

EXHIBIT X

Specification for Substation

Equipment Installation, Testing and Commissioning

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Substation Testing and Commissioning

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Substation Testing and Commissioning**1 Scope of specification****1.1 Contractor:**

This specification covers the testing of substation equipment, auxiliary equipment, relays, circuits, controls and communication Equipment associated with the installation and assembly of new equipment at Owner substations. Capitalized terms shall have the same meaning as defined in the Contact unless the context requires otherwise.

All equipment (i.e., transformers, switches, wiring, relays, controls, grounding systems, batteries, generators, buildings and associated systems, and all other devices) shall be tested and verified by Contractor to meet PacifiCorp Standards, Equipment Manufacturer's recommendations, Industry Standards and to be fully functional.

In addition, the specific testing and commissioning criteria as stated in this document and defined in PacifiCorp's Equipment Commissioning Summary document must be completed by Contractor or Equipment Manufacturer. Testing is to be complete and as extensive as necessary to ensure the proper operation and functionality of the entire Project.

Refer to 8.1 for definition of Equipment Commissioning Summary document.

1.2 Equipment Manufacturer:

This document provides an overview of requirements to complete the transformer, reactor or three-phase regulator pre-commissioning deliverables by the Equipment Manufacturer as defined in section 9.2.

All transformer, transformer equipment and all other auxiliary devices shall be tested and verified by the Equipment Manufacturer/Contractor to meet PacifiCorp Standards, Equipment Manufacturer as defined in section 9.

Unless otherwise specified by PacifiCorp (Owner), Equipment Manufacturer shall be responsible for transportation, off-loading, positioning, assembly, oil processing, pre-commissioning tests, all aspects of transformer pre-commissioning requirements as defined in section 9 of this document and PacifiCorp procedures and forms listed in the PacifiCorp, Equipment Commissioning Summary.

Refer to 8.1 for definition of Equipment Commissioning Summary document.

2 Definitions in this document

2.1 The term Contractor will cover all General Contractors and Subcontractors slated to perform equipment pre-commissioning and/or final commissioning testing.

2.2 The term PacifiCorp and Owner have the same meaning.

2.3 The following terms in this document have the same meaning: Equipment Manufacturer, Supplier and Vendor.

2.4 Oil-filled reactor, phase-shifting transformer and three-phase regulator will have the same meaning as transformer.

2.5 Definitions of Equipment pre-commissioning and final commissioning are defined in section 9.

3 Safety

Test equipment, test procedures and temporary circuits made up to accommodate testing shall be designed and used in a safe manner to minimize danger to testing technicians and other personnel. For example: current transformer temporary test circuits utilizing alligator clips shall not be permitted. Contractor/Equipment Manufacturer shall furnish and utilize safety devices such as personal protective equipment (PPE), personal grounds, rubber gloves and blankets, protective screens and barriers, yellow caution tape, danger signs, warning tags, and other items as appropriate to adequately protect and warn all personnel in the vicinity of the tests.

All individuals are required to wear all appropriated personal protective equipment and follow all applicable OSHA safety rules, regulations and guidelines at all times. Contractor/Equipment Manufacturer shall keep Owner personnel informed of potential hazards associated with their Work when it could impact Owner's personnel.

When working on or in the area of energized, unguarded electrical equipment, or equipment that may become energized at fifty (50) volts or above, Contractor shall ensure that such work is performed by Qualified Persons as defined by applicable OSHA or DOSH entity for the State in which the work is to be performed.

Contractor shall ensure compliance with all applicable requirements set forth in OSHA, DOT, EPA or any other applicable Federal, state and/or local regulations at all times.

When work that is typically completed by non-high voltage electrical contractor is being performed, Contractor/Equipment Manufacturer will provide a Qualified Person, on a continuous basis to act as a safety watch, and be responsible to monitor all work of non-qualified personnel. Qualified Person shall ensure all safety rules are observed, and stop any work that could create a hazard.

Contractor/Equipment Manufacturer with the Qualified Person shall participate in joint daily on-site safety meetings with Owner personnel to ensure all on-site personnel understand the safety concerns, and the activities being performed each day.

All Qualified Persons shall be pre-approved no less than thirty (30) calendar days before work activities begin, unless previously otherwise agreed to in writing by Owner. It is the responsibility of the Contractor/Equipment Manufacturer to contact Owner using the e-mail address Commissioning@PacifiCorp.com to arrange for in-person approval interview(s).

If any on-site personnel notices infractions of safety, health or environmental requirements. Contractor shall immediately correct the condition, and record the actions taken to make such corrections.

