Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:

Bid Receiving Public Works and Government Services Canada/Réception des soumissions Travaux publics et Services gouvernementaux Canada
Pacific Region
401 - 1230 Government Street
Victoria, B.C.
V8W 3X4
Bid Fax: (250) 363-3344

REQUEST FOR PROPOSAL
DEMANDE DE PROPOSITION

Proposal To: Public Works and Government Services Canada

We hereby offer to sell to Her Majesty the Queen in right of Canada, in accordance with the terms and conditions set out herein, referred to herein or attached hereto, the goods, services, and construction listed herein and on any attached sheets at the price(s) set out therefor.

Proposition aux: Travaux Publics et Services Gouvernementaux Canada

Nous offrons par la présente de vendre à Sa Majesté la Reine du chef du Canada, aux conditions énoncées ou incluses par référence dans la présente et aux annexes ci-jointes, les biens, services et construction énumérés ici sur toute feuille ci-annexée, au(x) prix indiqué(s).

Comments - Commentaires

Title - Sujet
25KV UNIT SUBSTATION

Solicitation No. - N° de l'invitation	**Date**
F1700-130664/A	2014-01-13

Client Reference No. - N° de référence du client
F1700-130664

GETS Reference No. - N° de référence de SEAG
PW-$VIC-211-6407

File No. - N° de dossier	**CCC No./N° CCC - FMS No./N° VME**
VIC-3-36189 (211)	

Solicitation Closes - L'invitation prend fin
at - à 02:00 PM
on - le 2014-02-24

Time Zone
Fuseau horaire
Pacific Standard Time
PST

F.O.B. - F.A.B.
Plant-Usine: ☐ **Destination:** ☑ **Other-Autre:** ☐

Address Enquiries to: - Adresser toutes questions à:	**Buyer Id - Id de l'acheteur**
Park, Isabell	vic211

Telephone No. - N° de téléphone	**FAX No. - N° de FAX**
(250) 363-3981 ( )	( ) -

Destination - of Goods, Services, and Construction:
Destination - des biens, services et construction:

Specified Herein
Précisé dans les présentes

Instructions: See Herein

Instructions: Voir aux présentes

Vendor/Firm Name and Address
Raison sociale et adresse du fournisseur/de l'entrepreneur

Delivery Required - Livraison exigée	**Delivery Offered - Livraison proposée**
See Herein	

Vendor/Firm Name and Address
Raison sociale et adresse du fournisseur/de l'entrepreneur

Telephone No. - N° de téléphone
Facsimile No. - N° de télécopieur

Name and title of person authorized to sign on behalf of Vendor/Firm (type or print)
Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)

Signature **Date**

Issuing Office - Bureau de distribution
Public Works and Government Services Canada - Pacific Region
401 - 1230 Government Street
Victoria, B. C.
V8W 3X4

Canada

PART 1 - GENERAL INFORMATION

1. Security Requirement
There is no security requirement associated with the requirement.

2. Requirement
The requirement is detailed under Article 2 of the resulting contract clauses.

3. Debriefings
Bidders may request a debriefing on the results of the bid solicitation process. Bidders should make the request to the Contracting Authority within 15 working days of receipt of the results of the bid solicitation process. The debriefing may be in writing, by telephone or in person.

PART 2 - BIDDER INSTRUCTIONS

1. Standard Instructions, Clauses and Conditions
All instructions, clauses and conditions identified in the bid solicitation by number, date and title are set out in the *Standard Acquisition Clauses and Conditions Manual* (https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual) issued by Public Works and Government Services Canada.

Bidders who submit a bid agree to be bound by the instructions, clauses and conditions of the bid solicitation and accept the clauses and conditions of the resulting contract.

The 2003 (2013-06-01) Standard Instructions - Goods or Services - Competitive Requirements, are incorporated by reference into and form part of the bid solicitation.

2. Submission of Bids
Bids must be submitted only to Public Works and Government Services Canada (PWGSC) Bid Receiving Unit by the date, time and place indicated on page 1 of the bid solicitation.

2.1 Improvement of Requirement During Solicitation Period
Should bidders consider that the specifications or Statement of Work contained in the bid solicitation could be improved technically or technologically, bidders are invited to make suggestions, in writing, to the Contracting Authority named in the bid solicitation. Bidders must clearly outline the suggested improvement as well as the reason for the suggestion. Suggestions that do not restrict the level of competition nor favour a particular bidder will be given consideration provided they are submitted to the Contracting Authority at least 15 days before the bid closing date. Canada will have the right to accept or reject any or all suggestions.

3. Enquiries - Bid Solicitation
All enquiries must be submitted in writing to the Contracting Authority no later than 15 calendar days before the bid closing date. Enquiries received after that time may not be answered.

Bidders should reference as accurately as possible the numbered item of the bid solicitation to which the enquiry relates. Care should be taken by bidders to explain each question in sufficient detail in order to enable Canada to provide an accurate answer. Technical enquiries that are of a proprietary nature must be clearly marked "proprietary" at each relevant item. Items identified as "proprietary" will be treated as such except where Canada determines that the enquiry is not of a proprietary nature. Canada may edit the questions or may request that the Bidder do so, so that the proprietary nature of the question is eliminated, and the enquiry can be answered with copies to all bidders. Enquiries not submitted in a form that can be distributed to all bidders may not be answered by Canada.

4. Applicable Laws
Any resulting contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in British Columbia.

Bidders may, at their discretion, substitute the applicable laws of a Canadian province or territory of their choice without affecting the validity of their bid, by deleting the name of the Canadian province or territory specified and inserting the name of the Canadian province or territory of their choice. If no change is made, it acknowledges that the applicable laws specified are acceptable to the bidders.

PART 3 - BID PREPARATION INSTRUCTIONS

1. Bid Preparation Instructions
Canada requests that bidders provide their bid in separately bound sections as follows:

Section I: Technical Bid (1 hard copies)
Section II: Financial Bid (1 hard copies)
Section III: Certifications (1 hard copies)

Prices must appear in the financial bid only. No prices must be indicated in any other section of the bid.

Canada requests that bidders follow the format instructions described below in the preparation of their bid:
(a) use 8.5 x 11 inch (216 mm x 279 mm) paper;
(b) use a numbering system that corresponds to the bid solicitation.

In April 2006, Canada issued a policy directing federal departments and agencies to take the necessary steps to incorporate environmental considerations into the procurement process Policy on Green Procurement (http://www.tpsgc-pwgsc.gc.ca/ecologisation-greening/achats-procurement/politique-policy-eng.html). To assist Canada in reaching its objectives, bidders should:

1) use 8.5 x 11 inch (216 mm x 279 mm) paper containing fibre certified as originating from a sustainably-managed forest and containing minimum 30% recycled content; and

2) use an environmentally-preferable format including black and white printing instead of colour printing, printing double sided/duplex, using staples or clips instead of cerlox, duotangs or binders.

Section I: Technical Bid
In their technical bid, bidders should explain and demonstrate how they propose to meet the requirements and how they will carry out the Work.

Section II: Financial Bid
Bidders must submit their financial bid in accordance with the Basis of Payment. The total amount of Goods and Services Tax (GST) or Harmonized Sales Tax (HST) must be shown separately, if applicable.

1.1 Exchange Rate Fluctuation
The requirement does not provide for exchange rate fluctuation protection. Any request for exchange rate fluctuation protection will not be considered and will render the bid non-responsive.

Section III: Certifications
Bidders must submit the certifications required under Part 5.

PART 4 - EVALUATION PROCEDURES AND BASIS OF SELECTION

1. Evaluation Procedures

(a) Bids will be assessed in accordance with the entire requirement of the bid solicitation including the technical and financial evaluation criteria.

(b) An evaluation team composed of representatives of Canada will evaluate the bids.

