

IEEE PES Volt/Var Control Task Force (VVCTF)

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**EPRI PQ and Smart Distribution
2010 Conference and Exhibition**

*Transporting You into the 21st Century Distribution
System*

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Volt/Var Control Challenges – Near Term

- High Penetration of Renewables
 - Distributed generation becoming the norm
 - Variable generation can impact volt/var control schemes
 - Especially when it is a large percentage of the feeder capacity
- Inverter-based distributed resources
 - Capable of providing local volt/var control but not currently allowed by 1547 standard
 - Multiple inverter control interaction and interaction with system level volt/var control
 - 1547.8 standards working group being formed to address new requirements such as volt-var control

Volt/Var Control Challenges – Near Term

- Fault Induced Delayed Voltage Recovery (FIDVR)
 - High SEER Air Conditioners and/or Heat Pumps Present
 - Low-inertia compressor motors with low starting torque; plus torque falls off by square of the voltage
 - Voltage sag due initially to sub-transmission
 - At 60 to 70% of nominal voltage, A/C susceptible to compressor stall during high temperature and humidity
 - A/C units draw 5-6 times their normal current (mostly reactive) when stalled; switch from motor load to constant impedance
 - Growing problem both in the west (WECC) and east with increased A/C use and high SEER HVAC

Volt/Var Control Challenges – Long Term

- Paradigm Shift in how “Generation and Load are Balanced”
 - More distributed generation and this trend will continue
 - More power electronic devices both on control and load side
 - Use of loads to balance generation especially for peaks
- Smart Grid Technologies
 - Responsive load to shift peaks and provide spinning reserve
 - Electric transportation (such as PHEV)
 - Energy Storage is the key
 - System reconfiguration with distribution automation
 - Smart meters

Volt/Var Control Challenges – Long Term

- Smart Grid Applications
 - GPS-based time synchronized measurements (IED, PMUs) at the substation
 - Faster Applications based on State Measurements
 - Verification of modeling/analysis with real-time measurements
 - Distribution Automation Schemes for system reconfiguration, capacitor control, adaptive protection and automatic controls
 - Micro-grids for generation redundancy to increase power delivery reliability and operate islanded from the grid when the system is in distress or system outage

Volt/Var Control Challenges – Overall

- How does this affect current volt/var control schemes used on the system?
- How will inverter controls (especially multiple units) interact these schemes?
- How does future volt/var control needs to evolve to accommodate?:
 - High Penetration Renewables
 - Electric and Plug-In Hybrid Vehicles
 - Energy Storage
 - Smart Grid Technologies, Applications and Control
- For these reasons, we have formed a new IEEE PES Task Force

Vision

- Look at how volt/var control needs to change for the smart grid.
- Start by looking at how volt/var control is presently implemented with and without DAC for example and how it needs to change for the smart grid.

Scope

- Understand how **new technologies** such as distributed resources, renewables, plug-in hybrids and their increased penetration in the distribution system will impact volt/var control and how it needs to change for the future.
- The smart grid can benefit from technologies such as smart inverters that can not only provide active power but also non-active power control and thus provide volt/var control. But they must be **compatible** with system level equipment.
- Along with the technology issues, we need to drive how the **standards** are developed so that they evolve or shift to account for needed technology and system changes.

Deliverables

- Provide a forum for discussion of issues on volt/var control in the distribution system
 - What are current concerns
 - What are impacts/benefits/costs of smart grid
- Provide input to the standards process to address volt/var procedures and hardware issues
- Conduct panel and technical sessions at IEEE meetings
- Develop white papers on key interest areas
- Hold workshops
 - To exchange information on experiences with technologies and applications
 - Provide lessons learned and guidance

Panel Session for 2010 IEEE PES GM

- Session Title: Volt/Var Control: Present & Future (morning of July 27)
 - “Volt/VAR Control at Progress Energy Carolinas Past, Present and Future”, Glenn Lampley
 - “Development of the Switched Capacitor Bank Controller for Independent Phase Switching on the Electric Distribution System”, Larry Clark (Alabama Power)
 - “Distribution Efficiency Voltage Optimization Supports Lowest Cost New Resource”, KC Fagen (RW Beck)
 - “Volt-VAR Control in the Smart Grid Era”, Bob Uluski (EPRI)

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