Peabody Municipal Light Plant

Community Owned. Not for profit. It's Ours.

LEGAL NOTICE

Peabody Municipal Light Plant is asking for bids on:

TWO (2) POWER TRANSFORMERS

Specifications and bid documents may be obtained at the Peabody Municipal Light Plant, 201 Warren Street Extension, Peabody, Massachusetts or at our website WWW.PMLP.COM.

Bids will be received at the Peabody Municipal Light Plant office until 11:00 a.m. on Tuesday, November 28, 2017 at which time they will be publicly opened and read. Proposals must be accompanied by a completed Bid Form.

The Peabody Municipal Lighting Commission reserves the right to reject any or all bids as authorized by law.

PEABODY MUNICIPAL LIGHT PLANT

GLENN TRUEIRA, MANAGER

GT/pas

ADV.: The Salem News – 10/26/17
Dodge Reports

BID PACKAGE & SPECIFICATIONS
APPROVED BY: _____
Division Manager

PEABODY MUNICIPAL LIGHT PLANT

BID - MATERIALS

INSTRUCTIONS TO BIDDERS

1. Peabody Municipal Light Plant (PMLP) will receive bids for Two (2) Power Transformers until 11:00 a.m., Tuesday, November 28, 2017 at its General Offices at 201 Warren Street Extension, Peabody, Massachusetts, 01960, at which time the bids will be publicly opened and read.

2. BIDS --

   A. All bids must be submitted along with the completed Bid Form provided in these specifications. If additional space is required, it shall be so noted on a supplemental attachment under the bidder's letterhead and entitled "Remarks". This attachment shall become a part of the Bid Form.

   B. The Bid Form shall be without interlineations, alterations, erasures or changes in phraseology.

   C. The Bid Form shall be enclosed in a sealed envelope, clearly marked on the outside with the bidders name and address, and the following bold lettering: **"TWO (2) POWER TRANSFORMERS".** Three copies of all bids, along with two (2) Electronic copies saved to a thumb drive, must be submitted in a sealed envelope and properly marked with the Title of the bid and mailed/delivered to:

      Peabody Municipal Light Plant
      ATTENTION: Glenn Trueira, Manager
      201 Warren Street Extension
      Peabody, MA 01960

      The thumb drive must be labeled with the Bidders name and Project Contract Number. The scanned copy on the thumb drive should include all required signatures and forms.

   D. The Bid Form and supplemental sheets identified on same shall constitute and shall hereinafter be termed the "Bid".

   E. The firm submitting a bid shall assume the responsibility of making a careful examination of the specifications and related documents and all other matters that may affect cost and performance. Bidders will be required, at their own expense, to comply with all statutes, regulations, ordinances and tests which may be applicable.

   F. Each firm shall submit with their bid, evidence of their experience and qualifications to satisfactorily fulfill the specifications and requirements.

G. Each firm submitting a bid shall notify PMLP, in writing, if they find any discrepancies or omissions from the specifications, or if in doubt as to their meaning. If an explanation is necessary, a reply will be made by an addendum issued to all firms who have received specifications. PMLP will not give verbal answers to any inquiries regarding the meanings of the specifications. All inquiries should be addressed to PMLP, Attention: Glenn Trueira, 201 Warren Street Extension, Peabody, Massachusetts, 01960.

3. CHANGES IN SPECIFICATIONS --

PMLP may advise all firms who have received specifications, by means of addenda, of any changes in the Specifications during the bid period. All such changes shall become a part of the Specifications as if originally included therein.

4. SITE INSPECTIONS --

PMLP is not responsible for any inspections, visits, etc., that may be made to any sites or potential sites in connection with this work. The coordination, approval, and expense for such inspections, visits, etc., is the responsibility of the firm submitting the bid.

5. PRICES --

All prices and applicable discounts will be firm for the delivery quoted. Bidders must include on a separate sheet, any discount schedule which may be applicable to this purchase. The bid prices shall include everything necessary for fulfillment of the Contract, including delivery (at PMLP jobsite, Peabody, MA), except as may be otherwise expressly provided in the Contract Documents.

6. ESCALATOR CLAUSES --

Bids which are not subject to any form of upward escalator clause are preferred. If firm prices cannot be quoted, the Bidder shall base the escalation provision upon the index stipulated in the specification attached thereto. If no index is stipulated in the specification, bidder shall state the index upon which his bid is based. Failure to do so will be considered grounds for rejection of the bid.

The PMLP reserves the right to consider any bid which may be offered subject to an escalator clause, up or down, that is clearly defined as to basis of escalation, specifically, a given lowest posted price in a nationally recognized index provided that no other index is stipulated in the attached specifications. Preference will be given to bids in accordance to the first paragraph in this section.

7. EXECUTION OF CONTRACT --

A. The Successful Firm will be notified of the award of the Contract in writing and shall properly and promptly execute a Contract on the PMLP Contract Form, within fifteen (15) days after receiving notification of the Award of the Contract.

B. The Contract, when executed, shall be deemed to include the entire agreement between the parties. The Seller shall not be entitled to any modifications resulting from unauthorized claims or statements made by representatives of PMLP or other persons.

C. PMLP shall have, at its option, the right to increase the contracted quantity bid by up to twice the original quantity which is stated in the bid specifications.

8. TERMS AND CONDITIONS --

The terms and conditions of the contract shall also be in accordance with the attachment entitled "Purchaser's Terms and Conditions." Any exceptions to these terms and conditions must be clearly identified in the bid under the category of exceptions to the Purchaser's Terms and Conditions.

9. DEFINITIONS --

The names and words Peabody Municipal Light Plant, PMLP, Purchaser, Owner, and Buyer as used in these documents are synonymous. The names and words, Bidder, Contractor, Seller, Vender, and Manufacturer as used in these Contract documents are synonymous.

10. RIGHT TO ACCEPT OR REJECT BIDS --

PMLP reserves the right to accept or reject bids or portions thereof, and to reject all bids, to waive any formalities in the process, if it is deemed to be in the best interests of PMLP. Proposals received after the public opening date and time will not be accepted.

11. ITEMS CONTAINED IN THE BID PACKAGE –

- Legal Notice
- Instructions to Bidders
- Purchaser's Terms and Conditions
- Specifications
- Bid Form
- Certified of Non-Collusion & Tax Compliance Certification
- Sample Contract

PURCHASER'S TERMS AND CONDITIONS

MATERIALS CONTRACT

1. ENTIRE AGREEMENT AND AMENDMENTS

The terms and provisions of this Contract, together with the terms and provisions of all documents incorporated herein by reference, constitute the full and entire Contract between the Purchaser and the Seller concerning the matters set forth herein, and no other agreement or understanding of any nature whatsoever has been entered into or will be recognized, nor has the Purchaser made any inducements or representations to the Seller except as expressly stated in this Contract. No modification of this Contract shall be binding or have any force or effect on either party, unless reduced to writing and signed by the Purchaser and the Seller, or the authorized representatives of same. No provision of this Contract is intended or shall be construed to be for the benefit of any third party.

2. PERFORMANCE

Time is of the essence in this Contract. If the Seller shall fail in any respect to prosecute the work with promptness and diligence, the Purchaser may cancel this Contract in part or in its entirety without liability for the cancelled part(s).

3. PATENTS, TRADEMARKS, COPYRIGHTS

It is mutually understood and agreed that the Contract includes all royalties and costs arising from patents, trademarks and copyrights in any way involved in the work. If the Seller, or its subvendors/subcontractors, is required or desires to use any design, device, material or process covered by letters, patent, trademark, or copyright, the Seller indemnifies and holds harmless the Purchaser from any and all claims for infringement by reasons of the use of any such patented design, device, material or process to be performed under the Contract and shall indemnify the Purchaser for any costs, expenses and damages which they may be obligated to pay by reason of such infringement, at any time during the prosecution or after the completion of the work. The Purchaser shall give to the Seller notification of the source of any such suit or proceeding and shall furnish the Seller (at the Seller's expense) all needed information, authority and assistance to enable the Seller to defend the same. If any material, equipment, or work is in any such suit or proceeding held to constitute infringement or its use in enjoined, the Seller, within a reasonable time, shall either secure for the Purchaser, at the Seller's own expense, the right to continue using said material, equipment or work by suspension of the injunction, by procuring for the Purchaser a license, or otherwise, or shall at the Seller's own expense and as the Purchaser may elect, replace such material, equipment or work with non-infringing material, equipment or work, or modify it so that it becomes non-infringing, or remove such infringing material, equipment

or work, and refund the sums paid therefore by the Purchaser all without injury or damage to any other property of the Purchaser.

4. INDEPENDENT CONTRACTOR RELATIONSHIP

The Seller shall perform work as an independent contractor.

5 INSPECTION EXPEDITING

All material, equipment and/or work to be supplied under this contract is subject to inspection and/or expediting by the Purchaser or its representative. The Seller shall allow the Purchaser or its representative free access to Seller's works and provide free access to the works of Seller's subvendors/subcontractors.

6. COMPLIANCE WITH LAW

The Seller will comply with all applicable federal, state, and local laws, rules and regulations. Compliance includes, but is not limited to, the Occupational Safety and Health Act of 1970, Peabody Municipal Light Plant Safety Rules & Regulations, Executive Order 11246 (Equal Opportunity) and guidelines established by the Council on Wage and Price Stability, all as amended periodically.

Seller agrees to comply with the provisions of the Occupational Safety and Health Act of 1970 and the Standards and Regulations issued thereunder and certifies that all items furnished under this Contract will conform to and comply with said standards and regulations. Seller further agrees to indemnify and hold harmless the Purchaser from all damages assessed against the Purchaser as a result of the seller's failure to comply with the Act and the standards issued thereunder and for the failure of the items furnished under this Contract to so comply.

7. RISK OF LOSS

Risk of loss and/or damages shall be upon Seller until goods are physically delivered to the Purchaser's plant, storerooms, job site, or location indicated in the Contract Document. Materials will be considered as delivered only if all goods are physically received in proper condition and accepted by purchaser.

8. DELIVERIES

The Purchaser will receive shipments Monday through Friday, holidays excluded, during its normal receiving hours (8:00 AM -3:00 PM). Any cost associated with shipments made during any time other than this receiving period will be to the Seller's account. All deliveries will be at PEABODY jobsite, Peabody, Massachusetts unless otherwise specified in the Peabody Municipal Light Plant specification section attached hereto.

9. ASSIGNMENT AND SUBCONTRACTING

The Seller's obligations authorized under this Contract are not assignable or transferable, and the Seller agrees not to subcontract any of the work authorized hereunder without the prior written approval of the Purchaser. The Purchaser retains the right to approve or disapprove of all subcontractors for such approved work.

10. CONFIDENTIALITY

The Seller shall keep all services carried out hereunder for the Purchaser (described in the Specifications attached hereto) entirely confidential, and not use, publish, or make known without the Purchaser's written approval, any information furnished by the Purchaser for purposes of such services, to any persons other than personnel of the parties of this Contract.

Any public representation regarding the Purchaser shall be made by the Purchaser, and any requests for information made to the Seller by a Third Party shall be referred to the Purchaser.

11. WAIVER

In the event the Purchaser shall fail to insist on performance of any of the terms or the exercise of any of its rights and privileges, such failure or any breaches, shall not constitute a waiver of such terms, conditions, rights or privileges.

12. CHANGES AND/OR AMENDMENTS

The Purchaser shall have the right, from time to time during the terms of this Contract, by written notice to the Seller, to make changes in or additions to drawings, specifications or instructions for the work covered in the Specifications, including the right to expand, decrease or limit the scope and nature of the work to be undertaken, or redirect work already in progress.

13. WARRANTY

The Seller warrants to the Purchaser that the article(s) provided and/or work performed under this Contract shall be fit for purpose in accordance with the Purchaser's specific instructions, shall be new and free from defects in material, workmanship and title, and shall meet all specifications. If the article(s) purchased and/or work performed do not meet the warranty above, the Purchaser, after determining a defect or non-conformance, will notify the Seller. At the sole discretion of the Purchaser the Seller shall replace, repair, or make good, without cost to the Purchaser, any defects or non-conformance arising within one year after date of acceptance of article(s) furnished and/or work performed.

14. CUMULATIVE REMEDIES

Every right or remedy herein conferred upon or reserved to the Purchaser shall be cumulative and shall be in addition to every right and remedy now or hereafter existing at law or in equity or by statute, and the pursuit of any right or remedy shall not be construed as an election.

