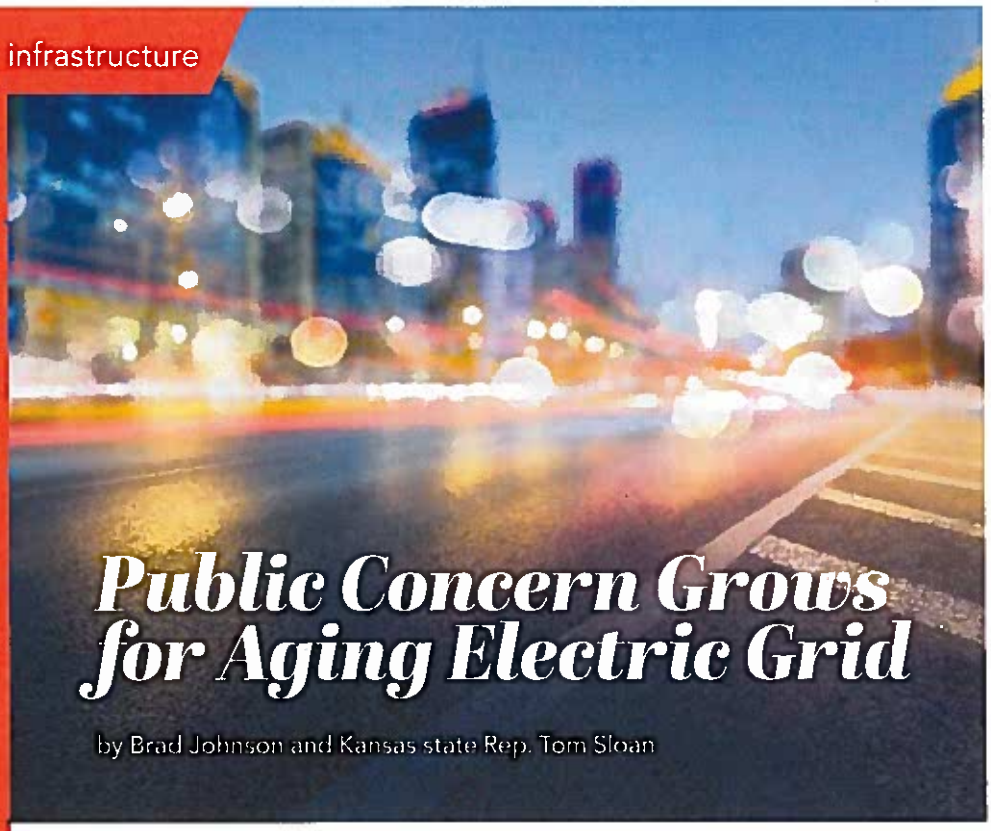


Public Concern Grows for Aging Electric Grid

by Brad Johnson and Kansas state Rep. Tom Sloan

State public servants are often reminded that our citizens want reliable, affordable and cleaner electricity. As policymakers, we have responded with ambitious goals, plans, schedules and financing policies to meet these demands. However, in our rush to hit these targets, we've forgotten one critical element, the nation's electricity grid.

Failing to invest in our energy infrastructure could hamstring efforts to boost economic productivity, drive job creation, and promote cleaner energy, as well as undermine a number of other important public policy goals. Thousands of miles of the nation's 115-500kV transmission circuits are aged, many of them 50-75 years old, and need to be replaced, upgraded and modernized with the latest technology. The addition of new generation sources, including power from renewables, compounds the need to invest in new and existing infrastructure. At the same time, the public is growing increasingly concerned about viewshed impacts associated with existing corridors and the development of new rights of way.

As we look for ways to address these challenges, it would be a huge disservice to those that we serve not to consider the potential contributions of commercially available technologies with revolutionary performance benefits. Cost-effective technology exists with the capability of adding high capacity and efficiency to circuits—depending upon the voltage, up to 75 percent and 33 percent more respectively with capital costs on par with conventional technology. Viewshed impacts can be reduced by using more advanced, cost-effective compact line design technology with tower heights about two-thirds the height of conventional towers. However, project developers are reluctant to incorporate these high-performing technologies into projects if they believe that regional transmission planners, independent system operators, and state public utility commissions and legislatures will consider only traditional technologies.

We are at a moment in time similar to the beginning of this decade when Kansas state Rep. Tom Sloan introduced The Council of State Governments' members to the relatively new volt/VAR optimization, or VVO, technology and its local efficiency benefits to customers on distribution grid circuits. He sponsored, and CSG adopted, his resolution *Supporting Electric Power Grid Modernization to Achieve Energy Efficiency and Demand Reduction Benefits* in 2012. In a July 2013 *Capitol Ideas* article, co-authors Sloan and West Virginia Public Service Commissioner Jon McKinney wrote:

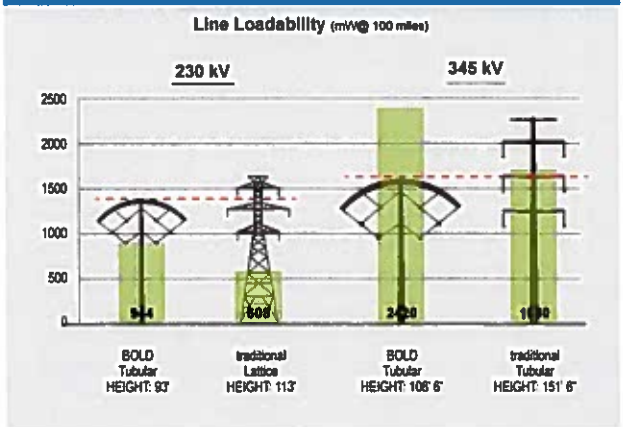
> "VVO (volt var optimization) is a prime example of a technology that can cost-effectively provide benefits to customers without their needing to take any actions. When added to the grid, this technology reduces voltage variance. By doing so, it provides energy and demand reduction benefits of 2 to 5 percent. These benefits are predictable and measurable at the consumer's electric meter."

