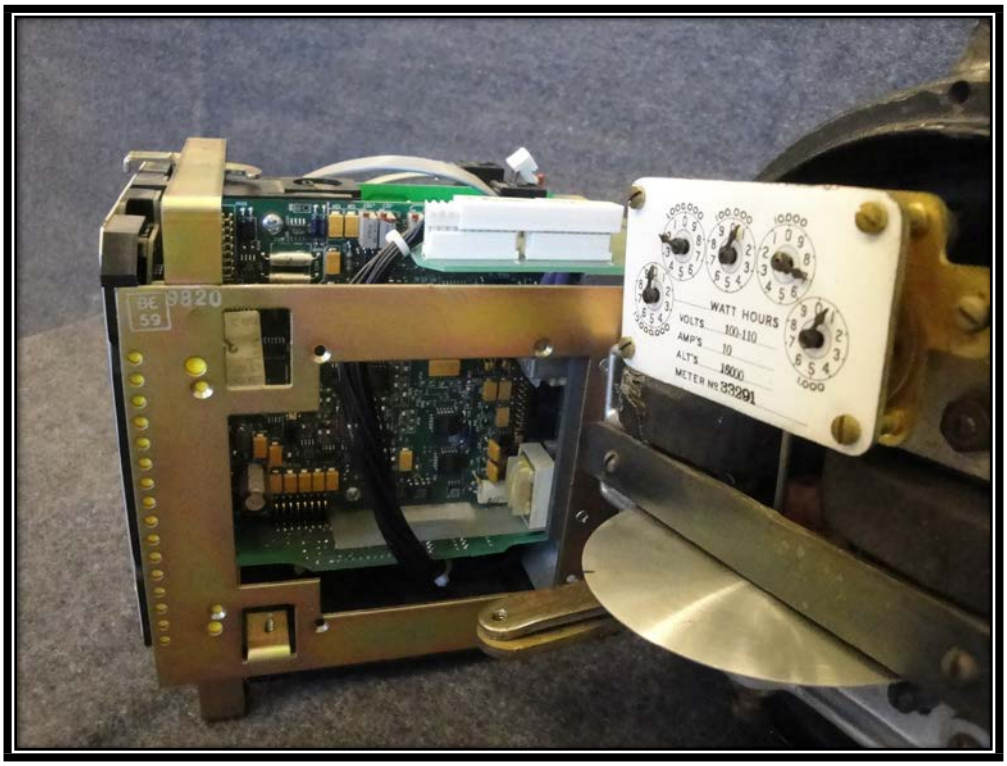
Western Area Power Administration

WESTERN AREA POWER ADMINISTRATION
Meter Policy



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1. Purpose

1.1. The Western Area Power Administration (WAPA) Meter Policy (Policy) establishes standards for WAPA and its Desert Southwest (DSW), Rocky Mountain (RMR), Sierra Nevada (SNR) and Upper Great Plains (UGP) Regions and the Colorado River Storage Project Management Center (CRSP), 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 Receipt (POR), Points of Delivery (POD), Points of Interconnection (POI) or Boundary Meter Points (BMP) to WAPA's power system for these regions, subject to Section 1.3 below.

1.2. WAPA'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), including as Balancing Authorities (BAs). WAPA 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. WAPA's Regions operate Balancing Authority Areas (BAAs), a Sub Balancing Authority Area (SBAA) and legacy balancing areas.

1.3. WAPA's Regions may be or become members of a RTO, ISO, or EIM. In the event that such RTO, ISO, or EIM has metering requirements that are more restrictive than this Policy, then such respective RTO, ISO, or EIM applicable metering requirements will be used by that Region. Such Regions will post applicable RTO, ISO, or EIM metering requirements that apply to metering points on WAPA's power system.

2. Scope

2.1. This Policy supersedes any previous Meter Policy in effect for WAPA'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. WAPA acquires, retrieves and integrates meter data into its billing, meter interrogation, scheduling, and power accounting systems. This Policy assures that accurate and consistent data are used by WAPA's billing, scheduling, power accounting programs, and operational systems. WAPA 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 WAPA-owned Facilities or WAPA-owned and maintained Meter Systems installed in Customer's Facilities. WAPA-owned Meter Systems will utilize the provisions of the Policy, to the maximum extent possible, when installing

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2.3. 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, POR, BMP, and/or new meter data that will be provided by the Customer and used by WAPA for Energy Services, as well as any meter maintenance services that are provided by WAPA. WAPA'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.