15. DELAYS

The Seller expressly agrees to the work schedule provided for in the Contract and such schedule includes allowances for all hindrances and delays incident to the work. No claims shall be made by the Seller for hindrances and/or delays from any cause during the progress of the work except as provided under "SUSPENSION OF WORK" and/or "FORCE MAJEURE".

16. SUSPENSION OF WORK

The Purchaser reserves the right to suspend and reinstate execution of the whole or any part of the work without invalidating the provisions of the Contract. Orders for suspension or reinstatement of work will be issued by the Purchaser to the Seller in writing. The time of completion of the work will be extended for a period equal to the time lost by reason of the suspension. No consideration shall be given by the Purchaser to cost increases or loss of anticipated profits, due to suspension or reinstatement of this Contract.

17. FORCE MAJEURE

A delay in, or failure of, performance of either party hereto shall not constitute default hereunder or give rise to any claim for damage if and to the extent such delay of failure is caused by occurrences beyond the control of the party affected, including, but not limited to, acts of God, or the public enemy, expropriation or confiscation of facilities or compliance with any order or request of a governmental authority, affecting to a degree not presently existing, the supply, availability, or use of materials or labor, acts of war, public disorders, rebellion or sabotage, floods, riots, strikes, or any causes whether or not the class or kind of those specifically named above, not within the control of the party affected and which, by the exercise of reasonable diligence, said party is unable to prevent. Should the work be delayed due to Force Majeure, or otherwise delayed due to conditions beyond the control of or without the fault or negligence of either party, the parties to this Contract shall confer to reach an agreement on the alterations of fees and/or other terms and conditions upon which the work shall be continued, or otherwise terminated.

18. ARBITRATION

Arbitration of all questions and issues in dispute under this Contract shall be submitted to Arbitration in accordance with the provisions of the standard Form of Arbitration of the American Arbitration Association, but only in the event that both parties to this Contract so

agree to such submission for Arbitration. If both parties fail to agree to submit to Arbitration in the manner prescribed above, or to submit to Arbitration in any mutually acceptable form, all questions and issues in dispute will be submitted to a court of competent jurisdiction of the Commonwealth of Massachusetts to be tried according to the applicable laws of the Commonwealth of Massachusetts. Costs of such arbitration will be shared equally by the parties, unless the arbitrator determines that the claim made by one of the parties is without merit, in which event the arbitrator may award costs to the other party.

19. TERMINATION FOR CAUSE

The Purchaser, on written notice, may suspend, postpone, abandon or terminate this Contract, or any part thereof, as a result of the Seller's failure to render to the satisfaction of the Purchaser the materials, work and/or services required of him under this Contract, including the progress of the work. The Purchaser shall be the sole determinant in all termination for cause issues and no consideration shall be given by the Purchaser to the Seller for any costs, claims, or loss of anticipated profits by the Seller as a result of the suspension postponement, abandonment or termination of this Contract, or any part thereof, by the Purchaser for the reason of cause.

20. TERMINATION FOR CONVENIENCE

The Purchaser, on written notice, may suspend, postpone, abandon or terminate this Contract or any part hereof, and such action shall in no event be deemed a breach of the Contract. Such suspension, postponement, abandonment or termination may come about for the sole convenience of the Purchaser. Upon receipt of written notification from the Purchaser that this order, or any part hereof, is to be terminated, the Seller shall immediately cease operations of the work stipulated, and assemble all material that has been prepared, developed, furnished or obtained under the terms of this Contract that may be in its possession or custody, and shall transmit the same to the Purchaser on or before the fifteenth day following the receipt of the above-written notice of termination, together with his evaluation of the cost of the work performed. The Seller shall be entitled to just and equitable payment in accordance with this Contract for any uncompensated work satisfactorily performed prior to such notice.

The Purchaser shall determine the amount of acceptable work performed by the Seller under this Contract. The Purchaser's evaluation shall be used as a basis to determine the amount of compensation due the Seller for this work, provided it shall be made in good faith and supported by substantial evidence.

In determining the value of the work performed by the Seller prior to termination, no consideration will be given to profit which the Seller might have reasonably expected to make on the uncompleted portion of the work.

21. INDEMNIFICATION

The Seller shall defend, indemnify and hold the Purchaser, and its employees free and harmless from and against any and all claims, demands, causes of action, suits or other litigation (including all costs thereof, including attorney's fees) of every kind and character arising on account of bodily injuries, death, damage to property in any way occurring incident to, arising out of or in connection with work performed or to be performed by the Seller hereunder or occurring incident to, arising out of or in connection with the presence of employees of the Seller or any of the Seller's subcontractors on the work premises, due to the sole negligence or willful misconduct of the Seller.

22. LAW OF CONTRACT - JURISDICTION

The Contract shall be construed under and shall be governed by the Laws of the Commonwealth of Massachusetts, and in case of controversy not otherwise settled shall be submitted to the exclusive jurisdiction of the Massachusetts Courts.

23. AUDIT

The Seller shall, at its own expense, keep and maintain complete records and books of account of its costs and expenses relating to the work in accordance with generally accepted accounting practices. Should a dispute arise between the Purchaser and Seller regarding reimbursable amounts and/or credits, the Seller shall grant the Purchaser permission to audit such records and books of account.

24. TAXES

The Seller shall pay all applicable state and local sales and use taxes on sales to, or used by, the Seller of tangible property and services employed by the Seller in the performance of the Order. The Seller shall identify all costs in connection therewith. The Purchaser is an organization exempt from the payment of such state and local taxes of tangible property and services, and will not reimburse the Seller for such taxes paid.

25. BID QUANTITIES

PMLP shall have, at its option, the right to increase the contracted quantity bid by up to twice the original quantity which is stated in the bid specifications.

26. ACCEPTANCE

This order expressly limits acceptance to the terms stated herein. Any additional or different terms proposed by the Seller are objected to and are hereby rejected.

27. COMPLETION OF CONTRACT

This Contract will not be considered complete until all specifications and Contract requirements have been satisfied. These requirements also include the Purchaser's acceptance of all documentation, drawings, manuals, etc. Final payment shall not be construed to relieve the Seller of any of its obligations under this Contract.

28. NOTICE

The Purchaser agrees to give the Seller immediate notice of any and all claims for which the Seller may be liable, and the Seller agrees to give the Purchaser immediate notice of any and all claims for which the Purchaser may be liable. All claims hereunder shall be in writing and shall be deemed to have been duly given if delivered or mailed, first class, registered mail, postage paid.

A. IF TO THE SELLER, ADDRESS

_____

B. IF TO THE PURCHASER, AT PEABODY MUNICIPAL LIGHT PLANT, 201 WARREN STREET EXTENSION, PEABODY, MASSACHUSETTS, 01960

_____

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

IPSWICH RIVER SUBSTATION

115 – 22.9 KV POWER TRANSFORMERS

TECHNICAL SPECIFICATION
NO. 919911IR-03

OCTOBER, 2017

PLM

ELECTRIC POWER ENGINEERING

35 MAIN STREET, HOPKINTON, MA 01748 TEL: (508) 435-0200 FAX: (508) 435-4491

IPSWICH RIVER SUBSTATION
115 – 22.9 kV POWER TRANSFORMERS

SECTION II
PROJECT ORGANIZATIONAL REQUIREMENTS

COMMUNICATION

All technical communications and correspondence shall be addressed to:

PLM
35 Main Street
Hopkinton, Massachusetts 01748
Attention: Mr. Michael C. Barrett
Phone: (508) 435-0200
FAX: (508) 435-4491
E-Mail: mcbarrett@plmnet.com

All commercial correspondence and copies of technical communications during the project shall be addressed to:

Peabody Municipal Light Plant
201 Warren Street Ext.
Peabody, Massachusetts 01960
Attention: Mr. Roy Simoes
Phone: (978) 573-1231
FAX: (978) 532-8902

ADDITIONAL TERMS AND CONDITIONS

1. Title

   Ipswich River Substation – 115 – 22.9 kV Power Transformers

2. Freight

   Freight shall be prepaid and allowed. The Contractor is responsible for all freight and cartage, including any additional freight to and from destination until the apparatus has been received in good condition, field tested, and accepted by Owner and PLM.

3. Terms of Payment

Firm prices are required. The OWNER will accept a progress payment schedule (all items are net 45 days) in order to attain a firm delivery price, as follows:

30% after return of approved shop drawings
65% at delivery to site
5% after field assembly/testing/OWNER Acceptance (not to exceed 120 days after delivery)

Payment shall not be made on apparatus damaged in transit until apparatus is received in good condition.

Any cash discount period will date from the later of: the receipt of invoice by Owner, or the delivery of equipment, and not from the date of invoice. On invoices returned for correction, the cash discount period and terms will date from the receipt of owner of the corrected invoice. Material not received, short-shipped material, and rejected material shall not be processed for payment by Owner until all disputes are settled.

A performance bond in the amount of 100% of the contract shall be provided, issued by a surety licensed to issue such bonds in Massachusetts. This bond shall guarantee the full performance on this contract in the event the Manufacturer will not or cannot complete the contract requirements after receipt of the progress payment(s).

4. Warranty

Warranty requirements are addressed in the Technical Specifications, Section 01 11 01.

INSPECTION

Owner's Representatives (maximum of 3) shall be allowed free access, at all reasonable times, to the Manufacturer's shops for inspection of the equipment or any of its parts, and to obtain information on the progress of the work. Any work or material found to be defective shall be rejected and shall be replaced by the Manufacturer at his own expense. Such inspection, however, shall not relieve the Manufacturer from responsibility for the quality and correctness of the work.

WITNESS OF TESTS AND FINAL INSPECTION

Owner's Representatives (maximum of 3) may be available to perform a final physical inspection and to witness final testing of the apparatus, at the Owner's discretion. Such inspection, however, shall not relieve the Manufacturer from responsibility for their quality and correctness of work.

The Manufacturer shall notify PLM of the planned testing dates with at least three (3) weeks notice and notify PLM of any changes of testing dates within sufficient time to make necessary travel arrangements. The Manufacturer shall make every effort to schedule testing dates which coincide during a single work week to eliminate unnecessary delays, and the final tests will continue without interruption until completion.

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

SUBSTATION POWER TRANSFORMERS
IPSWICH RIVER SUBSTATION
October 2017

BID DATA SHEETS

Bidder to enter product data in the appropriate spaces on the following pages and return with bid.

A. 36/48/60 MVA 115 – 22.9 kV Power Transformer (Per Section 26 12 14.63)

(Enter Guaranteed Characteristics and Technical Data for bid evaluation below)

1. Guaranteed Characteristics

a. No load losses, at rated voltage and frequency, not greater than: _____kW

b. Load losses at ONAN rating, rated voltage and frequency not greater than: _____kW

c. Minimum H-X positive sequence impedance, @ ONAN rating: _____kW

d. Noise level @ 1 foot, ONAN cooling: _____ dbA

e. Noise level @ 1 foot, second stage ONAF cooling: _____ dbA

f. Transformer and all ancillary equipment designed with overload capabilities in accordance with ANSI C57.92 and NEMA TR-98: _____(Y/N)

2. Technical Data

a. Manufacturer _____

b. Forced Cooling _____

1) Total cooling power requirements _____

2) Auxiliary power, volts _____

3) Total auxiliary load with fans, LTC and cabinet space heaters (kW) _____

c. Space heaters

1) Quantity _____

2) Voltage _____

3) Total watts _____

4) Controlled by thermostat, watts _____

d. Proposed outline drawing showing (ATTACH DRAWING)

