



PROVINCIAL ELECTRICITY AUTHORITY
ELECTRICAL AND MECHANICAL ENGINEERING DIVISION

115 kV MIXED TECHNOLOGY SWITCHGEAR (MTS)

Specification No.: RSUB-077/2564

Approved date: 30/04/2564

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Invitation to Bid No:

C Material, equipment, and specifications for 115 kV Mixed technology switchgear (MTS)

C1 General material and packing instructions

Additional to the general instruction, the following shall be observed:

1a Scope

This specification covers the minimum technical requirements for the design, manufacture, testing in the manufacturer's workshop, supply and CIF delivery, transportation to the Site(s), erection, installation site-tests and commissioning of 115 kV Mixed technology switchgear (MTS), complete in every respect with all components and necessary accessories for reliable continuous operation, even if not all details are expressively stated in specification.

1b Standards

All designs, calculations, materials, equipment, manufacture, construction, and testing shall conform as a basic requirement in accordance with the following standards:

IEC 62271-1 : 2011	High-voltage switchgear and controlgear – Part 1 : Common specifications
IEC 62271-100 : 2006	High-voltage switchgear and controlgear – Part 100 : Alternating-current circuit-breaker
IEC 62271-102 : 2013	High-voltage switchgear and controlgear – Part 102 : Alternating current disconnectors and earthing switches
IEC 62271-203 : 2011	Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV
IEC 62271-205 : 2008	Compact switchgear assemblies for rated voltages above 52 kV
IEC 61869-2: 2012	Instrument transformers – Part 2: Additional requirements for current transformers
IEC 61869-3: 2011	Instrument transformers – Part 3: Additional requirements for inductive voltage transformers
IEC 60376: 2005	Specification of technical grade sulfur hexafluoride (SF ₆) for use in electrical equipment
IEC 60480: 2004	Guidelines for the checking and treatment of sulfur hexafluoride (SF ₆) taken from electrical equipment and specification for it re-use
IEC 60529 : 2001	Degrees of protection provided by enclosures

And all other relevant standards, unless otherwise specified in these specifications.

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PEA will also accept the 115 kV Mixed technology switchgear and accessories tested in accordance with the later edition of the above standards.

PEA will also accept the type test report in accordance with the previous edition of the above standards, if there is no significant change in any test items or no additional test item(s) compared with the above standards. On the other hand, if there is significant change in any test items or there are any additional test items, the previous edition type test report with the additional test report(s) of the significant change test item(s) and/or additional test item(s) will be also accepted.

1c Principal requirement

1c.1 General

The 115 kV Mixed technology switchgear (hereinafter called the MTS) will be designed to be remote controlled from Area Distribution Dispatching Center or substation control room, or manually at device level.

The MTS and all associated equipment shall be designed and constructed for outdoor installation and operation and shall be capable of continuous operation at the specified ratings under the stated site conditions.

The supplier of the MTS and all associated equipment shall furnish all materials and necessary hardware, special tools for installation, commissioning and maintenance. He shall furnish all drawings, detailed descriptions and instructions for installation and operation of the complete circuit breakers and their auxiliaries.

1c.2 Site and service conditions

The MTS shall be designed and constructed for outdoor use in Thailand and shall be operated under the following conditions:

Altitude	:	up to 1,000 m above sea level
Maximum ambient air temperature	:	up to 40° C
Mean maximum annual ambient air temperature	:	35° C
Mean annual relative humidity	:	79%
Mean maximum annual relative humidity	:	94%
Climatic condition	:	tropical climate
Maximum wind velocity	:	100 km/h
Maximum seismic factor	:	0.1 g
Specific corrosive elements at site	:	salt, soot

The MTS shall be suitable for transit on first class paved road up to forty (40) km/h and on unpaved road up to twenty-four (24) km/h.

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1c.3 Construction

The MTS shall have robust construction and complete with factory assembled equipment. The equipment of MTS shall be suitably installed on skidding-based mounting frame(s).

