

**FUNDY OCEAN RESEARCH CENTER FOR ENERGY (FORCE)  
HANTSPORT, NOVA SCOTIA**

**IN-STREAM TIDAL POWER GENERATING PLANT  
INTERTIE SUBSTATION DEVELOPMENT**

**MANUFACTURE AND SUPPLY OF SIX (6)  
21kV (17kV MCOV) STATION CLASS SURGE ARRESTERS**

**JANUARY, 2011**

**SPECIFICATION No.  
023-478-1-11**

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**SPECIFICATION No. 023-478-1-11**

**SIGNED AND SEALED:**

  
\_\_\_\_\_  
**R. McCARTHY, P. ENG.  
SENIOR ELECTRICAL ENGINEER**



**SIGNED:**

  
\_\_\_\_\_  
**N. STRUM, P. ENG.  
QA/QC ENGINEER**

**STRUM ENGINEERING ASSOCIATES LTD.**

**JANUARY, 2011**

# **SPECIFICATION**

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**SPECIFICATION**

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**INFORMATION AND GENERAL REQUIREMENTS**

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# SPECIFICATION

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# **SPECIFICATION**

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# **SPECIFICATION**

## **SECTION A**

### **INFORMATION AND GENERAL REQUIREMENTS**

# SPECIFICATION

## SECTION A

### INFORMATION AND GENERAL REQUIREMENTS

#### 1. GENERAL

- 1.1 This Technical Specification, prepared by Strum Engineering Associates Ltd. on behalf of Fundy Ocean Research Center for Energy (FORCE), consisting of the Information and General Requirements, the Technical Requirements, together with all Schedules, Drawings, and Addenda issued with and subsequent to the "Invitation to Tender", shall become a part of any Contract or Purchase Order to perform the work involved. In case of discrepancies between the work tendered to be performed and the work specified to be performed, the Technical Specification shall be final and binding unless there be mutual agreement to the contrary between FORCE and the Vendor.

#### 2. DESCRIPTION OF PROJECT

- 2.1 The scope of work of this aspect of the project consists of the manufacture, delivery to site and warranty for six (6), 21kV (17kV MCOV) station class surge arresters for the 24.94kV distribution system, as specified herein.

#### 3. DEFINITIONS

- 3.1 The **Owner's Engineer** shall mean:

**Strum Engineering Associates Ltd.**  
80 Eileen Stubbs Avenue  
Dartmouth, Nova Scotia, B3B 1Y6

Contact: Mr. Richard McCarthy, P. Eng.

Telephone: (902) 468-7325  
Fax: (902) 468-1908  
E-Mail: [r.mccarthy@strumengineering.ca](mailto:r.mccarthy@strumengineering.ca)

- 3.2 The Vendor shall mean the Tenderer or Bidder as defined in the FORCE Terms and Conditions.



## **SPECIFICATION**

**3./**

3.3 The **Owner's** information and contact will be:

Fundy Ocean Research Center for Energy (FORCE)  
C/O Strum Engineering Associates Ltd.  
80 Eileen Stubbs Avenue  
Dartmouth, Nova Scotia  
B3B 1Y6

Contact: Mr. Frank LeBlanc, P. Eng., FORCE Project Manager

Telephone: (902) 443 4690  
Fax: (902) 468 1908  
E-Mail: [frank.leblanc@fundyforce.ca](mailto:frank.leblanc@fundyforce.ca)

### **4. ERRORS AND OMISSIONS**

4.1 Should any details necessary for a clear and comprehensive understanding be omitted or any errors appear in the tendering documents, it shall be the duty of the Bidder to obtain clarification from the Owner's Engineer before submitting his tender. All additions or corrections to the Technical Specification will be issued in writing to all Bidders as addenda thereto. Bidders shall list in their tenders all the addenda that were received and considered when their tender was prepared.

