Making the Case for High Performing PMUs in Distribution Grids

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PMUs: What Are They, What Can They Do?

- High-rate streaming of phasor data
- Synchronized measurements
- High-quality phasor, frequency measurements
- State estimation
- Islanding detection
- Fault “triangulation”
- 1547 compliance verification
- Distance to fault
- Line model validation
- Phase identification
- FIDVR detection
- Fault “triangulation”
Fault location using SCADA
Example Application – Fault Location

Fault location using SCADA

Fault location using current & voltage phasors from a single device
(distance to fault)
Example Application – Fault Location

Fault location using SCADA

Fault location using current & voltage phasors from a single device

Fault location using synchrophasors from multiple devices
(fault triangulation)

Benefits of fault location:
- Quicker restoration after permanent faults
  - Improved reliability
  - O&M saving
- Addressing momentary faults before they become permanent
  - Improved reliability
  - O&M saving
Not All PMUs Are the Same

- Precise ratio unknown
- Secondary voltage is dependent on unknown load
Not All PMUs Are the Same

Not All PMUs Are the Same

- P-class, 60 Hz
- certified
Not All PMUs Are the Same

- P-class, 60 Hz
- Error (%TVE)
- Response time (cycles)
- Noise (%THD)

PMU element

certified

integrated & calibrated
The Business Case for PMUs

Communication infrastructure

Connected switching and protection equipment

PMUs

PMU applications

Reliability improvement

O&M saving

Fire and public safety

Applications enabled by comms and smart protection devices

- Situational awareness
- Fast coordinated protection
- Restoration
- Asset management
- Predictive analytics
- Non-wire alternative
- …