4 Applicable standards

Contractor/Equipment Manufacturer shall complete the testing and commissioning Work defined in this specification and the Equipment Commissioning Summary in full compliance of the following standards:

- 4.1** International Electrical Testing Association, Inc.
- 4.2** Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems
- 4.3** American National Standards Institute (ANSI)
- 4.4** American Society for Testing and Materials (ASTM)
- 4.5** Institute of Electrical and Electronics Engineers (IEEE)
- 4.6** National Electrical Manufacturers Association (NEMA) and Insulated Cable Engineers Association (ICEA)

- 4.7 National Fire Protection Association (NFPA)
- 4.8 Occupational Safety and Health Administration (OSHA) regulations
- 4.9 Department of Occupational Safety and Health Administration (DOSHA) regulations
- 4.10 Environmental Protection Agency (EPA) guidelines and regulations
- 4.11 Department of Transportation (DOT) guidelines and regulations

5 Required test equipment

Contractor/Equipment Manufacturer shall furnish all required testing equipment. Prior to performing testing, test equipment shall have been tested, calibrated and certified to be in fully functional condition by the Equipment Manufacturer in accordance with the Equipment Manufacturer's recommended calibration/certification intervals.

Copies of all certificates shall be provided to Owner prior to testing. Copies of test equipment certificates are supplied with pre-commission schedule and test plan.

6 Testing and commissioning responsibilities

Contractor/Equipment Manufacturer shall be responsible for all aspects of installation, testing, pre-commissioning, post-energization failures and corrections as defined in the contract. The definitions of assembly, testing, pre-commissioning and commissioning as used in this document are defined in section 9. Contractor/Equipment Manufacturer may be required to install final protective relay settings, perform functional tests, and perform all in-service load tests. Specific breakdown of Work responsibilities between Contractor, Equipment Manufacturer, and Owner can be found in the PacifiCorp Equipment Commissioning Summary document.

Contractor/Equipment Manufacturer shall notify Owner of any deficiencies found during equipment pre-commissioning and in-service verifications checks within twenty-four (24) hours. Review and acceptance by Owner of Contractor's test results and data shall not release Contractor of responsibility for any workmanship or Equipment deficiencies. Any Equipment Manufacturing deficiencies found will require coordination by Contractor, Owner and Equipment Manufacturer to correct deficiency. Equipment Manufacturer and Owner must approve method to correct any Equipment deficiency(s) before corrective action is taken. Contractor shall be responsible to correct deficiencies due to Contractor performance of the work in the manner described above until the Equipment has been placed in service, after which normal Equipment warranty procedures shall apply. Any warranty issue will be addressed in the manner described above.

Contractor is responsible for confirming that all Equipment meets voltage, current, and other applicable ratings for the engineered design and application of the device. If there are any conflicts or potential conflicts between the Equipment Manufacturer testing requirements and Owner installation and/or testing requirements, such conflicts shall be highlighted and included in Contractor's/Equipment Manufacturer's pre-commissioning schedule and test plan submitted at least thirty (30) days before the Work starts, as described in sections 10.1 & 10.2.

7 Testing and commissioning personnel qualifications

The Owner has created a formal process for approval of all technicians who will provide Equipment commissioning activities. Technicians shall be pre-approved no less than thirty (30) calendar days before any commissioning activities begin, unless previously otherwise agreed to in writing by Owner. It is the responsibility

of the Contractor/Equipment Manufacturer to contact Owner using the e-mail address Commissioning@pacificorp.com to arrange for approval interviews.

7.1 Technicians pre-approval process:

Lead technicians must be interviewed in person at a PacifiCorp facility by two or more Owner representatives to determine if the technician is approved to perform Equipment installation, assembly and/or testing activities on PacifiCorp property. All documentation (as described in 7.4) as related to the technician's approval for work shall be submitted no less than one week before the approval interview date. Approvals may be limited to certain commissioning activities, equipment types or by voltage class. Approvals, once authorized, will apply to any PacifiCorp platform.

7.2 Lead technician – on-site:

The lead technician shall demonstrate to PacifiCorp's satisfaction: previous assembly, testing and commissioning experience on similar types and models of equipment being commissioned. Owner-approved lead technician should provide evidence of a minimum of ten (10) years of relevant experience in electric utility equipment assembly and/or testing and commissioning in addition to demonstrating a leadership role. Owner may elect to qualify lead technicians with less than 10 years of experience at Owner's discretion based on demonstrated experience.