3. General Meter Policy Requirements

3.1. Meter System equipment shall be connected and installed at the POD, POI, POR, or BMP in WAPA'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, POR, or BMP high voltage delivery point unless an exception is granted under Section 3.2

3.2. WAPA may grant limited exceptions for new low voltage, transformer loss compensated (TLC) metering. WAPA 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~~an existing Facility having existing TLC metering; b) high voltage connections are technically or physically not feasible; c) connected load is <250 KW; or 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, POR, or BMP. WAPA 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~~Kilo-Var-hour (KVARh) pulses and data interval storage. See Section 9 for WAPA'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, WAPA's or the operating utility's network system requirements,

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WAPA 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.

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3.6. Metering system installations shall adhere to current applicable utility standards that include, but are not limited to: American National Standards Institute (ANSI), Institute of Electrical and Electronics Engineers (IEEE), National Electric Safety Code (NESC), National Fire Protection Association (NFPA), National Electric Code (NEC), Occupational Safety and Health Administration (OSHA), WECC, MRO, and NERC.

3.7. WAPA 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, POR, or BMP, may require modifications to existing contracts or agreements. Links to WAPA's regional Point of Contact are located in Exhibit I: WAPA Contact Information.

3.8. The costs of material and labor to install, modify, replace, change, or remove Revenue or Boundary Meters within WAPA's system shall be at the Customer's expense, unless otherwise agreed in contractual agreements between WAPA and the Customer.

3.9. For all Customer-funded work, WAPA cannot obligate its funds or expend labor resources without a signed contractual agreement and advance funding. Further, WAPA must cease all work in progress if funding becomes deficient.

3.10. When the contract changes or terminates and WAPA no longer needs the POD, POI, POR, or BMP, the financial and replacement responsibility will be transferred to the Customer and WAPA will remove all WAPA-owned Meter System equipment. WAPA will either terminate or transfer to the Customer (or Customer's agent) any services WAPA provided, including maintenance, meter interrogation, and meter data reports or studies.

4. WAPA-Owned Facilities

4.1. Meter System installations located within a WAPA facility shall be owned and maintained by WAPA. Customer-funded Meter System installations will designate or convey ownership to WAPA in the contractual agreement.

4.2. WAPA shall be responsible for the engineering design, equipment procurement, installation, and commissioning of all Meter Systems in WAPA 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 WAPA

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Meter System equipment will adhere to this Policy and obtain the appropriate engineering reviews and approvals prior to installation. WAPA's engineering or maintenance personnel will review Meter System test reports and grant final approval before equipment is placed in-service.

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4.4. WAPA 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 Inter-Control Center Communication Protocol (ICCP) value or other means as determined by WAPA.

4.5. Customers may request installation of their Meter System equipment within a WAPA Facility for the Customer's own load monitoring or data retrieval. WAPA will review, and if appropriate, approve the design and make any connections into the Meter System circuits at the Customer's expense. WAPA 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. WAPA may contractually agree to provide the installation and/or maintenance services for this Meter System equipment.

5. Customer-Owned Facilities

5.1. WAPA's General Power Contract Provision dated September 1, 2007, as amended or ~~superceded~~superseded (GPCP), Section 6.1, 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 WAPA, a designated representative of WAPA, or where situations deem it appropriate as determined by WAPA, 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 WAPA, the Contractor shall ensure that the metering equipment complies with applicable metering policies established by WAPA." General Interconnection Contract Provisions dated September 26, 2013, as amended or ~~superceded~~superseded (GICP) Section 4.1, utilized in some regional contracts in lieu of GPCP Section 6.1, provides language substantially similar to GPCP Section 6.1.

5.2. In the situation described in GPCP 6.1 and GICP 4.1 where the metering equipment is furnished and maintained by the Contractor or its agent(s), WAPA requires prior review and approval for any new Meter System installations or proposed modifications to existing Meter Systems under Section 7 of this Policy. Section 13 of this Policy details the submittals WAPA requires for its review and approval. WAPA reserves the right to be present at the Customer's Facility when new Meter Systems are installed or modifications are accomplished. In the event WAPA later

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requires modifications to the Contractor's metering equipment, the Customer, at its own expense, will modify the metering equipment subject to WAPA's review and approval.

