

## August 23, 2011 Voltage Control Technical Conference, Planning and Operational Data Needs (Version 1)

Steady State and Dynamic Modeling for Studies	
Required Data	Why
<p><b>Complete and Up To Date Annual Data Certification</b></p> <ul style="list-style-type: none"> <li>• Transmission line data</li> <li>• Substation transformer data</li> <li>• Collector system information, equivalent model data</li> <li>• Wind plant <i>turbine</i> data               <ul style="list-style-type: none"> <li>○ Manufacturer</li> <li>○ Type</li> <li>○ Number of units</li> <li>○ Dynamic reactive capability or power factor correction capacitor specifications</li> <li>○ A clear description of any voltage or current limitations at the turbines that impact the active and reactive capabilities</li> <li>○ Wind turbine generator pad-mounted transformer data</li> </ul> </li> <li>• Wind plant <i>equivalent plant level</i> data               <ul style="list-style-type: none"> <li>○ Collector system equivalent model data (impedance, nominal kV)</li> <li>○ Wind plant turbine transformer equivalent data</li> <li>○ Dynamic reactive power devices: type, a complete description of their capabilities (continuous and short term) and of the control</li> <li>○ Shunt capacitor and reactor data, groups, sizes, clear and complete description of the controls</li> <li>○ Wind plant generator equivalent                   <ul style="list-style-type: none"> <li>▪ Active power capability</li> <li>▪ A complete reactive power capability description from 0 MW to full plant MW capability including all limits that may exist (for example collector system voltage rise at turbines), an accurate reactive capability curve for the wind plant</li> </ul> </li> </ul> </li> </ul> <p><b>Best Available Dynamic Data Models</b></p> <p>Model types and parameters that most accurately represent the dynamic active and reactive response and characteristics of the <i>wind plant</i> and wind plant <i>dynamic reactive power devices</i>. Updates will be required as models improve. Wind plant owners/operators, manufactures, and developers involvement in the efforts to improve the dynamic models is valuable.</p>	<ul style="list-style-type: none"> <li>• Transmission Planning and Operations require the most accurate models available for steady state studies and dynamic studies.</li> <li>• In Planning,               <ul style="list-style-type: none"> <li>○ Accurate data for studying the interconnection of new resources ensures the resource has sufficient capabilities and prevents any undetected negative impacts to the transmission system.</li> <li>○ System studies looking 5 to 10 years out are needed to bench mark the transmission system performance to ensure adequate capacity to meet the regions needs.</li> <li>○ The accuracy of the resource models can have significant impacts on the study results.</li> <li>○ Inaccurate study results may misdirect the planning of system investments.</li> </ul> </li> <li>• In Operations,               <ul style="list-style-type: none"> <li>○ The accuracy of the models are very important for transmission operating studies.</li> <li>○ The operating studies determine seasonal and real time operating limits.</li> <li>○ Inaccurate study results may cause unnecessary, costly transmission limits or in the other extreme system failures due to undetected system limits.</li> </ul> </li> <li>• For both Planning and Operations the most accurate modeling data is required to maintain reliability, adequacy, and optimization of the transmission system.</li> </ul>

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Real Time Operational Data	
Required Data	Why
<p><b>Wind power measurements needed</b></p> <ul style="list-style-type: none"> <li>• Main collector substation transformers, high side and low side voltages and currents</li> <li>• MVAR injection from each dynamic reactive device</li> <li>• Status of each switchable shunt reactive device</li> <li>• Point of metering MW/MVAR</li> <li>• Plant reactive power capacity, buck and boost</li> <li>• Plant real-time capacity, taking into account units out of service</li> <li>• Plant limit, if limited by plant control system for any reason (BA directive, controlling output closer to schedule, etc.)</li> <li>• Estimated plant output if limit is removed (if not available, wind data so we can calculate using power curves)</li> <li>• MW capacity of units off-line due to high-speed cutout</li> <li>• Plant voltage control status</li> </ul>	<ul style="list-style-type: none"> <li>• Real time operations of the transmission system requires: <ul style="list-style-type: none"> <li>○ Visual displays for the dispatchers (Operational Awareness)</li> <li>○ Sufficient system monitoring of reactive reserves and other operating parameters and tools</li> <li>○ Accurate state estimation cases for real time studies</li> </ul> </li> <li>• Model validation</li> <li>• System event diagnostics</li> </ul>