

Primary Metering at 35kV

Electric power utilities continue to expand utilization of 38kV sub-transmission systems (1) to provide bulk power rates to industrial and commercial establishments and (2) to provide inter-tie stations to the grid for connection of power secured from renewable-energy resources.

Bulk Power Rates

A number of years ago, electric power utilities with permission of the public utility commissions began establishing lower power rates for customers willing to accept the power connection at 15kV and 25kV. More recently, those rates have moved to include 35kV as well. These lower rates attract new businesses to the area and provide a means for existing businesses to expand further with increased economy in the expense for power consumption. For the electric power

utilities, they do not have to build new substations and the power delivery system is supported by existing infrastructure. For each of these installations, metering equipment suitable for use at the higher 35kV system voltage is required to allow the utility to bill the customer at the appropriate rate. In addition, the installation owners may also install metering equipment for its own purposes to check billing accuracy as well as to, perhaps, allow proportioning of the power consumption to different profit center elements.

Grid Inter-Ties

With existing infrastructure in place, electric power utilities are able to accept power delivered to its grid by wind, solar and other renewable or bulk storage systems without significant additional investment. Many of these grid inter-ties occur on the utilities 34.5kV

sub-transmission system. In this case, the owner of the renewable energy facility needs to have revenue metering accuracy voltage transformers and current transformers to provide input to the meters recording the power delivered to the grid, which allows them to bill the utility accordingly at rates that are set by the public utility commissions. In addition, it is very much expected that the electric power utility will want to install metering equipment to check and verify the billing accuracy.



Figure 1. Primary metering extends to 35kV for application by electric power utilities at commercial and industrial installations and by the renewable energy sector for billing power delivered to the grid at various inter-ties.

Federal Pacific Solutions

For over twenty (20) years, Federal Pacific has been providing 35kV rated metal-enclosed switchgear and pad-mounted switchgear to electric power utilities across the United States. In some cases, metering equipment was provided in the switchgear in addition to the typical switching and protection components. Featured in this newsletter is a stand-alone Primary-Metering Dead-Front (PMDF) unit manufactured by Federal Pacific. This particular unit is being furnished to a mining industry account so the unit carries the Line Power brand. But, similar units are equally suitable for use by electric power utility customers and for grid inter-tie installations. In the latter case, the renewable supplier may also integrate relayed protection devices, which will be the subject of a forthcoming newsletter. Remember, whatever the power delivery requirement, Federal Pacific can assist customers in developing the equipment configuration best suited for the applications.

Federal Pacific stand-alone primary-metering units are comprised of two sections: (1) the metering-transformer compartment, which contains the voltage transformers and current transformers that are live-front connected

but isolated by a secondary barrier behind the enclosure door; and (2) the termination section, which is accomplished utilizing bushing wells or bushings for application with load-break inserts and elbows (in the case of 200-amp bushing wells) and with 600-amp dead-break elbow connectors (in the case of 600-amp bushings). The metering-transformer section usually carries a label identifying that side (see Figure 1) and the termination side typically carries a label stating "Elbow" - or Bushings or Terminations - (see Figure 2).

The specification may require (a) that Federal Pacific furnish only mounting provisions for the metering transformers, as is the case in the featured unit, (b) that Federal Pacific furnish, install and wire the metering transformers to a meter socket, or (c) that Federal Pacific also provide other accessories such as test switches, terminal blocks, and externally mounted low-voltage compartments installation other specification requirements may also be desired. Whatever the requirement, Federal Pacific has the flexibility to provide the necessary features.

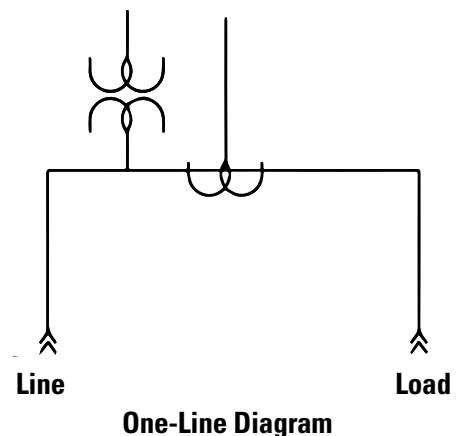


Figure 2. The "Elbow" or termination side of the enclosure is usually indicated by the appropriate label. Alternate designations such as terminations, bushings and dead-front, with the latter usually in combination with the term live-front on the metering-transformer side, may also be used. Insert shows the one-line diagram for the unit.