1.1 Technical Evaluation

1.1.1 Mandatory Technical Criteria
Contractor must meet all requirements identified in the Annex C - Section 26 11 13 - Unit Substation, Part 2 – Products.

1.2 Financial Evaluation

1. The price of the bid will be evaluated in Canadian Dollars, the Goods and Services Tax or the Harmonized Sales Tax excluded; Delivered Duty Paid (DDP) Destination Incoterms 2000, and Canadian customs duties and excise taxes included.

2. Bids submitted in foreign currency will be converted to Canadian currency for evaluation purposes. The nominal noon exchange rate given by the Bank of Canada (http://www.bankofcanada.ca/en/rates/exchform.html) in effect on the solicitation closing date will be applied as a conversion factor to the offers submitted in foreign currency.

2. Basis of Selection

2.1 Basis of Selection - Mandatory Technical Criteria
A bid must comply with the requirements of the bid solicitation and meet all mandatory technical evaluation criteria to be declared responsive. The responsive bid with the lowest evaluated price will be recommended for award of a contract.

PART 5 - CERTIFICATIONS

Bidders must provide the required certifications and related documentation to be awarded a contract. Canada will declare a bid non-responsive if the required certifications and related documentation are not completed and submitted as requested.

Compliance with the certifications bidders provide to Canada is subject to verification by Canada during the bid evaluation period (before award of a contract) and after award of a contract. The Contracting Authority will have the right to ask for additional information to verify bidders' compliance with the certifications before award of a contract. The bid will be declared non-responsive if any certification made by the Bidder is untrue, whether made knowingly or unknowingly. Failure to comply with the certifications, to provide the related documentation or to comply with the request of the Contracting Authority for additional information will also render the bid non-responsive.

1. Mandatory Certifications Required Precedent to Contract Award

1.1 Code of Conduct and Certifications - Related documentation
By submitting a bid, the Bidder certifies that the Bidder and its affiliates are in compliance with

the provisions as stated in Section 01 Code of Conduct and Certifications - Bid of Standard Instructions 2003. The related documentation therein required will assist Canada in confirming that the certifications are true.

PART 6 - RESULTING CONTRACT CLAUSES

1. Security Requirement
There is no security requirement associated with the requirement.

2. Requirement
The Contractor must provide the items detailed under the Annex C - Section 26 11 13 - Unit Substation.

3. Standard Clauses and Conditions
All clauses and conditions identified in the Contract by number, date and title are set out in the *Standard Acquisition Clauses and Conditions Manual*(https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual) issued by Public Works and Government Services Canada.

3.1 General Conditions
2010A (2013-04-25), General Conditions - Goods (Medium Complexity), apply to and form part of the Contract.

4. Term of Contract

4.1 Delivery Date
All the deliverables must be received on or before _____ (*insert the date*).

5. Authorities

5.1 Contracting Authority
The Contracting Authority for the Contract is:

Ji-Yon Isabell Park
Supply Specialist
Public Works and Government Services Canada
Acquisitions, Victoria
Address: 1230 Government Street, Suite 401, Victoria, BC V8W 3X4
Telephone: 250-363-3981
E-mail address: ji-yonisabell.park@pwgsc.gc.ca

The Contracting Authority is responsible for the management of the Contract and any changes to the Contract must be authorized in writing by the Contracting Authority. The Contractor must not perform work in excess of or outside the scope of the Contract based on verbal or written requests or instructions from anybody other than the Contracting Authority.

5.2 Project Authority
The Project Authority for the Contract is: **TBA**

The Project Authority is the representative of the department or agency for whom the Work is being carried out under the Contract and is responsible for all matters concerning the technical content of the Work under the Contract. Technical matters may be discussed with the Project Authority, however the Project Authority has no authority to authorize changes to the scope of the Work. Changes to the scope of the Work can only be made through a contract amendment issued by the Contracting Authority.

5.3 Contractor's Representative

Name:

Title:

Address:

Telephone:

Facsimile:

Email:

6. Payment

6.1 Basis of Payment

In consideration of the Contractor satisfactorily completing its obligations under the Contract, the Contractor will be paid a firm price for a cost of $ (*insert the amount at contract award*). Customs duties are included and Goods and Services Tax or Harmonized Sales Tax is extra, if applicable.

For the firm price portion of the Work only, Canada will not pay the Contractor for any design changes, modifications or interpretations of the Work unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work.

6.2 Multiple Payments

Canada will pay the Contractor upon completion and delivery of units in accordance with the payment provisions of the Contract if:

a. an accurate and complete invoice and any other documents required by the Contract have been submitted in accordance with the invoicing instructions provided in the Contract;
b. all such documents have been verified by Canada;
c. the Work delivered has been accepted by Canada.

6.3 T1204 - Direct Request by Customer Department

1. Pursuant to paragraph 221 (1)(d) of the *Income Tax Act*, R.S. 1985, c. 1 (5th Supp.), payments made by departments and agencies to contractors under applicable services contracts (including contracts involving a mix of goods and services) must be reported on a T1204 Government Service Contract Payments slip.

2. To enable departments and agencies to comply with this requirement, the Contractor must provide Canada, upon request, its business number or Social Insurance Number, as applicable. (These requests may take the form of a general call-letter to contractors, in writing or by telephone).

7. Invoicing Instructions

1. The Contractor must submit invoices in accordance with the section entitled "Invoice Submission" of the general conditions. Invoices cannot be submitted until all work identified in the invoice is completed.

2. Invoices must be distributed as follows:

   a) The original and one (1) copy must be forwarded to the address shown on page 1 of the Contract for certification and payment.

b) One (1) copy must be forwarded to the Contracting Authority identified under the section entitled "Authorities" of the Contract.

8. Certifications

8.1 Compliance

Compliance with the certifications and related documentation provided by the Contractor in its bid is a condition of the Contract and subject to verification by Canada during the term of the Contract. If the Contractor does not comply with any certification, provide the related documentation or if it is determined that any certification made by the Contractor in its bid is untrue, whether made knowingly or unknowingly, Canada has the right, pursuant to the default provision of the Contract, to terminate the Contract for default.

9. Applicable Laws

The Contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in (*Insert the name of the province or territory as specified by the Bidder in its bid, if applicable*).

10. Priority of Documents

If there is a discrepancy between the wording of any documents that appear on the list, the wording of the document that first appears on the list has priority over the wording of any document that subsequently appears on the list.

(a) the Articles of Agreement;
(b) the general conditions 2010A (2013-04-25), General Conditions - Goods (Medium Complexity);
(c) Annex A- Summary of Work;
(d) Annex C - Section 26 11 13 - Unit Substation;
(e) Annex B – Basis of Payment;
(f) the Contractor's bid dated (*insert date of bid*).

11. Insurance

The Contractor is responsible for deciding if insurance coverage is necessary to fulfill its obligation under the Contract and to ensure compliance with any applicable law. Any insurance acquired or maintained by the Contractor is at its own expense and for its own benefit and protection. It does not release the Contractor from or reduce its liability under the Contract.

Annex A – Summary of Work

1.1 BACKGROUND

.1 The existing service substation at the Conuma River Hatchery is due for replacement. The current system employs a single transformer to step down from 138kV directly to 600V. Due to the non-availability of a direct replacement transformer, Fisheries and Oceans Canada purchased a 4MVA 138kV/25kV transformer which is currently in storage awaiting installation. In order to get to the required 600V, a new 25kV/600V unit transformer is also needed. This contract is for the supply only of 25kV/600V transformer, with installation services being included as optional scope.

1.2 LOCATION

.1 The Conuma Hatchery is located at the head of Tlupana Inlet, off Nootka Sound on the West Coast of Vancouver Island, British Columbia. The hatchery is located approximately 45 minutes from the Village of Gold River. Access is via Highway 28 from Campbell River to Gold River, then 38 km along Head Bay Forestry Road towards Tahsis.