All testing and commissioning of Equipment shall be performed under the direct on-site supervision of the lead technician that has been pre-approved by Owner. Lead technicians are the only authorized technician to sign testing/commissioning forms.

7.3 Support Technician – on-site:

The support technician is defined by Owner to have relevant experience in electric utility equipment assembly and/or testing and commissioning. The support technician shall demonstrate to PacifiCorp's satisfaction previous assembly, testing and commissioning experience on similar types and models of equipment being commissioned.

7.4 Demonstration of experience:

Lead technician must submit written documentation that describes work history specifics, inclusive of: equipment, model, and manufacturer; specific responsibility during Equipment installation, testing, and assembly activities; and customer for each project. Owner may require all technicians to perform a practical skills and subject matter knowledge demonstration before being approved. A general purpose resume style document is unacceptable.

8 Reference commissioning documents

8.1 Equipment Commissioning Summary:

The Equipment Commissioning Summary is specific to project. PacifiCorp, Equipment Manufacturer and/or Contractor each have specific responsibilities listed on the Equipment Commissioning Summary document. Coordination between groups in order to complete test and commissioning process in the Contractor's/Equipment Manufacturer's responsibility (refer to Section 10.7.7).

8.2 PacifiCorp installation procedures and forms:

PacifiCorp supplies all commissioning procedures and forms with each project except communication equipment and devices. Refer to section 8.4 for communication equipment and

device commissioning procedures. The project-specific Equipment Commissioning Summary outlines applicable forms.

8.3 PacifiCorp procedure to obtain sulfur hexafluoride (SF6) gas cylinders, MATP-SF6CYL-PROCESS procedure:

PacifiCorp environmental policy prohibits the use of sulfur hexafluoride (SF6) furnished by the equipment manufacturer.

NO SF6 gas furnished by a manufacturer shall be used to fill any PacifiCorp substation equipment. All SF6 gas-filled equipment must be filled with PacifiCorp-issued gas according to procedure MATP-SF6CYL-PROCESS.

Caution: Substation equipment filled with SF6 gas must not be moved or handled in any way before SF6 gas pressure is reduced to manufacturer-recommended shipping gas pressure (approximately 5 psig).

8.4 PacifiCorp Communication Equipment and Devices:

Communication equipment and devices installed by Contractor and/or Equipment Manufacturer shall be tested and commissioned using forms and notes made available for use by PacifiCorp in an excel spreadsheet format.

Upon completion of the required form(s), the spreadsheet(s) completed by Contractor and/or Equipment Manufacturer will be sent to PacifiCorp commissioning via Commissioning@PacifiCorp.com.

9 Definition of Equipment installation, testing and the commissioning process

The commissioning process typically includes all activities from when the equipment is installed, until it is placed into operational in-service. In order to facilitate work assignments and responsibilities, and for purposes of clarification, the general sequence of events that make up the commissioning process are listed below:

9.1 Definitions:

The different terms as used in this process are intended to have the following meanings:

9.1.1 Installation/Assembly (of Equipment):

To place, position, or fit into the intended position or location, assemble sub-components and connect control and power cables, conductors, and all other accessories and fittings to the equipment as required to make it ready for operation.

9.1.2 Testing:

To perform appropriate electrical, mechanical, thermal, pressure, operational and functional testing and verification of Equipment such as transformers, circuit breakers, switches, relay and control equipment and ground mats. Testing of Equipment takes place during pre-commissioning and final commissioning, and can be sub-divided as follows:

Acceptance testing:

Testing activities performed to verify that the equipment has been properly assembled and installed. For control cables and relay panels perform insulation resistance (Megger), continuity, and point-to-point wiring verification tests. These activities are to be performed by the Contractor/Equipment Manufacturer, unless otherwise approved by Owner in writing.

Functional testing:

Testing activities that are performed immediately prior to and during initial energization of the equipment to verify correct operation under energized conditions. For protection and control systems, additionally implies applying final settings and performing functional tests to verify correct operation of the Equipment. These activities will typically be performed by the Owner. Contractor/Equipment Manufacturer may be responsible to perform these tests. Specific breakdown of work responsibilities between Contractor/Equipment Manufacturer and Owner can be found in PacifiCorp Equipment Commissioning Summary.

9.2 Pre-commissioning (Installation & Acceptance Testing):

To perform all installation and assembly (as defined in section 9.1.1), acceptance testing (as defined in section 9.1.2) and verification activities of substation equipment, cables and relay panels in order to prepare equipment for functional operation. For equipment such as batteries, circuit breakers, switches, reactors and transformers, pre-commissioning installation activities include: assembly, oil or gas processing, functional testing of accessories and sub-components, timing tests, and any electrical and mechanical acceptance tests required to verify that the equipment has been installed and connected according to the Equipment Manufacturer and Owner's specifications. The purpose of these activities is to ensure that the equipment is able to perform its intended function.