1c.4 115 kV Mixed technology switchgear

1c.4.1 Ratings

The MTS shall have the following ratings:

Rated voltage	:	123 kV
Number of phases	:	3
Rated power frequency withstand voltage, one-minute		
- phase to earth	:	230 kV (r.m.s.)
Rated lightning impulse withstand voltage, standard wave		
- phase to earth	:	550 kV (peak)
Rated frequency	:	50 Hz
Rated continuous current	:	2,000 A
Rated short-time withstand current (1 second), at 115 kV	:	31.5 kA (r.m.s.)
Rated peak withstand current	:	80 kA
Degree of protection for auxiliary and control circuit		
- outdoor	:	IP 54
- indoor	:	IP 4X
Power supply voltage for		
- motor, control and indication circuit	:	125 V DC
- auxiliary circuits	:	400/230 V AC, 50 Hz

1c.4.2 Design

The MTS shall be metal-enclosed SF₆-Gas Insulated Switchgears (GIS) suitable for the construction of outdoor modular substations. The MTS and the associated control and protection gears shall be accommodated on skidding-based mounting frame(s). The MTS shall be suitable for outdoor installation. The on-site erection and commissioning works are reduced to a minimum.

It is understood that each manufacturer has his own particular design concept for the GIS with regard to type and material of enclosures and there are no restrictions imposed in the specifications relevant to this.



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The MTS bays shall be of standardized, metal-enclosed design. The metallic enclosures shall be filled with SF₆ gas which served as insulating and arc-quenching medium. The MTS enclosures shall be made of aluminium, aluminium-alloy or stainless steel.

Each gas compartment shall be equipped with separate pressure relief device to ensure instant and safe discharge of overpressure in case of an internal arc fault. The pressure relief device shall be designed as spring loaded cover or bursting disc suitable for the specific requirements of the GIS.

All high-voltage carrying parts must have a minimum protection class of IP 65, i.e. totally protected against contact with live parts, ingress of dust and water jets (hose-proof).

Each gas zone shall be independently and continuously monitored by gas density gauge or temperature-compensated pressure gauge with two-stage alarm contacts to initiate alarm on loss of gas pressure. The pressure gauge shall be shock-proof type.

The DN8 valve for filling SF₆ gas shall be provided.

The first stage contact shall initiate alarm as an advanced warning that gas density/pressure is below nominal level. The second stage contact shall initiate operation lock-out for the circuit-breaker and give danger alarm or lock-out for other gas compartments (if any).

The gas compartments shall be equipped with static filters to absorb moisture. The filters located in the circuit-breaker compartment shall be capable to absorb gas decomposition products and moisture.

The guaranteed leakage rate of each individual SF₆ gas compartment shall be less than 0.5% per year over the life time of the GIS and Circuit-breaker. Initial filling shall guarantee gas service periods of not less than ten years. No provision for an automatic gas replenishment shall be necessary.

The GIS shall be capable of withstanding its rated phase to phase and phase to earth voltage in case gas pressure drops to atmospheric pressure in any compartment.

The MTS shall have minimum spare auxiliary contacts as follows:

- Circuit breaker : five (5) normally open (NO) and five (5) normally closed (NC) contacts
- Disconnecting switch : five (5) normally open (NO) and five (5) normally closed (NC) contacts
- Earthing switch : for (4) normally open (NO) and for (4) normally closed (NC) contacts

1c.4.3 Interlocking system

The interlocking system shall positively prevent the operator from unintentionally reaching or creating a dangerous, or potentially dangerous condition.



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The system shall be constructed in such a way that it can not be defeated without the use of tools or brute force.

The interlocking system shall be secure and logical and shall fulfill ultimate safety requirements. Any maloperation of related circuit breakers, disconnectors and earthing switches shall be positively prevented. All interlocks shall remain active if the auxiliary power supply fails.

A detailed description of the proposed interlocking system shall be submitted for PEA approval.

1c.4.4 Circuit-breakers

The circuit-breakers shall be designed for the ratings shown in Clause **1c.4.1** and with:

Rated continuous current : 2,000 A

Rated short-circuit breaking current,
at 115 kV : 31.5 kA (r.m.s.)