1.3 SCOPE OF WORK

.1 The scope of work is as per the attached specifications and drawings.

1.4 COMMENCEMENT AND COMPLETION

.1 The Contractor will commence work immediately after contract award. A completion schedule is to be provided with the Schedule of Prices.

1.5 DRAWINGS

.1 Details of the work are shown on DFO Drawings. The following is a list of the drawings, which are attached to, and form part of, these specifications:

DWG FILE NO.	TITLE
E01	Proposed Single Line Diagram For New Substation and Distribution Upgrades

.2 The above drawings will be supplemented by manufacturer's shop drawings.

.3 The Contractor shall examine all drawings in advance of construction and shall advise the Engineer of any apparent errors, discrepancies or inconsistencies, in order that the Engineer can provide instructions clarifying the design.

.4 The Contractor shall also advise the Engineer of any discrepancies or apparent inconsistencies between the drawings and the specifications, in order that the Engineer may clarify the intent of the Contract.

1.6 SITE INSPECTION

.1 There will be no formal pre-award site meeting.

1.7 MEASUREMENT AND PAYMENT

The quantities stated in the Schedule of Prices are given for the purpose of providing a basis for comparison. Payment will be made only on authorized quantities as determined in the field by the Engineer. No guarantee is given that actual quantities will conform in any way with the quantities shown. Offers and payment for the work supplied by the Contractor shall be at the unit rate prices of the schedule whether the quantities are increased or decreased. The work may be terminated or extended at the discretion of the Engineer.

.1 Payment will be based upon the prices set out in the attached Schedule of Prices.

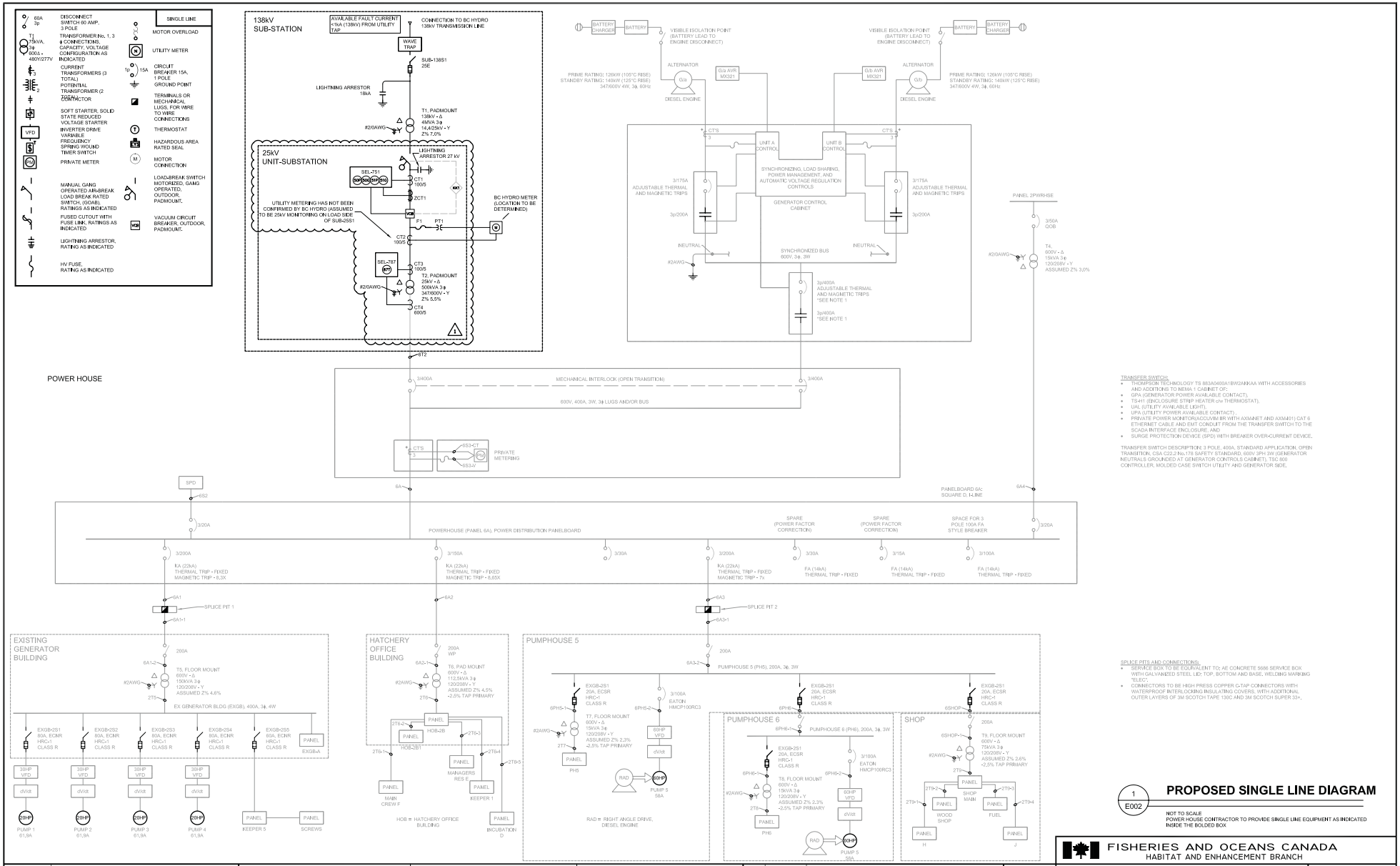
.2 In the case of a lump sum price, partial payment will be made based on the Fisheries and Oceans Canada representative's estimate of the work completed at time of payment.

.3 In the case of a unit price, payment will be made on the basis of the item called up in the Schedule of Prices. Invoices must be submitted which refer to the various items in the Schedule of Prices indicating a breakdown of the time and unit price.

Annex B - Basis of Prices

	COST
Unit Sub Station	$
Maintenance services	$
Warranty	$
As-built drawings	$
Site start up, commissioning and training services	$
	$
	$
TOTAL (without GST)	$

Completion Schedule	DATE
Unit Sub Station manufacture	
On-site delivery	



TRANSFER SWITCH:

- THOMPSON TECHNOLOGY TS 863A0400A1BW2ANKAA WITH ACCESSORIES AND ADDITIONS TO NEMA 1 CABINET OF:
- GPA (GENERATOR POWER AVAILABLE CONTACT),
- TS-411 (ENCLOSURE STRIP HEATER c/w THERMOSTAT),
- UAL (UTILITY AVAILABLE LIGHT),
- UPA (UTILITY POWER AVAILABLE CONTACT),
- PRIVATE POWER MONITOR/ACCUVIM IR WITH AX04-NET AND AX04401 CAT 6 ETHERNET CABLE AND EMT CONDUIT FROM THE TRANSFER SWITCH TO THE SCADA INTERFACE ENCLOSURE, AND
- SURGE PROTECTION DEVICE (SPD) WITH BREAKER OVER-CURRENT DEVICE.

TRANSFER SWITCH DESCRIPTION: 3 POLE, 400A, STANDARD APPLICATION, OPEN TRANSITION, CSA C22.2 No.178 SAFETY STANDARD, 600V 3PH 3W (GENERATOR NEUTRALS GROUNDED AT GENERATOR CONTROLS CABINET), TSC 800 CONTROLLER, MOLDED CASE SWITCH UTILITY AND GENERATOR SIDE.

SPLICE PITS AND CONNECTIONS:

- SERVICE BOX TO BE EQUIVALENT TO: AE CONCRETE 5686 SERVICE BOX WITH GALVANIZED STEEL LIDS TOP, BOTTOM AND BASE, WELDING MARKING "ELEC".
- CONNECTORS TO BE HIGH PRESS COPPER C-TAP CONNECTORS WITH WATERPROOF INTERLOCKING INSULATING COVERS, WITH ADDITIONAL OUTER LAYERS OF 3M SCOTCH TAPE 130C AND 3M SCOTCH SUPER 33+.