1) Height over bushings, inches _____

2) Height over tank, inches _____

3) Width, inches _____

4) Depth, inches _____

5) Base dimensions, inches _____

6) Dimensions over radiators, inches _____

7) Location of terminal cabinet _____

8) Location of all bushings _____

9) Shipping size _____

e. Weight

1) Fully assembled, without oil, lbs. _____

2) Filled with oil, lbs. _____

3) Shipping weight, lbs. _____

f. Conductor material

1) Conductor material proposed for HV windings _____

2) Conductor material proposed for LV windings _____

g. Rated voltage, kV

1) Primary _____

2) Secondary _____

h. Windings

1) Winding configuration, ANSI group

a) High voltage _____

b) Low voltage _____

2) Main Windings

a) Capacity @ 65 degrees C rise, MVA _____/_____/_____

b) BIL, kV _____

3) Secondary Windings

a) Capacity @ 65 degrees C rise, MVA _____/_____/_____

b) BIL, kV _____

i. Cooling

1) Class _____

2) Number of radiators _____

3) Fan manufacturer _____

j. Bushings

1) High Voltage (H1, H2, H3)

a) Manufacturer _____

b) Type _____

c) Voltage class, kV _____

d) Current rating, amperes _____

e) Creepage distance, inches _____

2) Low Voltage (X1, X2, X3, X0)

a) Manufacturer _____

b) Type _____

c) Voltage class, kV _____

d) Current rating, amperes _____

e) Creepage distance, inches _____

k. On-Load Tap Changer

1) Manufacturer _____

2) Type _____

3) Type of switching (i.e.: vacuum, resistor) _____

4) Current rating, amperes _____

5) Number of taps _____

a) Above rated voltage _____

b) Below rated voltage _____

6) Voltage change of each tap, percent of nominal _____

7) Rated short circuit current, kA _____

8) Rated short circuit current during tap change, kA _____

9) Controls

a) Manufacturer _____

b) Type _____

l. Relaying Current Transformers

1) Total quantity, H Bushings _____

2) Total quantity, X Bushings _____

3) Ratio _____

4) Accuracy class/voltage class _____

5) Burden capability, VA _____

6) Thermal rating _____

7) Mechanical limit, amperes _____

m. Surge arresters

1) High voltage

a) Manufacturer _____

b) Arrester rating (duty cycle, rms kV) _____

c) Maximum continuous operating voltage, (MCOV), rms _____

d) TOV capability, rms kV (L-N) @ one second _____

e) Creepage distance, inches _____

f) Total weight of each unit, lbs. _____

2) Low voltage

a) Manufacturer _____

b) Arrester rating (duty cycle, rms kV) _____

c) Maximum continuous operating voltage, (MCOV), rms _____

d) TOV capability, rms kV (L-N) @ one second _____

e) Creepage distance, inches _____

f) Total weight of each unit, lbs. _____

n. Oil

1) Manufacturer _____

2) Type _____

3) Quantity, main tank and radiators, gallons _____

4) Quantity, LTC tank, gallons _____

5) Total weight, pounds _____

o. Parts removed for shipment (attach list) _____

p. Proposed principal method of shipment _____

q. Location of manufacturing facility _____

r. Location of nearest repair facility _____

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

SUBSTATION POWER TRANSFORMERS
IPSWICH RIVER SUBSTATION
OCTOBER, 2017

SECTION IV
TECHNICAL SPECIFICATIONS

A. GENERAL

The technical specifications utilize the Construction Specifications Institute (CSI) 16 division format and are written in imperative and streamlined form. The imperative language is directed to Manufacturer unless specifically noted otherwise. The words "shall be" shall be included by inference where a colon (:) is used within sentences or phrases in sections within these Divisions.

B. MATERIALS AND WORKMANSHIP

All materials shall be new and of high quality which will yield long life and reliable operation. All equipment shall be modern in design and shall not have been in prior service except as required by factory tests. Workmanship shall be of high quality in every detail.

C. VARIATIONS FROM REQUIREMENTS AND SPECIFICATIONS

No change, variation or deviation from the specifications shall be made except by written order of the OWNER. Should the manufacturer find, at any time during the progress of the work, that in his opinion, existing conditions demand, make desirable or beneficial a modification in requirements covering any particular item or items, he shall promptly report such matters to the OWNER for their decision and instructions.

D. STANDARDS

The latest revision of the standards of ANSI, NEMA, IEEE, AISC, ASTM, and ASME shall be met in design, testing and manufacture of the equipment covered by this specification.

SECTION 01 11 01

POWER TRANSFORMER PROCUREMENT

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Summary of work included in this Contract

B. Schedule and Monthly Status Reports

C. Experience

D. Manufacturing Plant Location

E. Transformer Design Requirements

F. Warranty Requirements

G. Factory Inspection

H. Spare parts and accessories

1.02 WORK INCLUDED

A. Furnish and Deliver two (2) Power Transformers, 36/48/60 MVA, 115 kV Delta – 22.9 kV GrdY with LTC, in accordance with Section 26 12 14.63 to Ipswich River Substation.

B. Rigging and hoisting required to place the transformers on their foundations at the substation site.

C. Field assembly and field testing of the transformers to make ready for service.

1.03 COORDINATION, SCHEDULE AND MONTHLY STATUS REPORTS

A. OWNER and MANUFACTURER shall reach agreement with respect to the expected delivery schedule at the time of contract award.

B. The transformers are being delivered to the foundations in a new substation, and thus cannot be delivered until the foundations are ready for them MANUFACTURER shall consult with OWNER prior to transportation permitting, loading or shipping transformer, to verify that the site will be ready to receive transformers. Permitting, loading and shipping shall not take place without approval of the OWNER. In the event that delivery is delayed from the agreed upon schedule, the MANUFACTURER and OWNER may negotiate suitable compensation.

C. MANUFACTURER shall provide a detailed design and manufacturing schedule for each unit within 4 weeks of award of this Contract. This schedule shall include, at a minimum, the following line items and associated dates:

- Issue mechanical shop drawings
- mechanical drawings returned approved
- Issue electrical shop drawings
- electrical drawings returned approved
- tank fabrication

- core cutting & stacking
- winding
- nest core/coils and drying
- tanking
- factory acceptance tests
- shipment
- delivery to site
- assembled and ready to operate

D. This schedule shall include a column with the required date for each task, and a column with the actual date for each task.

E. MANUFACTURER shall provide monthly status reports and update the schedule with any actuals filled in (via email) to OWNER and ENGINEER. The schedule shall be updated and provided in the first week of each month.

F. MANUFACTURER shall immediately notify OWNER of any event that occurs that could cause a delay in the schedule.

1.04 EXPERIENCE

A. MANUFACTURER shall have a minimum of 5 years of experience with the design, assembly and testing of power transformers that are similar in size, type and voltage rating to the equipment specified herein. References shall be provided upon request.

1.05 MANUFACTURING PLANT LOCATION

A. <u>The transformers shall be manufactured at a facility located within a 1500 mile radius of the City of Peabody, Massachusetts (no exceptions).</u>

1.06 TRANSFORMER DESIGN REQUIREMENTS

A. Transformers shall be of a common design and shall utilize common components and accessories where possible. This shall include, at a minimum:

1. Bushings
2. Arresters
3. Insulators
4. Hardware and fittings
5. LTC
6. Gauges and electronic accessories
7. Radiators and cooling equipment
8. Oil preservation equipment (nitrogen system)

1.07 WARRANTY REQUIREMENTS

A. Include in the base bid cost a warranty that covers the transformer and all items included with the transformer ("bumper to bumper" warranty) for a period of 12 months from the date of energization, or 18 months from the date of acceptance by the OWNER, whichever is shorter. Warranty shall include disassembly, rigging, transport and reassembly costs to and from the factory if factory repair is required. In the event of a repair requiring return to the factory, the repaired transformer shall be returned to the site in the same condition as required for the original installation.

B. Provide an additional cost in the appropriate line items on the bid form for five (5) year extended warranty coverage for the transformer and all items included with the transformer ("bumper to bumper" warranty) in lieu of the standard warranty above. The five year warranty shall provide coverage for a period of 60 months from energization, or 66 months from date of acceptance by the OWNER, whichever is shorter. The extended Warranty shall include disassembly, rigging, transport and reassembly costs to and from the factory for at least the first 12 months after energization or 18 months after date of acceptance if factory repair is required. Any items that are excluded from the extended warranty must be clearly noted as part of the proposal.

1.08 FACTORY INSPECTION

A. Plan the manufacturing schedule so that both units of like ratings under this order are completed at the same time and tested at the same time.

B. Owner will typically witness dielectric testing of the first unit of each size/type to be completed, and may elect to witness additional testing.

C. Provide a minimum of twenty one (21) day advance notice of the transformer inspection dates to allow time for personnel scheduling and travel arrangements.

1.09 SPARE PARTS AND ACCESSORIES

A. Provide the following spare parts with order (include pricing within base bid):

1. Three (3) spare primary winding bushings, identical to those provided with the transformer
2. Three (3) spare secondary winding bushings, identical to those provided with the transformer
3. Three (3) spare primary winding surge arresters
4. Three (3) spare secondary winding surge arresters

B. Provide a list with pricing of recommended spare parts for each transformer WITH BID.

C. Provide separate cost for one (1) set of LTC contacts, to include all replaceable current carrying contact parts, along with any items that the Manufacturer recommends replacing with the contacts (springs, etc.)

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 24

SUBMITTALS AND SHOP DRAWINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Submittal Procedures

B. Submittal Schedule

C. Number of Copies

D. Final Drawings

1.02 SUBMITTAL PROCEDURES

A. Make submittals as required by the individual specification sections.

B. Coordinate and check all shop drawings furnished by suppliers and subcontractors for accuracy and conformance with requirements of the Contract Documents.

1.03 SUBMITTAL SCHEDULE

A. Provide a submittal schedule within fourteen (14) calendar days after vendor receipt of order indicating anticipated date of each required submittal.

B. Schedule submittals to expedite the project

C. Deliver submittals to the ENGINEER, with copy of transmittal to the OWNER, at the addresses shown in the specifications.

D. Include the following:

1. Description of each submittal

2. Date by which each submittal will be delivered to ENGINEER and OWNER.

3. Date by which each submittal must be approved to maintain project schedule.

4. Relevant specification section reference

E. Allow a minimum of 2 weeks from date of receipt by ENGINEER of submittal copies for ENGINEER and OWNER to review each submittal.

F. Shop drawing submittals are required no later than the following periods after Contract Award:

1. Outline and weight drawings suitable for foundation design – 8 weeks after vendor receipt of order

2. Remaining Drawings – as required to meet delivery schedule

1.04 NUMBER OF COPIES

A. Submit the following:

1. One set of electronic drawing files, compatible with AutoCAD 2007, supplied on CD or via E-Mail. The transmittal shall include any required plot, shape, font or linetype files to allow for proper plotting. Include a written description of the layer naming and line weight conventions and any instructions for setup of files for proper plotting.

2. One full size PDF print of each drawing shall be provided with the drawing submission.

3. Three copies in addition to the number the Vendor wants returned of all preprinted manufacturer's data, brochures and other information submitted.

1.05 PRESENTATION

A. Present in a clear and thorough manner.

B. Identify dimensions, show relation to adjacent or critical features.

C. Use sheet size of not less than 8-1/2 by 11 inches and not more than 24 by 36 inches.

1.06 SHOP DRAWING REVIEW COMMENTS

A. ENGINEER's review will be completed within a reasonable time after receipt by ENGINEER of each submittal in proper sequence, and will be returned to CONTRACTOR with one of the following markings:

"*Approved*" indicates submittal has been reviewed and appears to be in conformance with requirements of the Specifications. CONTRACTOR may proceed with construction shown on the submittal.

"*Make corrections noted*" indicates submittal appears to be in conformance with requirements of the Specifications. CONTRACTOR shall incorporate the corrections noted and may proceed with construction shown on the submittal. No resubmittal is required.

"*Amend - resubmit*" indicates submittal does not appear to be in conformance with the Procurement Documents. ENGINEER's comments will be noted on the submittal or in a separate letter. CONTRACTOR shall recheck, make necessary revisions and resubmit.

"*Submittal not required - no action taken*" indicates that the submittal is not called for by the Specifications and that no action was taken by ENGINEER.

B. Review for conformance with design concepts and compliance with Specifications does not require ENGINEER to review features solely related to construction or all dimensions, quantities and other data. CONTRACTOR shall not rely on ENGINEER's approval as a verification or check of all such items in the submittal or of satisfactory and safe installation and construction. CONTRACTOR shall verify all fabrication and installation requirements, quantities and dimensions.

C. The Vendor's responsibility for errors and omissions in submittals is not relieved by the ENGINEER's review.

D. Shop drawing acceptance by the OWNER or ENGINEER shall not be construed as approving departures from the Contract requirements.

