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Finding the ways that work

ENERGY

You wouldn't use a blowtorch to light a candle. The same logic can be applied to the electricity sector.

Voltage optimization: right-sizing grid voltage saves money and cuts pollution

Some utilities overpower homes and businesses with more voltage than is needed. Studies[1] have shown that customers routinely receive, on average, two to three percent higher voltage than they need from the utility to run their appliances. This is a symptom of inefficiencies in the electric system that can negatively impact people's wallets, health and the environment. If voltage were "right-sized," customers would only get the power they need to sufficiently power their appliances and devices, while building a cleaner, more efficient electricity system in the process.

Voltage optimization could cut U.S. energy waste by two to three percent each year—which is equal to taking approximately 15 million cars off of the road.

One of the lowest-hanging fruits

Voltage optimization is one of the lowest of the low-hanging fruits that could accelerate the transition to a clean energy economy. Specifically, voltage optimization refers to technology, including sensors, which can be installed by utilities to provide greater visibility of the state of the electric grid and assist in adjusting voltage to match the precise electricity needs of customers. This cost-effective, proven energy management technology helps customers waste less energy and save money while avoiding harmful air pollution from fossil fuel power plants.

What's more, it can be done by the utility without requiring customers to take any action or make sacrifices to the quality of their electricity service.

Saving money while reducing the need for dirty power plants

Many appliances and devices, like incandescent lighting, use less energy when the voltage provided to power them is reduced. When voltage optimization is used for the specific purpose of reducing energy use, it is referred to as Conservation Voltage Reduction (CVR). Deploying CVR nationwide could cut U.S. energy waste by two to three percent each year[2]—which is equal to taking approximately 15 million cars off of the road or eliminating carbon emissions from about seven million homes annually.[3]

This available, proven clean technology also allows for greater visibility and control of the electricity system, saving utilities money and making the grid more efficient, flexible, and reliable. In 2010, McKinsey estimated[4] the value of voltage optimization at about $43 billion. This estimate includes savings from improved utility operations and reduced electricity use, as well as avoided utility capital costs, improved reliability savings, and the health benefits to society due to reduced air pollution.

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Case studies

Voltage optimization "will allow Oklahoma Gas & Electric to avoid new fossil fuel generation until 2020."

–2013 OG&E Demand Programs Annual Report

Duke Energy:
As part of its Department of Energy-funded, comprehensive grid modernization project, Duke Energy has deployed intelligent voltage control along with a variety of other automated, "set-it-and-forget-it" energy management technologies system wide in Ohio. The goal is to help meet the state's energy efficiency and peak energy reduction targets by conserving energy and minimize energy losses during peak times when the grid is stressed.

After piloting a few locations in 2013, Duke Energy has now expanded voltage optimization to more than 65 percent of the utility's Ohio circuits.[5] The utility has consistently reduced voltage by two percent on the enabled circuits, cutting down on system losses and energy costs for customers.[6] The Public Utilities Commission of Ohio estimated an average benefit of $35.87 annually per customer with continuous application of this technology.[7] Building off the successful deployment in Ohio, Duke Energy is now exploring voltage optimization to other service territories in the Midwest, the Carolinas, and Florida.

Oklahoma Gas & Electric:
Oklahoma Gas & Electric has also pioneered smart, automated energy management technologies with the help of federal funding and is now expanding its voltage optimization operations following positive pilot results. To date, the utility has reduced peak energy demand by nearly two percent across the enabled circuits.[8] If successful, Oklahoma Gas & Electric expects to defer 75 megawatts (MW) of future fossil fuel needs from power plants[9] at one-third of the cost.[10]

1. AEP Ohio – Final Technical Report – gridSMART Demonstration Project, June 2014.
2. Evaluation of Conservation Voltage Reduction on a National Level. Pacific Northwest National Laboratory. July, 2010.
3. Based on the U.S. Energy Information Administration's estimate of electricity sales to customers for 2014 and using the U.S. Environmental Protection Agency's Greenhouse Gas Equivalency Calculator.
4. ETS Insights. Duke Energy presentation, September 30, 2015: "Country's largest Conservation Voltage Reduction Program" and 2014's IRP.
5. U.S. Department of Energy. Integrated Smart Grid Provides Wide Range of Benefits in Ohio and the Carolinas. September 2014.
6. Oklahoma Gas & Electric. Integrated Resource Plan. 2014.
7. Smart Grid Economic and Environmental Benefits. A Review and Synthesis of Research on Smart Grid Benefits and Costs. Smart Grid Consumer Collaborative. October 2013.
8. IEI (Institute for Electric Innovation). 2013. Innovations across the Grid: Partnerships Transforming the Power Sector. Washington, DC: IEI.
9. American Council for an Energy-Efficient Economy (ACEEE). New Horizons for Energy Efficiency: Major Opportunities to Reach Higher Electricity Savings by 2030 . ACEEE September 2015.
10. Based on the U.S. Energy Information Administration's estimate of electricity sales to customers for 2014 and using the U.S. Environmental Protection Agency's Greenhouse Gas Equivalency Calculator.

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