1 / E002

PROPOSED SINGLE LINE DIAGRAM

NOT TO SCALE
POWER HOUSE CONTRACTOR TO PROVIDE SINGLE LINE EQUIPMENT AS INDICATED INSIDE THE BOLDED BOX

FISHERIES AND OCEANS CANADA
HABITAT AND ENHANCEMENT BRANCH

1. EQUIPMENT SHOWN OUTSIDE THE UNIT-SUB IS FOR INFORMATION ONLY AND IS NOT PART OF THIS SUPPLY CONTRACT.

NOTES

EMPAC ENGINEERING LTD.
186 COLUMBIA AVENUE, CASTLEGAR, B.C. V1N 1A9
PHONE: (250) 365-6455 FAX: (250) 365-6414
WEBSITE: www.empac.ca

READY Engineering
READY ENGINEERING CORPORATION
PHONE: 403-327-2919
FAX: 780-960-6664
WEBSITE: www.readyengineering.com

NO.	DATE	REVISIONS
2	12/09/2013	REVISED TO DELTA-WYE - ISSUED FOR TENDER
1	12/05/2013	ISSUED FOR TENDER
0	Oct.28/2013	Issued for Discussion

DWG. NO. | REFERENCE DRAWINGS

DESIGNED MER
DRAWN SCY
CHECKED RCS
RECOMMENDED
APPROVED
APPROVED

CONUMA HATCHERY
PROPOSED SINGLE LINE DIAGRAM
FOR NEW SUBSTATION
AND DISTRIBUTION UPGRADES

SCALE AS SHOWN
DATE Dec.9, 2013
DRAWING NUMBER E01
REVISION 2

ANNEX C - SECTION 26 11 13.01

UNIT SUBSTATION TO 25KV

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 This specification covers the design, supply and testing of a unit substation including a 500kVA K-rated (k=11) liquid-immersed power transformer, load-break switch, circuit breakers, and instrument transformers. The references and herein apply to all outdoor pad-mounted high-voltage power apparatus will be installed outdoors in substation yards. Termination types are also detailed in this document.

.2 The purpose of the guidelines in this specification is to ensure that the electrical power system is designed to be economical, safe, reliable, and maintainable.

1.2 SYSTEM DESCRIPTION

.1 The following items make up the system discussed throughout this document:

- .1 One tamper-resistant pad-mount substation, with transformer and switchgear assembled as separate pieces of equipment.
- .2 Substation is used to feed the Conuma Hatchery 600V network from the 25kV network. Substation is not intended to be used for paralleling the two networks and strict operating procedures will be in place to prevent this from occurring.
- .3 Substation to be equipped with 25kV and 600V isolation switches and circuit-breakers, control power transformers, current transformers and overcurrent protection.

1.3 REFERENCES

.1 General

- .1 BC Hydro: Must comply with the applicable rules and regulations of the BCSA, BC Electrical Code and other regulating authorities having jurisdiction at the site.
- .2 BC Hydro Distribution Standards – Requirements for Customer-Owned Primary Services Supplied at 4kV to 35kV – Primary Guide.
- .3 CSA Std C22.1 (CEC Part 1), Rule 36-202, Rating and Capacity, paragraph (b): the type and rating of circuit breakers, fuses and switches, including the trip settings of circuit breakers and interrupting capacity of overcurrent devices shall be in compliance with the requirements of the supply authority.

.2 Canadian Standards Association (CSA):

- .1 CAN/CSA C88 Power Transformers and Reactors;
- .2 CAN/CSA-C227.4-06 (R2011) - Three-Phase, Pad-Mounted Distribution Transformers with Separable Insulated High-Voltage Connectors;
- .3 CAN/CSA-C802.3-01 (R2012) - Maximum Losses for Power Transformers;
- .4 CAN/CSA-C22.2 No.31-10, Switchgear Assemblies;
- .5 CSA C22.2 No.58-M1989 (R2010), High-Voltage Isolating Switches;
- .6 CSA Std. C13 Instrument Transformers; and

.7 CSA Std. C50 Insulating Oil, Electrical for Transformers and Switches.

.3 Electrical and Electronic Manufacturers Association of Canada (EEMAC):
- .1 B6-1 Insulating Mineral Oil for New Electrical Apparatus;
- .2 GL-1-2 Power transformer and Reactor Bushings;
- .3 L10-1 Load-Tap-Changing Paralleling Schemes;
- .4 L13-1 Dielectric Tests and Test Procedures for Power Transformers;
- .5 L14-1 Liquid Level Indicators for Power Transformers; and
- .6 L15-1 Temperature Indicators for Power Transformers.

.4 IEEE & American National Standards Institute (ANSI):
- .1 IEEE C37.04 Standard Rating Structure for AC High-Voltage Circuit Breakers
- .2 IEEE C37.06 Standard for AC High-Voltage Circuit Breakers Rated ona Symmetrical Current Basis – Preferred Ratings and Related Required Capabilities for Voltages Above 1000V
- .3 IEEE C37.09 Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrcial Current Basis – Amendment 2: To Change the Description of Transient Recovery Voltage for Harmonization with IEC 62271-100
- .4 IEEE C37.20.2 Standard for Metal-Clad Switchgear
- .5 IEEE C37.20.3 Standard for Metal-Enclosed Interrupter Switchgear
- .6 IEEE C37.30.1 Standard Requirements for AC High-Voltage Air Switches Rated Above 1000V
- .7 IEEE C37.90 Standard for Relays and Relay Systems Associated with Electrical Power Apparatus.
- .8 IEEE C37.90.1 IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electrical Power Apparatus.
- .9 IEEE C57.19.00 Standard General Requirements and Test Procedures for Power Apparatus Bushings.
- .10 IEEE C57.19.100 Guide for Application of Power Apparatus Bushings.
- .11 IEEE C62.11 Standard for Metal-Oxide Surge Arrester for AC Power Circuits (> 1kV)
- .12 IEEE C57.13 Standard Requirements for Instrument Transformers
- .13 IEEE C57.12.01 General Requirements for Dry-Type Distribution and Power Transformers, Including Those with Solid-Cast and/or Resin Encapsulated Windings.
- .14 ANSI / NETA ATS-2009 Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems.
- .15 IEEE C57.12.00 Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
- .16 IEEE C57.12.01 General Requirements for Dry-Type Distribution and Power Transformers, Including Those with Solid-Cast and/or Resin Encapsulated Windings.
- .17 IEEE C57.12.90 Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers
- .18 ANSI C57.12.29 American National Standard for Switchgear and Transformers—Pad- Mounted Equipment—Enclosure Integrity for Coastal Environments
- .19 IEEE Std C57.12.28 Standard for Pad-Mounted Equipment—Enclosure Integrity
- .20 IEEE Std C37.20.2 Standard for Metal-Clad Switchgear
- .21 IEEE Std C37.30.1 Standard Requirements for AC High-Voltage Air Switches Rated Above 1000V
- .22 IEEE C57.12.90 Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers

.23 IEEE C57.12.28 Pad-Mounted Equipment - Enclosure Integrity.
.24 IEEE 386 Separable Insulated Connector Systems for Power Distribution Systems above 600 V.

All equipment and materials rated 600 volts and under shall include a CSA label. Equipment and materials rated over 600 volts shall be provided with supporting data to show conformity with any of the above noted standards.

Distribution transformers cover from 3 to 500 kVA and power transformers are above 500 kVA as defined in IEEE Std. 141-1993 (Red Book).

1.4 EXTRA MATERIALS

.1 Include:
- .1 Fuses:
  - .1 3 fuse refills for each type above 600A.
  - .2 6 fuse refills for each type up to and including 600A.
- .2 Lightning Arrestors:
  - .1 1 spare arrestor for each type.
- .3 Auxiliary Relays
  - .1 3 spare relays for each type.

