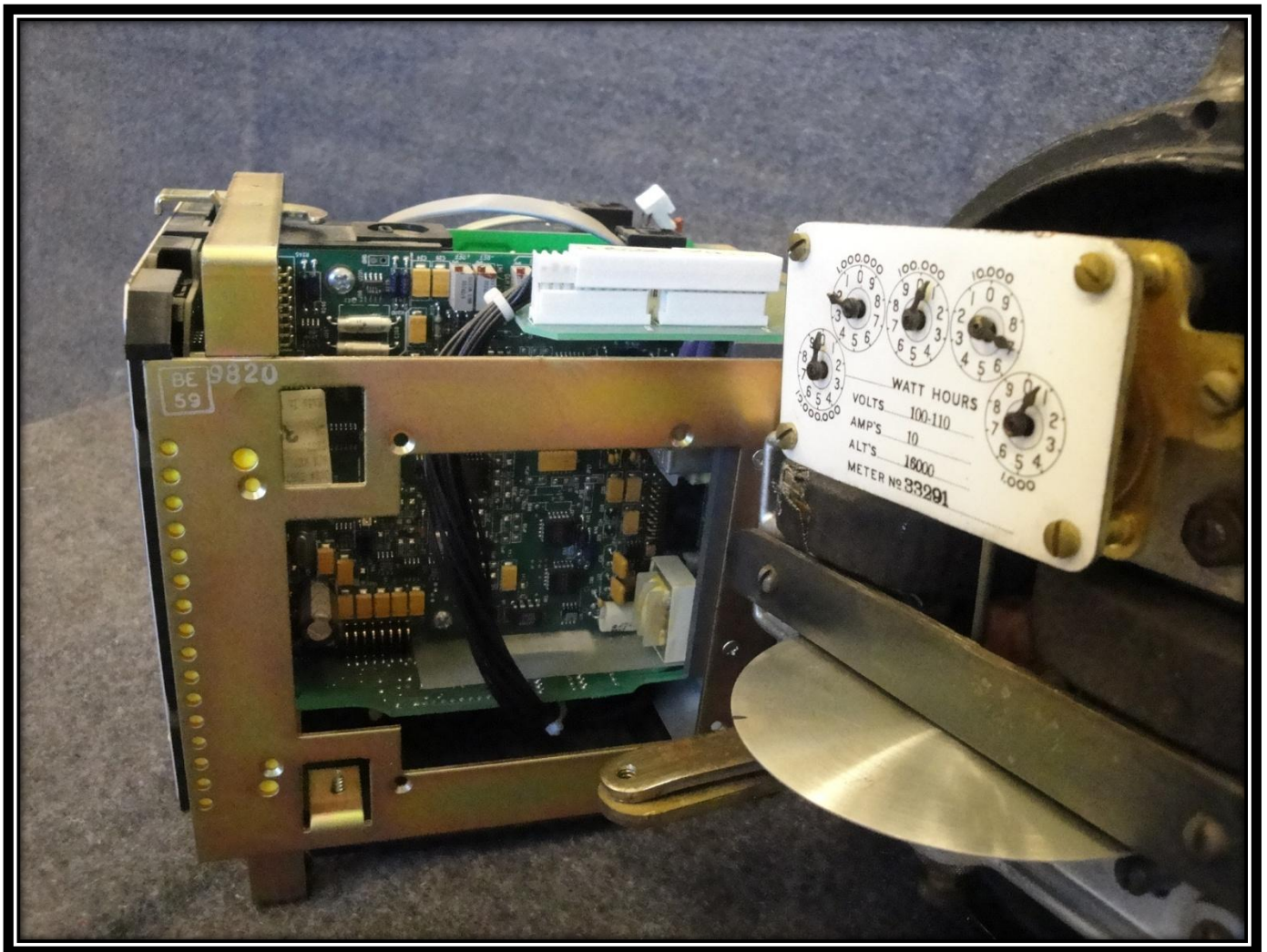


WESTERN AREA POWER ADMINISTRATION Meter Policy



November 22, 2013



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1. Purpose

- 1.1. The Western [Meter Policy \(Policy\)](#) establishes standards for the Western Area Power Administration and its Desert Southwest (DSW), Rocky Mountain (RMR), Sierra Nevada (SNR) and Upper Great Plains (UGP) regions (“Western”, collectively), for [Revenue Meters \(Intratie, Generation, and Load\)](#), [Boundary Meters](#) and [Meter System](#) equipment, installation requirements and responsibilities. This policy applies to all metering [Points of Delivery \(POD\)](#), [Points of Interconnection \(POI\)](#) or [Boundary Meter Points \(BMP\)](#) to Western’s power system for these regions.
- 1.2. Western’s regions are registered in various capacities with the North American Electric Reliability Corporation (NERC), within the Western Electricity Coordinating Council (WECC) and the Midwest Reliability Organization (MRO). Western adheres to, and complies with, all the relevant NERC, WECC and MRO standards for maintaining accurate data for Automatic Generation Control (AGC) and Area Control Error (ACE) systems. Western operates [Balancing Authorities \(BAs\)](#) and a [Sub Balancing Authority \(SBA\)](#).

2. Scope

- 2.1. This Policy supersedes any previous Meter Policy in effect for Western’s regions. The expectation is the requirements contained in this Policy Statement will be incorporated, to the extent possible, into specific contractual agreements (i.e., contracts, letter agreements, memorandum of understanding, etc.).
- 2.2. Western acquires, retrieves and integrates meter data into its billing, meter interrogation, scheduling and power accounting systems. This Policy assures that accurate and consistent data is used by Western’s billing, scheduling, power accounting programs and operational systems. Western also shares the data with interested parties and [Customers](#), consistent with any critical infrastructure and cyber security limitations, non-disclosure requirements, network and access policies, communication standards, etc.
- 2.3. This Policy applies to installations of new Meter Systems, in Western-owned [Facilities](#) or Western-owned and maintained Meter Systems installed in Customer’s Facilities. Western-owned Meter Systems will utilize the provisions of the Policy, to the maximum extent possible, when installing new or replacing existing Meter Systems. Exceptions for existing installations are detailed in Section 7.
- 2.4. This Policy applies to new Customer-owned Meter Systems installed in Customer-owned Facilities establishing a new POD, POI, BMP, and/or new meter data that will be provided by the Customer and used by Western for [Energy Services](#), as well as any meter maintenance services that are provided by Western. Western’s expectation is that it and its Customers will utilize, to the maximum extent possible, the provisions of this Policy when installing new or replacing existing Meter Systems. Exceptions for existing installations are detailed in Section 7.



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3. General Meter Policy Requirements

- 3.1. Meter System equipment shall be connected and installed at the POD, POI or BMP in Western’s facilities, transmission lines, Customer-shared transmission lines, or other shared facilities as defined in the contractual agreement. Meters shall be installed at the POD, POI or BMP high voltage delivery point unless an exception is granted under Section 3.2
- 3.2. Western may grant limited exceptions for new low voltage, transformer loss compensated (TLC) metering. Western requires this exception be evaluated, approved and documented in the contractual agreement. Exception criteria that may be considered for a new Meter System are: a) installation in a existing Facility having existing TLC metering; b) high voltage connections are technically or physically not feasible; c) connected load is <250 KW; d) prior agreements with a customer for build-out of their current system load capacity.
- 3.3. Only one Revenue or Boundary Meter shall be designated as the primary billing, power accounting and scheduling meter at each POD, POI or BMP. Western or Customers may install additional meters as back-up. Data from back-up meters should not be used for primary meter data functions, unless all interested parties agree and utilize the same meter data.
- 3.4. A primary Revenue or Boundary Meter shall be a single metering device providing all meter functions and outputs, including, but not limited to, real-time power (Mega/Kilo-Watts), real-time reactive power (Mega/Kilo-Vars), digital Kilo-Watt-hour (Kwh), digital kilo-Var-hour (KVARh) pulses and data interval storage. See Section 9 for Western’s meter specifications.
- 3.5. [MV-90](#) data access is required for every meter installation. The remote meter interrogation access may be provided by a public landline or cellular telephone, utility internal phone circuit or direct port connection. If remote access is prohibited by NERC Critical Infrastructure Protection (CIP) requirements, Western’s or the operating utility’s network system requirements, Western or the operating utility shall make reasonable efforts to provide MV-90 formatted data files within (5) business days of the 1st day of each month to each connected utility.
- 3.6. Metering system installations shall adhere to current applicable utility standards that include, but are not limited to, American National Standards Institute (ANSI), National Electric Safety Code (NESC), National Fire Protection Association (NFPA), National Electric Code (NEC), Occupation Safety and Health Administration (OSHA), WECC, MRO and NERC.
- 3.7. Western requires a contractual agreement for every new meter installation. The installation and funding of the metering system equipment may be covered under the scope of another contractual agreement, such as a construction contract. Existing meters that require Meter System upgrades, change of use, relocations of a POD, POI or BMP, may require modifications to existing contracts or agreements. Links to Western’s regional Point of Contact are located in [Exhibit I: Western Contact Information](#).