Rated short-circuit making current,
at 115 kV : 80 kA (peak)

Rated operating sequence : O – 0.3 sec – CO – 3 min – CO

Rated auto-reclosing duty (PEA's standard) : O – 0.3 sec – CO – 15 sec – CO

Rated total break time : not more than 60 ms

The three poles of the circuit-breakers shall be group operated by a common drive unit.

The operating mechanism shall be equipped with emergency manual tripping and for maintenance purpose, closing device.

1c.4.5 Current Transformers

The current transformers shall be of ring type. The secondary leads shall be connected to terminal blocks. The current transformers which installed inside gas compartment or over switchgear's bushings shall be accepted.

The short-circuit links for the secondary leads of the current transformers shall be provided at the terminal blocks located in the local control boards.

The magnetizing curves for each current transformer for protection shall be submitted for approval. To guarantee the correct protective relay operation, through-fault stability calculations shall be submitted showing the correctness of the chosen current transformer core, i.e. rated output, class of accuracy and rated accuracy limit factors. Furthermore the rated primary current, turns ratio, knee-point e.m.f. and resistance of the secondary windings (corrected to the maximum service temperature), shall be submitted for PEA approval.

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The accuracy classes and burdens shall match the requirements of the indicating and protection system of the switchgears. The current transformers shall be of the multi-ratio type as indicated in "**Metering and Relaying Diagram**".

The thermal rating of the current transformers shall allow, at site conditions, a 20% continuous overloading referred to nominal rating of the current transformers.

All current transformers shall be provided with an identifying label showing manufacturer, type, ratio, class, output and serial number.

Where multi-ratio secondary windings are offered, the above mentioned label shall clearly indicate the terminal connection required for each ratio, and they shall be clearly indicated at the appropriate diagrams and drawings.

1c.4.6 Voltage transformers (if applicable)

The voltage transformers shall be inductive type. The secondary windings shall be protected with secondary HRC fuses, suitably cover and complying with IEC 60269 or supervised with miniature circuit-breakers with auxiliary contacts of adequate characteristics and provided with transient over voltage protection. The voltage transformers which installed inside gas compartment or separately shall be accepted.

The voltage transformers shall be designed for the ratings shown in "**Metering and Relaying Diagram**".

1d Tests and test reports

1d.1 Type tests

1d.1.1 115 kV Mixed technology switchgear

The MTS shall be passed type tests in accordance with IEC 62271-203: 2011, or later edition, at least the following items:

- (1) Dielectric tests
- (2) Radio interference voltage (r.i.v.) test
- (3) Measurement of the resistance of the circuit
- (4) Temperature-rise tests
- (5) Short-time withstand current and peak withstand current tests
- (6) Verification of the protection
- (7) Tightness tests
- (8) Additional tests on auxiliary and control circuits
- (9) Verification of making and breaking capacities

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- (10) Mechanical and environmental tests
- (11) Proof tests for enclosures
- (12) Pressure test on partitions (if applicable)
- (13) Test under conditions of arcing due to an internal fault
- (14) Insulator tests (if applicable)

1d.1.2 Circuit breaker

The circuit-breaker shall be passed type tests in accordance with IEC 62271-100: 2006, or later edition, at least the following test items:

- (1) Dielectric tests
- (2) Radio interference voltage (r.i.v.) tests
- (3) Measurement of the resistance of the main circuit
- (4) Temperature-rise tests
- (5) Short-time withstand current and peak withstand current tests
- (6) Verification of the degree of protection
- (7) Tightness tests
- (8) Mechanical and environmental tests
- (9) Short-circuit current making and breaking tests
- (10) Critical current tests
- (11) Single-phase and double-earth fault tests
- (12) Short-line fault tests
- (13) Capacitive current switching tests
 - Line-charging and cable-charging current breaking tests

1d.1.3 Disconnecting switches and earthing switches

The disconnecting switches and earthing switches shall be passed type tests in accordance with IEC 62271-102: 2013, or later edition, at least the following test items:

- (1) Dielectric tests
- (2) Measurement of the resistance of main circuits
- (3) Temperature-rise tests
- (4) Short-time withstand current and peak withstand current tests
- (5) Verification of the protection
- (6) Tightness tests
- (7) Operating and mechanical endurance tests
- (8) Operation at the temperature limits
- (9) Test to verify the proper functioning of the position indicating device



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(10) Induced current switching tests (for earthing switches only)

1d.1.4 Current transformer

The current transformer shall be passed type tests in accordance with IEC 61869-2: 2012, or later edition, at least the following test items:

- (1) Temperature – rise test
- (2) Tests for accuracy
- (3) Verification of the degree of protection by enclosures
- (4) Short – time current tests

1d.1.5 Voltage transformer (if applicable)

The voltage transformer shall be passed type tests in accordance with IEC 61869-3: 2012, or later edition, at least the following test items:

- (1) Temperature – rise test
- (2) Impulse voltage withstand test on primary terminals
- (3) Test for accuracy
- (4) Verification of the degree of protection by enclosures
- (5) Enclosure tightness test at ambient temperature
- (6) Pressure test for the enclosure
- (7) Short – circuit withstand capability test

The type test reports shall be submitted with the bid.

PEA will also accept other document instead of the type test reports in the following conditions:

- In case the proposed the MTS has been registered for Product lists for substation turnkey project, the not – expired registration certificate counted to the bid closing date can be submitted instead.

However the document, in above case, shall be proved that the MTS specified in the Product list shall be the same product, type/model and all ratings as the proposed MTS for this bid.

The costs of all tests and test reports shall be borne by the bidders or manufacturers.

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1d.2 Routine tests

1d.1.1 115 kV Mixed technology switchgear

The MTS shall be passed routine tests in accordance with IEC 62271-203: 2011, or later edition, at least the following items:

- (1) Dielectric tests on the main circuit
- (2) Tests on auxiliary and control circuits
- (3) Measurement of the resistance of the main
- (4) Tightness test
- (5) Design and visual checks
- (6) Pressure test of enclosures
- (7) Mechanical operation tests
- (8) Tests on auxiliary circuits, equipment and interlocks in the control mechanism
- (9) Pressure test on partitions

1d.1.2 Circuit breaker

The circuit-breaker shall be passed routine tests in accordance with IEC 62271-100: 2006, or later edition, at least the following test items:

- (1) Dielectric test on the main circuit
- (2) Dielectric test on auxiliary and control circuits
- (3) Measurement of the resistance of the main circuit
- (4) Tightness tests
- (5) Design and visual checks
- (6) Mechanical operating tests

1d.1.3 Disconnecting switches and earthing switches

The disconnecting switches and earthing switches shall be passed routine tests in accordance with IEC 62271-102: 2013, or later edition, at least the following test items:

- (1) Dielectric test on the main circuit
- (2) Dielectric test on auxiliary and control circuits
- (3) Measurement of the resistance of main circuits
- (4) Tightness tests
- (5) Design and visual checks
- (6) Mechanical operating tests



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1d.1.4 Current transformer

The current transformer shall be passed routine tests in accordance with IEC 61869-2: 2012, or later edition, at least the following test items:

- (1) Power-frequency voltage withstand tests on secondary terminals
- (2) Tests for accuracy
- (3) Verification of markings

1d.1.5 Voltage transformer

The voltage transformer shall be passed routine tests in accordance with IEC 61869-3: 2012, or later edition, at least the following test items:

- (1) Power-frequency voltage withstand tests on primary terminals
- (2) Partial discharge measurement
- (3) Power-frequency voltage withstand tests between sections
- (4) Power-frequency voltage withstand tests on secondary terminals
- (5) Test for accuracy
- (6) Verification of markings
- (7) Enclosure tightness test at ambient temperature
- (8) Pressure test for the enclosure

The list of routine tests shall be submitted with the bid.

The costs of all tests and test reports shall be borne by the contractor or manufacturers.