1.07 AS-BUILT DRAWINGS

A. Revise all drawings to reflect the as-shipped condition of all equipment.

B. Submit as-built drawings, except wiring drawings, prior to delivery of the respective equipment.

C. Submit as-built wiring drawings no later than two (2) weeks after date of shipment of equipment.

D. Indicate "As-Built" in revision block and sign. Show all changes and revisions to date of completion. Submit the following quantities:

1. All Drawings – four (4) black-on-white prints (included with O&M manuals, see section 01 78 23).

2. One set of electronic drawing files, in AutoCAD 2007 or later format, supplied on CD or via E-Mail. The transmittal shall include any required plot, shape, font or linetype files to allow for proper plotting. Include a written description of the layer naming and line weight conventions and any instructions for setup of files for proper plotting.

3. One full size PDF print of each drawing shall be provided with the drawing submission.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 66 02

DELIVERY, STORAGE AND HANDLING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Products

B. Transportation and handling

1.02 PRODUCTS

A. Products: means new material, machinery, components, equipment, fixtures, systems and manufactured units used in Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.

B. Provide interchangeable components of the same manufacturer, for similar components.

1.03 TRANSPORTATION AND HANDLING

A. Prepare and load Products in such a manner as to provide protection from damage during shipment. Securely cover and protect Product so that it is not damaged during shipment by environmental factors such as rain, wind, snow, etc. or by physical conditions such as rocks or other objects.

B. Transformers shall be fully covered (top and sides) with a properly applied shrink wrap material to protect from road debris.

C. Provide advance copy of weight list for each shipment. Weight list to be received by OWNER in accordance with the minimum delivery notice requirements.

D. Ship heavy or bulky equipment in open-top truck to facilitate unloading at OWNER's site.

E. Where appropriate, mount heavy parts on skids or crates, and box or bundle securely small parts that may be lost. Mark packaged items for ready identification. Arrange Products exceeding 200 pounds in weight so that slings may be properly attached for lifting by crane.

F. Mark all parts for ease of field assembly.

G. Provide notices and packing lists required by Contract Documents

H. Vendor to retain responsibility for any damage to Product until delivery is accepted by OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 23

OPERATION, MAINTENANCE AND INSTALLATION MANUALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preparation

B. Contents

C. Submittal

1.02 PREPARATION

A. Provide complete Operations, Maintenance and Installation Manuals covering the Goods furnished under this Contract, as follows:

B. Prepare Manuals in 8 1/2" x 11" format, bound in a substantial binder with three (3) D-type rings (Avery Heavy-duty binder or equal, with clear cover pockets).

C. Internally subdivide the binder contents with permanent page dividers logically organized in accordance with the general table of contents below. Tab titles shall be clearly printed on reinforced, laminated plastic tabs, and keyed to a table of contents.

D. Each copy of the manuals shall be assembled and bound in a substantial binder imprinted on the backbone (spine) and cover with the following:

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

IPSWICH RIVER SUBSTATION
115–22.9 KV POWER TRANSFORMERS

(DATE OF DELIVERY)

Manufacturer's Name
Manufacturer's Address

E. Identify individual volumes as “1 of 2", “2 of 2", etc. on backbone and cover if manual requires multiple volumes.

F. Prepare a detailed table of contents for each binder, with material, equipment or system identified, to describe each section of the manual.

1.03 CONTENTS

A. The instruction manuals shall include, as a minimum, the following:

1. Directory listing the Name, address and contact telephone numbers of CONTRACTOR and any local field service facilities

2. General Table of Contents

a. Descriptions of equipment furnished

b. Specifications, test data, and curves

c. Instructions in the methods of receiving, inspection, storage, handling, and maintenance

d. Methods of installation and trial operation of the equipment

e. Assembly drawings

f. Parts list

g. Recommended spare parts with pricing

h. Lubrication instructions (if applicable)

i. Nameplate information

j. Shop order numbers for each item of equipment or component

1.04 SUBMITTAL

A. One copy of the equipment instruction manual and one set of the final drawings shall be provided in a pocket on the inside of the control cabinet door on each item of equipment. The manual and drawings shall be placed in the equipment prior to shipment.

B. Two (2) additional sets of printed instruction manuals shall be sent at time of final drawing submittal, this to take place before shipment of equipment.

C. The manuals shall include complete printed documentation for each electronic accessory that is furnished.

D. ENGINEER shall review and approve the manuals and any additional information shall be furnished in sufficient quantities to allow for insertion.

E. Following approval, three (3) electronic copies of each instruction manual shall also be provided. Electronic files shall be in Adobe (PDF) format, and shall be provided on CD. Electronic files shall include the entire instruction manual, with each component in a separate PDF file (ie. do NOT make the entire manual one very large PDF file).

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 26 12 14.63

115 -23 KV POWER TRANSFORMER

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Design, manufacture and testing of outdoor oil-immersed substation power transformer, 36/48/60 MVA, 115 – 22.9 kV.

B. Transport of transformer from MANUFACTURER to substation site, off-loading and placement of transformer on foundation, final assembly, dressing out, and field testing of transformer, as needed to make ready for service. All external wiring connections (primary, secondary, control and grounding) will be done by others.

1.02 REFERENCES

Design, manufacture and test in accordance with this section and applicable sections of the latest revision of the following standards.

A. ANSI C57 and NEMA TR-1, Transformer, Regulators and Reactors

B. ANSI C57.19, Apparatus Bushings

C. ANSI C62, Surge Arresters

D. ASCE 7, Minimum Design Loads for Buildings and Other Structures

E. ANSI Z55.1, Standard Gray Finishes for Industrial Apparatus and Equipment

F. ANSI C80.1, Standard Specifications for Rigid Steel Conduit

G. ANSI B16.5, Slip-on Welding Flanges

H. ANSI C57.92, NEMA TR-98 regarding loading

I. ASTM D-3487, Mineral Insulating Oil Used in Electrical Apparatus

J. IEEE, Latest Short Circuit Withstand Requirements

K. ICEA, Specifications for Wire and Cable

L. NEC, Current rating of Control Wiring

1.03 DESIGN AND PERFORMANCE REQUIREMENTS

A. Application: oil immersed three phase, two-winding, delta/wye-grounded power transformer, applied as a distribution substation step-down transformer.

B. Supply voltage: nominal 115 kV within a range of 115 kV, plus or minus 5 percent.

C. Design transformers and all ancillary equipment with overload capabilities in accordance with ANSI C57.92 and NEMA TR-98.

D. Provide load tap changing capability on low voltage windings and de-energized tap changing capability on high voltage windings.

E. Design transformers to be capable of withstanding short circuit forces in accordance with ANSI C57.12.00 and C57.12.90. Certified short circuit test data for a transformer of similar design, voltages and MVA capacity showing no evidence of failure during the short circuit test shall be provided to document the capability of the transformer plant and design. A description of the test code under which the transformer was tested shall be provided.

F. A vapour phase system shall be utilized to dry and impregnate the completed core and coil assembly.

G. The Transformer and its accessories shall be qualified in accordance with IEEE Standard 693-1997, IEEE Recommended Practice for Seismic Design of Substations. The seismic qualification level shall be “MODERATE”.

H. Loss Evaluation

1. No load loss factor: $6,285 per kW at nominal voltage ratings.

2. Load loss factor: $1,144 per kW at ONAN rating.

If the tested losses for the transformer do not exceed the quoted guaranteed maximum losses, the transformer will be accepted.

If the tested No-Load losses for the transformer do exceed the quoted guaranteed maximum No-Load losses, a sum equal to the excess amount of the No Load loss times the No Load loss factor will be deducted from the contract dollar amount. Credits will not be issued for tested losses below quoted values.

If the tested Load-Loss losses for the transformer do exceed the quoted guaranteed maximum Load-Loss values, a sum equal to the excess amount of the Load-Loss times the Load-Loss factor will be deducted from the contract dollar amount. Credits will not be issued for tested losses below quoted values.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 24

1. Product Data: Catalogs and cut sheets.

2. Shop Drawings

a. Outline showing general arrangement, legend, plan, elevation, base details, shipping and installed weights, dimensions, gallons of oil, with location of centers of gravity on outline, and material list detailing all major accessories, including OEM manufacturer’s catalogue numbers.

1) All user interface points (conduit entrance plates, flanges, etc.) shall be dimensioned on the outline drawing.

b. Connection, alarm, control and auxiliary schematic diagrams

c. Internal wiring and connection diagrams (tabular format is not acceptable). **Wiring diagrams shall utilize an address (destination) system notation**.

d. Bushing current transformers:

1) Excitation and ratio correction factor curve for each secondary ratio.

2) Resistance of current transformer secondary and connecting leads for each ratio.

3) Actual current ratio and turn ratio for each tap.

4) Mechanical and thermal short time (one second) rating

e. Nameplate data, including current transformer taps. Resubmit nameplate drawing after factory tests with all fill-in data completed.

f. Physical drawings of control cabinets showing equipment arrangement, terminal block locations, cable entrance and panel layout.

g. Bushing lifting accessories and ground pad outlines.

h. Notes and symbols

i. Bill of material

3. Design Data

a. MANUFACTURER's certification that all equipment and assemblies conform to the seismic performance requirements stated in Article 1.03.

b. Certified short circuit withstand test results on units of comparable rating and design.

4. Test Reports

a. Five (5) copies of certified factory test reports of transformer after final test.

b. Five (5) copies of certified factory test reports for all accessories.

c. Five (5) copies of certified field test reports of transformer after installation and assembly.

5. As-Built Drawings

a. Show all changes and revisions to date of equipment shipment.

6. Pictures

a. Take a minimum of six (6) digital high resolution color photographs of the core and coil assembly prior to placement in the tank, one each from the top, bottom and each of the four sides. Pictures shall show internal construction and connection details and leads.

b. Provide two complete high-resolution 8” x 10” printed sets of the transformer pictures.

c. Provide digital files for pictures via email or on CD.

B. Operation, Maintenance and Installation Manuals

1. In accordance with Section 01 78 23

1.05 QUALITY ASSURANCE

A. Assemble, adjust and complete routine production tests in accordance with Table 19 of ANSI C57.12.00-2000, NEMA TR-1 and these specifications. In addition, complete the following other tests

(all tests to be performed on all units procured under this contract unless noted).

1. Insulation Resistance

    a. High Voltage to Low Voltage

    b. High Voltage to Low Voltage grounded

    c. Low Voltage to High Voltage grounded

    d. Each core to ground with core ground strap removed

2. Turns ratio test shall be performed for all three phases, on all De-energized Tap Changer positions with LTC in neutral and on all LTC positions with DETC in center position.

3. Polarity and Phase Relationship tests shall be performed on each phase to verify subtractive polarity and correct angular displacement and phase sequence.

4. No-load Loss and Excitation Current Tests

    a. Perform tests at 90%, 100% and 110% of rated voltage on the exciting winding, with the other winding on rated voltage tap.

    b. Perform single-phase excitation test on all three phases, in all De-energized Tap Changer positions, with LTC in neutral.

5. Impedance and Load Loss Tests

    a. Test values to be corrected to 85˚C.

    b. Perform tests at the ONAN and top ONAF ratings, for all De-energized Tap Changer positions and LTC in neutral, and for highest loss tap combination.

    c. Report impedance values in percent on the base ONAN rating of the high voltage winding.

    d. Perform zero sequence impedance test

6. Noise Tests

    a. Conduct noise tests on the first unit of each rating only.

    b. Measure and report the A-weighted sound level, in accordance with ANSI C57.12.90, for all ratings.

    c. Perform the noise test with the actual auxiliary equipment (radiators, fans, external compartments, etc.) that will be supplied with the transformer.

    d. Perform the noise test on the fixed tap and LTC tap position that results in the highest noise level.

7. Temperature Rise Tests

    a. Conduct a temperature rise test in accordance with ANSI C57.12.90 for both the ONAN and top ONAF ratings. Take sufficient measurements to ensure that no portion of the transformer exceeds the maximum allowable temperature rise.

    b. Temperature rise tests to be conducted at the tap and connection configuration that is expected to produce the highest temperature rise.

c. Temperature rise tests shall utilize the actual cooling equipment that will be furnished with the transformer, not substitute equipment.

d. DGA tests shall be performed in accordance with ANSI C57.104 before the Temperature rise test, and immediately after each test (one after ONAN rating test and one after top ONAF rating test).