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- 3.8. The costs of material and labor to install, modify, replace, change or remove Revenue or Boundary Meters within Western's system shall be at the Customer's expense, unless otherwise agreed in contractual agreements between Western and the Customer.
- 3.9. For all Customer-funded work, Western cannot obligate its funds or expend labor resources without a signed contractual agreement and advance funding. Further, Western must cease all work in progress if funding becomes deficient.
- 3.10. When the contract changes or terminates and Western no longer needs the POD, POI or BMP, the financial and replacement responsibility will be transferred to the Customer and Western will remove all Western-owned Meter System equipment. Western will either terminate or transfer to the Customer (or Customer's agent) any services Western provided, including maintenance, meter interrogation and meter data reports or studies.

4. Western-Owned Facilities

- 4.1. Meter System installations, located within a Western facility, shall be owned and maintained by Western. Customer-funded Meter System installations will designate or convey ownership to Western in the contractual agreement.
- 4.2. Western shall be responsible for the engineering design, equipment procurement, installation and commissioning of all Meter Systems in Western facilities.
- 4.3. Customers or their contractors that have been granted authority by contractual agreement to provide the engineering design services, procurement, installation or commissioning of Western Meter System equipment will adhere to this Policy and obtain the appropriate engineering reviews and approvals prior to installation. Western's engineering or maintenance will review Meter System test reports and grant final approval before equipment is placed in-service.
- 4.4. Western will make provisions to share the primary meter analog and/or digital data with authorized parties and Customers, consistent with any critical infrastructure and cyber security limitations, non-disclosure requirements, network and access policies, communication standards, etc. Methods to share data include direct meter connection, connection to a Local Data Concentrator (LDC), Remote Terminal Unit (RTU), Remote Data Concentrator (RDC), shared phone line, [MV-90/MV-WEB](#) data files or as a posted ICCP value or other means as determined by Western.
- 4.5. Customers may request installation of their Meter System equipment within a Western Facility for the Customer's own load monitoring or data retrieval. Western will review, and if appropriate, approve the design and make any connections into the Meter System circuits at the Customer's expense. Western requires a contractual agreement detailing the Customer's financial responsibility for the installation, maintenance, communication circuits, data retrieval and ownership of the Meter System equipment. Western may contractually agree to provide the installation and/or maintenance services for this Meter System equipment.



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5. Customer-Owned Facilities

- 5.1. Western's [General Power Contract Provision \(GPCP\)](#) Section 6.1, dated September 1, 2007 states: "The total electric power and energy supplied or transmitted under the contract will be measured by metering equipment to be furnished and maintained by Western, a designated representative of Western, or where situations deem it appropriate as determined by Western, by the Contractor or its agent(s). In the event metering equipment is furnished and maintained by the Contractor or its agent(s) and the equipment is used for billing and other accounting purposes by Western, the Contractor shall ensure that the metering equipment complies with applicable metering policies established by Western."
- 5.2. In the situation described in [GPCP](#) 6.1 where the metering equipment is furnished and maintained by the Contractor, Western requires prior review and approval for any new Meter System installations or proposed modifications to existing Meter Systems under Section 7. Section 13 details the required submittals Western needs for its review and approval. Western reserves the right to be present at the Customer's Facility when new Meter Systems are installed or modifications are accomplished. In the event Western later requires modifications to the Contractor's metering equipment, the Customer will modify the metering equipment subject to Western's review and approval.
- 5.3. Customers that are internal members of Western's BA or SBA shall follow the provisions of this Policy, when installing or modifying a POD, POI or BMP; unless a specific exception is approved and documented in a contractual agreement with Western.
- 5.4. Western Customers, served within other BA's geographical designated areas that reside within Western BAs and SBAs or adjacent BA's footprint, will follow the BA's meter policy in effect for that designated area.
- 5.5. Customers will make provisions to share the primary meter analog and/or digital data with Western and other interested parties. This may be provided by a direct meter connection, connection to a LDC, RTU, RDC, shared phone line, data files or as a posted ICCP value.
- 5.6. Western reserves its right to witness routine testing, maintenance repairs or renovations of Meter System equipment in a Customer's facility where Western has a contractual interest in a Revenue or Boundary Meter. Advance notification is required prior to removing any in-service Meter System equipment as defined in Section 16.
- 5.7. In the event Western cannot witness Customer testing of meters, the Customer shall maintain a copy of the current test results plus an accumulation of three years of prior test results. These results will be available electronically upon Western's request.



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6. New Boundary Meter Installations

- 6.1. When the meter is a BMP installed in a non-BA owned substation. Western, as a BA or SBA, requires a BA or SBA to own and to maintain the Boundary Meter supplying the common AGC data. Operations and maintenance of the BMP equipment can be assigned and performed by other parties through contractual agreements, but the BA that owns the meter retains the responsibility to provide accurate AGC data and is responsible for any NERC, MRO or WECC standard requirements, archived testing documentation and compliance reporting, if required. The ownership, operating utility and maintenance responsibilities shall be detailed in a contractual agreement signed by all of the participating parties.

7. Existing Meter Installations

- 7.1. This Policy does not supersede existing metering conditions and configurations. However, as opportunities permit, Western and its Customers will collaborate to modify existing metering configurations in compliance with this Policy.
- 7.2. Western will review the design, equipment specifications and data resources of existing Western-owned and Customer-owned Meter Systems. Western may adapt or modify the Meter System design and replace or upgrade equipment to achieve features, functions, accuracy or performance that Western deems necessary, by utilizing the Policy provisions and standards. Western will apply the provisions of the Policy with consideration of the particular Facility and/or Customer's requirements.
- 7.3. For existing POD, POI or BMP Customer-owned Meter Systems located in a Customer or Western-owned Facilities, Western's expectation is to utilize the provisions of this Policy, to the maximum extent possible, when upgrading, replacing or relocating Meter System equipment. Western may grant limited exceptions for particular Facilities and/or Customer requirements.
- 7.4. An existing meter located at a POD, POI or BMP, that is being relocated or split into multiple delivery points, shall be connected to the same voltage as the original connection point.
- 7.5. When an existing TLC low voltage Meter System, POD, POI and BMP connection point that is being upgraded, replaced, split or relocated, it must be evaluated and given due consideration for an uncompensated, high voltage connection. This evaluation and consideration is recommended for major Facility expansions, replacements or when future load growth is planned.
- 7.6. Existing meters that have allowed TLC low voltage POD, POI or BMP connections shall:
 - 7.6.1. Continue within existing meters until the Meter System equipment is upgraded, replaced, or relocated and requires a contractual modification, at which time the meter TLC will be evaluated to either remain within the meter, or;



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- 7.6.2. Programmatically calculate the losses within MV-90, other metering and power accounting systems, or as defined in a contractual agreement.
- 7.7. Line loss compensation shall be programmatically calculated either using MV-90, other metering and power accounting systems or as defined in a contractual agreement.

