

IEDs with integrated PMU functionality

by

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Status

- Some vendors have incorporated PMU functionality into their IEDs, such as relays, DFRs, etc.
 - Revolutionary and evolutionary vendor business strategy
- Main benefit is to substantially reduce the cost of implementing a PMU system
- There are concerns on using IEDs with PMU functions
- Addressing this issue is important for the wider application of PMU technology
 - PRTT has recommended to create “Guidelines for using IEDs with integrated PMU functionality”

Some Benefits and Opportunities

- Integrated PMU functionality is an enabler for more efficient use of substation devices - Industry trend
 - Comparison to conventional SCADA vs. integrated SCADA
- Easier and less costly to add new functionality and make improvements requiring PMU functionality in future applications
- Major step in system-wide use of PMU functionality
 - Same data are being used across the enterprise by different users (planning, operations, and maintenance)

Some Specific Questions

- Will PMU function work properly during a fault when a relay is running protection functions or DFR operates under worse conditions? Will a PMU function affect protection?
- How are installation, commissioning and maintenance procedures affected?
 - Will remote control of PMU function violate relay settings and data communication procedures?
 - Are there any additional cyber security issues?
- Relays use protection class PTs and CTs - Will this affect the performance of the integrated PMU function?
- What are the communications and architecture requirements and differences with this configuration?

Factors Affecting PMU HW Selection

- Application dependent
 - Post-event data analysis and system modeling
 - System monitoring
 - System and market operations (e.g. EMS, congestion management)
 - Improvements to System Integrity Protection Schemes (SIPS/RAS)
 - System protection and control
- Relays with the integrated PMU function would continue using protection class PTs and CTs
- Will PMU be needed when there is a fault, considering that a fault will be cleared fast (in tens of ms)?
- Redundancy and upgrade requirements
 - There are advantages and disadvantages of integrated PMU functionality

Factors Affecting PMU Selection (cont.)

- Overall system architecture and communication requirements
 - Standalone PMU in a substation has more channels and could collect voltages and currents without a need for a substation PDC
 - Individual relays with PMU functionality may require a substation PDC
 - Comm. requirements between substations and to central PDC/SPDC
- Integrated SCADA and substation automation architecture allows for easier implementation of integrated IEDs
 - New relays have Ethernet ports
 - DNP/Modbus or even IEC 61850
 - Cyber security issues addressed

Recommendations

- Performance test of integrated devices under fault conditions (define test guidelines)
- Define application requirements that influence the overall system design and PMU selection and specify system requirements
- Define standard procedures (data collection, communications, security, etc.) and responsibilities for commercial O&M of PMU systems
 - PMU installation, commissioning, and maintenance
 - Access to data and setting and set-up changes
 - Security procedures and issues
 - Needs for separate access by various groups