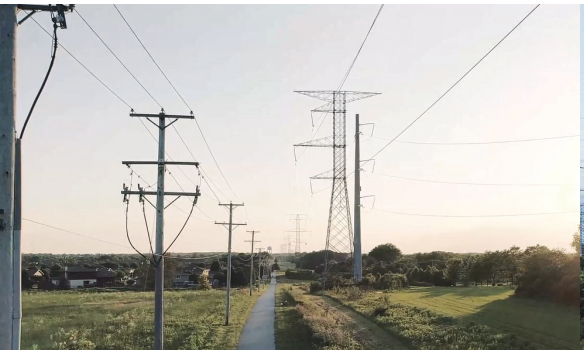
G&W Electric

What's Ahead for Power Transmission

Power transmission is critical to society as electricity is a modern necessity. Transmission lines connect power generation companies to the communities in their network to enable our very way of life. They are the channels through which bulk power is transmitted.



Aging Infrastructure

Population growth, increased electricity usage, and the addition of renewables are impacting the grid and creating new challenges at all levels, including in the transmission space. Some utilities are updating and enhancing the aging infrastructure of transmission networks to ensure appropriate levels of reliability and resiliency are achieved. Others are needing to install new transmission lines in order to provide reliable power to growing areas, and these new lines often must traverse challenging territories, as rights of way are increasingly hard to obtain. Modernizing protection and control as well as increasing monitoring technologies to enable better management and optimization of transmission lines is essential. Cost effective, straightforward ways to enable better automation, management, and monitoring of transmission assets will allow utilities to improve reliability and resiliency, even considering constrained personnel and financial resources. Other ways to improve the transmission infrastructure are through updating or adding substations, which are costly for utilities. Finding ways to reduce these costs is important. Alternatives to traditional high cost grounded substation installations, such as pole mounted switching and monitoring technology which can be readily mounted on existing transmission towers or frames, can help offset these high costs, planning intensive enhancements to the transmission infrastructure.

Renewable Power Generation

As more renewable power generation becomes available, driven especially by an increasingly strong focus on reducing the overall dependency on fossil fuels in power generation, these distributed energy resources (DERs) will have to connect to the grid. Often such connections are done at not only medium voltage levels but at sub-transmission and transmission voltage levels. For example, some utilities will add additional transmission lines from existing transmission infrastructure to locations which were obtained for site placement of new solar or wind DER installations. As demand increases, more power generation is needed; and as more renewable resources fill this need, even more pressure and challenges are introduced into the grid. These challenges include the need for equipment to connect and disconnect the DER site from the grid, which may happen on a much greater frequency than typical switching along long transmission feeders. Additionally, inverter based DERs are known to introduce interesting power quality challenges into the grid, which must be considered in monitoring solutions that are deployed. Finally, fault current levels can change in the vicinity of DERs, although typical resources such as solar have lower levels of available fault current than traditional spinning generation will produce. Having greater visibility along transmission lines, especially when DER-driven changing patterns of fault currents are occurring, coupled with equipment which can act in the case of faults to minimize large scale power outages, is becoming even more essential.

The recently issued Federal Energy Regulatory Commission (FERC) ruling should reduce the time it takes power generation companies to connect to the grid. This is a major change to FERC's interconnection requirements. The requests will be grouped into a cluster study to determine what grid updates may be needed. Reducing the interconnection request time from start to completion for power generation companies will improve reliability and reduce the overall cost of the project. However, as the desire for faster interconnection arises, the need for equipment to be more readily deployed, faster and with less infrastructure changes, becomes more important. New technologies are becoming available which can help fill this need.

Automation Site-Ready Solutions

As the reliability and resiliency of transmission assets continues to grow in need and complexity, technology to monitor and manage not only at the transmission substations, but also along the transmission feeders themselves is becoming increasingly important. Additionally, the ability to rapidly and securely sectionalize long transmission lines in the event of service interruptions due to planned or undesired issues, such as damage to transmission assets, or faults which can cause transmission outages, is more necessary than ever before. Automation-ready solutions, both in monitoring and switching devices, as well as field-deployed intelligent electronic devices (IEDs) such as controllers and power quality monitoring equipment, is needed. This need exists along the feeders and at intertie points, especially those points connecting DER assets to the transmission infrastructure. However, often when traditional switching technology is added to the transmission system, additional infrastructure needs to be built to install the new equipment, and often the equipment is apparatus that is maintenance intense, such as motor operated switches, or that could include non-desirable gases such as SF6.