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5.3. Customers that are internal members of WAPA's BAA or SBAA shall follow the provisions of this Policy when installing or modifying a POD, POI, POR, or BMP; unless a specific exception is approved and documented in a contractual agreement with WAPA.

5.4. WAPA Customers served within other BAs' geographical designated areas that reside within WAPA BAAs and SBAAs or adjacent BAAs' 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 WAPA 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. WAPA reserves its right to witness routine testing, maintenance repairs or renovations of Meter System equipment in a Customer's facility where WAPA 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 WAPA 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 WAPA's request.

6. New Boundary Meter Installations

6.1. When the meter is a BMP installed in a non-BA owned substation, WAPA, as a BA or SBA, or legacy balancing area requires a BA or SBA or legacy balancing area 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 entity 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, WAPA and its Customers will collaborate to modify existing metering configurations in compliance with this Policy.

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~~7.2.~~ WAPA will review the design, equipment specifications and data resources of existing WAPA-owned and Customer-owned Meter Systems. WAPA may adapt or modify the Meter System design and replace or upgrade equipment to achieve features, functions, accuracy or

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7.2. performance that WAPA deems necessary, by utilizing these Policy provisions and standards. WAPA will apply the provisions of this Policy with consideration of the particular Facility and/or Customer's requirements.

7.3. For existing POD, POI, POR, or BMP Customer-owned Meter Systems located in Customer or WAPA-owned Facilities, WAPA's expectation is to utilize the provisions of this Policy, to the maximum extent possible, when upgrading, replacing or relocating Meter System equipment. WAPA may grant limited exceptions for particular Facilities and/or Customer requirements.

7.4. An existing meter located at a POD, POI, POR, 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, POR, and BMP connection point 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, POR, 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;

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 ± 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 WAPA. Instrument transformers shall meet the requirements of Sections 11 and 12.

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8.3. Meter percent registration error (measured by out-of-service testing) for microprocessor meters shall be no greater than ± two-tenths of one percent (±0.2%) for full load kWh, light load kWh, and kVARh in each power direction.

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8.4. Meter in-service testing percent error shall be no greater than ± three-tenths of one percent (±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 ± two-tenths of one percent (±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. Three-element metering is required at POD, POI, or POR locations where Real-Time Data is collected for AGC or ACE needs.

8.7. Meters measuring loads <250 kW that are delta-connected or other ungrounded types of configurations are permitted on a limited basis by exception only. The Customer is required to install, at their own expense, metering quality, grounded isolation PTs for WAPA's metering equipment.

8.8. 480-volt meters are unacceptable for Revenue Metering. When a Customer requests that WAPA 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 that will comply with the applicable contractual or regulatory requirements for equipment security access, cyber security, telecommunication transmission, and data storage.

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 WAPA for each Boundary and Revenue Meter. Any deviation from these requirements must receive prior approval from WAPA and must be documented in the appropriate contractual agreement.

9. Meter Requirements

9.1. WAPA uses a microprocessor meter for its standard meter as detailed in Exhibits D through G and below. WAPA shall approve use of other meter manufacturers, if they meet the following minimum requirements to measure, record, store, and transmit data, as determined by WAPA, based on the meter data requirements.

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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 for loads less than 250 kW.

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. ±-Two-tenths percent (±0.2%) accuracy class per the most recent ANSI C12.20 standard.

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 Business 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~~the most recent 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).

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 (4) 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.

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9.18. Twelve load profile channels (minimum); 5-60 minutes data interval storage per channel, a minimum of eight (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.

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 PT or metering accuracy ~~capacitance coupled~~coupling capacitor voltage transformers (CCVT) may be used for metering, provided they meet the requirements under ~~ANSI~~IEEE C57.13 or C57.13.6 for the following accuracy classifications at system voltages of five (5) kilovolts and higher, three-tenths percent (0.3%) at all burdens W, X, M, Y, Z, and ZZ. To preserve the accuracy of the waveforms and signals, the manufacturer recommended burdens for potential transformers shall not be exceeded.

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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. WAPA 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, POR, 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~~IEEE C57.13 or C57.13.6 for an accuracy classification of three tenths percent (0.3%) or better for the entire normally expected load range CT secondary burden rating B1.8.

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 High Accuracy. ~~CT secondary burden rating B1.8~~CT secondary burden rating of B1.8 or CT burden ratings less than B1.8 would be acceptable for other combinations of rating factors and burden ratings, provided a calculation of the total circuit burden, with the proposed CT specifications are submitted for WAPA's review and approval.