### **5. MATERIAL AND WORKMANSHIP**

- 5.1 All materials shall be new. Workmanship and material shall be of the best quality.
- 5.2 Equipment of the same type shall be interchangeable. Listed spare parts shall be identical and inter-changeable with parts in service that they are intended to replace.
- 5.3 There shall be no omission of items necessary or required to make a finished workmanlike first class installation, even though every item of labour and material may not be mentioned or shown in the Specification or on the Drawings.
- 5.4 Materials and standard parts which are supplied under the requirements of the Specification, and also those which are not specifically designated herein and which are necessary for the fulfilment of this Specification, shall be new, of high industrial quality, and in accordance with good industrial practice.

## **SPECIFICATION**

### **6. GUARANTEE/WARRANTY**

- 6.1 The Vendor shall warrant that all materials, equipment, and workmanship furnished in accordance with the purchase documents, comply in all respects with the Technical Specification, and shall guarantee in writing that the equipment will give successful and efficient service.
- 6.2 The Vendor shall, to the satisfaction of the Owner, rectify any defects which may appear in the equipment, or of which he shall receive notice from the Owner and for which he may have been responsible in the opinion of the Owner, for a period of twelve months after start-up or eighteen months after shipment, whichever occurs first.
- 6.3 Any equipment which fails to perform in accordance with the requirements of the Specification during this period may be rejected by the Owner. The Vendor shall proceed at once to make alterations or furnish new equipment, as may be necessary.
- 6.4 Costs of supplying any replacement equipment, or of modifications or alterations to equipment, in order to meet specified requirements shall be borne by the Vendor, including the costs, if any, of any work or materials provided by the Owner, and of any shipping charges incurred by the Owner.
- 6.5 Operation by the Owner of the equipment or any part thereof shall not constitute any waiver of the Owner's rights under this agreement.
- 6.6 The Vendor shall ensure that the Unit meets the requirements set out in the Specification and all relevant standards listed herein.
- 6.7 The Owner's purchase order terms and conditions shall prevail.

## **SPECIFICATION**

### **7. PACKAGING AND SHIPPING**

- 7.1 All parts shall be thoroughly cleaned to remove oil, grease, dust, and other foreign material and all equipment openings shall be capped to prevent entry of foreign materials or damage.
- 7.2 Equipment shall be suitably prepared and packed so as to prevent damage occurring during storage, transportation, and unloading operations and to ensure that the equipment is in perfect working condition, has suffered no damage, and that all parts are intact on arrival at the destination.
- 7.3 Packaging and crating shall include suitable weather protection, moisture control, temporary bracing, blocking straps, skids, etc.

### **8. CORRESPONDENCE**

- 8.1 In view of the urgency attached to this project, the tender submission shall be by courier; all other correspondence shall be by courier, facsimile or electronic mail (E-Mail).
- 8.2 The Vendor shall allow for this requirement in the prices quoted herein.

### **9. SCHEDULE**

- 9.1 All equipment associated with this specification is required on site not later than 25 March, 2011. Refer to Schedule No. 5, Page C-7, for the specific schedule requirements.

**SPECIFICATION**

**SECTION B**

**TECHNICAL REQUIREMENTS**

# SPECIFICATION

## SECTION B

### TECHNICAL REQUIREMENTS

#### 1. SCOPE OF WORK

- 1.1 Design, manufacture, test, deliver to FORCE, at the substation location in Black Rock, Nova Scotia, 10km west of the town of Parrsboro, Nova Scotia, and provide a written warranty for six (6), 21kV (17kV MCOV) station class surge arresters for the 24.94kV distribution system, as specified herein.
- 1.2 Offloading, erection, testing and commissioning of the station class surge arresters will be carried out by others and does not form part of this Contract.

#### 2. SERVICE CONDITIONS

##### 2.1 Application

- 2.1.1 The surge arresters will be installed outdoors on galvanized steel support structures, supplied and installed by others.