1e Packing

The MTS shall be shipped/delivered in the assemblies; and means shall be provided to firmly secure and protect the substation equipment during transportation.

Some parts of the switchgear bushings may be detached and separately packed in wooden packages.

Spare parts and special tools, if order, shall be separately packed other packages on which the words "SPARE PARTS" and "SPECIAL TOOLS" shall be marked.

Every separated package shall be paintly taged and / or marked for easy identification.



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C2 Material and packing data to shall be submitted the bid

The bidders have to submit the following data and details:

2a Critical document of the proposed MTS (See page 13 of 13)

2b Design data and guarantee of the proposed MTS (See Annex 1)

2c The following details shall be submitted for each item offered:

- Catalogue
- Type/Design reports
- Specifications of materials used for the component parts
- Detailed drawing(s) with dimensions and tolerances in mm
- Drawing(s) of the MTS arrangement on supporting structures

2d Lists of routine tests for the MTS.

2e Packing details



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Note: Conditions for documentation and consideration

1. The Contractor has to supply the following documents in English and/or Thai, before shipment/delivery, as follows:

1.1 Documents which shall be sent to PEA for approval before shipment:

- a) Reports of type test and routine test.
- b) Three (3) sets of drawings, schematic diagram, internal wiring diagram and terminal diagram
- c) Three (3) sets of instruction book for installation, operation, and maintenance

The above documents shall be sent to the following address:

Substation Construction Department

Provincial Electricity Authority
200 Ngam Wong Wan Road, Chatuchak
Bangkok Metropolis 10900
Thailand

1.2 Documents which shall be packed together with each set of the MTS:

- a) One (1) set of drawing of the MTS set arranged on supporting structures, with part list.
- b) One (1) set of instruction book for installation, operation, and maintenance
- c) One (1) set of routine test

2. Delivery time is one of the important factors to be considered.

3. The Contractor has to guarantee the quality of the MTS and their equipment, for **three (3) years** from the date of issuance of the notice of acceptance. During the guarantee period, the Contractor shall replace the defective MTS and their equipment for free of charge or shall pay an amount equal to the exact purchasing value for the defective quantity of the MTS and their equipment.



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Critical documents of the proposed 115 kV Mixed Technology Switchgear

Item	Required document	Proposed technical document	Reference document (Page/Item)
1	Type test report, or	<input type="checkbox"/> YES <input type="checkbox"/> NO	
	Product lists registration certificate	<input type="checkbox"/> YES <input type="checkbox"/> NO	
2	Design data and guarantee of the proposed MTS	<input type="checkbox"/> YES <input type="checkbox"/> NO	
3	The following details shall be submitted for each item offered:		
	- Catalogue	<input type="checkbox"/> YES <input type="checkbox"/> NO	
	- Specifications of materials used for the component parts	<input type="checkbox"/> YES <input type="checkbox"/> NO	
	- Detailed drawing(s) with dimensions and tolerances in mm	<input type="checkbox"/> YES <input type="checkbox"/> NO	
	- Drawing(s) of the MTS arrangement on supporting structures	<input type="checkbox"/> YES <input type="checkbox"/> NO	
4	Lists of routine tests for the MTS	<input type="checkbox"/> YES <input type="checkbox"/> NO	
5	Packing details	<input type="checkbox"/> YES <input type="checkbox"/> NO	

Note:

The bidders who do not submit all critical documents mentioned in the above table with the bid will be rejected.



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C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
1	1040100203	set(s)	115 kV Mixed Technology Switchgear (MTS) without voltage transformer, suitable for Line Bay.
2	1040100204	set(s)	115 kV Mixed Technology Switchgear (MTS) without voltage transformer, suitable for Transformer Bay.
3	1040100205	set(s)	115 kV Mixed Technology Switchgear (MTS) with voltage transformer, suitable for Line Bay.
4	1040100206	set(s)	115 kV Mixed Technology Switchgear (MTS) with voltage transformer, suitable for Transformer Bay.