12.5. A minimum thermal rating factor (RF) of two (2.0) is required. If that cannot be attained, then a lower RF must be approved by WAPA. The CT ratio and RF 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. RFs of three (3.0) or four (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.

~~50˚C ambient rating to maintain CT performance.~~

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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~~Reference Section 10).

12.9. WAPA 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. WAPA requires drawings and equipment data for its historical files and compliance documentation for every meter installation. These drawings and documents shall be provided to WAPA at the Customer's expense unless noted otherwise in a contractual agreement. If these drawings and equipment data are not provided, WAPA 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. The Customer shall:

13.2.1. Provide a system type drawing showing the meter point location in WAPA's power system including all substation or line tap breaker and switch numbers, PT and CT device identifiers and power transformer identifiers.

13.2.2. Provide schematic drawings of Meter System equipment including auxiliary power and communication circuits. Wiring drawings are required when WAPA maintains any Meter System equipment in a Customer's facility.

13.2.3. 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 WAPA-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.

13.2.4. 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 WAPA-owned or -maintained equipment. CTs that are used or stored more than 2 years will require re-testing, prior to placing them

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in-service at a new location.

~~13.2.5.~~ Provide meter configuration data, MV-90 configuration data and nameplate data. Data shall include, but are not limited to, manufacturer, model, type, form, number of

13.2.5. 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.

13.3. All drawings shall be standard D-size, electronic format AutoCAD or PDF. All data documentation will be electronic format PDF.

13.4. Engineering review requires a minimum of forty-five (45) Business Days prior to the meter's scheduled in-service date.

13.5. All revisions (as-built) of the installation drawings or documentation are required within thirty (30) Business Days following the meter's in-service date.

13.6. 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.

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14. Boundary Meter Data

14.1. A WAPA BMP requires a dedicated communication channel for the meter real-time AGC data to the WAPA Operations Center. The primary meter data channel shall carry Real-Time Data and pulse Accumulator Data. Real-time reactive ~~megavar~~MegaVar power (~~MVar~~MVar) may be required. WAPA may require routing this data through a LDC and/or a RDC in WAPA 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.

14.2. WAPA 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 to the BAA or SBAA 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 WAPA 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. WAPA 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 WAPA.

14.5. BAs or other utilities may install a second backup meter or other backup metering devices. WAPA 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~~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.

15.2. WAPA requires Real-Time Data for any generation source added (behind the meter) to an existing Customer's POD, POI, or POR greater than >1 ~~Megawatt~~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 a technical issue, contractual agreement exception or equipment limitation prevents or hinders transmitting discrete meter data individually or within a data stream.

15.4. WAPA 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 WAPA.

16. Maintenance Notification

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16.1. All maintenance requests for meters, including Meter System equipment, supplying Real-Time Data, will be coordinated with WAPA's Outage Coordinators (Links: Exhibit I: WAPA Contact Information) no later than ten (10) Business Days prior to any scheduled work. The Outage

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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)-Business Day notification of any routine maintenance. WAPA'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. WAPA-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. WAPA 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. WAPA Maintenance will then work with Contracts and Finance to draft a letter agreement and invoice the Customer to cover WAPA'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 WAPA's GPCP 6.2 and GICP 4.2, or subsequent revisions, which state: "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."

17.2. WAPA will troubleshoot and repair any reported or suspected problem or error with any WAPA-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.

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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 WAPA's GPCP Sections 6.3 through 6.5 and GICP Sections 4.3 through 4.5 to resolve the billing errors.

17.8. WAPA 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 WAPA's contractual relationship with its Customers and the historical business practice for documentation of metering billing accuracy.