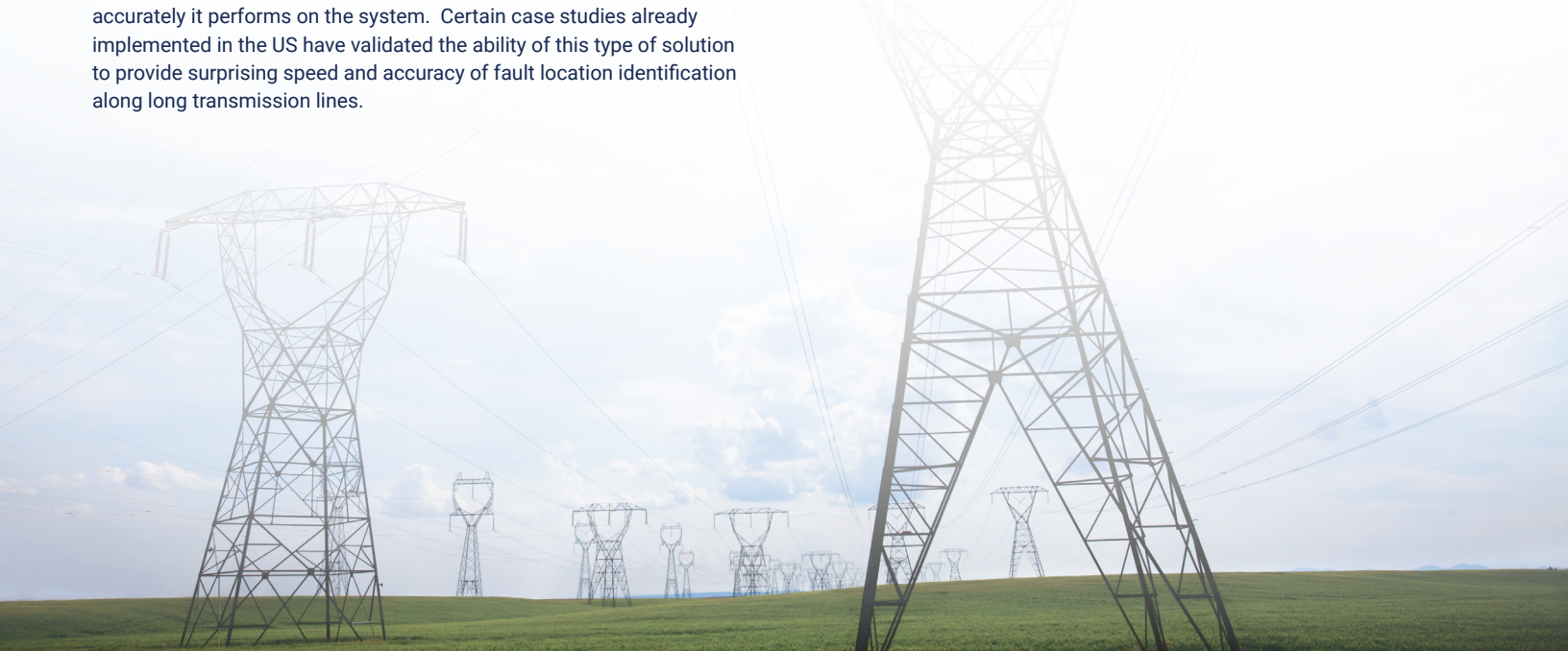
Technology Advances

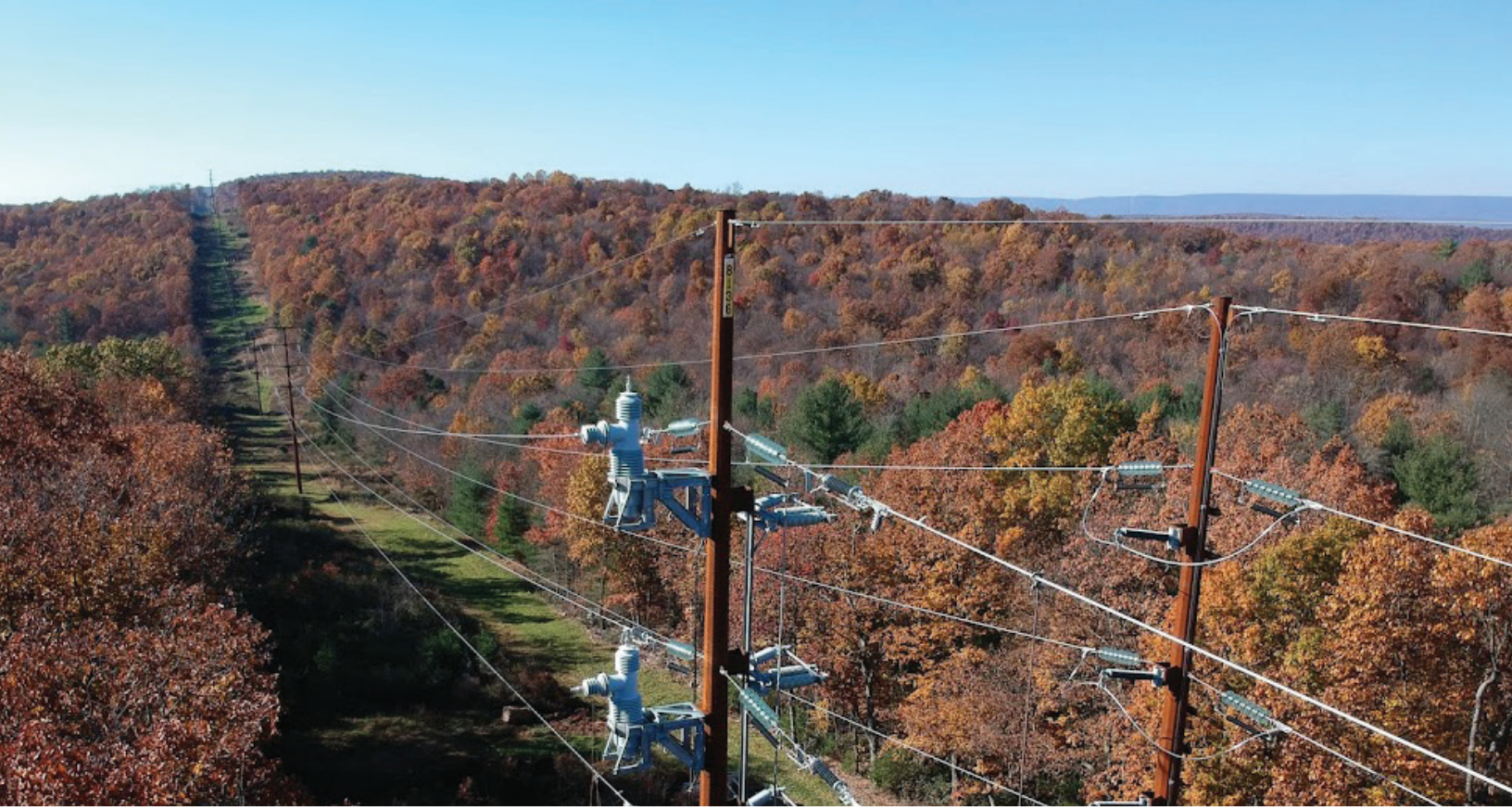
Recent technology advances have entered into the sub-transmission space in the form of solid dielectric, gas-free, reclosing technology which offers fast opening and reclosing capabilities when temporary faults occur, but which can also serve as a sectionalizing option, suitable for installation on existing tower infrastructure in a site-ready format. Utilizing this technology, with advanced intelligence in the recloser controllers, on sub-transmission lines will increase reliability and reduce costs because the utility doesn't have to build substations in many cases. This is attractive for upgrading existing infrastructure when the addition of traditional breakers would require substation expansion to install, or when new lines are being run through rugged territory and pole mounted infrastructure is more convenient. Having solid dielectric equipment mounted on existing tower or pole infrastructure is also enhanced when the equipment is flexible regarding orientation, as there is a wide variety of line support infrastructure scenarios in actual field deployments. In some cases, reductions of up to 300%-400% in total equipment and deployment costs, while also reducing planning and installation time significantly, are possible.

Coupled with advanced controller applications, such as traveling wave monitoring, locations of transmission line faults can be very quickly determined with considerable accuracy to further improve rapid service restoration to large numbers of customers. A first step in the use of this leading-edge monitoring solution, which is faster and more accurate than traditional impedance-based fault location methodologies, is to deploy equipment to monitor and understand how it works and how accurately it performs on the system. Certain case studies already implemented in the US have validated the ability of this type of solution to provide surprising speed and accuracy of fault location identification along long transmission lines.