8. Meter System Requirements

- 8.1. Individual metering system equipment devices shall be installed to collectively achieve no greater than \pm one percent ($<1\%$) inaccuracy or error for the overall Meter System accuracy.
- 8.2. Meters and instrument transformers shall be installed to correctly measure real power (Watt), reactive power (Var) and energy usage (kWh) and shall not be bypassed without approval by Western. Instrument transformers shall meet the requirements of Sections 11 and 12.
- 8.3. Meter percent registration error (measured by out-of-service testing) for microprocessor meters shall be no greater than \pm two-tenths of one percent ($\pm 0.2\%$) for full load kWh, light load kWh and kVARh in each power direction.
- 8.4. Meter in-service testing percent error shall be no greater than \pm three-tenths of one percent ($\pm 0.3\%$) for the measured power flow.
- 8.5. Meter percent error for real-time Watts and Vars (if required) shall be no greater than \pm two-tenths of one percent ($\pm 0.2\%$) in each power direction. Zero (null) shall be tested for accuracy with no-load applied.
- 8.6. Meters located at grounded wye-connected facilities shall be 3-element, 4-wire meters. 3-element metering is required at POD or POI locations where [Real-Time Data](#) is collected for AGC or ACE needs.
- 8.7. Meters located at delta-connected or ungrounded wye-connected facilities may be 2-element, 3-wire meters for revenue (Load) type meters only. Delta connections are not permitted for Generation, Intratit or Boundary Meter installations.
- 8.8. 480 volt meters are unacceptable for Revenue Metering. When a Customer requests that Western assume maintenance or ownership responsibility for a 480 volt meter, the Customer shall be responsible for all costs to change to a 120 volt meter.
- 8.9. The Customer that is responsible for the metering and telecommunications will comply with the applicable contractual or regulatory requirements for equipment security access, cyber security, telecommunication transmission and data storage.



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- 8.10. Typical block diagram configurations are provided for the various meter installations and configurations in [Exhibits A through C](#). These drawings detail the standard requirements for data and communications that are required by Western for each Boundary and Revenue Meter. Any deviation from these requirements must receive prior approval from Western and must be documented in the appropriate contractual agreement.

9. Meter Requirements

- 9.1. Western uses a microprocessor meter for its standard meter as detailed in [Exhibits D through G](#) and below. Western shall approve use of other meter manufacturers, if they meet the following minimum requirements to measure, record, store, and transmit data, as determined by Western, based on the meter data requirements.
- 9.2. Meters shall be electronic microprocessor based: wye connected, grounded configuration: 3-phase, 3-element, 4-wire for any Boundary or Revenue Meter requiring Real-Time Data. Delta connected configuration: 3-phase, 2-element, 3-wire may be approved for Revenue (load) metering only.
- 9.3. Form 5 (delta connection) and form 9 (wye connection) [Exhibit H](#) user configuration option.
- 9.4. Class: Transformer rated class 2, 10 or 20 (user configuration option) bi-directional; four (4) quadrant instantaneous quantities.
- 9.5. \pm Two-tenths percent (0.2%) accuracy class per the most recent ANSI C12.20.
- 9.6. Power supply: 125 VDC or 120 VAC
- 9.7. Control input voltage: 125 VDC.
- 9.8. Power quality measurement and data storage capability for a minimum of 45 days, user selectable configuration.
- 9.9. 120 VAC line to neutral metering voltage for wye metering; 120V phase to phase for delta metering; 60 HZ system frequency; auto-ranging voltage.
- 9.10. RS-232 serial or optical communication port, front mounted, ANSI type 2, for magnetic sensor attachment, per latest ANSI C12.18 standard, with adjustable communication rate from 300 to 9,600 bps (minimum), with 2 password levels (minimum).
- 9.11. Serial communication ports, rear mounted, EIA RS-232, with adjustable communication rate from 300 to 38,400 bps (minimum), with selectable communication protocols including DNP 3, and 2 password levels (minimum).
- 9.12. 10-base-T Ethernet port, rear mounted, with adjustable communication rate from 300 to 38,400 bps (minimum), with 2 password levels (minimum).



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- 9.13. Cyber security access, ports and services user configuration capabilities. Compliant with all current applicable NERC (CIP) standards.
- 9.14. Internal telephone modem, with adjustable communication rate from 300 to 19,200 baud (minimum), with 2 password levels (minimum).
- 9.15. TCP/IP accessible; Ethernet compatible.
- 9.16. A minimum of four analog output channels configurable for Real-Time Data. Analog output will be: -1 to 0 to +1 mA, user programmable, with a compliance voltage of at least +/- 10 volts.
- 9.17. A minimum of four (4) A, B, or C form output contacts, user selectable for function type, suitable for 125 VDC control "wetting" voltage.
- 9.18. Twelve load profile channels (minimum); 5-60 minutes data interval storage per channel, a minimum of (8) time of use (TOU) rates; transformer and line loss compensation.
- 9.19. A minimum of one (1) meter "health" alarm output contact, i.e., a meter health monitor. This meter health monitor contact shall be separate from and in addition to the four output contacts specified in 9.17.
- 9.20. Meter configuration software, if required. The manufacturer shall certify any meter configuration software is, and future releases shall remain, backward compatible with all earlier versions of the software.
- 9.21. Remote interrogation access for meter configuration programming and/or MV-90 data retrieval shall be user selectable via telephone connection, RS-232, Ethernet, fiber optic through any communication processor, port switch, sharing device, or data collection device.
- 9.22. Local interrogation access by direct RS-232 or optical interface connection for meter configuration programming and MV-90 data retrieval using a portable computer. Local interrogation as a data collection method shall be allowed only when remote access is temporarily unavailable.

10. Meter Connection and Enclosure

- 10.1. Meters shall be installed with a disconnect device on the line side of the meter for isolation to facilitate the safe maintenance and repair of the meter. Disconnecting devices shall open the potential signals and shunt the current signals around the meter. Suggested devices are ABB, model FT test switches or States brand switches of similar style.
- 10.2. Meter auxiliary power of 125 VDC or 120 VAC will be supplied to a fuse disconnect that is accessible at the meter location. The fusible disconnect shall be capable of using (Lock Out, Tag-Out (LOTO). Operating the meter auxiliary power from the meter PT source will only be allowed when no other power source is available.



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- 10.3. A properly designed space shall be provided to protect meters and other communication equipment from the environment and that meets appropriate State and Federal Safety regulations. A National Electrical Manufacturers Association (NEMA) Type 4X enclosure is required for all outdoor locations.

11. Potential Transformers (PTs)

- 11.1. Either wound-type potential transformers (PT) or metering accuracy capacitance coupled voltage transformers (CCVT) may be used for metering, provided they meet the requirements under ANSI C57.13 for the following accuracy classifications at system voltages of five (5) kilovolts and higher, three-tenths percent (0.3%) at all burdens W, X, Y, Z. To preserve the accuracy of the waveforms and signals, the manufacturer recommended burdens for potential transformers shall not be exceeded.
- 11.2. Metering PT or CCVT shall be three phase, grounded WYE connected, having a nominal rated 120 volts phase-to-ground secondary. Delta connections are permitted for Revenue (Load) Meters for serving small pumping or station service loads, <250 KW.
- 11.3. Meter voltage secondary circuits shall have a cartridge type fuse disconnect for each phase that is accessible at the meter location. The fusible disconnect shall be capable of using LOTO. This fusible disconnect shall be electrically inserted before the meter disconnect. (reference Section 10)
- 11.4. Western does not routinely test or request the Customer to test metering PTs once they are placed into service, unless there is a suspected accuracy problem; see Section 17. All expenses for a test request will be paid by the requesting entity unless validated as an accuracy issue per Section 17.

12. Current Transformer (CTs)

- 12.1. All current transformers (CT) used for metering shall be located as close to the delivery or Interchange points as practical. They shall be designed and installed such that the power to the meter and transducers will not be interrupted when a line breaker is bypassed (main-transfer bus configuration) or when one of the breakers is opened (ring bus, breaker-and-a-half bus or two breaker bus configurations).
- 12.2. Three phase CTs will be installed at metering POD, POI or BMP locations and properly grounded to a single CT secondary meter common connection. Delta meter connections are limited only to Revenue (Load) Meters serving small pumping or station service loads, <250 KW.
- 12.3. CTs for metering shall be of the wound-type and meet the requirements under ANSI C57.13 for an accuracy classification of three tenths percent (0.3%) for loads between 10% to 100%. CT secondary burden rating B1.8



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- 12.4. Interchange or backfeed generation station service loads less than 10% or more than 100%, that have large power directional swings, shall specify accuracy class 0.15%, Extended Range and Extended Accuracy. CT secondary burden rating B1.8.
- 12.5. A minimum thermal rating factor (RF) of two (2.0) is required. The CT ratio and rating factor combination shall match or exceed all line equipment ratings, which shall be in line with the metering CT. The highest CT ratio/ RF combination shall also match or exceed the maximum expected emergency loading of the circuit. Rating factors of 3.0 or 4.0 and lower CT ratio combinations are desirable for large interchange or generation points.
- 12.6. A radial load that has a limiting factor of the transformer MVA will not require sizing CT ratios to line conductor, breaker or switch ratings. The CT ratio should be set closer to the present radial load or future MVA limits.
- 12.7. CT ambient temperature ratings of 40°C are required. Desert locations may require a higher 50°C ambient rating to maintain CT performance.
- 12.8. Meter CTs shall have a shorting terminal block that shall short and ground each phase current that is accessible at the meter location. This shorting terminal block shall be electrically inserted before the meter disconnects. (reference Section 10)
- 12.9. Western does not routinely test or request the Customer to test metering CTs once they are placed into service, unless there is a suspected accuracy problem; see Section 17. All expenses for a test request will be paid by the requesting entity unless validated as an accuracy issue per Section 17.