8. Dielectric Tests

a. Insulation Power Factor

1) Test and report the following readings:

a) High Voltage to Low Voltage and Ground

b) Low Voltage to High Voltage and Ground

c) High Voltage and Low Voltage to Ground

d) Low Voltage to Ground, Guard on High Voltage

e) High Voltage to Ground, Guard on Low Voltage

f) High Voltage to Low Voltage, Guard on Ground

2) Tests shall be performed utilizing the Doble M4000 test set. Provide electronic and printed copies of test file for each unit.

3) Tests shall be performed as close as practical to 20°C to minimize inaccuracies from correction factors. Readings shall be corrected to 20°C for reporting and analysis.

4) Direct failure criteria shall be based on ANSI C57.12.90, Method II. If any corrected insulation power factor reading listed in Method II is greater than 0.5%, then the OWNER must be consulted prior to shipment. The OWNER reserves the right to reject any transformer with an insulation power factor reading, corrected to 20°C that is greater than 0.5% in accordance with ANSI C57.12.90, Method II.

5) The OWNER reserves the right to require that corrective actions be taken, at the OWNER's expense, if any corrected insulation power factor reading required by this specification but not listed in Method II is greater than 0.5%.

b. Class II Power Transformer Impulse tests, in accordance with ANSI C57.12.90

c. Partial discharge measurement concurrent with Class II Power Transformer Induced Voltage test. Failure detection criteria shall be in accordance with ANSI C57.12.90-1999, 10.8.5.

d. DGA tests shall be performed in accordance with ANSI C57.104 both before and immediately after the Dielectric Tests.

9. Sweep Frequency Response Tests: Test equipment shall be the Doble M-series test set or similar approved equipment. Provide electronic and printed copies of test file for each unit.

10. Leakage Reactance test

11. Accessory Tests

a. Bushings:

1) Test each bushing in accordance with routine tests as detailed in ANSI C 76.1 and C37.09a.

2) Where applicable, test bushing power factor, C1 and C2 with Doble M4000 test set. Include results in transformer test file.

b. Surge Arrestors

1) Test each surge arrester in accordance with ANSI standards.

2) Where applicable, test surge arrestor power factor with Doble M4000 test set. Include results in transformer test file.

c. Test each auxiliary device (fans, gauges, controls, relays, etc.) for proper operation and in accordance with Manufacturer recommendations.

d. Perform dielectric tests on control devices and wiring per NEMA IC-1, “Standard for Industrial Control".

e. Perform the following tests on each current transformer:

1) Low frequency, one-minute 2,500 volts to ground dielectric test on secondaries

2) Proper nameplate and polarity marking check

3) Polarity and ammeter ratio check after installation in bushing

f. Perform certified meter accuracy testing on certain instrument transformers (all VT’s, all meter accuracy CT’s) delivered (note serial number and location on test report) in accordance with ANSI C57.13.

1) Ratio correction factor and phase angle tests for each CT ratio, standard burdens B=0.3 through B=2.0, 0.5 and 5.0 secondary amperes.

2) Resistance of current transformer secondary and connecting leads for each ratio.

3) Excitation and actual current ratio and turn ratio for each tap.

B. Provide a certified factory test report for each individual transformer that is to be furnished. Test reporting shall generally be in accordance with ANSI/IEEE C57.12.90. Test results shall be tabulated and included. Test report shall include results for additional tests that are required by this specification.

C. Provide certified test results for certain instrument transformers (all VT’s, all meter accuracy CT’s) procured under this order. Testing shall be performed on each CT or VT delivered (note serial number and location installed on test report) in accordance with ANSI C57.13.

1. Ratio correction factor and phase angle tests for each CT ratio, standard burdens B=0.3 through B=2.0, 0.5 and 5.0 secondary amperes.

2. Resistance of current transformer secondary and connecting leads for each ratio.

3. Excitation and actual current ratio and turn ratio for each tap.

D. OWNER and ENGINEER may inspect unit and/or witness all or a portion of the testing procedure.

E. Manufacturer shall notify OWNER and ENGINEER within 24 hours of failure of any factory test that could impact the delivery schedule.

F. Test Failure (factory or field tests)

1. Grounds for rejection

a. Failure to attain satisfactory test results

b. Failure to meet applicable standards

2. In the event of failure of test:

a. Submit details of the test failure in writing.

b. Submit a recommended procedure and schedule for equipment repair and retesting to the OWNER and ENGINEER for approval.

c. Obtain ENGINEER approval before proceeding.

d. Notify OWNER and ENGINEER as soon as practical before retesting is to occur, allowing enough time for attendance if desired.

e. Furnish new equipment which meets the requirements of the Specification if rejected equipment cannot be rectified to the satisfaction of the OWNER and ENGINEER.

f. Retest after rectification or replacement of equipment in presence of OWNER or ENGINEER unless waived.

3. Assume responsibility for all costs associated with any test failure, including but not limited to:

a. Loss or damage due to testing

b. Rectification

c. New equipment to replace damaged or non-rectifiable equipment

d. Retesting

e. Replacement equipment, including installation, removal, delivery, transportation, field service, etc.

f. Witness of retesting by OWNER and ENGINEER, including travel, lodging, meals, and payroll for up to three personnel, at no additional cost to OWNER.

G. Submit factory test report to OWNER and ENGINEER for approval prior to shipment of transformer. Do not ship transformer until factory test report is approved by OWNER and ENGINEER.

H. Submission of certified factory or field test reports does not relieve manufacturer of responsibility for meeting the requirements of the entire Specification.

I. For units that are shipped filled with dry air, a dew point measurement shall be taken with the transformer on the shipping vehicle, 24 hours after filling the tank with dry air. The dew point shall meet the MANUFACTURER's standard requirements for oil filling, but shall be at least -30°C at 20°C ambient temperature. The results shall promptly be reported to ENGINEER. The OWNER reserves the right to reject or require corrective actions to the transformer if it does not pass this test.

J. Complete field testing in accordance with Part 3 - Execution of these specifications.

1.06 DELIVERY, STORAGE AND HANDLING

A. Proceed in accordance with Section 01 66 02.

B. Deliver assembled to fullest extent possible, f.o.b. to substation foundation. MANUFACTURER is responsible for arranging, paying freight and shipping, and handling equipment between factory and foundation. MANUFACTURER is responsible for all charges caused by delays in offloading transformer associated with damage or impact recording during shipment, including excess crane, demurrage and personnel charges.

C. MANUFACTURER is responsible for all required transportation surveys, routing and permitting. MANUFACTURER is advised to inspect site during bid period to identify any site access concerns.

D. Deliver all accessories, including oil if required, to the Project Site. MANUFACTURER is responsible for arranging for, coordinating and paying for delivery and handling of accessories.

E. It is OWNER's strong preference that transformer and associated equipment be shipped via truck. Delays related to shipment by rail, including an allowance for extra handling time between rail siding and project site, shall be factored into the proposed manufacturing and delivery schedule. Transformers shall not be shipped by rail unless initially internally designed and braced for rail shipment.

F. Transformer shall be shipped filled with breathable dry air.

G. Transformer shall be covered with shrink wrap during shipment. Shrink wrap shall cover 100% of the sides and top of the unit.

H. Firmly attach three-way impact recorder accelerometer with GPS position transmitter to transformer tank during transportation period. Recorder shall transmit geographic position and impacts recorded at least 12 times per day. Information that is transmitted shall be stored and shall be made available to OWNER on a real time basis via internet connection. Provide login and password information to OWNER and ENGINEER prior to shipment. Recorder shall be removed only at designated f.o.b. delivery point. MANUFACTURER's representative shall be present along with OWNER, and both shall inspect the transformer upon delivery for any obvious signs of damage. MANUFACTURER shall maintain a copy of the position and impact recording data and a copy shall be furnished to OWNER and ENGINEER upon request.

I. Equipment shall be unloaded by MANUFACTURER.

J. Concrete foundation shall be provided by OWNER.

1.07 PROJECT/SITE CONDITIONS

Isokeraunic level	30 thunderstorm - days/year
Snow Load	40 pounds per square foot
Elevation above sea level	less than 3,300 feet NGVD
Temperature range (min/max)	-30 degrees F/plus 115 degrees F
Precipitation	40-45 inches/year average

PART 2 - PRODUCTS

2.01 PRINCIPAL RATINGS AND ELECTRICAL CHARACTERISTICS

A. Furnish power transformer with the following principal ratings and electrical characteristics.

1. Overload capabilities: in accordance with ANSI C57.92, NEMA TR-98.
2. Number of phases 3
3. Frequency ..... 60 Hz
4. Cooling class ONAN/ONAF1/ONAF2
5. Continuous Ratings and Impedance:
   a. ONAN, 65 degrees C rise: ..... 36 MVA
   b. ONAF1, 65 degrees C rise, first stage forced cooling: ..... 48 MVA
   c. ONAF2, 65 degrees C rise, second stage forced cooling: ..... 60 MVA
   d. High Voltage to Secondary Voltage Impedance at ONAN Rating: .....12.0 %
      (ANSI Standard Tolerance)
6. High Voltage Winding
   a. Voltage ..... 115,000 V
   b. Connection ..... Delta
   c. Basic Impulse Level (BIL) ..... 550 kV
   d. De-Energized Tap Changer Plus or minus 5 percent in four 2.5 percent steps
7. Low Voltage Winding
   a. Rated voltage ..... 22,900 GRDY/13,220 V
   b. Connection ..... Wye-grounded
   c. Basic Impulse Level (BIL) ..... 150 kV
   d. Load tap changer 32-5/8 percent taps, 10 % above and 10 % below rated voltage
8. Maximum Temperature Rise
   a. By Resistance ..... 65 degrees C
   b. By Hot Spot ..... 80 degrees C
9. Duty ..... Continuous
10. Angular displacement.....ANSI Standard
11. Noise level ..... 10 dBA below NEMA standard, or quieter, for all cooling levels, on all no-load and LTC tap positions

2.2 COMPONENTS

A. Transformer Tank

1. Welded steel plate construction, liquid tight, with bolted and gasketed manhole(s) on top of tank. Mounted on steel skid base, suitable for skidding in any direction. Use care to avoid tank or component distortion during welding operations. Assembled transformer base shall be sufficiently flat to be installed on a flat concrete foundation without supplemental shims.

2. Adequately designed and braced to allow full vacuum filling and vacuum drying operations in the field.

3. Provide jacking lugs and pulling eyes for lifting or moving along either axis when completely assembled and oil-filled. Lifting lugs shall be mounted near the top of the tank. Jacking lugs shall be installed with approximately 13 inches of clearance to the bottom of the base plate.

4. Provide two NEMA 2-hole copper faced or stainless steel ground pads at diagonally opposite corners of transformer tank near base, with two-bolt terminal connectors for 4/0 AWG copper conductors.

5. Provide NEMA 2-hole copper faced or stainless steel ground pads at Surge Arrester ground points, and on tank cover adjacent to secondary neutral bushing X0.

6. Maintain positive pressure continually to prevent ingress of moisture during shipping.

7. Provide an adequately braced domed or sloped top on all major surfaces. Design tank and fittings to prevent water puddling on surfaces or in cavities.

8. Provide raised flanges with thru-bolts for all removable cover penetrations, including bushings, manhole/handhole covers and removable equipment. Welded studs are not acceptable.

9. All gasket surfaces shall be machined true and smooth, and shall have a recess or raised stops to properly seat the gasket and limit compression to design values.

10. Provide manholes and handholes as required to properly access internal components that require maintenance or connection, including but not limited to bushing connections and current transformers. A minimum of one manhole cover, a minimum of 24 inches in diameter, shall be provided to allow access to the top of the tank without lowering the oil below the top of the core.

11. Tether Pole

    a. Provide fully welded safety tether pole mounting provisions as near as practical to the center of the tank cover. Manufacturer: Pelsue Model #FB-SW3 (No Exceptions)

B. Drain, Fill and Sampling Valves

1. All valves and plugs for oil handling shall be of brass or bronze, unless otherwise noted.

2. All valves shall be supplied with a threaded plug or cap to seal the end when not in use.

3. Provide combination fitting for tank drain, lower filter press connection and oil sampling point. This fitting shall be located where it will be readily accessible for oil handling and sampling activities, and not below a radiator bank. This fitting shall be at the base of the transformer tank low enough to fully drain the entire volume of oil. This fitting shall include one (1) two inch globe valve for drain and filter press connection, and one 3/8 inch oil sampling valve with a 5/16 inch – 32 male thread and cap.

4. Provide one (1) two inch globe valve for tank filling, located in the tank sidewall near the top of the tank (just below the 25 C oil level).