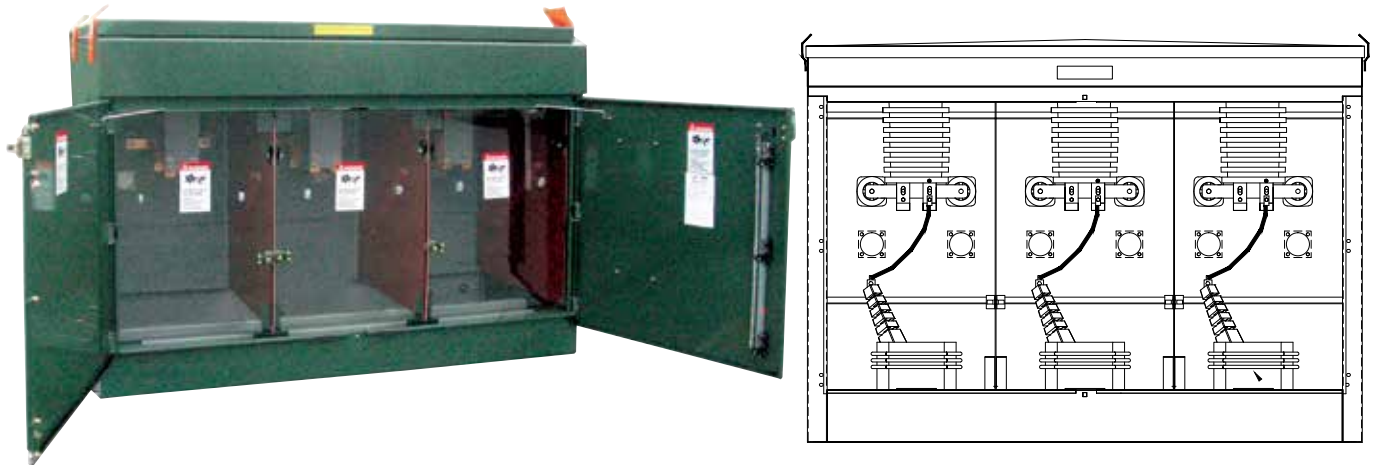


Figure 3. Open door view of "Metering Transformers" section shows customer specified clear-polycarbonate dual-purpose barriers providing initial isolation from metering transformers when enclosure door is open. "DANGER" labels on barriers and doors provide notice of the electrical hazard that exists. Penta-head bolts secure the dual-purpose barriers in the normal hanging position. Adjacent drawing shows a front view of the orientation for the CTs and PTs that the customer expects to install.



Figure 4. Interphase and end barriers include slides allowing the dual-purpose barriers to be installed in the slide-in position to provide some isolation and separation between CTs and PTs when, for example, changing PT fuses. For units equipped with the automatic door latch, dual-purpose barriers can be stored temporarily behind the latch bar to avoid placing them on the roof or on the ground which may place contamination on the barriers. This unit is also furnished with copper bus and, since the unit is furnished with provisions only for the metering transformers, a painted steel plate is mounted to support the bus during shipment. Adjacent drawing shows a section view from the side of the orientation for the CTs and PTs that the customer expects to install.



Unit Ratings

Voltage Class 35kV
 Basic Impulse Level 150kV
 Continuous Current 200A

Figure 5. Elbow termination compartment provides 35kV bushing wells to accommodate 200-amp load-break inserts and elbow connectors providing an effective electrical and environmentally secure method to connect power cables to the Primary Metering unit. This unit is furnished as a radial application with one line-side bushing well and one load-side bushing well for each phase. The same unit can accommodate a loop feed arrangement with two line side bushing wells while metering two combined, but independent, load-side circuits as there are (as shown in the above photo) provisions for four bushing wells per phase.

FEATURES IN THIS UNIT:

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| <ol style="list-style-type: none"> 1. Automatic Door Latch System 2. Identification Labels for Line, Load, Phase, Enclosure Compartment and Hazard Alerting 3. Mimic Bus 4. Parking Stands 5. Ground Bus 6. Stainless-Steel Wind Braces, Hinges and Hinge Pins 7. Penta-Head Bolts Secure Passive Doors and Removable Dual-Purpose Barriers 8. Stainless-Steel Door Lock Box 9. Gasket on Enclosure Bottom Flange Isolates Metal from Base or Pad 10. Lifting Brackets with Protective Backing can be Removed (the Holes are Blind-Tapped) or Turned Down and Left in Place for Future Use 11. Cushioned Door Bumpers | <ol style="list-style-type: none"> 12. Instruction Manual and Spare Fuse-Unit Holder 13. 11-Gauge Steel Enclosure, Doors and Roof 14. Ventilation Maze at Roof and Door Edges 15. Clear Polycarbonate Hanging Barriers 16. Barriers Between Phases Slide Out to Facilitate Installation of Metering Transformers 17. Red NEMA-Grade GPO-3 Fiberglass Interphase and End Barriers 18. Copper Bus 19. Stainless-Steel Compartment Ground Brackets 20. Insulated Undercoating on Underside of Roof and in Door Bottom Flange 21. 90° Flanges at Door Openings and Enclosure Bottom 22. 200-amp 35kV Bushing Wells 23. Removable Shipping Supports for Copper Bus |
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