AdaptiVolt™ - A Transmission Asset and System Stability Tool!

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Since the Blackout of August 14, 2003, much emphasis has been placed on upgrading the transmission infrastructure in the United States and Canada to improve electric system reliability and stability. Very little has been mentioned about the possibility of using or operating the distribution system as a transmission asset or system stability tool.

The UtiliData® AdaptiVolt™ adaptive voltage control system is an effective tool in improving the capability of the existing transmission grid to handle system emergencies. AdaptiVolt™ allows a distribution system to be operated at lower average voltages, while keeping all customer service voltages within acceptable ANSI or CAN ranges. By operating distribution systems at lower than traditional levels, peak load levels are reduced, energy consumption is reduced and system reactive power requirements are reduced.

On distribution feeders where AdaptiVolt™ operates in Conservation Voltage Regulation (CVR) Mode, with an average voltage reduction of 2.6 volts (121.6v to 118.8v), tests show a reduction of up to 2.5% in energy use, 3.8% reduction in peak load. Peak shaving to lower the average distribution end-of-line voltage to 116 volts would provide an additional short time demand reduction of approximately 3.7%. If voltage levels at the ANSI B range were dispatched, the total demand reduction would be over 10%. In addition to the energy savings achieved with UtiliData® AdaptiVolt™, test results show a reduction of up to 30% of reactive power[1].

AdaptiVolt™ is dispatchable from system control centers. This allows system operators to effectively manage peak load and reactive power being consumed by the distribution system on a "real time" basis. During system emergencies, AdaptiVolt™ can be used to further reduce peak load and reactive power requirements. It can prevent the distribution regulating systems (on-load tap changers or voltage regulators) from trying to increase distribution voltage levels when that action only exacerbates the transmission system emergency[2]. While the blocking of transformer tap changing is a common emergency control tactic (particularly in Europe), just blocking the taps doesn't take full advantage of the available control. Further, these schemes are often implemented using simple voltage relays that sense low voltage conditions rather than being coordinated from control

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[1] In September 1981, the University of Texas prepared a two volume report for EPRI, "Effects of Reduced Voltage on the Operation and Efficiency of Electric Loads", EL-2036, Volumes 1 and 2. This study shows the effective energy and load reduction obtained from reducing voltage on end-use devices. There are many additional technical papers plus actual data from operating at reduced voltage by utilities and PCS UtiliData that confirm the efficacy of reducing voltage to reduce load, conserve energy and reduce reactive power.

[2] There is little data available on the operation of distribution on-load tap changers and voltage regulators during the time leading up to the collapse of the system on August 14, 2003. However, with the transmission voltage levels collapsing, the tendency of traditional distribution regulation systems would be to continue to tap higher positions to sustain voltage levels on the distribution lines.

centers. AdaptiVolt™ can be a valuable tool preventing voltage collapse by sending control signals from the control centers. This would be more effective than tap blocking and less disruptive than low voltage load shedding.

Most electric utilities lack the culture or organizational structure to integrate distribution planning or operation activities into transmission and stability planning and operations. However, the cost of implementing AdaptiVolt™ adaptive voltage control over a widespread area is less costly than many of the solutions being discussed. The cost of installing AdaptiVolt™ in areas affected by the Blackout in the Northeast United States and Ontario would be orders of magnitude less than some estimates of the economic loss suffered during the Blackout.