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
BAA	Balancing Authority Area
BMP	Boundary Meter Point (interchange between BA's)
CIP	Critical Infrastructure Protection (NERC standards)
CRSP	Colorado River Storage Project (Referred to collectively as WAPA)
CT	Current Transformer
DNP3	Distributed Network Protocol Level 3
DSW	Desert Southwest Region (Referred to collectively as WAPA)
EIM	Energy Imbalance Market
IEEE	Institute of Electrical and Electronics Engineers
GICP	General Interconnection Contract Provisions

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GPCP	General Power Contract Provisions
ICCP	Inter-Control Center Communications Protocol
ISO	Independent System Operator
KWh, KVARh	KiloWatt Hour, KiloVar Hour
LOTO	Lock Out, Tag Out (NFPA-NEC)
MRO	Midwest Reliability Organization

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~~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 to collectively as WAPA)
RTO	Regional Transmission Organization
RTU	Remote Terminal Unit
SBA	Sub-Balancing Authority
SBAA	Sub-Balancing Authority Area
SCADA	Supervisory Control and Data Acquisition
SNR	Sierra Nevada Region (Referred to collectively as WAPA)
TCP/IP	Transmission Control Protocol/Internet Protocol
TLC	Transformer Loss Compensation
TOU	Time of Use
UGP	Upper Great Plains Region (Referred to collectively as WAPA)
VAC	Voltage Alternating Current
VAR, ~~Mvar~~MVar	Volt-Ampere-Reactive (Instantaneous Reactive Power), Mega-Var
VDC	Voltage Direct Current
VT	Voltage Transformer
W, KW, MW	Watt (Instantaneous Real Power), Kilo=Watt, Mega-Watt
WECC	Western Electricity Coordinating Council
WAPA	In this document only, refers to WAPA's regions and CRSP.

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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.

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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 WAPA's operational requirements. Relay quality current transformers are acceptable for the ADS requirement.

	~~***Western Area Power Administration Meter Policy***~~The responsible entity that integrates resource plans ahead of time, maintains load- interchange-	

~~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.~~
Balancing Authority Area (BAA)	The collection of generation, transmission, and loads within the metered boundaries of the Balancing Authority. The Balancing Authority maintains load-resource balance within this area.
Boundary Meter	A Boundary Meter is NERC-compliant equipment located at WAPA's interconnected or interchange point with another BA. Its primary function is providing Real-Time Data to WAPA Operations Centers, its ACCs, BAs, and to other utilities or interested parties. The meter provides accounting for power values for WAPA's AGC and 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 WAPA's MV-90 data system.
Boundary Meter Point (BMP)	The metered interchange point between WAPA and other BAs. The BMP may be located in other party's facilities.
Business Day	Business Day means any day other than Saturday, Sunday, or a legal public holiday as designated in section 6103 of title 5, U.S. Code.
Customer	Any entity that receives contractual firm electric power, transmission, BA or maintenance services from WAPA, or is interconnected to WAPA's system.
Energy Services	Typically billing, scheduling, regulation, control, electric power transactions or other ancillary power services provided by WAPA to its Customers.
Facilities	Generation station, utility substation, transmission or distribution line tap. Typically, the location of the POD, POI, POR, or BMP.
General Power Contract Provisions (GPCP)	Standard terms and conditions included in WAPA's power delivery and transmission service contracts.
General Interconnection Contract Provisions (GICP)	Standard terms and conditions included in some of WAPA's interconnection, construction, or maintenance contracts.
Meter Policy (Policy)	Standards, guidelines, requirements and responsibilities of WAPA and its Customers for installation and operation of Meter System equipment to measure Energy Services.

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Point of Delivery (POD)	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.
Point of	
MV-90 (Itron, Inc.)	Meter interrogation, data collection, and data management program used by WAPA's Settlements department.
MV-WEB (Itron, Inc.)	Online tool that provides secure and reliable access to Customer load data.

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~~Point of Delivery (POD)~~	~~The place where the Customer's facilities or the Customer's transmission agent connects with WAPA 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 WAPA's power system that may allow bi-directional flow of power between WAPA's and another party's power system. An Intratie Meter is usually located at a POI. The POI may be located in a Customer's facility.~~
~~Point of Receipt (POR)~~	~~The location that the Transmission Service Provider specifies on its transmission system where an interchange transaction enters or a generator delivers its output.~~
~~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 WAPA's Operations and Settlements Departments. It is used for the purpose of scheduling power resources into WAPA's system and to provide regulation services. Demand power data is recorded, stored and transmitted to WAPA'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 WAPA's Operations and Settlements Departments. It is used for the purpose of billing energy and demand use, as provided by WAPA, to a Customer. Demand power data is recorded, stored and transmitted to WAPA's MV-90 data system.~~
~~Revenue Meter (Load)~~	~~Revenue Meter with the primary function of providing kWh, watt and var demand data to WAPA's Settlements Departments for the purpose of accounting for loads. Demand power data is recorded, stored and transmitted to WAPA'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 system of remote control and telemetry used to monitor and control the transmission system.~~