5. Provide one (1) 3" ball valve for vacuum filling. Locate valve at top of tank and far enough from the top oil valve connection to prevent oil spray from being drawn into vacuum line. Provide 90 degree elbow fitting between tank and valve so valve and connection are horizontal.

6. Provide ball valve and fittings to allow nitrogen pressurization of the head space.

7. Provide ball valves and fittings suitable for all external accessories such as fault gas monitors, etc.

C. Core

1. Highest quality, non-aging, cold-rolled, grain-oriented, stress free, thin silicon steel laminations, having high permeability and low hysterisis loss

2. Properly annealed, with smooth surfaces at edges

3. Each sheet shall be provided with an insulated surface treatment which is impervious to hot transformer oil.

4. Carefully assembled, rigidly clamped and blocked to prevent deteriorating vibrations, interference with oil circulation, objectionable noise conditions and short circuit and shipment distortions.

5. Provide a core ground lead connected to an external bushing for each core. Provide a flexible ground strap to connect the terminal of the bushing to the transformer tank, thereby grounding the transformer core. Provide a suitable cover or deflector to protect the core ground bushing from damage from falling objects. Provide an engraved nameplate clearly indicating the function of the bushing. Provide a separate core ground bushing and ground strap for each separate core (main core, preventative auto, etc.). If core ground bushings are located in a box, no other connections (CT, etc.) shall be made in that box.

6. Provided with means for properly handling core assembly when untanked

7. Core: cruciform shape, fabricated with sheets stepped in dimension to approximate a circle and minimize the clearance from core steel to windings.

D. Windings

1. Electrolytic copper with high conductivity characteristics

2. Winding type: circular in plan view, fabricated from wire or strap material. Sheet type windings are not acceptable.

3. Provided with thermally upgraded insulation system of high dielectric and mechanical strength, arranged to permit free circulation of oil

4. Made up, shaped and braced to provide for expansion and contraction due to temperature changes and avoid abrasion of insulation.

5. Adequately braced to prevent distortion due to any normal or abnormal operating condition

6. Brazed joints and pressure connectors are acceptable. Soldered connections are not allowed. No more than one connection shall be made in a single lead. Crimp connectors shall be copper "long barrel" type, with a minimum of two crimps each end.

7. Each lead for connection to tap changers, bushings, etc. shall be permanently identified.

8. Leads shall be adequately supported to resist movement due to normal or abnormal operating conditions, including maximum rated short circuit.

9. The maximum hot spot temperature of any lead shall not exceed the hot spot for any winding under operating condition, including specified overload ratings.

E. Cooling Equipment

1. Type: Two-stage ONAF conforming to ratings previously specified.

2. Radiators and Manifolds

a. Fully supported by the main tank (no external support points will be permitted)

b. Mounted to ANSI Segment 3 to the greatest extent practical

c. Of nominal dimensions and interchangeable

d. Radiators shall be constructed with galvanized steel

e. Welded construction, with flanged connections, top plug to vent and bottom ball valve (with suitable threaded plug) to drain, and without external cavities that would collect moisture

f. Provided with lifting eyes or lugs

g. Provided with oil-tight valves at connections to main tank that will allow removal of radiators without taking transformer out of service

3. Fans

a. Weatherproof construction with motors designed for fan duty.

b. Mounted on sides of radiators. Bottom mounting is not acceptable.

c. Provided with weatherproof locking type plug and socket connections.

d. Provide with OSHA approved blade guards.

e. Connected for 120/240V (single phase) station service.

f. Manufacturer: Krenz or OWNER approved alternate

4. Controls

a. Cooling system shall be automatically controlled by the winding temperature device, provided with automatic starting switches, auxiliary relays, alarm contacts, selector switch for AUTOMATIC-OFF-MANUAL operation and any other necessary devices. Provide a minimum of two spare, unused contacts in each position of the AUTOMATIC-OFF-MANUAL switch, wired to terminal block points in the control cabinet, for OWNER indication.

b. Provide separate circuit breaker of suitable rating for each fan stage.

c. Provide manual switching scheme to alternate fan banks (lead and lag) to allow more equal usage of the two fan banks.

d. Provide jumpered contact on terminal block to connect OWNER supplied external lockout relay contact to disable all fan operation.

e. Mounted in main transformer control cabinet

F. Transformer Oil

1. Pure inhibited mineral oil obtained by a hydrogen or a solvent extraction process from naphthalenic base crudes, meeting the requirements of ASTM D 3487 and ANSI C57.106.

2. Prepared and refined especially for transformer use, free of moisture, acid, alkali, PCB's and injurious sulphur compounds.

3. Free from deposit formation under normal operating temperatures.

4. Dielectric strength not less than 30,000 volts between one inch discs spaced 1/10 inch apart.

G. Oil Preservation System

1. Type: positive pressure nitrogen blanket system, designed to automatically maintain a blanket of dry nitrogen gas above the oil level at a positive pressure, not to exceed 5 psig.

2. Include sufficient dry nitrogen gas for the initial gas supply, including any gas needed to purge the tank prior to operation. There shall be at least one full cylinder remaining when the transformer is fully assembled and ready for service.

3. Provide a weatherproof enclosure with a full-height, gasketed hinged door, mounted at ground level, to contain active nitrogen cylinder, spare nitrogen cylinder, and regulator, valve and alarm assemblies. Locate enclosure so that the bottom is no more than one (1) inch above the base of the Transformer.

4. Size the enclosure such that the cylinders can be installed so as to not damage hoses or wiring. Regulator and valves shall be supported by a chain hanger connected to the enclosure, to prevent transferring strain or force to the hose.

5. Include a separate sample/fill valve, connected through independent piping to as separate valve into the gas space, so that gas can be sampled for analysis.

6. Include a three-stage pressure regulator, with cylinder pressure and tank pressure/vacuum gauges. Include the following alarm contacts, wired through terminal strips to annunciator:

a. Nitrogen cylinder low pressure (set to alarm <200 psig.)

b. Transformer low pressure alarm

c. Transformer high pressure alarm

7. Include an engraved metallic plate on the inside of the cylinder enclosure door that contains a diagram of the nitrogen system and detailed instructions for use.

H. Bushings

1. Bushing studs: Threaded, stud type, silverplated. Provide stud connectors with NEMA standard 4-hole (minimum) pad drilling sized to accommodate the full rating of the bushing.

2. Porcelain glazing: Free of imperfections.

3. Color: ANSI Z 55.1, No. 70, Light Gray.

4. High Voltage Bushings (H1, H2, H3)

a. Type ..... Interchangeable

b. BIL Rating ..... 550 kV minimum

c. Current Rating ..... 800 amperes minimum

d. Creepage Distance ..... Standard

e. Mounting .....On Tank Cover – Segment 3

f. Material: Porcelain, manufactured by the wet process

g. Manufacturer: Pecore, ABB or Approved Equal

5. Low Voltage Phase and Neutral Bushings (X1, X2, X3, X0)

a. Type ..... Interchangeable

b. BIL Rating ..... 150 kV minimum

c. Continuous current rating:..... 2,000 amperes minimum

d. Creepage Distance ..... Standard

e. Mounting: .....On Tank Cover – Segment 1

f. Material: Porcelain, manufactured by the wet process

g. Manufacturer: Pecore, ABB or Approved Equal

I. Neutral Bus

1. Type: Copper bar.

2. Rating: as required to accommodate maximum phase to ground fault current, assuming an infinite capacity source (minimum 1/4" x 3").

3. Routing: along outside wall of transformer from adjacent to neutral bushing (X0) to NEMA standard 2-hole ground pad located near base of transformer (for connection to ground grid by OWNER).

4. Provide flexible connector between neutral bus and neutral bushing.

J. Bushing Current Transformers

1. Windings: fully distributed.

2. Minimum thermal rating factor: 2.0

3. Leads

a. Bring out to short circuiting-type terminal blocks located in main control cabinet.

b. Terminate leads from each current transformer on a separate terminal block.

c. Mark leads with permanent sleeve markers to indicate taps and polarity.

d. Use #10 AWG minimum, stranded copper with oil proof insulation

4. Relay Accuracy Current Transformers (for OWNER's Use)

a. Multi-ratio, 5 lead, bushing type for relaying duty

1) Two 2000 - 5A MR, C800 Accuracy Class, on H1, H2, and H3 bushings

2) Two 2000 - 5A MR, C800 Accuracy Class, on X1, X2, and X3 bushings

3) Two 1200 - 5A MR, C800 Accuracy Class, on X0 bushing

5. Current Transformers (for Internal Use)

a. One CT, on X1 bushing for line drop compensation control of load tap changer

b. One CT, on one low voltage bushing for winding temperature indicator

K. Surge Arresters

1. Type: Outdoor, station class, gapless, metal oxide, for mounting connected to Transformer H and X bushings.

2. H Bushings - Ratings

a. Nominal Line Voltage ..... 115 kV

b. Maximum Line Voltage ..... 121 kV

c. Duty-Cycle Voltage ..... 108 kV

d. Maximum Continuous Operating Voltage (MCOV) ..... 88 kV

e. TOV Capability, rms kV (L-N) at one second ..... per ANSI

f. Creepage Distance ..... 123 inches, min.

g. Hardware and fittings for assembly and installation of the surge arresters: MANUFACTURER's design.

h. Mounting: brackets attached to tank, so that top terminals of arresters approximately 2” below the elevation of the 4-hole pad on the stud connector provided for the bushing terminals.

3. X Bushings - Ratings

a. Nominal Line Voltage ..... 23.0 kV

b. Maximum Line Voltage ..... 25.0 kV

c. Duty-Cycle Voltage ..... 21 kV

d. Maximum Continuous Operating Voltage (MCOV) ..... 17 kV

e. TOV Capability, rms kV (L-N) at one second ..... per ANSI

f. Creepage Distance ..... 40 inches, min.

g. Hardware and fittings for assembly and installation of the surge arresters: MANUFACTURER's design.

h. Mounting: brackets attached to tank, so that top terminals of arresters approximately 2” below the elevation of the 4-hole pad on the stud connector provided for the bushing terminals.

4. Housing

a. Material: polymer composite body with internal epoxy fiberglass wrap around metal-oxide varistor blocks.

b. Color: ANSI No. 70, Light Gray.

5. Manufacturer: Ohio Brass Type EVP.

6. Grounding: Connect ground end terminals of arresters with copper cable or straps (minimum 4/0 CU equiv.) to stainless steel or copper-faced two-hole ground pad attached to transformer tank side. Locate ground pad near base of arresters, but located so that there is a direct path for discharge current to flow to the two transformer ground pads at the base of the transformer tank without having to pass through a structural bolted connection (cover to tank, etc.).

L. De-Energized Tap Changer (DETC)

1. Externally operated when transformer is de-energized

2. Provide with indicating pointer, dial, and means for locking in any tap position. Include provisions for OWNER supplied padlock.

3. Mount at a convenient operating height.

4. Capable of withstanding full transformer short circuit current without damage

5. Configured to prevent leaving a winding open or short circuited when operating handle is in locked position

6. Provided with full capacity taps as specified herein

M. Automatic Load Tap Changer (LTC)

1. Electrical Location: Low voltage winding

2. Physical Location: ANSI Segment 2

3. Manufacturer: Reinhausen type RMV-II

4. Regulating range: 10 percent above to 10 percent below rated voltage in 32 approximately 5/8 percent steps.

5. Rating: capable of delivering full rated transformer kVA at the rated (nominal) secondary voltage position and all positions above rated voltage. The transformer shall be capable of delivering current corresponding to rated secondary current at nominal tap for all positions below nominal tap. These values shall include the overload capabilities stated in Article 1.03.

6. Tap Selector Switch and Mechanism

a. Mount in oil-filled compartment separate from main transformer tank.

b. Maintain physical isolation so it is not necessary to drain oil or break seal of main transformer tank when servicing LTC.

c. Provide suitable crossover pipe and ball valve between LTC contact tank and main tank, if required to allow full vacuum processing on main tank without damaging LTC barrier.

d. Provide dehydrating type breather with ball valve if required by LTC design. Breather shall be mounted at an easily accessible location and height.

e. Type: Inductive bridging with vacuum interrupters.

f. Tank Accessories

1) Hinged maintenance door with oil-resistant gasket

2) Drain, filter, and sampling valves

3) Magnetic level indicator with low level alarm and low-low level trip contacts

7. Controls

a. Type: Automatic, solid state

b. Primary Control:

1) Provide a primary LTC control with the following minimum features:

a) Adjustable bandwidth and voltage level

b) High limit/low limit blocking.

c) Line drop compensation

d) Local/remote LTC control capability.

e) SCADA communications via Ethernet and RS-485 ports with MODBUS and DNP 3.0 protocols

f) Provide output contact in control that closes when voltage reduction is active, either via local or remote initiation.