1.5 GENERAL CONDITIONS

.1 Order of Precedence
- .1 This specification provides supplemental information on regulatory codes, standards and drawings. The stricter requirement shall be followed in the case of discrepancies.

  Under no circumstances shall drawings or this specification be interpreted as reducing the requirements of regulatory codes and standards.

  Any exceptions or deviations shall be defined and submitted with the quotation.

.2 Documentation
- .1 The following items are important documentation requirements and should be followed whenever possible:
  - .1 Drawings shall be submitted to the Owner for approval prior to the manufacture of the equipment.
  - .2 It is preferred that all vendor documentation be supplied in electronic PDF format as noted in the RFQ document.
  - .3 The units of measurement shall be Imperial Units accompanied by SI Units in brackets.

1.6 SITE LOCATION AND ENVIRONMENTAL CONDITIONS

.1 Location - At the head of Tlupana Inlet, off Nootka Sound on the West Coast of Vancouver Island, British Columbia, Canada.

.2 Average Daily Temperature 10 °C

.3 Historical Maximum Daily Temperature 32 °C

.4 Historical Minimum Daily Temperature -10 °C (i.e., 10 °C below zero)

.5	Average Yearly Rainfall	271 mm
.6	Historical Maximum Daily Rainfall	211 mm
.7	Average Yearly Snowfall	< 2 cm
.8	Historical Maximum Daily Snowfall	27 cm
.9	Geography	Sea coast
.10	Elevation	< 1000 m

PART 2 – PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

.1 Some general requirements have been determined for the project outlined in this document. Requirements for various specifications are numbered throughout this document for ease of referral should a discussion be necessary. General requirements for the scope can be summarized as follows:

- .1 The enclosure integrity of the tank and cabinet to meet the requirements for tamper resistance set forth in ANSI C57.12.28 or equivalent CSA standard.
- .2 Entire substation to be tamper-resistant from outside. All doors to be equipped with tamper-resistant pad-lockable hasps in addition to requiring a special-tool for opening (a penta-head socket for example).
- .3 No external auxiliary devices or fittings that are susceptible to vandalism or tampering are permitted. Any such required devices are to be mounted behind the tamper-resistant doors.
- .4 Outdoor pad-mount style, suitable for mounting on concrete pad.
- .5 Low voltage and high voltage compartments equipped with individual doors and to be separated by metallic barriers, or as required in the individual equipment sections.
- .6 Include one complete spare set of each fuse type, including control fuses.
- .7 All descriptive labels and nameplates to be permanent engraved type, mechanically fastened.
- .8 Provide a two-year warranty. (Five years on coatings).

2.2 BUSHING & INSULATOR DESIGN REQUIREMENTS FOR OUTDOOR APPARATUS

.1 Creep Distance – all bushings and insulators shall have sufficient creep distance for reliable operation in a coastal sea salt environment.

.2 Contamination Level – at a minimum, all bushings and insulators shall be rated for a contamination level of “Heavy”, as per IEEE Std C57.19.100 Guide for Application of Power Apparatus Bushings, Table 1.

2.3 LOAD BREAK SWITCH DESIGN REQUIREMENTS

.1 The following items make up the Load Break Switch Design Requirements:

- .1 Voltage Rating – suitable for 25kV line voltage, 3ph-4wire, 60Hz.
- .2 Current Rating – as required by site and by standards.

.3 BIL – equal to or greater than 150kV.

.4 Switch

.1 Switch shall be air-insulated.

.2 Load Break Switch blades shall be motorized gang-operated. The blades shall be opened and closed by either motorized or by external operating handle. Power for the motorized operation shall be load-side 120V, 1ph, 60Hz (by others).

.5 Enclosure

.1 Pad mounted, bottom cable entry, top bushing load connection.

.2 Enclosure shall be metal enclosed, suitable for power switchgear.

.3 Enclosure shall be constructed to meet the required seismic zone of the area of the site.

.4 Outdoor, gasketed, ventilated with stainless steel metal mesh filters. Mesh openings shall be no larger than 1/16” x 1/16”. Enclosure shall be suitable for coastal environment of salt sea air and high humidity.

.5 Load-side Bushings – external. Suitable for coastal environment of salt sea air and high humidity.

.6 Manual Operating Handle – Handle shall have two distinct operating positions corresponding to the air switch’s positions of closed and open. A pointer attached to the handle shall be provided for easy identification of the handle’s position. Handle shall have provisions for pad-locking. Handle height above grade shall not exceed 1.5m.

.7 Chain Operation – if a chain is used between the operating handle and the opening mechanism, a guard shall be provided so that if the chain breaks it will not come into contact with any live parts.

.8 Load-break switch shall be key-interlocked (K1) with the downstream vacuum circuit breaker. The load-break switch shall not be opened unless the key is inserted and turned in the lock mechanism on the manual operating handle. Once the load-break switch is open, the key is held captive. The key cannot be released until the load-break switch is returned to its closed position.

.9 Viewing Window – window shall be of wired glass or heat-tempered plate, and shall be sized and positioned such that a viewer can conveniently observe all switch blade status with the access door closed.

.10 Viewing Compartments – inside surfaces of compartments which have viewing windows shall be painted white.

.11 All exposed cable connections and buswork must be covered with removable insulation board to prevent accidental contact with energized live parts.

.12 Heaters and Humidistats – the Load Break Switch shall be provided with heaters and humidistats to maintain temperature and control moisture. Heaters shall be controlled by the humidistat (user adjustable) and rated for 120V, 1ph, 60Hz. Power for heaters and humidistat shall be provided by others.

.13 Utility Service Entrance

.1 The utility service entrance compartment shall comply with all requirements of BC Hydro “Requirements for Customer-Owned Primary Services Supplied at 4kV to 35kV – Primary Guide”. Specific attention is drawn to but not limited to drawings PG C1-01.01, .02, .03 and PG C1-02.01, .02.

.2 Grounding ball studs (e.g. AB Chance Catalog No C600-2102 or equal) shall be permanently mounted on each of the phase bus bars, as well as the equipment ground bus in the service entrance compartment. Ball studs shall be positioned

such that they will accept universal grounding ball clamps operated from hotsticks.

.3 All exposed cable connections and buswork inside the service entrance compartment must be covered with a removable insulation board to prevent accidental contact with energized parts. Alternatively, the buswork may be covered with rated polymer based material, whereas cable connections and grounding balls may be covered with adequately rated, removable insulation boots.

.4 Service termination bus shall be furnished with a NEMA 2-hole pattern.

.5 The ground/neutral bus shall have a minimum of qty=4, 2-hole NEMA patterns. The ground/neutral bus shall be designed to allow installation of grounding/neutral connectors and associated hardware (by others).

.6 Inverted cable terminations are not allowed.

.7 Minimum clearance between the assembled termination, including high-side grounding ball, and the compartment door shall be at least 225mm.

.8 Cable clamps shall be used to provide support for the incoming cables. Cable clamps shall be mounted with ½" hardware.

.9 The service entrance door or cover shall include a hasp that is compatible with standard lock dimensions of: shackle diameter – 9mm; shackle vertical clearance – 25mm; shackle horizontal clearance – 25mm.

.10 Service entrance compartment door or cover shall be secured with minimum three (3) Pentabolts. Pentabolt shroud dimension shall be 30mm ID x 30mm long.

.14 Drawings

.1 Submittal drawings shall be included with vendor quotation package. Submittal drawings shall include but not be limited to:

.1 Plan and Elevation mechanical drawings showing dimensions; weights; center-of-gravity; lift points; cable entry/exit; details of utility service entrance; construction details such as window location and dimensions, interior layout, interior finish, enclosure material; exterior finish; layout of critical components; and bill-of-material including manufacturer, make and model of critical components along with their agency listing (e.g. UL, CSA, etc).

