



**IEEE P2030 TF1
Trans. Subs. Subcommittee
Status Report
July 26, 2009**

Objective: Provide guidelines in understanding and defining smart grid interoperability of the electric power system with end-use applications and loads

- **Task Force 1. Power Engineering Technology (IEEE P2030 TF1): Pertaining to Transmission Substations**
 - Address topics - Smart Grid Definitions, Topologies, Interoperability, end-use, interfaces, and integration, etc.)
 - Systems Approach – focused on Functional and Performance Attributes including Test and Verification methods Clarify 2020 Smart Grid Objectives/Vision in terms of federal and state policy goals and SCE internal goals

Transmission Substation Committee Members

- Chair: Tony Johnson - Southern Calif. Edison
- Secretary: Dick Krause - Southern Calif. Edison
- Tom Field – Entergy
- Vijay Pargaonkar - Pauwels-CGL
- Tom Prevost - Weidmann Diagnostic Solutions Inc
- Raj Patel - EEI
- Dean Samara-rubio - Intel
- Sam Sciacca – Microsol, Inc.
- Wayne Stec - Distregen LLC
- Alex Takahashi – West Power
- Greg Obenchain - EEI

Meetings

- June 23, 2009 Kickoff meeting
 - Action Items:
 - Working definition of Interoperability
 - Suggest IEEE guides that might help
 - Brainstormed: identifying elements inside the Trans. Sub
- July 9 , 2009
 - Action Items Completed and New
 - “Working definition” of Interoperability
 - First draft of definitions of Transmission Substations equipment
 - Work Assignments for substation equipment initiated
- Next meeting: Aug 5th
 - 8 am PST
 - Contact:
 - Dick Krause dick.krause@SCE.com
 - Tony Johnson anthony.johnson@SCE.com

Task & Approach

- **Transmission Substation Sub-Committee**

- The initial goal of our subcommittee's first effort will be to provide input to the other taskforce groups at the Oct P2030 meeting:
 - Equipment in the substation
 - Defined
 - Elements monitored in each equipment
 - Interoperability Issues
 - Data size, rate, period for each piece of equipment

- **Tasks / Schedule**

- Provide input for TF2 and TF3
 - October IEEE 2030 meeting
- Develop an overall schedule
 - To follow

Transmission Substation Equipment Definitions

	<--- IEEE definitions
	<--- IEEE definitions needing more work
	<--- Need to be defined with IEEE definitions

Interoperability Equipment = potential direct access both in and outside substation

HMI (Human Machine Interface)	Aggregate of means by which people (the users) interact with (the system) a particular machine, device, computer program or other complex tool. The user interface provides means of input, allowing the users to manipulate a system and output, allowing the system to indicate the effects of the users' manipulation.
PMU (Phasor Measurement Units)	PMU units provide realtime measurement of positive sequence voltages and currents at power system substations. Typically the measurement windows are 1 cycle of the fundamental frequency, and the measurements are time-stamped to a common GPS time synchronization signal. Data from substations are collected at a suitable site, and by aligning the time stamps of the measurements a coherent picture of the state of the power system is created.
Transformer	<p>(1) (National Electrical Code). A device, which when used, will raise or lower the voltage of alternating current of the original source.</p> <p>(2) (Power and Distribution Transformer). A static electric device consisting of a winding, or two or more coupled windings, with or without a magnetic core, for introducing mutual coupling between electric circuits. Transformers are extensively used in electric power systems to transfer power to electromagnetic induction between circuits at the same frequency, usually with changed values of voltage and current.</p>
Circuit Breaker	(1) (Transmission and Distribution). A switching device capable of making, carrying, and breaking currents under normal circuit conditions and also making, carrying for a specified time, and breaking currents under specified abnormal conditions such as those of short circuit.
Circuit Interrupter	A manually operated device designed to open under abnormal conditions a current-carrying circuit without damage to itself.
Digital Fault Recorder	<p>Recording system that uses communications to retrieve Fault, Disturbance, and Sequence of Event records that are captured by the protection relays distributed throughout a substation. The DFR internally stores this critical substation information for local station troubleshooting as well as archives this data in a remote enterprise network location for permanent storage and analysis.</p> <p>Within seconds of an event occurring, the DFR automatically collects and archives information about power system faults and disturbances that have been recorded by the protective relays. The DFR is able to retrieve the following power system information:</p> <ul style="list-style-type: none"> • Transient Fault Records (Oscillography) • Sequence of Event Records • Disturbance Records (Triggered Data Logs)