2) Provide required components and wiring to allow this control and LTC to be operated in parallel with the other unit purchased under this order.

3) Primary control to be Beckwith M-2001D or approved equivalent, with required associated equipment

c. Backup Control

1) Provide independent backup LTC control to prevent voltage excursions out of acceptable range if the primary LTC control fails.

2) Backup control to provide block raise and block lower functions to inhibit the primary control signals, a lower command contact to force the LTC to a lower voltage if the voltage is unacceptably high, and an alarm contact to indicate operation of the backup control (backup control operation presumes primary control failure).

3) Backup control to be Beckwith M-0329B or approved equivalent.

8. Accessories

a. Position indicator with resettable drag hands to indicate maximum travel.

b. Limit switches and stops to prevent travel beyond extreme tap positions.

c. Crank or handwheel for manual operation during maintenance

d. Positioning devices and off-position contacts

e. Operations counter

f. Self-synchronous transmitter mounted on the LTC drive mechanism to operate a remote position monitor (Incon Model 1250-LTC). Remote position monitor provided by others.

g. Control circuit protective devices.

h. Manual control switches for RAISE-LOWER, AUTOMATIC-MANUAL, LOCAL-REMOTE. Provide status contacts for OWNER switch position indication for AUTOMATIC-MANUAL and LOCAL-REMOTE switches. Manual LTC controls shall be located in the main transformer control cabinet. If LTC is supplied with manual controls located in its cabinet, then an additional set of manual controls shall be installed in the transformer control cabinet for ease of OWNER use.

9. Voltage Reduction

a. Provide voltage reduction feature to reduce output voltage by 2.5% or 5%.

b. Include selector switch in transformer compartment to select Normal, 2.5% reduction or 5% reduction. Provide LOCAL-REMOTE switch with status contact for OWNER indication for voltage reduction function.

c. Include provisions to initiate by OWNER's dry contact closure (for remote operation).

d. Provide status contact in order to provide positive remote indication that voltage reduction function is engaged. Status contact shall be an output from the primary voltage regulator control.

10. Mounting: In easily accessible location in main transformer control cabinet

11. Wiring: connected to terminal blocks in main transformer control cabinet for field connection. Wire power supply switch, light and convenience outlet, space heater and switch to main terminal cabinet.

N. Wire and Terminal Blocks

1. Wiring:

a. 600 volt insulated copper, 90 degrees C rating.

b. No. 10 AWG minimum for current transformer wiring within control cabinet

c. No. 12 AWG minimum for auxiliary circuits

d. No. 14 AWG minimum for control circuits

e. AC auxiliary circuit neutral wires shall utilize white insulation.

f. Power circuits shall be connected to separate power terminal blocks.

g. AC auxiliary power shall be routed separately from the control and Indication circuits.

h. All wiring shall be installed and routed so as to be protected from damage. All holes and sheet metal edges shall be fitted with suitable grommets or guards to prevent wire damage.

i. All wiring shall be run continuous from terminal to terminal. All terminal points shall be accessible. Splicing within conduits or raceways is NOT allowed.

2. Terminations

   a. Made using short-shank, insulated ring-tongue terminal connectors.

   b. Crimped using ratcheting type crimping tools designed to ensure a proper crimp by not releasing the connector until the crimp is fully complete (AMP "Certicrimp" hand tools or equivalent).

   c. Made with no more than two conductors per terminal stud

   d. Identify at each wire end using white tubular plastic wire markers securely gripping the wire, with black markings in accordance with schematic and wiring diagrams. Wire markers shall indicate the destination (other end) of the respective wire. Wire markers shall completely surround the wire, shall be oriented so as to be easily read when the wiring is installed, and shall not be removable once termination has been crimped on.

3. Terminal Blocks:

   a. Rated 30 amperes, 600 volts minimum, or as required by circuit conductors (GE type EB-25 or approved equal).

   b. Equipped with insulating barriers between poles and washer-head binding screws on each pole.

   c. Furnished with marking strips and installed in sufficient quantity to provide a minimum of 20 percent spare terminal points for each type block. Spare terminal points shall be grouped logically in each cubicle, not distributed throughout the group of terminal strips.

   d. Short circuiting type for current transformer terminations (GE type EB-27 or approved equal).

   e. Marked to identify source and function. Hand written marks will not be acceptable.

O. Conduit

1. Wiring shall be installed in galvanized rigid steel conduit when external to control cabinets or enclosures.

2. Junction boxes, condulets and fittings shall be galvanized cast iron manufactured by Appleton or approved equal.

3. All conduits shall be connected using appropriate threaded ends. All field made threads shall be treated with two coats of zinc rich paint after threading. All fittings shall be properly tightened.

4. Galvanized conduit shall be properly treated and painted to match the adjoining surface.

5. Conduit runs shall be neat, parallel where multiple conduits are run together, generally parallel to the main dimensions of the tank, and secured properly to the tank.

6. Short sections of flexible, liquid-tight conduit are acceptable where a flexible connection to equipment is desired.

P. Main Transformer Control Cabinet

1. Connections to auxiliary devices shall be wired to terminal blocks in the main transformer control cabinet by MANUFACTURER.

2. Location: ANSI Segment 1, right side

3. Make weatherproof.

4. Fasten securely to transformer tank.

5. Doors: quantity as required, maximum width 24", with removable center latch post if two doors are used, vertically hinged, with provisions for OWNER's padlock.

6. Conduit entrance: Removable, gasketed bottom plate, attached to underside of control cabinet, field drilled by OWNER.

7. Mount terminal blocks and equipment at least 6 inches above bottom plate.

8. Provide anticondensation space heaters powered from transformer auxiliary supply. Heaters shall be rated at 240 V ac, operated at 120 V ac, and properly sized for reduced output. Provide an ammeter to measure heater current. Provide a nameplate indicating "Control Compartment Heater Ammeter - Normal =_ A". Fill in normal amp reading. Heaters shall be energized continuously (not thermostatically controlled).

9. Mount all controls and devices requiring field operation, including LTC controls, fan controls, circuit breakers, fuses, sudden pressure seal in relay, annunciator, etc. at an easily accessible elevation when standing on the ground (within a range of 36" above transformer base to 72" above transformer base).

10. Provide gasketted window in door of control cabinet in front of annunciator, such that annunciator alarms can be viewed through window without opening door.

Q. Auxiliary and Control Power

1. 120/240 volts ac, 1-phase, 3-wire source for fans, space heaters and other accessories

2. 125 volts dc for control functions.

R. Gauges and Instruments

1. Protect all gauges and instruments with protective guards and mount at eye level when operator is standing on ground level.

2.3 NAMEPLATES

A. Main Transformer Nameplate

1. The nameplate shall be of weatherproof corrosion resistant stainless steel construction and shall be mounted on the transformer at approximate eye level. The nameplate shall be in accordance with the latest ANSI Standards and shall also include:

a. Date of Manufacture

b. Sound level in dB

c. Type of metal used as conductor in each winding for each voltage rating.

d. Volume of insulating oil in gallons

e. Actual tested impedance.

f. A statement that the transformer oil contains no PCB's at the time of manufacture

g. Special devices included in the transformer (i.e. winding surge suppressors).

h. State core design (e.g. shell, core)

i. If transformer is equipped with an LTC, state the actual tap voltages for the LTC.

j. Weights of core, tank, oil, etc.

k. Accurately depicted drawing of internal equipment and core orientation.

B. Device Nameplates

1. Provide a weatherproof corrosion resistant stainless steel engraved nameplate at each external device (gauge, relay, etc.) indicating its designation and ANSI function number where applicable.

C. Prior to shipment, the nameplates and labels shall be inspected to ensure that all information is readily visible, correctly depicted, and that they are clean.

2.4 ACCESSORIES

A. Provide the following accessories with power transformer:

1. Loss of AC auxiliary relays wired to indicate loss of AC power to each fan circuit and the associated fan control circuit.

2. Loss of DC auxiliary relay wired to indicate loss of DC power to the sudden pressure relay and annunciator circuit, with contacts wired to terminal block for OWNER's use.

3. Sudden pressure relay, under oil type, 125 Vdc (Qualitrol Series 900 or equal) mounted to a suitably sized full port gate or ball valve on the side of the transformer main tank. Manufacturer shall determine the optimum location.

4. Sudden pressure auxiliary relay, 125 Vdc, with seal in, target indicator and reset button

5. Oil level indicators, with non-adjustable contact(s), as follows:

a. Main Tank oil level indicator, with low level alarm and low-low level trip contacts

b. LTC Tank oil level indicator, with low level alarm and low-low level trip contacts

6. Oil temperature indicator (Qualitrol), with adjustable alarm and trip contacts, and resettable drag hands

7. Winding temperature indicator (Qualitrol), with adjustable alarm and trip contacts, and resettable drag hands

8. Pressure relief valves, self-resealing, with visual signal flag, alarm and trip contacts (Qualitrol XPRD, No Exceptions). Pipe discharged oil towards the base of the transformer but away from locations where personnel are likely to be standing while accessing transformer components. Discharge pipe to run to a point approximately 2 feet above the base of the transformer.

a. Locations:

1) Main tank

2) LTC tank

9. A 120 volt, 100 watt incandescent light fixture with SPST switch and a 120 volt, 20 ampere single-phase duplex GFI receptacle, complete with protective fuses.

10. Other standard accessories per ANSI, C57.12.10, Table 11

11. Annunciator

    a. 12 point, self contained, LED Indicators, with 125V DC power supply.

    b. Manufacturer: Seekirk Series B1002R/O-A-S14/43

    c. Provide engraved nameplates for all annunciator windows indicating function of each alarm point.

    d. Mount annunciator on swing panel in transformer main control cabinet.

    e. Wire all transformer alarms to individual annunciator points, in accordance with the following list:

        1) 49T – Winding Temperature Alarm

        2) 26T – Liquid Temperature Alarm

        3) 71L – Low Oil Level – Main Tank

        4) 71Q – Low Oil Level – LTC Tank

        5) 63PR1 – Pressure Relief – Main Tank

        6) 63PR2 – Pressure Relief – LTC Tank

        7) 63XP – Sudden Pressure

        8) High or Low Transformer Tank Pressure

        9) Nitrogen Cylinder Low Pressure

        10) LTC Trouble

        11) Loss of Cooling Auxiliary Power

        12) Hydrogen/Water Monitor Alarm

    f. Provide two sets of “repeater” contacts for each annunciator point. Wire repeater contacts to terminal blocks for Owner connection.

12. Dissolved Hydrogen and Water Monitor

    a. Manufacturer: Morgan Schaffer Systems

    b. Type: Calisto 2 with RS485 serial and Ethernet communications (DNP protocol).

    c. Mounting: to main transformer tank at an easily viewable and accessible height.

    d. Install and connect in accordance with MANUFACTURER’s instructions.

    e. Provide solid copper or stainless steel tubing with suitable ball valves for oil connections to main tank. Carefully bend and train tubing and support as required to prevent damage to tubing or connections due to inadvertent contact. Do not use braided or flexible tubing.

f. Wire all external connections, including communications, to transformer control cabinet for OWNER connection.

g. Wire alarm contacts to annunciator as “Hydrogen/Water Monitor Alarm”.

h. Provide the following accessories:

1) Any special tools required for installation, removal and calibration.

2) Host PC software

i. Provide vendor field support to calibrate and commission all Calisto units procured under this order.

13. Safety tether pole, OSHA compliant, carbon fiber, with triple attachment points for lanyards, suitable for mounting on the transformer tank mounting plate. Furnish one safety tether pole under this order. Manufacturer: Pelsue Model #FT-C70 (No Exceptions)

B. Provide MSDS sheets for all applicable items furnished with the transformer, including but not limited to Mineral Oil, paint, nitrogen.

2.5 PAINTING

A. Clean and treat tank interior and exterior transformer surfaces according to MANUFACTURER's standards. Carefully treat all exposed metal, including galvanized surfaces, to properly receive paint.