Another capability of this new type of switching device for sub-transmission systems is in-line sectionalizing. This capability to use the same device as both recloser and sectionalizer, with coordination between those operating in one mode versus the other, also brings significant value, as it allows equipment standardization and enables fast deployment of equipment to further isolate service outages for minimal negative customer impact. Coupled with automation software, faster and more widespread reclosing and sectionalizing equipment deployment, and IEDs including advanced fault detection capabilities, allows more advanced protection and reliability initiatives typically implemented in distribution system architectures to be considered in higher voltage sub-transmission networks.

Listening to customers who wanted this more advanced technology for high-voltage lines, G&W Electric introduced the Viper®-HV recloser. This innovative technology is receiving considerable attention in global markets as it brings significantly more overall value than traditional solutions in this space. New levels of sub-transmission system reliability and resiliency are within reach quickly and with less total cost and complexity than traditional technology alternatives. Utilities looking to reduce costs are considering the long-term value of equipment. Reduced maintenance and labor costs over the life of equipment are considered when purchasing solutions. In the short-term the cost of sub-transmission equipment such as the Viper-HV recloser may be more than other equipment, but the long-term value of reduced maintenance and labor costs outweighs the short-term costs.





CONCLUSION

In summary, the grid is evolving and becoming more challenging, and new and improved technology is bringing new capabilities to the transmission and sub-transmission space to better manage these evolving changes. Technology including new overhead mounted switching equipment using solid dielectric, maintenance free, and site ready designs allows faster and less costly deployment. This in turn enables wider scale deployment, which, when coupled with automation software, and new IED capabilities to enable fast and accurate fault location on long lines, brings unprecedented value realization to utilities needing to maintain and enhance the reliability and resiliency of their transmission networks.

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