.2 Mechanical drawings showing details of switch operation, including but not limited to motorized mechanism, manual handle, manual operating mechanism, etc.

.3 Electrical drawings showing both power and control schematics and all current and voltage ratings, and all applicable CW and FW BIL ratings. Schematics to include power requirements for all control components, I/O points, etc.

.4 Submittal drawings must be approved prior to release-to-manufacture.

.2 As-Built Drawings. As-Built drawings shall include but not be limited to:

.1 Plan and Elevation mechanical drawings showing dimensions; weights; center-of-gravity; lift points; cable entry/exit; details of utility service entrance; construction details such as window location and dimensions, interior layout, interior finish, enclosure material; exterior finish; layout of critical components; and bill-of-material including manufacturer, make and model of all components along with their agency listing (e.g. UL, CSA, etc).

.2 Mechanical drawings showing details of switch operation, including but not limited to motorized mechanism, manual handle, manual operating mechanism, etc.

.3 Electrical drawings showing both power and control schematics and all current and voltage ratings, and all applicable CW and FW BIL ratings. Schematics to include power requirements for all control components, I/O points, etc.

.4 As-built drawings must be approved prior to release-for shipment.

.15 Test Reports – applicable test reports shall be submitted for approval prior to shipment. Shipment shall not occur until test reports have been approved.

2.4 CIRCUIT BREAKER DESIGN REQUIREMENTS

.1 Voltage Rating – suitable for 25kV line voltage, 3ph-4wire, 60Hz.

.2 Current Rating – as required by site and by standards.

.3 Short-circuit rating – greater than 11.5kA symmetric and 20kA asymmetric.

.4 BIL – equal to or greater than 125kV.

.5 Breaker

.1 Breaker shall be vacuum-insulated, draw-out type. Opening time shall be less than or equal to 8 cycles.

.2 Vacuum breaker shall be gang-operated. Trip mechanism for each phase shall be mechanically linked and the electronic control shall be set so that a trip on any one phase shall simultaneously trip all three phases.

.3 The vacuum breaker shall be opened, closed and reset by either motorized or by external operating handle. Power for the motorized operation shall be load-side 120V, 1ph, 60Hz (by others).

.4 Stored energy voltage trip schemes are not allowed.

.5 The vacuum breaker shall incorporate a trip-free mechanism to prevent the possibility of the holding the interrupter mechanism closed under a faulted circuit condition.

.6 Enclosure

.1 Pad mounted, top bushing for both line-side and load-side connections.

.2 Enclosure shall be metal-clad, suitable for power switchgear.

.3 Enclosure shall be constructed to meet the required seismic zone of the area of the site.

.4 Outdoor, gasketed, ventilated with stainless steel metal mesh filters. Mesh openings shall be no larger than 1/16” x 1/16”. Enclosure shall be suitable for coastal environment of salt sea air and high humidity.

.5 Bushings – external. Suitable for coastal environment of salt sea air and high humidity.

.6 Manual Operating Handle – Handle shall have three distinct operating positions corresponding to the vacuum breaker positions of closed, open and tripped. A pointer attached to the handle shall be provided for easy identification of the handle’s position. Handle shall have provisions for pad-locking. Handle height above grade shall not exceed 1.5m.

.7 Chain Operation – if a chain is used between the operating handle and the opening mechanism, a guard shall be provided so that if the chain breaks it will not come into contact with any live parts.

.8 Vacuum breaker shall be key-interlocked (K1) with the upstream load-break switch. The vacuum breaker switch shall not be closed unless the key is inserted and turned in the lock mechanism on the manual operating handle. Once the vacuum breaker is closed, the key is held captive. The key cannot be released until the vacuum breaker is in its open position.

.9 Inside surfaces of compartments shall be painted white.

.10 All exposed cable connections and buswork must be covered with removable insulation board to prevent accidental contact with energized live parts.

.11 Heaters and Humidistats – the vacuum breaker shall be provided with heaters and humidistats to maintain temperature and control moisture. Heaters shall be controlled by the humidistat (user adjustable) and rated for 120V, 1ph, 60Hz. Power for heaters and humidistat shall be provided by others.

.12 The vacuum circuit breaker shall be provided with compartment for all instrumentation, protective relays, etc. This compartment shall be provided with heaters and humidistats to maintain temperature and control moisture. Heaters shall be controlled by the humidistat (user adjustable) and rated for 120V, 1ph, 60Hz. Power for heaters and humidistat shall be provided by others.

.13 The vacuum circuit breaker shall be provided with ground and phase overcurrent protective relays, ANSI designation 50P, 50G, 51P, 51G, Schweitzer Type SEL-751 or equal. Shorting blocks shall be provided for all CTs. Power for relays shall be 120V, 1ph, 60Hz and provided by others.

.14 The vacuum circuit breaker shall be provided with ground and phase overcurrent protective relays, ANSI designation 50P, 50G, 51P, 51G, Schweitzer Type SEL-751 or equal. Shorting blocks shall be provided for all CTs. Power for relays shall be 120V, 1ph, 60Hz and provided by others.

.15 Drawings

.1 Submittal drawings shall be included with vendor quotation package. Submittal drawings shall include but not be limited to:

.1 Plan and Elevation mechanical drawings showing dimensions; weights; center-of-gravity; lift points; cable entry/exit; details of utility service entrance; construction details such as window location and dimensions, interior layout, interior finish, enclosure material; exterior finish; layout of critical components; and bill-of-material including manufacturer, make and model of critical components along with their agency listing (e.g. UL, CSA, etc).

.2 Mechanical drawings showing details of vacuum breaker, manual handle operation, including but not limited to motorized mechanism, manual handle, manual operating mechanism, etc.

.3 Electrical drawings showing both power and control schematics and all current and voltage ratings, and all applicable CW and FW BIL ratings. Schematics to include power requirements for all control components, I/O points, relays, CTs, etc.

.4 Submittal drawings must be approved prior to release-to-manufacture.

.2 As-Built Drawings. As-Built drawings shall include but not be limited to:

.1 Plan and Elevation mechanical drawings showing dimensions; weights; center-of-gravity; lift points; cable entry/exit; details of utility service entrance; construction details such as window location and dimensions, interior layout, interior finish, enclosure material; exterior finish; layout of critical components; and bill-of-material including manufacturer, make and model of all components along with their agency listing (e.g. UL, CSA, etc).

.2 Mechanical drawings showing details of vacuum breaker, manual

handle operation, including but not limited to motorized mechanism, manual handle, manual operating mechanism, etc.

.3 Electrical drawings showing both power and control schematics and all current and voltage ratings, and all applicable CW and FW BIL ratings. Schematics to include power requirements for all control components, I/O points, relays, CTs, etc.

.4 As-built drawings must be approved prior to release-for-shipment.

.16 Test Reports – applicable test reports shall be submitted for approval prior to shipment. Shipment shall not occur until test reports have been approved.

2.5 LIGHTNING ARRESTER DESIGN REQUIREMENTS

.1 Arrester Rating & Type – 27kV, station class.

.2 Arrester Material – Metal Oxide Varistor

.3 Arrester Shed Material – Porcelain, Hydrophobic Cycloaliphatic Epoxy, Polymer or Silicone Rubber. All non-porcelain material must not support biological growth, must not be flammable and must not support combustion.

.4 Submittal Drawings – shall include outline drawings with all pertinent product details including but not limited to BIL rating, creep and strike distances, shed material, etc. Submittal drawings must be approved prior to release-to-manufacture.

.5 As-Built Drawings – shall include outline drawings with all pertinent product details including but not limited to BIL rating, creep and strike distances, shed material, etc. As-built drawings must be approved prior to release-for-shipment.

.6 Test Reports – all applicable test reports shall be submitted for approval prior to shipment. Shipment shall not occur until test reports have been approved.

