Conservation Voltage Reduction

All electric utilities have a need to better gauge demand during peak load times. Too high, and everybody pays more. Too low, and you risk brownouts and blackouts.

Sensus Conservation Voltage Reduction (CVR) is a better way to monitor real-time voltage data and optimize voltage across your entire distribution network.

What Right Size Voltage Means to You

Sensus has developed a CVR solution that allows utilities to reduce their system demand during peak events. The ability to see voltage data and make adjustments in real time gives you unprecedented accuracy and control.

You can:

- Monitor and manage real-time voltage data using metrology, communications and analytics.
- Measure and optimize voltage across your entire distribution network from substations to homes and businesses.
- Ensure the proper level of service voltage is delivered to your customers.
- Reduce overall energy usage for your utility system through right size voltage.
- Save money with less need for in-house generation (larger utilities) or for purchased power (smaller utilities).

Voltage Levels Backgrounder

The nominal voltage for a residential home in the U.S. is 120 volts with an acceptable variation of +/- 5 percent (+/- 6 volts). Therefore a range between 114-126 volts is considered 'good' power supply.

Distribution feeders are supplied from the utility's electric substations. Voltage regulation is often managed through regulators located in the substations or out on the feeders. Impedance settings in the regulator controllers help correct the adjusted voltage on the feeder. This approach typically results in higher voltages at the beginning of the feeder and lower ones along the feeder as voltage drop occurs along the distribution lines (Figure 1).

Long feeders can be challenging since the voltage can drop below the 114 volt level at some point. When this condition occurs, utilities use field equipment (capacitor banks, line regulator banks) to adjust the voltage back to 'good' levels. From this adjusted point, the voltage will again drop along the feeder's lines (see Figure 2).

How it Works

The Sensus FlexNet® communication network uses voltage data from electricity meters working together as a feedback loop of actual values. The voltage information is measured in two ways. First, all of the meters on the feeder can be programmed to send voltage data into Sensus' head-end software (as part of their normal billing read). Second, Sensus meters have the added capability of calculating a one-minute average of voltage and frequently reporting those detailed values. These act as bellwether meters–1 to 2 percent of the electricity meters spread out over the distribution system. The combined approach provides additional voltage resolution for improved accuracy.

Utilities use the voltage data to identify which feeders are running with lower or higher voltage and can be adjusted. The data may also indicate which feeders are the best candidates for further CVR load reduction.