Annex 1

Invitation to Bid No. :

Specification No. : RSUB-077/2564

Manufacturer :

Bidder :

1a.1 Design data and guarantee of 115 kV Mixed Technology Switchgears (MTS)**1a.1.1 Common features**

Description		Required	Proposed
Manufacturer	-	-	
Country of origin	-	-	
Manufacturer's type number	-	-	
Standards	-	IEC	
Segregated-phases	yes/no	-	
Rated voltage	kV, r.m.s.	123	
Rated frequency	Hz	50	
Number of phases	-	3	
Rated lightning impulse withstand voltage 1.2/50 μ s peak value - phase to earth - across open gap - phase to earth at SF ₆ pressure 1 bar abs.	kV, peak	550	
Rated power-frequency withstand voltage (1 min) - phase to earth - across open gap - phase to earth at SF ₆ pressure 1 bar abs.	kV, r.m.s.	230	
Rated short-time withstand current (1 s), at 115 kV	kA, r.m.s.	31.5	
Rated peak withstand current	kA, peak	80	

Annex 1

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Manufacturer :

Bidder :

Common features

Description		Required	Proposed
Rated normal current at 40 ^o C ambient temperature			
- busbar and line bays (if any)	A	2,000	
- transformer bays	A	2,000	
Rated short-circuit breaking current (symmetrical, r.m.s.) , at 115 kV	kA	31.5	
Rated short-circuit making current	kA	-	
Rated duration of short-circuit	s	-	
Short- time withstand current, 1 s	kA	-	
Rated cable-charging breaking current	A	-	
Max. Capacitive breaking current	A	-	
Rated operating sequence	-	O-0.3s-CO-3min-CO	
Operating time - closing time	ms	-	
- dead time	ms	-	
- total break time	ms	not more than 60	
- make time	ms	-	
Arcing time max.	ms	-	
Number of breaks in series (per phase)	-	1	
Arc quenching medium	-	SF ₆	
Rated pressure of SF ₆ for arc quenching at 20 ^o C	bar	-	

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Bidder :

Common features

Description		Required	Proposed
SF ₆ pressure at which alarm operates at 20 ^o C	bar	-	
SF ₆ pressure at which lockout operates at 20 ^o C	bar	-	
Signal "Loss of SF ₆ gas" at pressure	bar	-	
Type of pressure monitors	-	-	
Gas quantity of circuit-breaker module (3-phase)	kg	-	
Number of refilling required/years	No./years	-	
Material of high-voltage conductor	copper/aluminium	-	
Material of contacts	-	-	
Insulation medium	-	SF ₆	
Rated SF ₆ gas pressure, at 20 ^o C	bar	-	
Type of pressure relief device	-	spring loaded cover or bursting disc	
Setting of pressure relief device	bar		
Mechanical strength of enclosure			
- design pressure	bar	-	
- operating pressure	bar	-	
- type test pressure	bar	-	
- routine test pressure (.....min.)	bar	-	
- leakage test pressure (.....min.)	bar	-	
- safety factor (type test/operating pressure)	-	-	

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Manufacturer :

Bidder :

Common features

Description		Required	Proposed
Operating mechanism			
- for closing	-	-	
- for opening	-	-	
Number of making coils per breaker	pcs	-	
Rated power each	W	-	
Number of trip coils per breaker	pcs	-	
Rated power each	W	-	
Rated voltage of motor	VDC	125	
Rated power of motor	W	-	
Type of main contacts	-	-	
Material of main contacts	-	-	
Surface treatment	-	-	
Life duration of contacts at rated short-circuit breaking current	number of operations	-	

Annex 1

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Bidder :

1a.1.2 Current transformer for 115 kV system

Description / Characteristics		Required	Proposed
Manufacturer	-		
Country of origin	-		
Manufacturer's type number	-		
Number of poles	-		
Standards	-		
Catalog number (to be attached)	-		
Outline drawing number (to be attached)	-		
Type of current transformer	-		
Rated voltage	kV	123	
Rated frequency	Hz	50	
Rated lightning impulse withstand voltage of primary winding	kV, peak	550	
Rated power-frequency withstand voltage, one-minute dry, of primary winding	kV, r.m.s.	230	
Rated primary current	A	see Drawing	
Rated-short time thermal current (1 s)	kA		
Rated dynamic current	kA, peak		
Rated continuous thermal current in percentage of rated primary current	%		
Class of insulation and material	-		
Maximum temperature rise, at.....A	K		