9.3 Final Commissioning (Functional Testing & Energization):

Functional testing (as defined in section 9.1.2) of the equipment will be followed by energizing the equipment at rated voltage and power to perform all post energization testing and verify proper power flows before equipment is placed in operational service.

Final commissioning requires that pre-commissioning (as defined in section 9.2) of the equipment has been submitted to PacifiCorp Commissioning.

10 Documentation**10.1** Equipment Manufacturer Pre-commissioning schedule and test plan:

10.1.1 Equipment Manufacturer shall provide a written pre-commissioning schedule and test plan for all pre-commissioning activities to be completed for this project no later than thirty (30) calendar days prior to the start of those activities, unless specific exceptions have been granted by Owner in writing via e-mail to mirequiptrechng@PacifiCorp.com. The test plan shall include the overall sequence and time frame that equipment will be installed and tested. Owner shall approve this plan in writing before any test or pre-commissioning work may commence.

10.1.2 Components of test plans and schedule:

10.1.2.1 Equipment Manufacturer shall factor in the test plan the required coordination with Owner or Owner's Contractor the logistics to complete the pre-commissioning activities of the Equipment.

10.1.2.2 Equipment Manufacturer to provide Owner with sub-contractor contact information. Information must include:

- Company name
- Lead Technician

- Support Technician
- Qualified Person for review by Owner's substation technical services group

10.1.2.3 Pre-commissioning schedule and test plan will be submitted to Owner e-mail mirequiptrchng@PacifiCorp.com for approval by Owner's substation technical services group.

10.1.2.4 List equipment to be tested and expected dates of pre-commissioning testing

10.1.2.5 List testing equipment to be used by Equipment Manufacturer and/or Sub-contractor. To also include calibration certificates as described in Section 5.

10.2 Contractor Pre-commissioning schedule and test plan:

10.2.1 Contractor shall provide a written schedule for equipment pre-commissioning activities to be completed for this project no later than thirty (30) calendar days prior to the start of those activities, unless specific exceptions have been granted by Owner in writing.

10.2.2 This project pre-commissioning schedule shall include the following:

10.2.2.1 List equipment to be tested and expected dates of pre-commissioning testing.

10.2.2.2 When required, the scheduled date for SF6 gas circuit breakers (shipped with nitrogen gas, requiring field assembling) manufacturer field service technician to be onsite to oversee the final equipment installation, assembly and commissioning tests to comply with manufacturer requirements for equipment warranty.

10.2.2.3 Quantity of SF6 gas required to fill project equipment, and expected date to obtain the gas.

10.2.2.4 When required, the scheduled date for power transformer or reactor manufacturer field service technician to be onsite to oversee the final equipment installation, assembly and commissioning tests to comply with manufacturer requirements for equipment warranty.

10.2.2.5 When required, the scheduled date for substation emergency generator power unit manufacturer field service technician to be onsite to oversee the final equipment installation, assembly and commissioning tests to comply with manufacturer requirements for equipment warranty.

10.2.2.6 Contact information for Sub-contractor testing company including name(s) for lead testing technician(s).

10.3 Installation and testing documentation completion:

Equipment test reports are required no later than five (5) calendar days prior to energization. Where circumstances do not allow the five (5) days prior to energization of the equipment, Contractor/Equipment Manufacturer will request a wavier in writhing by Owner for each piece of equipment that cannot make the five (5) day notice to energize. All test results are to be dated and signed by the lead on-site test technician.

10.3.1 Contractor/Equipment Manufacturer shall supply Owner with the complete test data and reports within two (2) days after completion of the tests for each piece of equipment as it is installed.

10.3.2 Transformer (>1000kVA) Equipment Manufacturer shall supply Owner with the completed test data reports within ten (10) days after completion of the tests for each piece of equipment as it is installed.

10.4 Use of Owner-provided installation procedures and forms:

Equipment-specific procedures and forms are provided by Owner as an Exhibit to the Contract, Release or Purchase Order. It is the responsibility of the Contractor/Equipment Manufacturer to read and follow the procedures prior to completing and submitting commissioning forms.

The purpose of the commissioning forms is to document the actions taken, tasks completed and results observed during the equipment installation, commissioning and testing. All line items must be completed and signed off by Lead Technician.