13. Drawings and Equipment Data Requirements

- 13.1. Western requires drawings and equipment data for its historical files and compliance documentation for every meter installation. These drawings and documents shall be provided to Western at the Customer's expense unless noted otherwise in a contractual agreement. If these drawings and equipment data are not provided, Western reserves the right to generate its own drawings and collect the pertinent equipment data, charging the expense to the Customer's funding account.
- 13.2. All drawings shall be standard D-size, electronic format AutoCAD or PDF. All data documentation will be electronic format PDF.
- 13.3. Engineering review requires a minimum of forty-five (45) days prior to the meter's scheduled in-service date.
- 13.4. All revisions (as-built) of the installation drawings or documentation are required within thirty (30) days following the meter's in-service date.



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- 13.5. Any meter or Meter System equipment that is upgraded, modified, or replaced requires a new set of engineering drawings and data documentation or revisions to the original drawings and documentation.
- 13.6. Provide a system type drawing showing the meter point location in Western's power system including all substation or line tap breaker and switch numbers, PT and CT device identifiers and power transformer identifiers.
- 13.7. Provide schematic drawings of Meter System equipment including auxiliary power and communication circuits. Wiring drawings are required when Western maintains any Meter System equipment in a Customer's facility.
- 13.8. Provide metering PT schematic drawings, single line or three lines, nameplate data, manufacturer's PT accuracy test reports and transformer turns ratio test reports. Winding insulation or power factor testing is required on Western owned or maintained equipment. PTs that are used or stored more than 2 years will require re-testing, prior to placing them in-service at a new location.
- 13.9. Provide metering CT schematic drawings, single line or three lines, nameplate data, manufacturer's CT accuracy test reports, transformer turns ratio test reports. Winding insulation or power factor testing is required on Western-owned or maintained equipment. CTs that are used or stored more than 2 years will require re-testing, prior to placing them in-service at a new location.
- 13.10. Provide meter configuration data, MV-90 configuration data and nameplate data. Data shall include, but is not limited to, manufacturer, model, type, form, number of elements, serial number, meter and channel multipliers, data channel configuration and labels, programmed PT and CT ratios, meter ID, phone number, and port switch number.

14. Boundary Meter Data

- 14.1. A Western BMP requires a dedicated communication channel for the meter real-time AGC data to the Western Operations Center. The primary meter data channel shall carry Real-Time Data and pulse [Accumulator](#) Data. Real-time reactive megavar power (Mvar) may be required. Western may require routing this data through a LDC and/or a RDC in Western field offices. The communications path will be owned, operated and maintained by the utility providing the data communication channel(s) or its contractors, and will not utilize public communications circuits that are not maintained by the utility.



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- 14.2. Western may approve an alternative method to receive its AGC data from BMPs by contractual agreement. These alternate methods do not imply approval totalizing and/or summing of discrete AGC meter data points unless needed under 14.2.4. The alternate method requires a communication path that is owned, operated and maintained by the utility supplying the data or its contractors, and will not use public communications circuits.

The following alternative methods are allowed as existing meter conditions or limited exceptions:

- 14.2.1. Manual readings for small loads (<250kw) where communication access is unavailable.
 - 14.2.2. Customer's meters supplying AGC metering data routed through a LDC and/or a RDC located at another utility's facility.
 - 14.2.3. Customer's meter(s) located within or external of the BA or SBA connected by a contractual transmission path.
 - 14.2.4. Pseudo-Tie (Virtual) Real time AGC value derived from system data points, meter data points, allocations and calculations that will represent the BA's or Sub-BA's best practice, using metering accuracy data points, to replicate a physical Boundary Meter.
- 14.3. All Western BMPs require an [Alternate Data Source](#) (ADS) for the Real-Time Data that is not connected to the same CT source as the primary meter. Relay quality CTs are acceptable for the ADS. The ADS shall be transmitted via a second data channel, such as within the station [SCADA](#) RTU, or as a posted ICCP value.
- 14.4. Western requires that the primary AGC data be duplicated and transmitted independently to its Alternate Control Center (ACC). This may require an additional communications channel or other means approved by Western.
- 14.5. BAs or other utilities may install a second backup meter or other backup metering devices. Western will not use these as the primary ADS, but may acquire these data points as an alternate, third data resource, if available.

15. Revenue Meter (Intratie, Generation or Load) Real-Time Data

- 15.1. Meters used that provide power accounting or ancillary service data including, but not limited to, load control, regulation or energy accounting or other transmission services, require real-time MW power and kWh pulse Accumulator data. Real-Time Mvar data may be required. These data may be transmitted via a Customer-owned or leased data channel, contained within the RTU SCADA source or as a posted ICCP value.



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- 15.2. Western requires Real-Time Data for any generation source added (behind the meter) to an existing Customer's POD or POI greater than >1 Megawatt (MW). Real-Time Data may be transmitted over communication circuits that are owned, maintained, controlled or leased by the Customer, contained within the SCADA RTU or ICCP value.
- 15.3. New Facilities, that have multiple Meter Systems, should not total or sum meter data unless some technical issue, contractual agreement exception or equipment limitation prevents or hinders transmitting discrete meter data individually or within a data stream.
- 15.4. Western requires that the primary Real-Time Data be duplicated and transmitted independently to its ACC. This may require a second communications channel or other means approved by Western.

16. Maintenance Notification

- 16.1. All maintenance requests for meters, including Meter System equipment, supplying Real-Time Data, will be coordinated with Western's Outage Coordinators ([Links: Exhibit I: Western Contact Information](#)) no less than ten (10) business days prior to any scheduled work. The Outage Coordinators will notify all interested parties by their electronic e-mail notification process. A shorter notification period may be permitted if agreed to by all parties.
- 16.2. Meters supplying only kWh data, with no Real-Time Data connection, require a three (3) day notification of any routine maintenance. Western's Settlements Departments and the load Customer(s) should be notified prior to any testing or maintenance. A shorter notification period may be permitted if agreed to by all parties.

17. Meter Testing Requirements and Responsibilities

- 17.1. Western owned or Customer shared meters shall be tested once every three (3) years unless a more frequent interval is required by WECC, MRO or NERC standards. Western will not test meters it owns or maintains by contract agreement out-of-sequence of the three (3) year time interval. Any Customer requesting out-of-sequence testing will need to initiate a written request to the appropriate Regional Maintenance Manager. Western Maintenance will then work with Contracts and Finance to draft a letter agreement and invoice the Customer to cover Western's labor for the out-of-sequence testing. The only exception will be to troubleshoot a bad meter data point, and/or to correct meter values or billing data errors.

This Section 17.1 modifies the meter testing and inspection intervals stated in Western's [GPCP](#), or subsequent revisions, where under Provision 6.2 it states: "Metering equipment shall be inspected and tested each year by the party responsible for meter maintenance, unless a different test interval is determined in accordance with good utility practices by an applicable regional metering policy, or as agreed upon by the parties. Meters shall also be tested at any reasonable time upon request by a party hereto, or by an affected supplemental power supplier, transmission agent, or control area operator."