The CSG policy supported VVO and other energy-efficiency and demand-reduction technologies associated with electric utility grid modernization efforts as qualified resources in meeting legislative Energy Efficiency Resource Standards and/or regulatory orders to achieve energy and demand reductions.

It's time for governors, legislators and regulatory commissioners to demand that advanced transmission technology solutions are proposed by project developers side-by-side with conventional technology solutions so that a true cost benefit and cost-effectiveness comparison can take place. These technologies can increase grid efficiency and reduce the short-term need for new generation units.

Technology innovators are working hard to bring new infrastructure into the commercial market with performance guarantees our citizens need. There are advanced technologies whose absolute capital costs are already very close to the capital costs of conventional technologies. We should focus on long-term operational cost savings and improved electricity delivery metrics, not short-term installation costs. Furthermore, we should ensure that customers do not assume financial risks if there are any concerns that such innovative technologies do not perform to anticipated standards.

BOLD carries more power with less virtual impact than conventional technologies



Last year, the National Association of Regulatory Utility Commissioners, or NARUC, and CSG adopted national policy resolutions to help bring cost-effective transmission technology solutions into states. They co-sponsored the CSG resolution[1] *Supporting State Policies for Advanced Transmission Lines*, which identifies examples of commercially available, high-performing, cost-effective technologies that can be deployed.

When implemented at a state-level, these policies should:

- Encourage project developers to propose projects that use innovative, advanced technologies with revolutionary, not just incremental, performance improvements.
- Encourage states to work together with regional transmission organizations and other planning organizations to compare traditional approaches with advanced technologies, and approve the technologies that are cost-effective on a long-term cost-per-megawatt basis.
- Encourage or direct public utility commissioners and staff to evaluate technologically innovative options that will deliver long-term lower electricity delivery costs.
- Encourage all public policymakers and regulators to work together to adapt and adopt these and other enabling policies in their own statehouses to help achieve their economic productivity, job growth, environmental and other public policy goals on schedule.

Arkansas was the first state to enact a similar policy. Montana Public Service Commission Chairman Brad Johnson's testimony before Montana legislative committees, using the CSG policy and a fact sheet, was well received. As of this date, a resolution has been passed out of the Senate and has strong support in the House. The New York Public Service Commission has provided complementary guidance to the New York Independent System Operator organization evaluating transmission solutions in that state.

Comparison of BOLD vs. Conventional Designs

BENEFITS	BOLD 345 kV	BOLD 230 kV
Increased Capacity*	10-60%	15-75%
Lower Tower Height	(25%-35%)	(20%-30%)
Lower Magnetic Field Levels	(45-50%)	(45-50%)
Lower Energy Losses*	Up to (33%)	Up to (15%)

*Comparisons dependent on conductor selection. BOLD also works for other voltage classes.

- BOLD can be used for new or replacement transmission circuits up to 500 kV
- Costs for BOLD differ depending on design standards, but current estimates put BOLD on par with conventional designs before considering any benefits
- BOLD is up to 33% less expensive than conventional on a cost per MW basis; this also means fewer lines are required to achieve the same level of capacity
- Savings associated with reduced line losses further offset up-front material cost
- BOLD benefits are much greater compared to the aging lines now in service

Examples of Advanced Transmission Technologies Include:

- Advanced conductors: New materials can provide increased capacity, lower line losses and lighter weight that can be beneficial in reconductor projects (re-use of existing towers).
- Flexible alternating current transmission systems, or FACTS, devices: These devices, such as static VAR compensators and static synchronous compensators, provide reactive power and dynamic regulation of voltage and frequency to maintain power system stability. They can also be used to control power flows and optimize system performance.
- Dynamic line rating systems: These devices can be used to determine capacity and apply line ratings in real time. This can enable system operators to take advantage of additional capacity when it is available based on actual conditions, rather than fixed assumptions.
- Asset health monitoring systems: These real-time information systems help reduce maintenance costs and proactively prevent equipment failures in T&D substations.
- Fiberoptic protection and control systems: Used with digital relays, these systems replace much of the standard wiring with fiberoptic cable, improving system protection, reducing overall costs and providing a higher level of security.
- Breakthrough overhead line design, or BOLD: BOLD has a cost advantage on a price/MW capacity basis versus traditional overhead lines, and is significantly less expensive than underground lines. Using optimized bundled conductors, BOLD's lower impedance leads to reduced energy losses. The ability to rebuild with BOLD in existing rights-of-way can save both time and money. The lower-profile aesthetic design has less impact on communities and viewshed, potentially lowering public resistance to new or upgraded lines and helping to expedite the siting and construction process.

[1] The respective sponsors of the resolutions are NCUC Chairman Finley (finley@ncuc.net), MTPSC Chair Johnson (bjohnson@mt.gov), KS Representative Sloan (tom.sloan@house.ks.gov), AR Representative Rick Beck (rick.beck@arkansashouse.org), OH Senator Chuck Hite (hite.ohiosenate.gov), ID Senator Chuck Winder (cwinder@senate.idaho.gov), WA Representative Jeff Morris (Jeff.Morris@leg.wa.gov), and AR Senator Eddie Joe Williams (EddieJoe.Williams@senate.ar.gov).

About the Authors

Brad Johnson is the Montana Public Service Commission chairman and vice chair of CSG's National Energy and Environment Committee.

Kansas State Rep. Tom Sloan is serving his 23rd year in the Kansas House of Representatives. He is chairman of the Water & Environment committee and serves on DOE, FCC and EPA advisory committees.