Transmission Substation Equipment Definitions

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Intraoperability Equipment Definitions

of Engineering the Future

Ground Grid	(1) (Conductor stringing equipment). A system of interconnected bare conductors arranged in a pattern over a specified area and on or buried below the surface of the earth. Normally, it is bonded to ground rods driven around and within its perimeter to increase its grounding capabilities and provide convenient connection points for grounding devices. The primary purpose of the grid is to provide safety for workmen by limiting potential differences within its perimeter to safe levels in case of high currents which could flow if the circuit being worked became energized for any reason or if an adjacent energized circuit faulted. Metallic surface mats and gratings are sometimes utilized for this same purpose. When used, these grids are employed at pull, tension and midspan splice sites.
CCVT (Coupling Capacitor Voltage Transformer)	(Metering). A voltage transformer comprised of a capacitor divider and an electromagnetic unit so designated and interconnected that the secondary voltage of the electromagnetic unit is substantially proportional to, and in phase with, the primary voltage applied to the capacitor divider for all values of secondary burdens within the rating of the coupling-capacitor voltage transformer.
Reactor	(1) (Power and distribution transformer). An electromagnetic device, the primary purpose of which is to introduce inductive reactance into a circuit.
Disconnect	(1) (Watthour meter). A conductor, bar, or nut used to open an electrical circuit for isolation purposes.
Surge Arrestor	(AC power circuits). A protective device for limiting surge voltages on equipment by discharging or bypassing surge current: it prevents continued flow of follow current to ground, and is capable of repeating these functions as specified.
Ground Switch	A switch that connects circuit elements to earth ground. This device is used to discharge circuit elements to ground for safety.
Motor operated device	Any device that requires a prime mover (electric, pneumatic, hydraulic motor; turbine; or reciprocating engine) for operation.
Shunt Capacitor	Devices that provide source of reactive power. By supplying VARs shunt capacitors: power factor on a lagging load, increase voltage level at the load and increase system capacity, improve voltage regulation, reduce I^2R real power losses in the system, and reduce I^2X reactive power loss in the system. Typically placed near the load and are applied in the sub-transmission and distribution substations and distribution lines.
LTC (Load Tap Changer)	(Power and Distribution transformer). A selector switch device used to change transformer taps with the transformer de-energized.

Next Steps

- Update definitions with IEEE definitions (when they exist)
- Assignment Matrix
 - Subject Mater Experts for each equipment
 - Elements monitored in each equipment
 - Interoperability Issues
 - Data size, rate, period for each piece of equipment
- Gain from this meeting
 - Better understanding of the deliverables
- Next meeting present what I learned here and develop:
 - Preliminary Guide Outline
 - Work Plan
 - Time line

Working Definition

- **Interoperability** - "the ability of equipment, systems, networks, and programs to communicate and exchange information and data between each other and to use the information exchanged to enable them to operate effectively together with complete compatibility while maintaining system reliability and cyber security.

Equipment Subject Mater Experts and Assignments

Work Assignments Breakout

NAMES		Transformer	Circuit breaker	Relay	HMI & RTU & PLC	Phasor Meas. Units	Other
Last	Fist						
Johnson	Tony	x	x	x	x	x	
Field	Thomas						
Krause	Dick				x		
Obenchain	Gregory						
Pargaonkar	Vijay	x	x				
Patel	Raj						
Prevost	Tom	x					
Samara-rubio	Dean						
Sciacca	Sam						
Stec	Wayne	x	x	x			
Takahashi	Alex		x	x			