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- 17.2. Western will troubleshoot and repair any reported or suspected problem or error with any Western-owned Meter System equipment or meter communication connectivity at its own expense, provided that all parties have validated their data with each party and it is agreed that the Meter System equipment is the source of the problem or error.
- 17.3. The Customer (owner or maintenance responsible party) will troubleshoot and repair any reported or suspected problem or error with any meter or meter communication connectivity at its own expense, provided that all parties have validated their data with each party and it is agreed that the Meter System equipment is the source of the problem or error.
- 17.4. While the meter is out-of-service, technicians will inject test voltage and current to simulate real-time meter data to each party's operation center to confirm correct scaling and data values. Data validation is a unique testing requirement for Boundary Meters and other meters supplying real-time operational data.
- 17.5. MV-90 and other remote access connectivity and data validation shall be performed before and after any Meter System equipment maintenance.
- 17.6. In-service or commissioning testing shall be performed at the time of installation and subsequent meter tests. This testing will include 3-phase voltage and current magnitude, load phase angles and power quantities. CT burden testing for existing electro-mechanical or electronic meter installations may be required.
- 17.7. Meter data errors determined through testing shall follow Western's [GPCP](#) Sections 6.3 through 6.5 to resolve the billing errors.
- 17.8. Western will archive its meter test reports in the maintenance data directory and distribute copies of these test reports to Customers upon request. Presently, there is no NERC/WECC/MRO requirement to maintain these records, but it is required by Western's contractual relationship with its Customers and the historical business practice for documentation of metering billing accuracy.



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18. Acronyms

Acronym	Long Name
ACC	Alternate Control Center
ACE	Area Control Error
ADS	Alternate Data Source
AGC	Automatic Generation Control
ANSI	American National Standards Institute
BA	Balancing Authority
BMP	Boundary Meter Point (interchange between BA's)
CIP	Critical Infrastructure Protection (NERC standards)
CRSP	Colorado River Storage Project (Referred collectively as Western)
CT	Current Transformer
DNP3	Distributed Network Protocol Level 3
DSW	Desert Southwest Region (Referred collectively as Western)
GPCP	General Power Contract Provisions
ICCP	Inter-Control Center Communications Protocol
KWh, KVARh	KiloWatt Hour, KiloVar Hour
LOTO	Lock Out, Tag Out (NFPA-NEC)
MRO	Midwest Reliability Organization
MV-90, MV-WEB	Itron Inc. Billing data program and web based Customer data access.
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
OSHA	Occupational Safety & Health Administration
POD	Point of Delivery
POI	Point of Interconnection or Point of Interchange
PT	Potential Transformer
RMR	Rocky Mountain Region (Referred collectively as Western)
RTU	Remote Terminal Unit
SBA	Sub-Balancing Authority
SCADA	Supervisory Control and Data Acquisition
SNR	Serria Nevada Region (Referred collectively as Western)
TCP/IP	Transmission Control Protocol/Internet Protocol
TLC	Transformer Loss Compensation
TOU	Time of Use
UGP	Upper Great Plains Region (Referred collectively as Western)
VAC	Voltage Alternating Current
VAR, Mvar	Volt-Ampere-Reactive (Instantaneous Reactive Power), Mega-Var
VDC	Voltage Direct Current



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Acronym	Long Name
VT	Voltage Transformer
W, KW, MW	Watt (Instantaneous Real Power), Kilo=Watt, Mega-Watt
WECC	Western Electricity Coordinating Council
Western	In this document only, refers to Western’s regions and CRSP.

19. Definitions

Term	Definition
Accumulator	Digital counter that is normally referred in metering as a SCADA hourly pulse counter, collecting meter kW digital pulses at a predetermined pulse rate that equals kW-hour.
Alternate Data Source (ADS)	Back-up data source, from a different current transformer, for all real-time meter data used for Boundary Meters. Revenue Meters may also require ADS, depending on Western’s operational requirements. Relay quality current transformers are acceptable for the ADS requirement.
Balancing Authority (BA).	The responsible entity that integrates resource plans ahead of time, maintains load-interchange-generation balance within a Balancing Authority Area, and supports Interconnection frequency in real-time.
Boundary Meter	A Boundary Meter is NERC-compliant equipment located at Western’s interconnected or interchange point with another BA. Its primary function is providing Real-Time Data to Western Operations Centers, its ACCs, BAs, and to other utilities or interested parties. The meter provides accounting for power values for Western’s AGC and to calculate the ACE required by NERC, WECC and MRO standards. Demand power data is recorded, stored and remotely interrogated for billing and energy accounting purposes by Western’s MV-90 data system.
Boundary Meter Point (BMP)	The metered interchange point between Western and other BAs. The BMP may be located in other Customer’s facilities.
Customer	Any entity that receives contractual firm electric power, transmission, BA or maintenance services from Western, or is interconnected to Western’s system.
Energy Services	Typically billing, scheduling, regulation, control, electric power transactions or other ancillary power services provided by Western to its Customers.
Facilities	Generation station, utility substation, transmission or distribution line tap. Typically, the location of the POD, POI or BMP.
General Power Contract Provisions (GPCP)	Standard terms and conditions included in Western’s power delivery and transmission service contracts.
Meter Policy (Policy)	Standards, guidelines, requirements and responsibilities of Western and its Customers for installation of Meter System equipment to measure Energy Services.



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Term	Definition
Meter System(s)	The collective equipment required to meter a Customer’s interconnection or delivery point. This may include, but is not limited to, the meter, CTs, PTs, CCVTs combination CT and PT transformer packages, modem, port sharing device, phone line sharing device, AC and/or DC power source, AC power protection devices and phone line protective devices, as required.
MV-90 (Itron, Inc.)	Meter interrogation, data collection, and data management program used by Western’s Settlements department.
MV-WEB (Itron, Inc.)	Online tool that provides secure and reliable access to Customer load data.
Point of Delivery (POD):	The place where the Customer’s facilities or the Customer’s transmission agent connects with Western for the delivery of firm electric service. A Load Meter is usually located at a POD. The POD may be located at a Customer’s facility.
Point of Interconnection (POI)	The location where the utility, transmission or generation agent connects to Western’s power system that may allow bi-directional flow of power between Western’s and another party’s power system. An Intratier Meter is usually located at a POI. The POI may be located in a Customer’s facility.
Real-Time Data	Instantaneous Megawatts, Mega-Vars, and KWH digital pulses transmitted over a communication data channel.
Revenue Meter (Generation)	An energy meter that provides real-time watt and reactive (var) power flow, Kilowatt-hour (kWh) and demand data to Western’s Operations and Settlements Departments. It is used for the purpose of scheduling power resources into Western’s system and to provide regulation services. Demand power data is recorded, stored and transmitted to Western’s MV-90 data system.
Revenue Meter (Intratie)	An energy meter that provides real-time watt and reactive (var) power flow, Kilowatt-hour (kWh) and demand data to Western’s Operations and Settlements Departments. It is used for the purpose of billing energy and demand use, as provided by Western, to a Customer. Demand power data is recorded, stored and transmitted to Western’s MV-90 data system.
Revenue Meter (Load)	Revenue Meter with the primary function of providing kWh, watt and var demand data to Western’s Settlements Departments for the purpose of accounting for loads. Demand power data is recorded, stored and transmitted to Western’s MV-90 data system.
Sub-Balancing Authority (SBA)	Transmission Service Provider and/or Power Marketer who markets transmission and power inside a Balancing Authority. SNR operates as a SBA under Sacramento Municipal Utility District.
SCADA	Supervisory Control and Data Acquisition. A proprietary software program used to remotely control equipment, acquire equipment status, monitor system information and provide alarms for equipment malfunctions and problems for operational purposes.

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20. References

American National Standards Institute (ANSI)
 General Power Contract Provisions (GPCP), dated September 1, 2007
 National Electric Manufacturers Association (NEMA)
 National Electric Reliability Corporation (NERC)
 Occupational Safety and Health Administration (OSHA)
 Nation Fire Protection Association (NFPA)
 National Electric Code (NEC)
 Rocky Mountain Meter Policy 03/15/2011
 DSW_RMR Meter Policy 08/08/12

21. Exhibits

Exhibits	Rev	Title
Exhibit A	01	Boundary Meter Typical Block Diagram
Exhibit B	01	Intratie or Generation Meter Typical Block Diagram
Exhibit C	01	Revenue Meter Typical Block Diagram
Exhibit D	01	SEL-735V Standard Vertical Case Model Configuration
Exhibit E	01	SEL-735H Standard Horizontal Case Model Configuration
Exhibit F	01	SEL-735H_DSW Standard Horizontal Case Model Configuration
Exhibit G	01	SEL-735EX Standard Easy Extractable Model Configuration
Exhibit H	01	Form 5 and Form 9 Wiring Diagram
Exhibit I	01	Western Contact Information

22. Revision History

Effective Date	Version Number	Revised By	Revision History
11/22/2013	Final	Western Team	Approved Final Version 11/21/2013



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23. Point of Contact/Reviewers/Subject Matter Experts