2.6 POTENTIAL TRANSFORMER & CURRENT TRANSFORMER DESIGN REQUIREMENTS

.1 Potential Transformers for Metering

.1 Potential transformers are required for metering purposes. Necessary specifications are as follows:

.1 Voltage, frequency, phase: 25kVac, 60Hz, 1ph
.2 Environment: Outdoors
.3 BIL: ≥ 125kV
.4 Configuration: Single-bushing to ground
.5 Voltage Ratio: 120:1
.6 Metering Accuracy: 0.3%
.7 Burden: Suitable for WXY
.8 Submittal Drawings – shall include outline drawings with all pertinent product details including but not limited to BIL rating, creep and strike distances, shed material, voltage ratio, metering accuracy, burden, etc. Submittal drawings must be approved prior to release-to-manufacture.
.9 As-Built Drawings – shall include outline drawings with all pertinent product details including but not limited to BIL rating, creep and strike distances, shed

material, voltage ratio, metering accuracy, burden, etc. As-built drawings must be approved prior to release-for-shipment.

.10 Test Reports – all applicable test reports shall be submitted for approval prior to shipment. Shipment shall not occur until test reports have been approved.

.2 Current Transformers for Metering & Relay Protection

.1 Current transformers are required for metering and relay protection. Necessary specifications are as follows:

.1 Voltage, frequency, phase: 25kVac, 60Hz, 1ph
.2 Environment: Outdoors
.3 BIL: ≥ 125kV
.4 Metering Accuracy: 0.3B-0.9
.5 Relay Accuracy: T100
.6 Primary Current: See Single Line Drawing
.7 Secondary Current: 5A
.8 Continuous Current Rating Factor: 1.5
.9 25kV: Short-time mechanical current rating: ≥ 10kApk
.10 25kV: Short-time thermal current rating: ≥ 3kA
.11 600V: Short-time mechanical current rating: ≥ 35kApk
.12 600V: Short-time thermal current rating: ≥ 15kA
.13 Submittal Drawings – shall include outline drawings with all pertinent product details including but not limited to BIL rating, creep and strike distances, shed material, current ratio, metering accuracy, relay accuracy, short-time ratings, burden, etc. Submittal drawings must be approved prior to release-to-manufacture.
.14 As-Built Drawings – shall include outline drawings with all pertinent product details including but not limited to BIL rating, creep and strike distances, shed material, current ratio, metering accuracy, relay accuracy, short-time ratings, burden, etc. As-built drawings must be approved prior to release-for-shipment.
.15 Test Reports – all applicable test reports shall be submitted for approval prior to shipment. Shipment shall not occur until test reports have been approved.

2.7 TRANSFORMER DESIGN REQUIREMENTS

.1 Ratings

.1 A 500kVA K-rated (k=11), 25kV/600V/347V Delta-Y Grounded liquid-immersed transformer. Impedance shall be less than or equal to 5.5%.

.2 Unless otherwise stated, transformer KVA, short circuit withstand and BIL / LIL ratings shall be in accordance with IEEE / ANSI or CSA standards.

.3 The transformer shall be capable of operating at rated KVA without exceeding winding temperatures.

.4 The transformer shall be designed and constructed to withstand the mechanical and thermal stresses produced by external short circuits two seconds in duration and a magnitude specified in Section 10, Table 3A of CSA CAN3-C88-M90

.5 Transformers BIL levels shall comply with ANSI Std C57.12.01 as shown in the following table unless otherwise specified:

Rated Voltage of Windings (L-L) (kV)	Power Levels (BIL kV)
0.6	30
25	150

.6 Provide provisions for future fan cooling where no forced air cooling is indicated unless specifically noted otherwise. Vendor to state level of capacity increase with each fan stage.

.2 Windings and Connections
- .1 Transformers shall be 3 phase, 60 hertz, delta primary, grounded-wye secondary.
- .2 Transformer windings shall be copper.
- .3 Scott connected or T-connected power and distribution transformers are not allowed.
- .4 A core ground bushing is not required.

.3 Enclosure
- .1 Lifting lugs and jacking facilities shall be provided to allow lifting or jacking of the transformer as follows:
  - .1 Lifting facilities for the whole transformer. The bearing surfaces of the lifting means shall be free of sharp edges;
  - .2 Provisions for guying if required;
  - .3 Jacking facilities shall be located near the extreme ends of the junction of the base segments; and
  - .4 The jack ports or lugs shall be suitably sized and located to allow the insertion of the lifting members in accordance with ANSI C57.12.10.
- .2 Enclosure and core grounding provisions shall consist of two ground pads, welded on the base or on the tank wall near the base on diagonally opposite corners of the tank. Additional ground pads shall be furnished near each neutral bushing and surge arrester bracket.
- .3 The transformer shall be painted ASA 70 light grey unless otherwise indicated. Use a corrosion inhibiting primer and the vendor's premium paint finish such as "Acrycote" or epoxy powder etc.
- .4 Provide two litres of finish touch up paint for field use.
- .5 Enclosure shall be constructed to meet the required seismic zone of the area of the site.

.4 Bushings
- .1 The insulation level of the line bushings shall be no less than that specified for the winding terminal to which they are connected. Bushings rated at 150 kV BIL and above located on top of the transformers or 200 kV and above when mounted on the side of the transformers shall be of the condenser type. Load break elbow style bushings are not acceptable.
- .2 Neutral bushings shall be furnished for all three phase wye-connected windings. Neutral studs shall not be connected (grounded) to the transformer tank by the Vendor. An external Xo bushing shall be located directly above one of the ground pads.
- .3 Load-Side Connections: Transformer output shall be copper bus bars in a dedicated load-side enclosed service compartment suitable for the environment, and suitable for

bottom cable entry. Bus shall have a NEMA 4-hole pattern. Provisions shall be made for incoming cable support. All exposed cable connections and buswork inside the load-side service compartment must be covered with a removable insulation board to prevent accidental contact with energized parts. Alternatively, the buswork may be covered with rated polymer based material, whereas cable connections may be covered with adequately rated, removable insulation boots.

.5 Forced Cooling

.1 Future cooling fans shall be controlled from top oil temperature or from winding temperature when specified.

.6 Auxiliary Devices

.1 Unless otherwise indicated, the transformer(s) shall be equipped with the following standard accessories:

.1 Transformer Control Cabinet. The control cabinet shall be NEMA/EEMAC 4X rated and shall include a 120 VAC anti-condensation heater and hinged cover; an 87T differential protection relay (SEL 787 or equivalent); and ancillary components.

.2 Stainless steel transformer nameplate.

.2 If specified, the Primary Tap Changer shall be an off-load manually operated type and shall incorporate the following features:

.1 External operation on the high voltage windings;

.2 Five positions with 2 x 2.5% FCBN and 2 x 2.5% FCAN positions. The position providing the maximum ratio of transformation shall be assigned the number ‘1’ or the letter’A’;

.3 Padlockable operating handle;

.4 Position Indicator readable from grade; and

.5 Warning label, “OFF LOAD TAP CHANGER – DO NOT OPERATE WITH TRANSFORMER ENERGIZED”.

.3 Or, if otherwise specified as such, the Primary Tap Changer shall be a load type tap changer incorporating the following features:

.1 + 10%, -10% of the rated voltage in 16 equal steps;

.2 Motor operated with manual hand crank back up;

.3 Alarm contacts in case of faulty operation;

.4 Position Indicator readable from grade; and

.5 Operation Counter.

.4 Provide materials and wiring methods suitable for the area classification as noted in the ‘Liquid Immersed Power Transformer Product Information Sheet’.

.5 Provide isolation valves on all auxiliary compartments containing transformer oil such as expansion tanks that are not designed for vacuum filling when sealed tank designs are specified.

.6 The transformer nameplate and all gauges shall be easily readable from grade.

.7 The transformer control cabinet and tap changer operating handle shall be accessible from grade.