##### 2.2 Existing Supply System Data

###### 2.2.1 24.94kV System Data

Nominal service voltage	kV rms	24.94
Rated (maximum) voltage	kV rms	27.4
Rated frequency	Hz	60
No. of phases & wiring		3/3
Neutral grounding	Solidly grounded at 5/6.67 MVA transformer and utility distribution transformer neutrals	
3 phase short circuit level (interrupting)	MVA	250

## SPECIFICATION

2./

### 2.3 Environmental Data

2.3.1 Design and manufacture the station class surge arresters to be suitable for operation under the following conditions:

Elevation above sea level	m	75
Maximum ambient temperature	°C	40
Minimum ambient temperature	°C	-35
Maximum relative humidity	%	100

2.3.2 The intended location of the surge arresters is classified as an outdoor environment with a heavy level of airborne contamination.

### 3. STANDARDS

3.1 Unless otherwise specified herein, design, manufacture, and test the switchgear assembly in accordance with the latest issue of the following standards:

ANSI/IEEE C62.11-2005	IEEE Standard for Metal Oxide Surge Arresters for AC Power Circuits
IEEE C62.22-2009	IEEE Guide for Application of Metal Oxide Surge Arresters for Alternating Current Systems
IEEE C62.1-1989	IEEE Standard for Surge Arresters for Alternating Current Power Circuits
IEEE C62.2-1987	IEEE Guide for the Application of Gapped Silicon-Carbide Surge Arresters for Alternating Current Systems
ANSI/NEMA C29.9-1983	American National Standard for Wet-Process Porcelain Insulators - Apparatus, Post-Type.
CSA Z299.3-85	Quality Assurance Program – Category 3

3.2 Apply all reference publications and amendments listed within the above standards.

3.3 In case of conflict between any of the publications listed above, the governing standard shall be one which requires the highest quality of work and materials and afford the highest degree of safety to personnel as interpreted by the Engineer.

3.3 Other alternative standards may be used if approved by the Owner's Engineer.

## SPECIFICATION

### **4. EQUIPMENT, APPARATUS AND MATERIAL SUPPLIED BY OTHERS**

- 4.1 All high voltage leads and grounding conductors external to the surge arresters will be supplied and installed by others.
- 4.2 The galvanized steel structure required to support the surge arresters will be supplied and installed by others.

### **5. SURGE ARRESTER TECHNICAL INFORMATION**

#### 5.1 21kV Station Class Surge Arresters - Ratings and Data:

Quantity		6
Rated nominal system voltage (L-L)	kV rms	24.94
Rated maximum system voltage (L-L)	kV rms	27.4
Rated surge arrester voltage (L-N)	kV rms	21
Maximum Continuous Operating Voltage	kV rms	17
Rated frequency	Hz	60
Maximum 8/20 $\mu$ s Discharge Voltage	kV crest	54
Maximum Switching Surge Voltage	kV crest	45
Minimum Energy Capability	kJ/kV of MCOV	5.6
Maximum Current for Energy Rating	kA rms	100
Maximum Fault Current Capability	kA rms	65
Insulator Material		Porcelain Gray
Minimum Bushing Creepage (kV based on Phase to Phase Voltage)	mm/kV	25.0 (Level III - Heavy)

## SPECIFICATION

### 5.1/

Primary Line Terminals NEMA 4 Hole

Ground Connector NEMA 4 Hole

### 5.2 Surge Arrester Base:

- .1 The surge arrester shall have a three-legged base, fabricated from cast steel, as required to form a rigid vibration-free mounting for the complete assembly.
- .2 The mounting feet shall be spaced 120° apart from the centre of the arrester body. Each mounting foot shall have a slotted mounting hole fixed on a 22.2mm (8.75”) diameter bolt circle.
- .3 The complete base assembly shall be hot-dipped galvanized in accordance with G164 to a minimum of 610 g/m<sup>2</sup> of exposed surface area and in no case shall minimum thickness be less than 0.085 mm.

### 5.3 Surge Arrester Rating Plate:

- .1 Each surge arrester shall have a stainless steel rating plate securely attached near the mounting base containing the following information:
  - Manufacturer’s Name and Address
  - Surge Arrester Type, Catalogue Number & Serial Number
  - Rated Maximum Voltage
  - Rated Maximum Continuous Operating Voltage (MCOV)
  - Pressure Relief Amperes
  - Rated Frequency
  - Classification
  - Altitude Rating
  - Customer Order Number and Date of Manufacture

### 5.4 Surge Arrester Grounding:

- .1 A grounding pad shall be provided on the mounting base of the surge arrester to accommodate a 4/0 AWG – 500kcmil copper grounding conductor.