POC/Reviewers/SME	Organization Code	Phone
Claire Douthit	CSO A0200	720-962-7026
John Quintana	CSO A7900	720-962-7296
Matt Miller	CSO A0400	406-255-2871
Scott Mallard	UGP B5000	605-353-2700
Dirk Shulund	UGP B4061	406-255-2841
Michael Radecki	UGP B6200	406-255-2930
Rick Hillis	DSW G5000	602-605-2440
Brian Young	DSW G6200	602-605-2594
Tina Ramsey	DSW G6300	602-605-2565
Matt Caldwell	DSW G5350	602-605-2578
Kevin Howard	RMR J5000	970-461-7261
Nick Klemm	RMR J5500	970-461-7256
Melanie Reed	RMR J6200	970-461-7229
Steve Johnson	RMR J4900	970-461-7451
Diane Glessner	RMR J4200	970-461-7236
Orlando Reyes	RMR J4014	970-461-7288
Bob Springer	RMR J5525	970-240-6362
Richard Ferner	RMR J4240	970-461-7257
Brent Osiek	CRSP L6230	801-524-5495
Lewis Trujillo	SNR N5000	916-353-4090
Daryl Rictor	SNR N5200	916-353-4574
Jeanne Haas	SNR N6200	916-353-4438



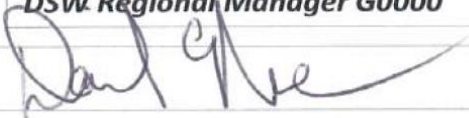

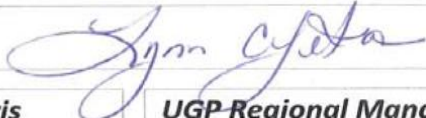

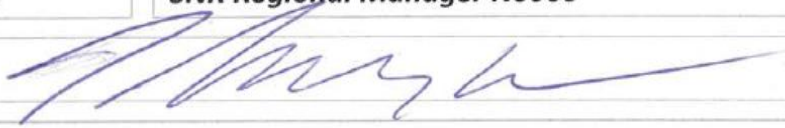
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24. Approvers

(Image of Signature Page)

Signature	Title	Date
Darrick Moe	DSW Regional Manager G0000	12/30/13
		
Bradley Warren	RMR Regional Manager J0000	1-31-14
		
Lynn Jeka	CRSP Manager L0000	1/7/14
		
Robert Harris	UGP Regional Manager B0000	12/18/13
		
Tom Boyko	SNR Regional Manager N0000	12/26/13
		

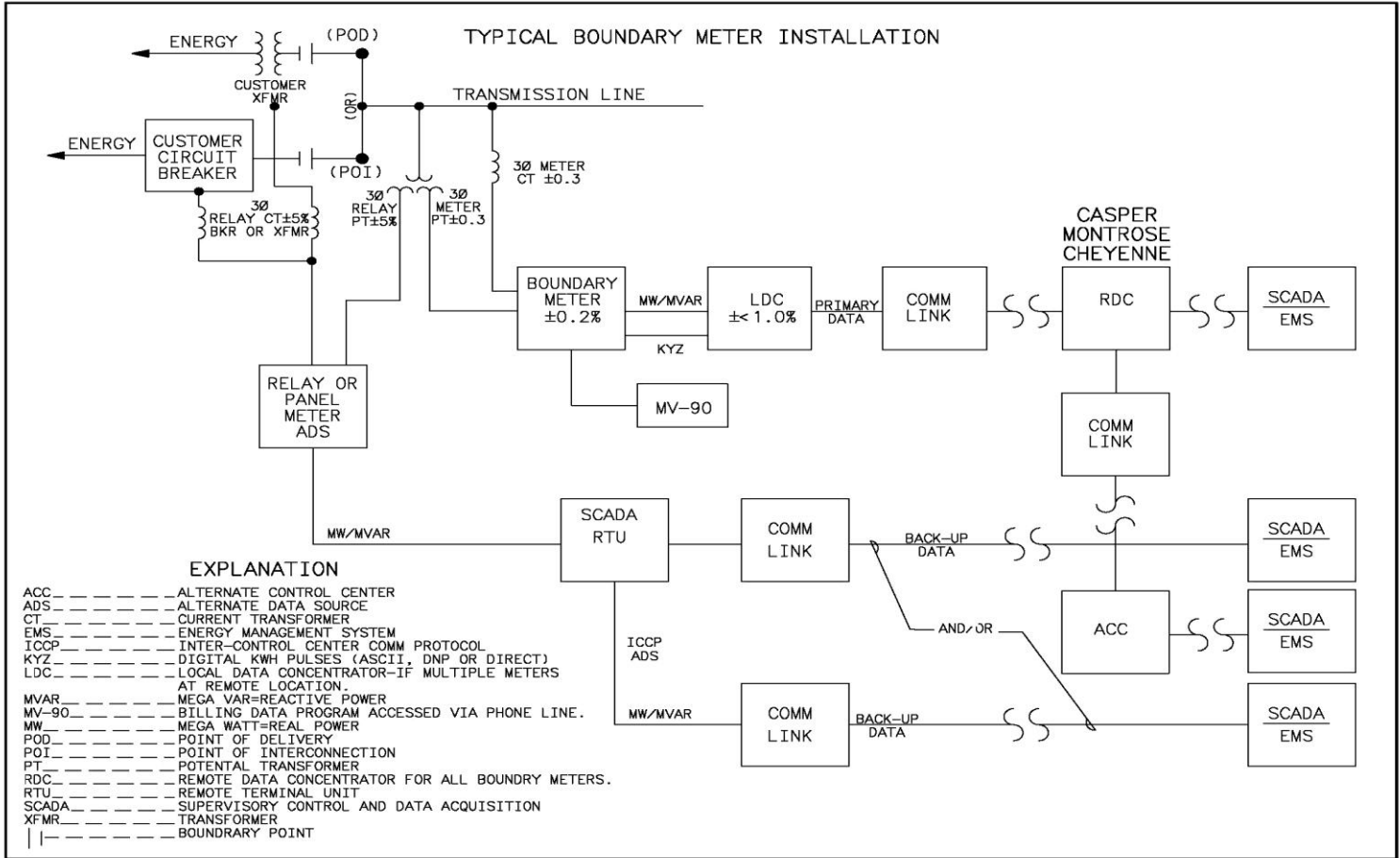


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Exhibit A: Boundary Meter Typical Block Diagram