.7 Wiring and Terminal Blocks

.1 All alarm and trip contacts for sudden pressure relays, winding / top oil temperatures, liquid level, current transformers, cooling fans etc. shall be wired to Weidmuller WDU ‘Wemid’ or approved equal terminal blocks in the transformer control cabinet. Terminal block barriers shall be provided to segregate terminals according to voltage levels. Current transformer terminal blocks shall include shorting bars. Provide 15% spare

terminal blocks.

.2 Wiring shall be sized as follows:

.1 Current Transformers AWG #10 minimum

.2 Power Wiring AWG #12 minimum

.3 Control Wiring AWG #14 minimum

.3 All wiring shall include machine printed heat shrink wire markers at both ends.

.4 The transformer control cabinet terminal blocks shall include barriers to separate different signal types and voltage levels. Terminal blocks shall be labelled on both sides with manufacturer's machine printed labels.

.5 All wiring shall enter the bottom of the transformer control cabinet.

.8 Instrument Transformers

.1 When specified, current transformers shall comply with the requirements of IEEE / ANSI or CSA and the values in Table 1, below.

.2 Current transformers shall have 5 A secondaries except for specialized manufacturer's ground current sensor type CTs connected to matched ground fault current relays.

.3 Current transformers for measuring the secondary output line current shall be included and integral to the transformer. They shall be routed and wired to shorting blocks in the Transformer Control Cabinet.

.9 Documentation

.1 The following transformer drawings and information shall be included in the Vendor's documentation package:

.1 General drawings requirement: Transformer plan and elevation views showing detailed dimensions, weights, center of gravity, recommended tank cover bolt torque requirements and component locations;

.1 Transformer nameplate drawing, including:

.1 Primary, secondary and tap changer voltages;

.2 Primary and secondary BIL/LIL;

.3 Winding configuration diagram;

.4 65°C kVA/MVA ratings for self-cooled and maximum forced cooled operation;

.5 65°C impedance;

.6 Full load currents;

.7 Weights (filled & empty, core & coil, tank & fittings);

.8 Liquid volume;

.9 Winding material;

.10 Maximum and minimum internal operating pressures; and

.11 Transformer tag number(s).

.12 Schematic diagrams for all auxiliary control and protective devices.

.13 Terminal connection diagram for all electrically connected equipment including recommended connection torque requirements.

.14 Predicted and actual transformer losses and impedance values.

.15 Regulation and efficiency calculations at rated load and rated frequency. Regulation shall be stated at both 0.8 and 1.0 power factor. Efficiency shall be stated at ¼, ½, ¾ and full load on the base and highest forced cooled rating.

.16 Ratio correction factors and excitation curves for each size and type of current transformer.

.17 Bill of materials.

.18 Field service rates.
.19 Recommended spare parts including prices, quantities and manufacturer's part numbers.
.20 Instructional pamphlets for individual components such as contactors, relays and gauges, etc.
.21 Listing of Vendor's standard tests.
.22 Certified test results.
.23 Lightning Arresters (if specified).
.24 Potential Transformers (if specified) and Current Transformers (600V).

.2 Submittal drawings shall be included with the vendor quotation package. Submittal drawings shall include but not be limited to those in the following list.
.1 The following submittals are required for approval prior to release for manufacturing:
.1 Overall dimensions, weight and volume of insulating fluid.
.2 Location of power terminals.
.3 Location of control terminals (where applicable)
.4 Location and dimensions of cable tray entry area.
.5 Location and dimensions of seismic anchoring.
.6 Location and dimensions of grounding pads.
.2 Identify location and part descriptions of all accessories and ancillary devices.
.1 Transformer nameplate drawing.
.2 Schematic or wiring diagram of low voltage control devices (where applicable).
.3 Surface separation and coating schedule.
.3 As Built Drawings: The following submittals are required before shipment of the equipment. The equipment will not be considered delivered until the following information is received:
.1 Installation and maintenance manual.
.2 Specifications / data-sheets of all ancillary devices.
.3 MSDS sheet for insulating fluid.
.4 Factory test reports.
.5 "As-Built" drawings.

Table 1: IEEE / ANSI or CSA Requirements for Current Transformers

PRIMARY		**METERING**		
RATING	RELAYING	(60 HZ STANDARD BURDENS)		
(AMPS)	"C" Rating	B 0.1	B 0.5	B 2.0
50	10	2.4	4.8	--
100	10	0.6	2.4	--
150	20	0.6	1.2	--
200	50	0.6	1.2	2.4

300	50	0.3	0.6	1.2
400	100	0.3	0.6	1.2
500	100	0.3	0.3	0.6
600	100	0.3	0.3	0.6
800	100	0.3	0.3	0.6
1000	100	0.3	0.3	0.3
1200	100	0.3	0.3	0.3
1500	200	0.3	0.3	0.3
2000	200	0.3	0.3	0.3
2500	200	0.3	0.3	0.3
3000	200	0.3	0.3	0.3
4000	200	0.3	0.3	0.3

2.8 VENDOR TESTING

.1 Witness Testing
- .1 When specified, the vendor shall make allowances to have the transformer testing witnessed by Owner or Owner's representative.
- .2 The vendor shall notify the Owner or Owner's representative in writing at least two weeks in advance that the transformer is ready for witness testing.

.2 Required Inspections and Tests
- .1 The transformer shall be visually inspected to ensure that all specified components are present.
- .2 Transformers shall be tested in accordance with the standard transformer test requirements of CSA CAN3-C88-M90 and shall include the following tests:
  - .1 Winding Resistance Tests including at the tap extremes of one transformer of a given rating per order;
  - .2 Ratio Test on the rated voltage connections and on all tap connections;
  - .3 Polarity and Phase Relation Tests on the rated voltage tap connections;
  - .4 No Load Losses and Excitation Current Test at rated voltage and frequency on the rated voltage tap connections;
  - .5 Impedance and Load Loss Tests at the rated voltage and frequency on the rated voltage tap connections, and at the tap extremes of one transformer of a given rating per order;
  - .6 Applied and Induced Potential Test;
  - .7 Insulation Resistance Tests (high voltage to ground, low voltage to ground, high voltage to low voltage);
  - .8 Insulation Power Factor Test for all high and low voltage windings and bushings. CH, CL and CHL values shall not exceed 0.5%;
  - .9 Dissolved Gas in Oil Analysi;
  - .10 Tank Pressure Test;

.11 Auxiliary Device Insulation Test; and
.12 Operational Test of all Auxiliary devices.

.3 The following tests shall have been performed on similar transformers. Certified tests results shall be available on request.
.1 Short Circuit Withstand Test;
.2 Sound Level Tests;
.3 Temperature Rise Test; and
.4 Impulse Test to verify insulation integrity.

.4 Additional test requirements shall be as stated in the 'Liquid Immersed Power Transformer Product Information Sheet'.

.5 The transformer test values shall be within the standard tolerances given in Table 10 of CSA CAN3-C88-M90.

.6 One set of certified test reports and operating & maintenance instructions shall be shipped with the transformer.

.7 Vendor shall supply certified seismic calculations detailed that the equipment design meets the required seismic zone. Approval of certified seismic calculations is required prior to release-to-manufacturing.

2.9 SHIPPING

.1 Transformers shall be suitably protected and braced during shipping.

.2 Transformers with sealed tank designs shall be filled with insulating liquid and shall include a positive dry nitrogen purge unless otherwise noted in the 'Liquid Immersed Power Transformer Product Information Sheet'.

.3 Attach a weatherproof tag indicating transformer tag number and purchase order number to the transformer(s) prior to shipping.

.4 Parts and accessories such as radiators, fans bushings, neutral grounding resistors etc., which are to be shipped loose, shall include instructions for assembly on site. All such parts and accessories shall be pre-fitted at the manufacturing facility to ensure no such issues arise during field installation.

END OF SECTION