Annex 1

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Manufacturer :

Bidder :

Current transformer for 115 kV system

Description / Characteristics		Required	Proposed
Current ratio	-	see Drawing	
Number of cores	-	see Drawing	
<u>Measuring core</u>			
- rated burden	VA	see Drawing	
- accuracy class	-		
- overcurrent factor	-		
<u>Protection core</u>			
- rated burden	VA	see Drawing	
- accuracy class	-		
- overcurrent factor	-		
Net weight of current transformer	kg		

Annex 1

Invitation to Bid No. :

Specification No. : RSUB-077/2564

Manufacturer :

Bidder :

1a.1.3 Voltage transformer for 115 kV system

Description / Characteristics		Required	Proposed
Manufacturer	-		
Country of origin	-		
Manufacturer's type number	-		
Number of phases	-		
Standards	-		
Catalog number (to be attached)	-		
Outline drawing number (to be attached)	-		
Type	-	Inductive	
Rated voltage	kV	123	
Rated frequency	Hz	50	
Rated lightning impulse withstand voltage of primary side	kV, peak	550	
Rated power frequency withstand voltage, one-minute, of primary side	kV, r.m.s.	230	
Rated primary voltage	kV	115/sqrt3	
Rated secondary voltage	V	115 and 115/sqrt3	
<u>Measuring core</u>			
rated output	VA	see Drawing	
accuracy class	-		
rated voltage factor	-		

Annex 1

Invitation to Bid No. :

Specification No. : RSUB-077/2564

Manufacturer :

Bidder :

Voltage transformer for 115 kV system

Description / Characteristics		Required	Proposed
<u>Protection core</u> rated output accuracy class rated voltage factor	VA - -	see Drawing	
Class of insulation and material	-		
Maximum temperature rise at.....A	K		
Net weight of voltage transformer	kg		

Annex 1

Invitation to Bid No. :

Specification No. : RSUB-077/2564

Manufacturer :

Bidder :

1a.1.4 Air - to - SF₆ - bushing

Description		Required	Proposed
Manufacturer	-	-	
Country of origin	-	-	
Manufacturer's type number	-	-	
Standards	-	-	
Insulator material	-	-	
Rated voltage	kV	123	
Rated current	A	-	
Rated frequency	Hz	50	
Rated power-frequency withstand voltage, one-minute	kV, r.m.s.	230	
Rated impulse-withstand voltage	kV, peak	550	
Creepage distance			
- for 115/22 kV substation	mm	3,070	
- for 115/33 kV substation	mm	3,810	
Cantilever strength	N	-	
Admissible bending load at terminal	N	-	

Annex 1

Invitation to Bid No. :

Specification No. : RSUB-077/2564

Manufacturer :

Bidder :

1a.1.5 Local control cubicle

Description		Required	Proposed
Material	-	-	
Manufacturer	-	-	
Type	-	-	
Standards	-	-	
Protection degree	Outdoor/Indoor	IP54 / IP4X	
Material	-	-	
Sheet thickness	mm	-	
Surface finish and thickness	micron	50	
Dimensions			
- length	mm	-	
- width	mm	-	
- height	mm	-	
Net weight	kg	-	

Annex 1

Invitation to Bid No. :

Specification No. : RSUB-077/2564

Manufacturer :

Bidder :

1a.1.6 Remote control cubicle

Description		Required	Proposed
Material	-	-	
Manufacturer	-	-	
Type	-	-	
Standards	-	-	
Protection degree	IP	IP4X	
Material	-	-	
Sheet thickness	mm	-	
Surface finish and thickness	micron	50	
Dimensions			
- length	mm	-	
- width	mm	-	
- height	mm	-	
Net weight	kg	-	