4	Height of Cable box from ground Level		