B. Apply one prime coat to the exterior surface. Ensure that all surfaces are coated, including areas partially blocked by conduit or equipment.

C. Apply two finish coats of Light Gray (ANSI 70) color to the exterior surface. Ensure that all surfaces are coated, including areas partially blocked by conduit or equipment.

D. Top surface of transformer tank and LTC compartment to be coated with non-skid paint

E. Paint interior of transformer tank and all cabinets white.

PART 3 - EXECUTION

3.1 DELIVERY

A. Transformer shall be shrink wrapped (top and sides) for shipment.

B. MANUFACTURER is responsible for arranging and paying for delivery of power transformer and all accessories (including separate oil delivery, if required) to substation site. MANUFACTURER shall provide a qualified technical representative to receive transformer and accessories on site and supervise rigging activities. The technical representative shall be a regular full time employee of the MANUFACTURER.

C. MANUFACTURER is responsible for arranging and paying for all transportation, rigging and hoisting services required to place transformer on OWNER-furnished foundation, and hoisting and rigging of transformer accessories. Site and foundation drawings will be provided to MANUFACTURER upon request following final foundation design, to take place following receipt of transformer outline and weight shop drawings.

D. MANUFACTURER shall obtain OWNER approval of the actual date the site will be ready for receipt of the transformer prior to permitting, loading or shipping the transformer.

E. Transformer accessories (radiators, bushings, etc.) will be delivered to an OWNER designated location within the project site. Due to ongoing construction constraints, it may not be possible to store these items directly adjacent to the transformer. MANUFACTURER will be responsible for moving these items from where they are stored to the transformer at no additional cost to the OWNER.

3.02 FIELD ASSEMBLY AND TESTING

A. MANUFACTURER shall fully assemble all parts required to make the transformer ready for service, including but not limited to radiators, bushings, surge arresters, and any other parts removed for shipping.

B. Upon completion of the transformer assembly, add oil required to fill transformer and accessories in accordance with MANUFACTURER's requirements. Perform a dew point measurement prior to filling unit with oil. The measurement shall meet the MANUFACTURER's requirements for oil filling, but shall be at least -30°C at 20°C ambient temperature. OWNER reserves the right to reject the transformer or require corrective actions in the event that the dew point does not meet these standards.

C. Perform a dielectric test on a sample of oil from each shipping container in accordance with ASTM method D-877. Advise ENGINEER immediately if the dielectric test is less than 30 kV. OWNER reserves the right to refuse oil delivery if dielectric strength is less than 30 kV. Filter and process the insulating oil, as required, to fill the transformer tank to the required levels. Take proper precautions to prevent contamination of the insulating oil during handling.

D. MANUFACTURER shall remove from the site and properly dispose of all associated shipping and packing materials and debris, wipe clean all bushings and arrestors, unwrap and clean all gauges, remove surface contamination resulting from shipping from the entire unit, and properly touch up any damaged paint.

E. The OWNER shall provide all required external wiring connections to each transformer, including primary, secondary, control, and grounding connections.

F. The MANUFACTURER shall perform the following field testing after site assembly (prior to placing unit in service). Certified test reports of all field testing shall be provided to the OWNER and ENGINEER before final payment. At a minimum, field tests shall include the following:

1. Turns Ratio on all DETC positions (LTC on neutral)

2. Turns Ratio on all LTC positions (DETC on nominal Tap)

3. Megger (2500 volt)

    a. High Voltage to Low Voltage

    b. High Voltage to Low Voltage grounded

    c. Low Voltage to High Voltage grounded

    d. Each core to ground with core ground strap removed

4. Insulation power factor

    a. Test and report the following readings:

        1) High Voltage to Low Voltage and ground

        2) Low Voltage to High Voltage and ground

3) High Voltage and Low Voltage to Ground

4) Low Voltage to ground, Guard on High Voltage

5) High Voltage to ground, Guard on Low Voltage

6) High Voltage to Low Voltage, Guard on ground

b. Tests shall be performed as close as practical to 20°C to minimize inaccuracies from correction factors. Readings shall be corrected to 20°C for reporting and analysis.

c. Direct failure criteria shall be based on ANSI C57.12.90, Method II. If any corrected insulation power factor reading listed in Method II is greater than 0.5%, then the OWNER must be consulted prior to acceptance. The OWNER reserves the right to reject or require corrective measures to any transformer with an insulation power factor reading, corrected to 20°C that is greater than 0.5% in accordance with ANSI C57.12.90, Method II.

5. Bushing power factor test (both C1 and C2), where appropriate. Bushing Power Factor and Capacitance test results should be within tolerances specified by Doble Engineering Test Assistant software when compared to Bushing Nameplate values.

6. Surge arrester power factor test, where appropriate. Test results should be within tolerances specified by Doble Engineering Test Assistant software when compared to surge arrester nameplate values.

7. Sweep Frequency Response Tests: Test equipment shall be the Doble M-series test set or similar approved equipment

8. Oil testing, per MANUFACTURER's standards, but minimum to include PPM water, dielectric strength and DGA

9. Check gauges, relays, annunciator, hydrogen-water in oil monitor, heaters, convenience outlet and light, and other auxiliary circuits to assure proper working condition.

10. Check and operate cooling equipment to verify proper operation.

11. Additional testing and start-up as normally performed by the manufacturer or as listed in their instruction books shall also be completed.

G. Check tank thoroughly for evidence of oil or gas leaks.

H. Make arrangements to correct any deficiencies identified during field testing.

I. OWNER will make available a 120/240V single-phase power source for use in the assembly process.

END OF SECTION

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

SUBSTATION POWER TRANSFORMERS
IPSWICH RIVER SUBSTATION

BID FORM

Peabody Municipal Light Plant
201 Warren Street Extension
Peabody, MA

_____

_____

(Bidder)

_____

(Date)

1. Pursuant to your Advertisement for Bids inviting Bids for the equipment described in the Contract Documents of which this Bid Form is part, the undersigned Bidder hereby certifies and represents that it has examined and thoroughly understands the Contract Documents including the following:

ADDENDA NO.	DATE

2. The undersigned Bidder, having made such examinations and reached such understandings:

   a. encloses the required Bid Bond or deposit in the amount of 5% of the Bid amount.
   b. accepts the obligation of a Bidder incurred by submitting this Bid.
   c. agrees to the rights reserved to the Owner set forth in the Instructions to Bidders.
   d. proposes to execute the Contract as set forth in the Contract Documents, of which this Bid Form is a part.
   e. has signed and included the Non-Collusive Bidders Certificate.
   f. also encloses Transformer Bid data sheet information

3. The following statements of experience, personnel, equipment and general qualifications of the Bidder are submitted as a part of the Bid and the Bidder represents and guarantees the truthfulness and accuracy thereof:

   a. Our organization has been in business continuously from_____.

   b. Our organization has had experience in manufacturing equipment comparable to that required under the proposed contract, a prime manufacturer, for _____ years, as a component manufacturer for _____ years or as an equipment supplier for _____ years.

BID SCHEDULE		
Substation Power Transformers 36/48/60 MVA		
BID ITEM	**DESCRIPTION AND AMOUNT**	
1.	Furnish Two (2) 115 – 22.9 kV, 36/48/60 MVA Substation Power Transformers, complete as specified herein, for the lump sum of: _____ _____ and_____/100 Dollars	$ _____
1a.	Furnish five (5) year extended warranty, complete as specified herein, for the lump sum of: _____ _____ and_____/100 Dollars	$ _____

All bid prices shall be firm for sixty (60) days from the date of the Bid Opening.

All bid prices exclude the Commonwealth of Massachusetts Sales and Use Taxes, PMLP State Sales Tax Exempt No. E04-600-1407

The Owner reserves the right to reject any or all Bids, to waive informalities or irregularities, and to award a contract by individual items, in aggregate or a combination thereof.

The above proposal is in complete compliance with Technical Specifications: **Yes** ☐ **No** ☐

The above proposal is in complete compliance with PMLP's Terms and Conditions: **Yes** ☐ **No** ☐

Name, address and telephone number of three (3) references for which you have provided a similar service:

Reference Company Name: _____

Contact and Phone # _____

Reference Company Name: _____

Contact and Phone # _____

Reference Company Name: _____

Contact and Phone # _____

DELIVERY INSTRUCTIONS

The equipment and all related accessories will be delivered to the location designated herein. Please indicate your ability to meet the specified delivery by entering your proposed best delivery periods in the following table (weeks **After Vendor Receipt of Order**):

EQUIPMENT DELIVERY			
BID ITEM	**DESCRIPTION**	**DESIRED DELIVERY LEAD TIME**	**PROPOSED DELIVERY LEAD TIME**
1	Outline & Weight Drawings	6 weeks ARO	_____ weeks ARO
1	Remaining Shop Drawings	As required to meet delivery	_____ weeks ARO
1	Transformer Delivery	38 weeks ARO (Early Delivery will not be acceptable)	_____ weeks ARO

Firm Name: _____

Address: _____

Contact #: _____

Signature: _____

Title and Date _____

Remarks: _____

BID FORM

The party by whom this Bid is submitted and by whom the contract will be entered into, in case this Bid is accepted is a _____,
("Corporation", "Partnership", or "Individual")
doing business at _____, _____,
(Street) (City)
_____, _____, to which address Notice of Acceptance of Bid and all
(State) (Zip)
other written notices may be mailed or delivered until further written notice is given the Owner.

_____
(Legal Name of Bidding Organization)

By: _____
(Signature of Authorized Person)

_____
(Printed Name)

_____
(Title)

The undersigned hereby certifies and represents to the Owner that the person signing this Proposal on behalf of the Bidder is authorized to do so.

_____
(Partner of Partnership
or Official of Corporation)

CERTIFICATE OF NON-COLLUSION

THE BELOW SIGNED QUOTER HAS NOT DIVULGED TO, DISCUSSED OR COMPARED HIS QUOTE WITH OTHER QUOTES AND HAS NOT COLLUDED WITH ANY OTHER QUOTER OR PARTIES TO A QUOTE WHATSOEVER. The undersigned certifies under penalties of perjury, that this accompanying bid or proposal is not the result of, or affected by, any unlawful act of collusion with any other person or company engaged in the same line of business or commerce, or any other fraudulent act punishable under the Commonwealth of Massachusetts or United States Law. As used in this certification, the "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

Note: No premiums, rebates or gratuities to any employee are permitted with, prior to, or after any delivery of materials. Any such violation will result in the cancellation and/or return of material (as applicable) and the removal from the master bidders list.

Contractor's Full Legal Name: (PLEASE TYPE OR PRINT)	
Authorized Signature:	
Date:	

TAX COMPLIANCE CERTIFICATION

Pursuant to MGL c. 62C, §49A, I certify under the penalties of perjury that, to the best of my knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

Contractor's Full Legal Name: (PLEASE TYPE OR PRINT)	
Duly Authorized Signature:	
Date:	
Social Security # or FID #:	

S A M P L E

C O N T R A C T

AGREEMENT made this «Day» by and between the Peabody Municipal Light Plant, a business duly established under the laws of the Commonwealth of Massachusetts and having a usual place of business at 201 Warren Street Extension, Peabody, Massachusetts 01960, hereinafter referred to as "PMLP" and «Name», having a usual place of business at «Address», hereinafter referred to as «Nickn».

WITNESSETH, that the PMLP and «Nickn», for the consideration hereinafter stated, agree as follows:

1. That «Nickn» shall furnish «Material» as set forth in the specifications incorporated in the bid opened on «Date».

2. All material shall be furnished and delivered to the PMLP jobsite as defined in the attachments hereto.

3. The Contract price for the material shall be the bid price of «Amount» as set forth on the bid form dated «Biddate» and herein incorporated by reference.

4. «Nickn» shall not assign or transfer this contract, or any part thereof, or any sum due or to become due hereunder without the written consent of the PMLP.

5. This AGREEMENT together with the Instructions to Bidders, Purchaser's Terms and Conditions, PMLP Specifications, and Vendor's Bid, hereto attached, form this Contract and are as fully a part of this Contract as if herein repeated.

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT the day and year above first written.

«Company»

BY_____
(NAME)

_____
(TITLE)

DATE:_____

PEABODY MUNICIPAL LIGHT PLANT

BY_____
GLENN TRUEIRA, MANAGER