20. References

American National Standards Institute (ANSI)
General Power Contract Provisions (GPCP), dated September 1, 2007
General Interconnection Contract Provisions (GICP), dated September 26, 2013

National Electric Manufactures Association (NEMA)
National Electric Reliability Corporation (NERC)
Occupational Safety and Health Administration (OSHA)
Nation Fire Protection Association (NFPA)
National Electric Code (NEC)

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	WAPA 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~~13
07/20/2018	2	Western Team	Approved Final Version 5/31/~~2018~~18,

Exhibit A: Boundary Meter Typical Block Diagram

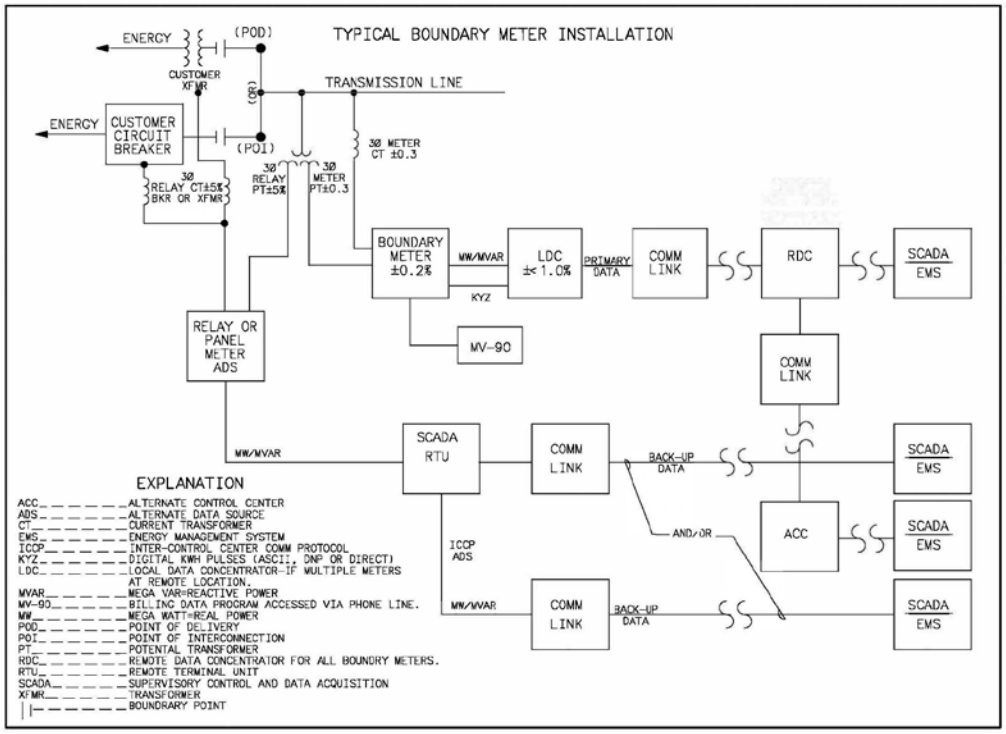

Exhibit B: Intratie or Generation Meter Typical Block Diagram

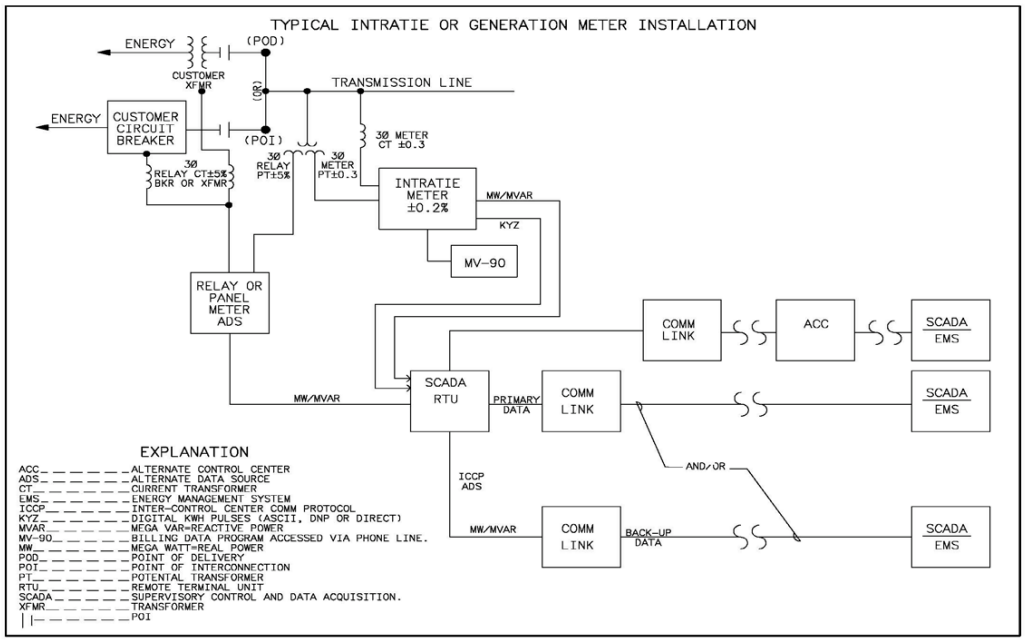

Exhibit C: Revenue Meter Typical Block Diagram

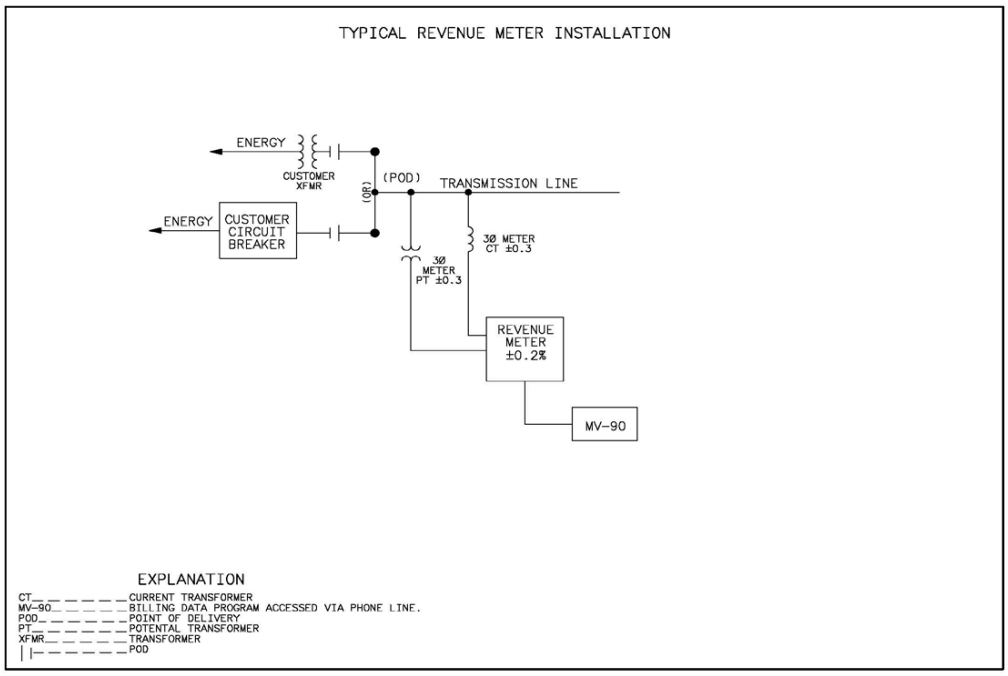
TYPICAL REVENUE METER INSTALLATION
ENERGY
CUSTOMER XFMR
(OR)
(POD)
TRANSMISSION LINE
ENERGY
CUSTOMER CIRCUIT BREAKER
3Ø METER CT ±0.3
3Ø METER PT ±0.3
REVENUE METER ±0.2%
MV-90
EXPLANATION
CT CURRENT TRANSFORMER
MV-90 BILLING DATA PROGRAM ACCESSED VIA PHONE LINE.
POD POINT OF DELIVERY
PT POTENTIAL TRANSFORMER
XFMR TRANSFORMER
POD

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

SEL Online MOT

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

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, MIRRORED BITS® Communications, Telnet, and DNP3 Level 2 Slave Serial and LAN/WAN																				1					
Front-Panel Labeling	ANSI Labeling																						0			
Conformal Coat	None																							1		

Exhibit F: SEL-735H_DSW Standard Horizontal Case Model Configuration

Part Number: 0735AX10944CGXCXXX16101XX Key: 1695

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, EIA-232 Port					A																				
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		