## **SPECIFICATION**

### **6. PACKING AND SHIPPING**

- 6.1 Each station class surge arrester shall be supplied fully assembled.
- 6.2 All crating shall be adequately designed and constructed to permit safe delivery and acceptable receipt of the surge arresters and components.

**SPECIFICATION**

**SECTION C**  
**SCHEDULES**

# **SPECIFICATION**

## **SECTION C**

### **SCHEDULES**

#### **1. INSTRUCTIONS**

- 1.1 Complete and submit with the tender and schedules contained in this section.
- 1.2 Incomplete schedules may render the tender inadmissible.

# SPECIFICATION

## SCHEDULE No. 1

### TECHNICAL INFORMATION

#### 1. 21kV STATION CLASS SURGE ARRESTERS

##### 1.1 General Information:

Manufacturer \_\_\_\_\_

Model No. / Designation \_\_\_\_\_

##### 1.2 Electrical Characteristics:

Rated nominal voltage (L-L) kV rms \_\_\_\_\_

Rated maximum voltage (L-L) kV rms \_\_\_\_\_

Rated frequency Hz \_\_\_\_\_

Rated surge arrester voltage (L-N) kV rms \_\_\_\_\_

Maximum Continuous Operating Voltage kV rms \_\_\_\_\_

Maximum 8/20 $\mu$ s Discharge Voltage kV crest \_\_\_\_\_

Rated minimum leakage distance mm \_\_\_\_\_

Maximum Switching Surge Voltage kV crest \_\_\_\_\_

Energy Capability kJ/kV of MCOV \_\_\_\_\_

Maximum Current for Energy Rating kA rms \_\_\_\_\_

Maximum Fault Current Capability kA rms \_\_\_\_\_

**SPECIFICATION**

**SCHEDULE No. 1**

**TECHNICAL INFORMATION (Cont'd)**

**1. 21kV STATION CLASS SURGE ARRESTERS (Cont'd)**

1.2 Electrical Characteristics (Cont'd):

Insulator Material/Colour		_____
Minimum Bushing Creepage (kV based on Phase to Phase Voltage)	mm/kV	_____
Primary Line Terminal		_____
Ground Connector		_____

1.3 Structural Data:

Overall Dimensions of the 21kV System Surge Arresters:

Height	mm	_____
Diameter	mm	_____
Weight	kg	_____
Cap (Top) Material		_____
Base Material		_____
HV Line Terminal Material		_____
HV Terminal Pad Configuration	NEMA	_____
Ground Terminal Material		_____
Ground Terminal Pad Configuration	NEMA	_____

**SPECIFICATION**

**SCHEDULE No. 2**

**DOCUMENTS TO BE SUBMITTED WITH TENDER**

**Drawing or Document Ref. No.**

Completed Schedules \_\_\_\_\_

Outline dimensions and layout  
of equipment and enclosures \_\_\_\_\_

Bills of Material \_\_\_\_\_

Catalogues \_\_\_\_\_

Instruction Pamphlets \_\_\_\_\_

Certified "Type Test" Reports  
(including list of Type Tests to be performed) \_\_\_\_\_

List of Recommended Spare Parts  
(Include prices for each item):

- readily available \_\_\_\_\_

- long delivery \_\_\_\_\_

List of required Special Tools \_\_\_\_\_

Bar chart progress schedule showing  
manufacture, delivery, issue of  
drawings, and all phases of the work \_\_\_\_\_

Transportation method and route (including  
details of trailer and wheel loading) \_\_\_\_\_

**SPECIFICATION**

**SCHEDULE No. 3**

**TENDERED VARIATIONS FROM THE SPECIFICATION**

The Tenderer shall detail hereunder, any variations from the terms and conditions of this Specification:

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**SPECIFICATION**

**SCHEDULE No. 4**

**ERECTION SUPERVISOR**

State the daily rate for the provision of a qualified person to supervise the erection and commissioning of the equipment being supplied.