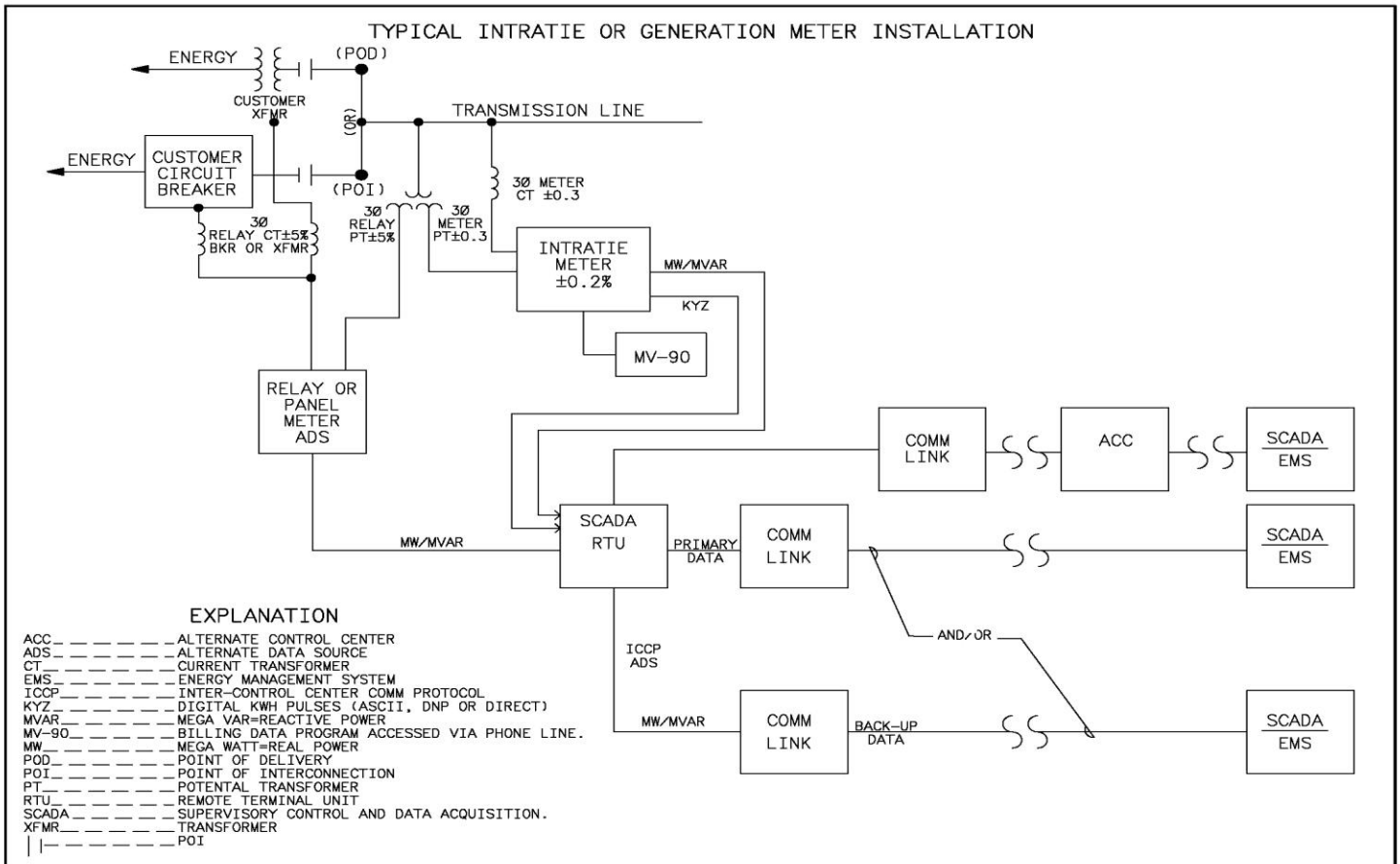


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Exhibit B: Intratie or Generation Meter Typical Block Diagram



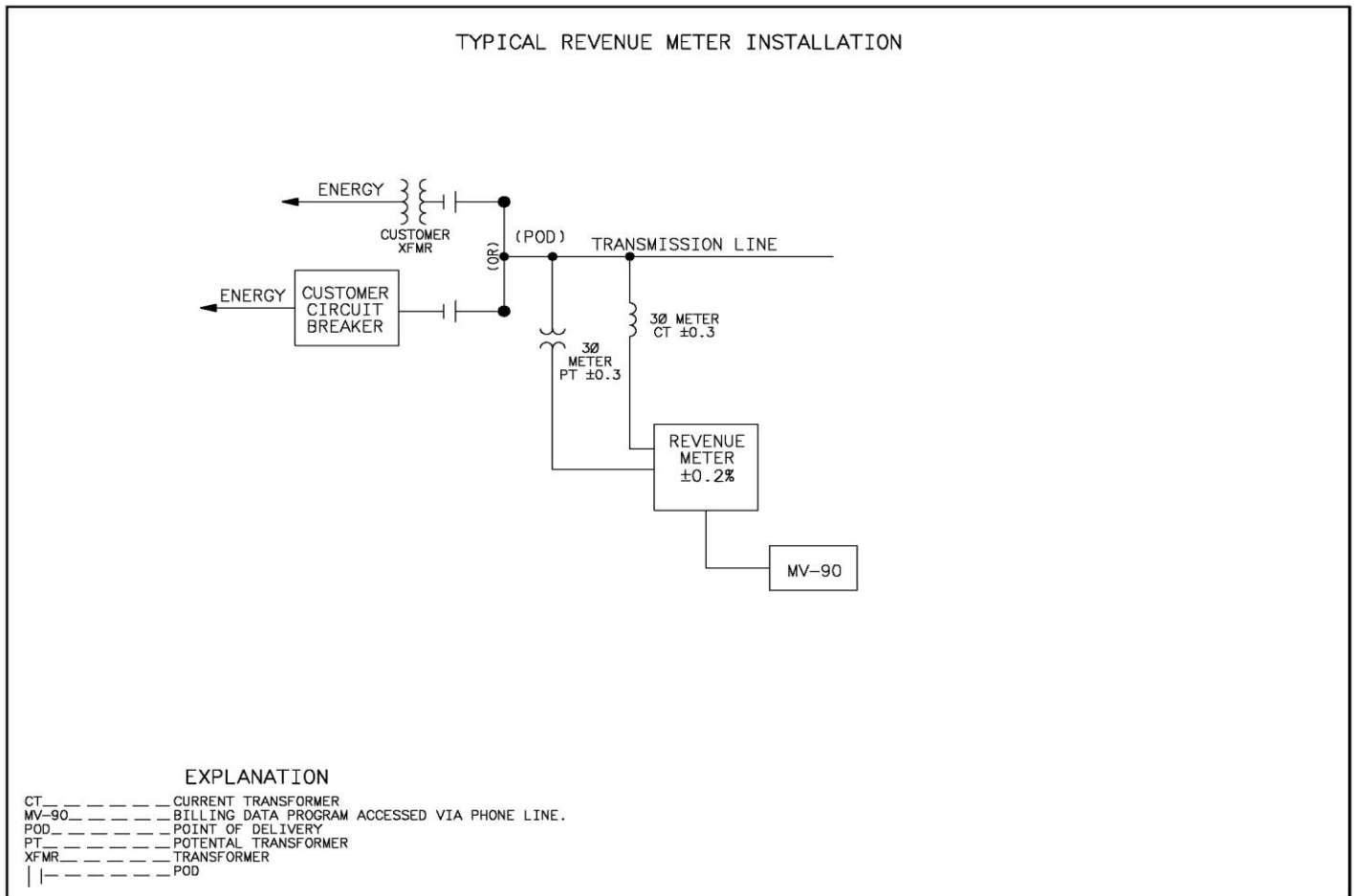


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Exhibit C: Revenue Meter Typical Block Diagram





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Exhibit D: SEL-735V Standard Vertical Case Model Configuration

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Part Number: 0735VX10944CGXCXXX16101XX		Key: 1800
Product:	SEL-735	0 7 3 5 0 X X X X X
Category	Selection	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Chassis	Vertical Panel Mount, ANSI Optical Port	V
Enclosure	None	X
Power Quality and Recording Option	Intermediate PQ and Recording*	1
Meter Form	Form 9	9
Slot A, Power Supply	125/250 Vdc or Vac; 3 Contact Outputs, 2 Inputs	4
Slot A, Power Supply Control Input Voltage	125 Vdc or Vac	4
Slot B, Main Board Communications	Two EIA-232 Ports and One 10/100BASE-T Ethernet Port*	C
Slot C, SELECT Boards	Telephone Modem plus Additional EIA-232 and EIA-485 Port*	G
Slot D, SELECT Boards	4 ±1 mA Analog Outputs, 4 Solid-State Outputs*	C X
Slot D Control Input Voltage	Empty	X
Slot Z Current and Voltage Inputs	Current Class CL2/10/20, Optimized for Low-End Accuracy	1
System Frequency	60 Hz	6
Communications Protocol	SEL ASCII, SEL Distributed Port Switch Protocol, SEL Fast Meter, SEL Compressed ASCII, MV-90 Translation™, Modbus® RTU/TCP, MIRRORED BITS® Communications, Telnet, and DNP3 Level 2 Slave Serial and LAN/WAN	1
Front-Panel Labeling	ANSI Labeling	0
Conformal Coat	None	1

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Exhibit E: SEL-735H Standard Horizontal Case Model Configuration

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Part Number: 0735HX10944CGXCXXX16101XX		Key: 1730
Product:	SEL-735	0 7 3 5 0 X X X X X
Category	Selection	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Chassis	Horizontal Panel Mount, ANSI Optical Port	H
Enclosure	None	X
Power Quality and Recording Option	Intermediate PQ and Recording*	1
Meter Form	Form 9	9
Slot A, Power Supply	125/250 Vdc or Vac; 3 Contact Outputs, 2 Inputs	4
Slot A, Power Supply Control Input Voltage	125 Vdc or Vac	4
Slot B, Main Board Communications	Two EIA-232 Ports and One 10/100BASE-T Ethernet Port*	C
Slot C, SELECT Boards	Telephone Modem plus Additional EIA-232 and EIA-485 Port*	G
Slot D, SELECT Boards	4 ±1 mA Analog Outputs, 4 Solid-State Outputs*	C X
Slot D Control Input Voltage	Empty	X
Slot Z, Current and Voltage Inputs	Current Class CL2/10/20, Optimized for Low-End Accuracy	1
System Frequency	60 Hz	6
Communications Protocol	SEL ASCII, SEL Distributed Port Switch Protocol, SEL Fast Meter, SEL Compressed ASCII, MV-90 Translation™, Modbus® RTU/TCP, MIRRORING BITS®, Communications, Telnet, and DNP3 Level 2 Slave Serial and LAN/WAN	1
Front-Panel Labeling	ANSI Labeling	0
Conformal Coat	None	1