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

SEL Online MOT Page 1 of 6

Part Number: 0735EX10944CGXCXXX16101XX Key: 1715

		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
Product:	SEL-735	0	7	3	5			0					X			X	X							X	X	
Category	**Selection**																									
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, 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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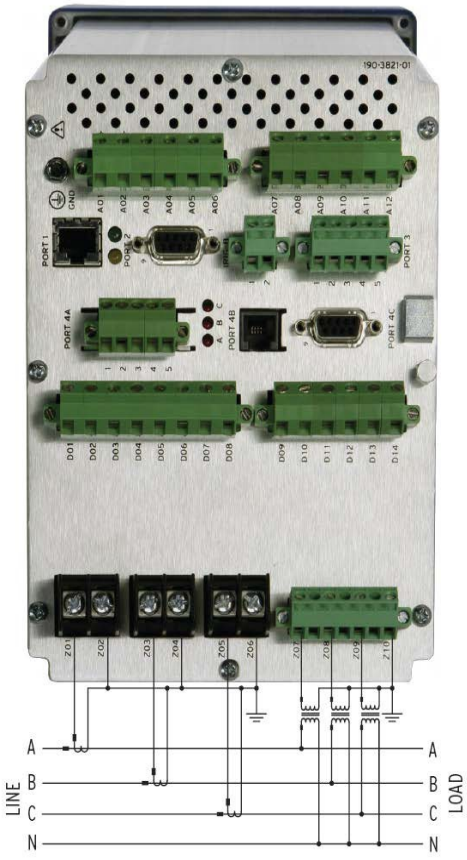
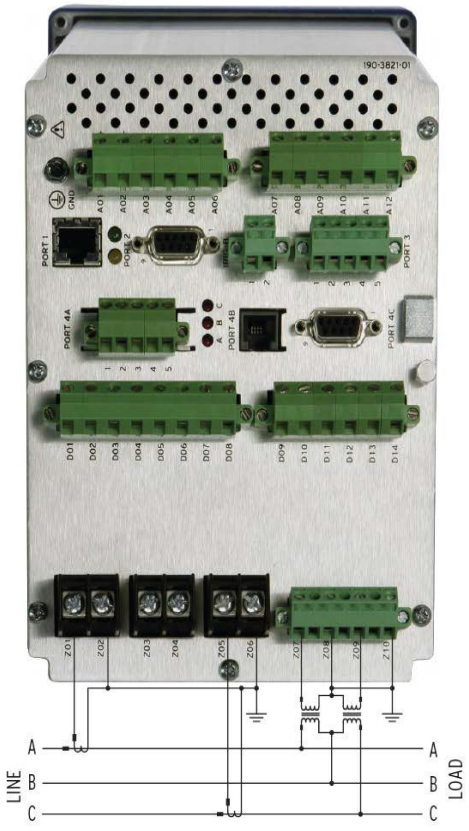
Exhibit H: SEL-735 Wiring Connections



Form 9, 3-Element, Four-Wire Wye



Form 5, 2-Element, Three-Wire Delta

Exhibit I: WAPA Contact Information

DSW: Contact for any metering request or access to their MV-WEB data.

Link: https://www.wapa.gov/regions/DSW/Pages/contact.aspx

DSW Outage Coordinator: (mailto:WALCoutage@wapa.gov)

DSW Maintenance Manager: 602-605-2440

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, POR, or BMP, necessitating contractual modifications, also require the MAA.

https://www.wapa.gov/regions/RM/Pages/contacts.aspx

RMR Outage Coordinator: (RMROUTAGENORTH@wapa.gov)

RMR Maintenance Manager: 970-461-7261

Engineering: 970-461-7236

SNR: Contact Outage Coordinator by e-mail request.

Link: https://www.wapa.gov/regions/SN/Pages/contact.aspx

SNR Outage Coordinator: (WAMPOC@wapa.gov)

SNR Maintenance Manager: 916-353-4090

UGP: Contact Outage Coordinator by e-mail request.

Link: https://www.wapa.gov/regions/UGP/Pages/contact.aspx

UGP Outage Coordinator: (UGPWAPATOP@wapa.gov)

UGP Maintenance Manager: 605-353-2700

Montana: 406-526-8505

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North Dakota: 701-221-4546
South Dakota: 605-353-2570

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