


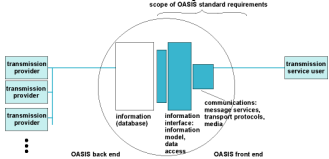






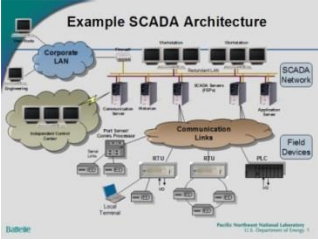
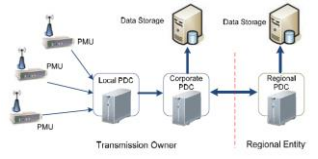
Electric Power Timing Applications¹

Table 3. Timing Dependent Equipment

Equipment		
<p>Transmission Line Fault Detection</p> 	<p>Equipment that determines the location on the transmission system of a fault, namely an event such as a short circuit, a broken wire, or an intermittent connectioni.</p>	<p>Frequency Measurement</p>  <p>Equipment that measures the frequency, or rate of change of frequency, of the power grid. Also, equipment that computes the median of all the Frequency Response observations reported annually by Balancing Authorities or Frequency Response Sharing Groups for frequency events specified by the ERO. This will be calculated as MW/0.1Hz.ⁱⁱ</p>
<p>Synchrophasors/Phasor Measurement Units</p> 	<p>Measures the electrical parameters of an electricity grid with respect to universal time (UTC) such as phase angle, amplitude, and frequency to determine the state of the systemⁱⁱⁱ.</p>	<p>Internet-based Market Transactions (OASIS, NTP, SNTP)</p>  <p>IP-based workstations, networks, and websites that use the network timing protocol (NTP) or simple network timing protocol (SNTP) to enable access to wide area energy market operation systems providing high-level market signals for transmission and distribution companies (ISO/RTO, Utility Operations).^{iv}</p>
<p>Substation Control/ Re-Synchronization</p> 	<p>A type of control system at a transmission or distribution substation that transmits individual device status, manages energy consumption by controlling compliant devices, and allows operators to directly control power system equipment. Re-synchronization is the process of synchronizing an energized substation to the power grid.^v</p>	<p>Disturbance Monitoring Event Recorders</p>  <p>Devices capable of monitoring and recording system data pertaining to a Disturbance. Such devices include the following categories of recorders: Sequence of event recorders Fault recorders Dynamic Disturbance Recorders (DDR)^{vi}</p>
<p>Protective Relays</p> 	<p>A protective relay is an electromechanical or micro-processor controlled electronic system that senses an abnormal or fault condition and sends a trip to a circuit breaker in order to protect generators, transformers, and lines.^{vii}</p>	<p>Bulk Metering</p>  <p>Equipment that records the amount of power used in a particular area or sent down a particular line for power flow measurement and billing purposes.^{viii}</p>

¹ MITRE, "GPS Resiliency for Critical Infrastructure: Energy Sector Baseline Report (FINAL)," Version 1.1, November 24, 2013

Table 4. Timing Dependent Networks

Networks			
<p>SCADA Networks</p>  <p>Example SCADA Architecture</p>	<p>A system of remote control and telemetry used to monitor and control the transmission [and distribution] system [including substations].^{ix}</p>	<p>Synchrophasor Networks</p> 	<p>PMUs that are networked and synchronized to a single coordinated time source like GPS. Refers to a set of PMUs that all transmit data to a Phasor Data Concentrator.^x</p>

ⁱ NERC, “Glossary of Terms Used in NERC Reliability Standards”, Updated July 22, 2013.

ⁱⁱ NERC, “Glossary of Terms Used in NERC Reliability Standards”, Updated July 22, 2013.

ⁱⁱⁱ NIST IR 7628, Rev1, Volume I., Table 2-1.

^{iv} NIST IR 7628, Rev1, Volume I., Table 2-1.

^v NIST IR 7628, Rev1, Volume I., Table 2-1 and MITRE/SEDI additions.

^{vi} NERC, “Glossary of Terms Used in NERC Reliability Standards”, Updated July 22, 2013.

^{vii} Faulkenberry, L. “Electrical Power Distribution and Transmission”, Prentice Hall, 1996, p.197.

^{viii} Faulkenberry, L. “Electrical Power Distribution and Transmission”, Prentice Hall, 1996, p.221.

^{ix} NERC, “Glossary of Terms Used in NERC Reliability Standards”, Updated July 22, 2013.

^x MITRE/SEDI definition.