The daily rate shall cover all costs such as salary, subsistence, local traveling within 30 kilometres of the jobsite, communications and the supply of any special tools he/she requires to properly perform the work.

Daily Rate for Erection Supervisor:                   \$ \_\_\_\_\_

Also provide details of any terms and conditions applicable to each supervisor:



## SPECIFICATION

### SCHEDULE No. 5

#### COMMENCEMENT AND COMPLETION DATES

	<u>Required Dates</u>	<u>Tendered Dates</u>
1. Issue of Purchase Order	7 February 2011	
2. Submit Bills of Material and Planning Schedule for review.	25 February 2011	
3. Submit assembly drawings, foundation and base plate details, layout and drilling details, single line diagrams, wiring diagrams, control schematics and drawings for review.	25 February 2011	
4. Submit performance curves and other supporting documentation.	15 March 2011	
5. Submit final copies of shop drawings	15 March 2011	
6. Submit draft copies of Operation and Maintenance Manuals.	15 March 2011	
7. Delivery of surge arresters, DDP F.O.R.C.E. Intertie Substation location Black Rock, Nova Scotia, 10km west of Parrsboro, Nova Scotia	25 March 2011	

**SPECIFICATION**

**SCHEDULE No. 6**

**SPARE PARTS LIST**

**Recommended Spare Parts**

**Quantity**

**Price (Cdn \$)**

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Total Price Carried to Schedule 8:

\$ \_\_\_\_\_

**SPECIFICATION**

**SCHEDULE No. 7**

**ACCESSORIES AND SPECIAL TOOLS LIST**

<b><u>Recommended Accessories and Special Tools</u></b>	<b><u>Quantity</u></b>	<b><u>Price (Cdn \$)</u></b>
1.		
2.		
3.		
4.		
5.		

Total Price Carried to Schedule 8: \$ \_\_\_\_\_

**SPECIFICATION**

**SCHEDULE No. 8**

**PRICE LIST**

<b><u>Item</u></b>	<b><u>Description</u></b>	<b><u>Qty</u></b>	<b><u>Price (Cdn \$)</u></b>
1.	Design, manufacture, factory test, delivery to site and provide warranty for six (6), 21kV (17kV MCOV) station class surge arresters.	lot	\$ _____
2.	Accessories and Special Tools (from Schedule No. 7)	lot	\$ _____
<b>Total Equipment Supply (Items 1 &amp; 2)</b>			<b>\$ _____</b>
	Transportation DDP FORCE Intertie Substation site. Black Rock, Nova Scotia, 10km west of Parrsboro, Nova Scotia	lot	\$ _____
	Canadian Customs Duty	lot	\$ _____
	Harmonized Sales Tax (HST)	13%	\$ _____
<b>Total Supply &amp; Deliver</b> FORCE Intertie Substation site. Black Rock, Nova Scotia, 10km west of Parrsboro, Nova Scotia			<b>\$ _____</b>
4.	Tenders shall provide a separate price for the following optional item:		
	Spare Parts List (from Schedule No. 6)	lot	\$ _____

**SPECIFICATION**

**SCHEDULE No. 9**

**FORM OF TENDER**

**Item: Six (6), 21kV (17kV MCOV) Station Class Surge Arresters**

Vendor Ref. No.: \_\_\_\_\_

1. Total Supply and Delivery (From Schedule No. 8): \$ \_\_\_\_\_
2. Terms of Payment: \_\_\_\_\_
3. Customs Clearance by: \_\_\_\_\_
4. Point of Shipment: \_\_\_\_\_
5. Promised Shipping Date: \_\_\_\_\_
6. INCOTERMS 2000 Definition: \_\_\_\_\_
7. Recommended Methods of Shipment: \_\_\_\_\_
8. Estimated No. of Packages:
  - Shipping Weight Each Package: \_\_\_\_\_
  - Shipping Dimensions Each Package: \_\_\_\_\_
9. Conditions of Guarantee: \_\_\_\_\_
10. Other: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Prepared by: \_\_\_\_\_

Date: \_\_\_\_\_