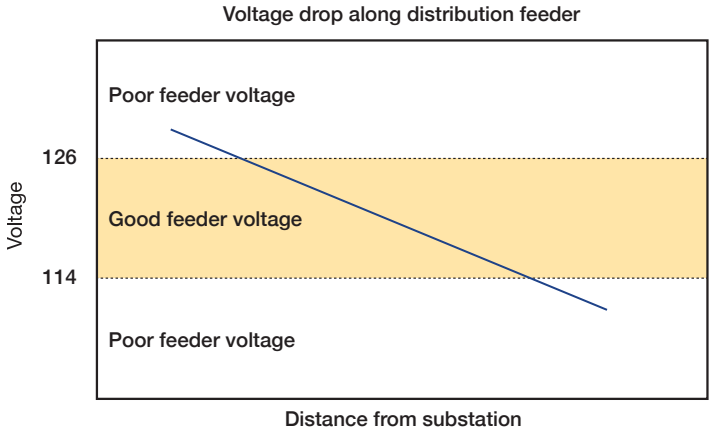

Figure 1: Typical feeder voltage drops with greater distance from substation

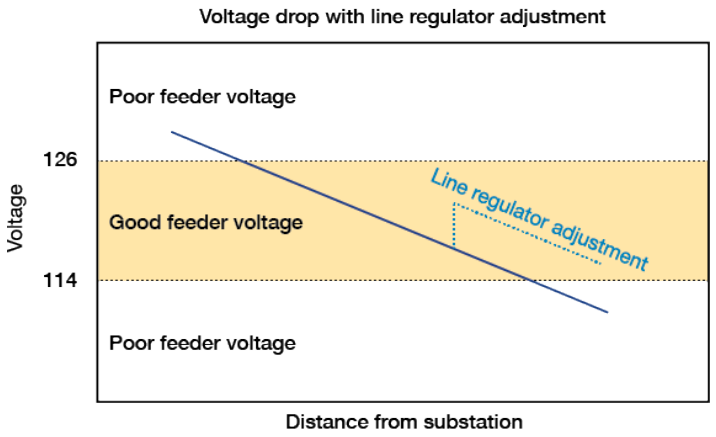

Figure 2: Adjusted voltage drop using line regulator

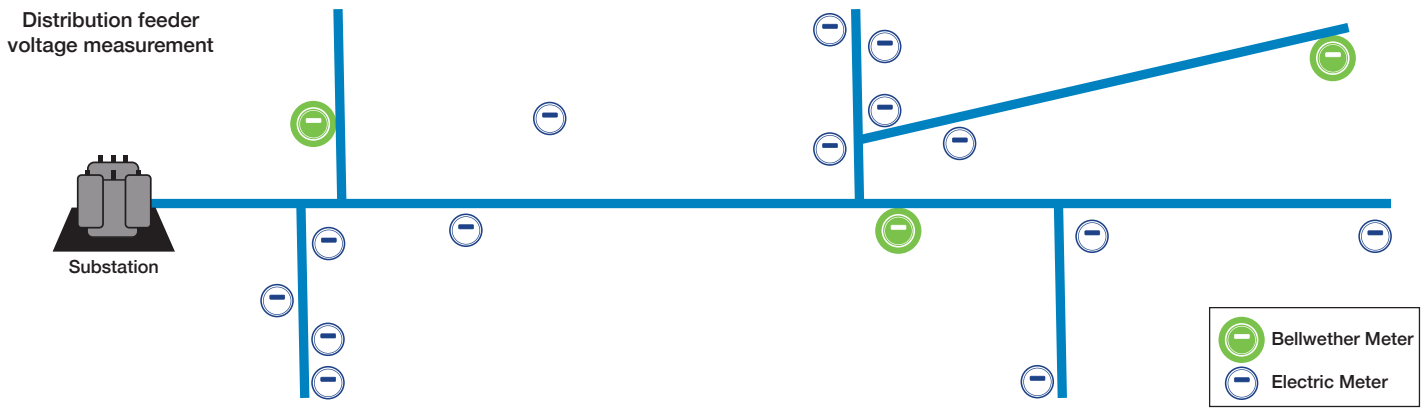

Figure 3: Sample Sensus CVR distribution feeder configuration

Behind the Scenes

Voltage Insight is the name of the analytics application that receives CVR information from meters installed on the FlexNet system. This software provides the systems view of where voltage is too high or too low.

As seen in Figure 4, Voltage Insight indicates where to use your SCADA system to adjust levels by raising or lowering voltage to get back to good levels.

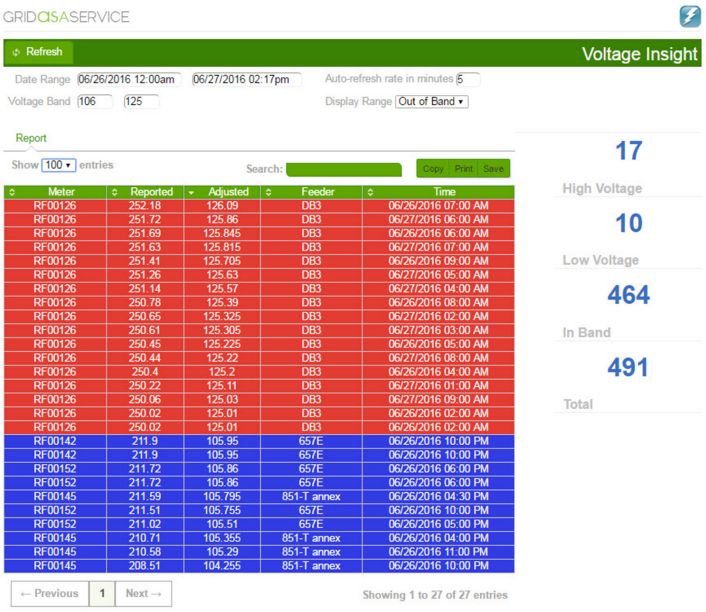

Figure 4: Sensus Voltage Insight interface

Bottom Line Impact

Conservation Voltage Reduction is another powerful solution delivered by Sensus FlexNet that provides strong economic benefits while meeting critical utility needs.

With CVR, utilities have experienced a 2 to 5 percent voltage reduction as well as corresponding energy consumption reduction. Specific amounts depend on the load types on a particular feeder, but it is common to see corresponding energy savings of 1 to 2.5 percent on feeders running CVR.

That type of energy reduction, during peak events, across the entire utility, adds up to significant cost savings.

Sensus CVR Benefits

- Reduces system peak demand consumption
- Improves service quality
- Boosts efficiency
- Extends the life of equipment
- Lowers operating costs
- Enables preventive maintenance
- Offers voltage visibility and insights across your network
- Provides information to insure adequate power generation
- Balances energy supply and demand

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