Where Owner procedures and forms are not available for a specific type of equipment, Contractor/Equipment Manufacturer shall submit their own procedures and suitable forms for documenting the test data for Owner review and approval. All Contractor/Equipment Manufacturer procedures and forms that are to be used shall be included with the pre-commissioning schedule and test plan for Owner review and approval in writing before Contractor/Equipment Manufacturer procedures and forms can be used.

10.5 Miscellaneous Equipment and Equipment without company identification numbers:

10.5.1 Control cable tests, wiring verifications, alarm verifications and all other required testing that does not have a specific associated check sheet or computer generated test result shall be highlighted (yellow for wire verification and pink for devices), initialed by the tester, and dated on the appropriate clean construction drawing or print. The highlight will confirm that all verification and testing has been completed by Contractor.

10.5.2 Additions of Equipment, wiring, or any other modifications to the drawings shall be fully and professionally documented. Removals of Equipment or wiring shall be drawn in green and permanent corrections and additions shall be marked in red. All changes shall be reviewed and approved by design engineer.

10.5.3 Testing technician comments or notes pertaining to the marked changes that are not intended for permanent retention on the drawings shall be marked in standard pencil. Corrected drawings (“as-constructed”) shall be continually updated and completed prior to energization for Owner’s engineering review and technician’s use during energization commissioning.

10.6 Review and acceptance of test results:

All test results, forms and data shall be approved by Owner before the Equipment may be energized or placed in service. No testing forms with failed test results shall be submitted to PacifiCorp. The technician will contact PacifiCorp prior to submitting form(s) to determine an appropriate course of action when acceptable test results cannot be achieved.

10.7 Submittal of Installation reports and test data format and file naming convention:

10.7.1 All test reports and documentation packages shall be e-mailed to the following email address: Commissioning@PacifiCorp.com.

10.7.2 All major equipment that is specified in the Equipment Commissioning Summary document shall have all required forms and test reports submitted.

10.7.3 Test data and forms pertaining to any one piece of Equipment shall be submitted together in one e-mail. If the e-mail message size will exceed ten (10) megabytes, the data shall be

divided into separate e-mails and clearly labeled with subpart numbers, for example: Part 1 of 3; Part 2 of 3; etc.

10.7.3.1 E-mail Subject Line: Substation_Task ID_Work Order #

- Substation – installed location of equipment
- Task ID – work done (e.g. circuit breaker installation)
- Work Order # - PacifiCorp Work Order number assigned to project

10.7.3.2 File Naming Convention: Sub Name _ Position _SAP Equip#_Form Name

- Sub Name-installed location of equipment
- Position-position in substation of equipment installed
- SAP Equip# - PacifiCorp equipment number assigned to equipment
- Form Name – PacifiCorp form name for specified equipment

10.7.4 Electronic test set-generated data:

This will typically apply for any power factor, transformer turns ratio, battery, protective relay, current transformers, and transformer sweep frequency analysis test results, etc. Test set-generated electronic data results shall be submitted in two formats:

- Adobe Acrobat copies or print-outs of all test set generated reports.
- Test set generated data files shall be submitted as attachments in the OEM test equipment software format.

10.7.5 When several different forms are submitted for a particular piece of equipment, these forms may not be combined or scanned into one electronic Adobe Acrobat file. Protection and control forms (or ‘relay’, forms starting with PCF-) should be submitted in a separate e-mail from forms for substation (or ‘apparatus’, forms starting with SF-). Each form or data set shall be included as a separate attachment contained in the one e-mail submittal. The body of the e-mail shall list all the attachments contained in the e-mail by form or document name.

10.7.6 All test forms shall be delivered to Owner electronically in the original Adobe Acrobat format as provided and using marked up design or installation drawings (when required). Testing and verification data not specifically addressed in this specification shall be formally documented and submitted in Adobe Acrobat format, unless otherwise agreed to by Owner in writing.

Note: For MAC Users, after completing your form in preview. Go to the print menu (cmd+P) and use the PDF drop-down in the bottom-left, selecting to save as PDF to generate a new, ‘flattened’ PDF.

10.7.7 All information fields on all Owner-provided PacifiCorp forms shall be completed in full by Contractor/Equipment Manufacturer. Where more than one Subcontractor performs parts of the Work for any particular type of Equipment, their respective Work shall be combined on one form for Owner review. Partially completed forms from each Subcontractor are unacceptable.

End of Section

ATTACHMENTS

Exhibit X

Testing & Commissioning

PacifiCorp Equipment Commissioning Summary
spreadsheet, tailored for each substation project