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Exhibit G: SEL-735EX Standard Easy Extractable Model Configuration

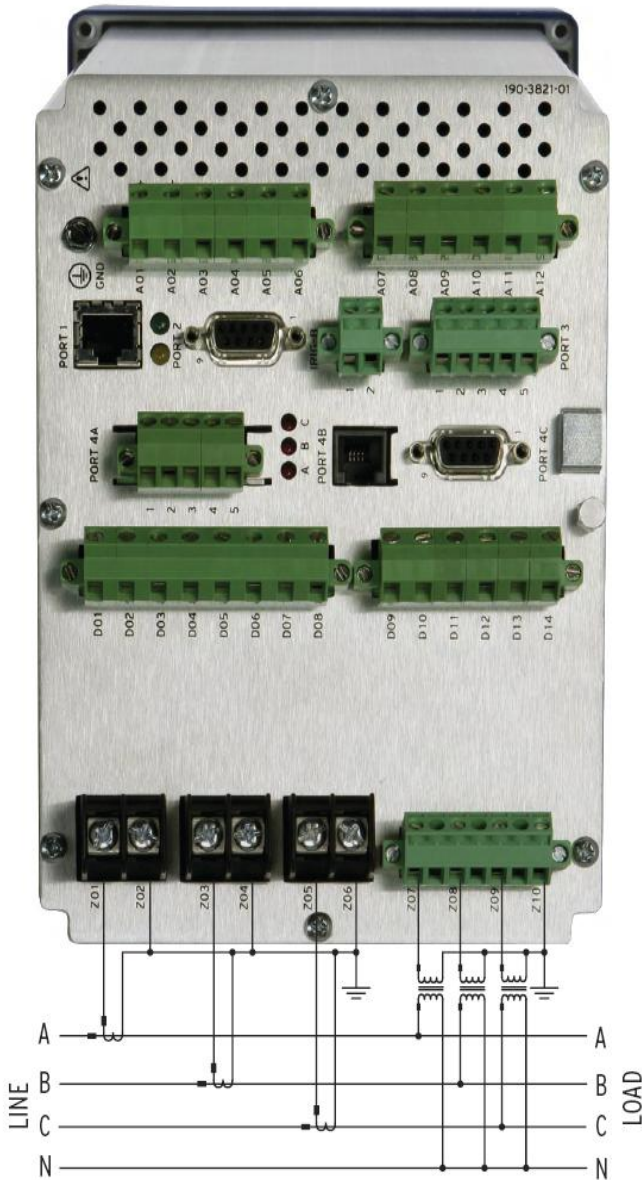
SEL Online MOT

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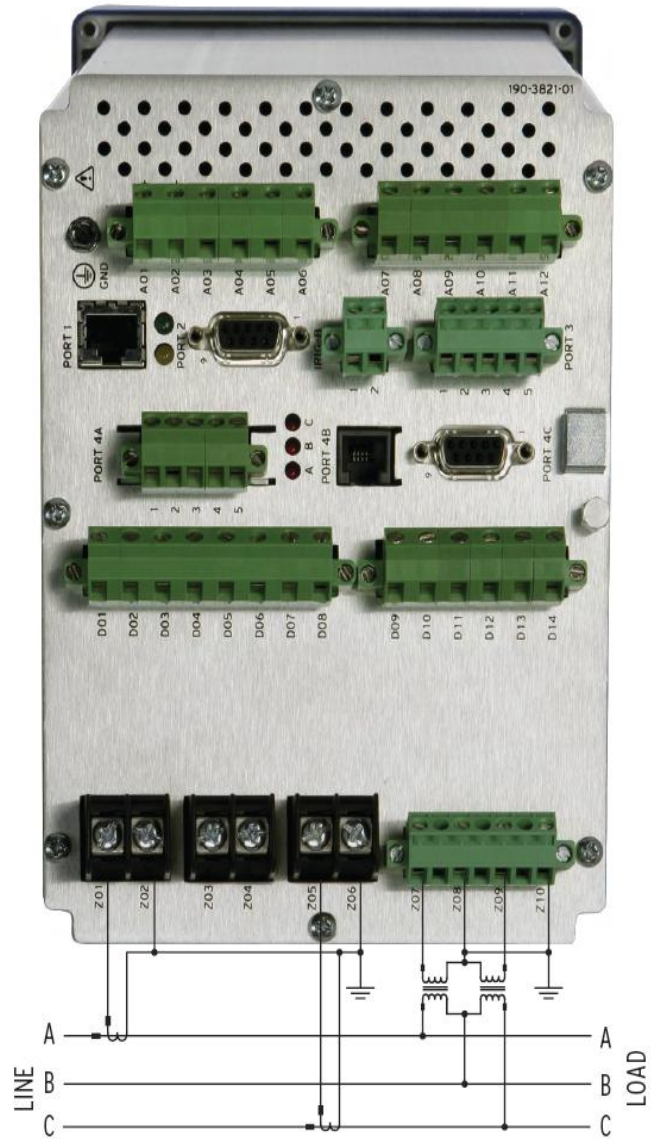
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Product:	SEL-735	0 7 3 5 0 X X X X X
Category	Selection	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Chassis	Easily Extractable Meter (EXM), Vertical Panel Mount, ANSI Optical Port*	E X
Enclosure	None	X
Power Quality and Recording Option	Intermediate PQ and Recording*	1
Meter Form	Form 9	9
Slot A, Power Supply	125/250 Vdc or Vac; 3 Contact Outputs, 2 Inputs	4
Slot A, Power Supply Control Input Voltage	125 Vdc or Vac	4
Slot B, Main Board Communications	Two EIA-232 Ports and One 10/100BASE-T Ethernet Port*	C
Slot C, SELECT Boards	Telephone Modem plus Additional EIA-232 and EIA-485 Port*	G
Slot D, SELECT Boards	4 ±1 mA Analog Outputs, 4 Solid-State Outputs*	C X
Slot D Control Input Voltage	Empty	X
Slot Z Current and Voltage Inputs	Current Class CL2/10/20, Optimized for Low-End Accuracy	1
System Frequency	60 Hz	6
Communications Protocol	SEL ASCII, SEL Distributed Port Switch Protocol, SEL Fast Meter, SEL Compressed ASCII, MV-90 Translation™, Modbus® RTU/TCP, MIRRORRED BITS® Communications, Telnet, and DNP3 Level 2 Slave Serial and LAN/WAN	1
Front-Panel Labeling	ANSI Labeling	0
Conformal Coat	None	1

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Exhibit H: SEL-735 Wiring Connections



Form 9, 3-Element, Four-Wire Wye



Form 5, 2-Element, Three-Wire Delta



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Exhibit I: Western Contact Information

DSW: Contact them by e-mail or letter for any metering request or access to their MV-WEB data

Link: <http://www.wapa.gov/dsw/contact/>

DSW Outage Coordinator: (WALCoutage@wapa.gov)

RMR: Requires a Metering Application Agreement (MAA) for every new meter installation except where the installation and funding of the metering system equipment is covered under the scope of another agreement. Existing meters that require system upgrades, change of use, relocations of a POD, POI or BMP, necessitating contractual modifications, also require the MAA.

<https://www.wapa.gov/rm/opsmaintRM/documents/Meter%20Application%20and%20Agreement%20Final%205-17-11%202.pdf>

RMR Outage Coordinator: (RMROUTAG@wapa.gov)

SNR: Contact them by e-mail request.

Link: <http://www.wapa.gov/sn/contact/>

SNR Outage Coordinator: (WAMPOC@wapa.gov)

UGP: Contact them by E-mail request:

Link: <http://www.wapa.gov/ugp/ContactUs/default.htm>

UGP Outage Coordinator: (UGPWAPATOP@wapa.gov)
