

Overview of Smart Wires Solutions

Enabling the Dynamic Grid of the Future with Modular Power Flow Control

Smart Wires' modular power flow control solutions are installed within meshed transmission and subtransmission networks and enable the operator to adjust transmission line reactance in real time to change power flows in the network. The unique approach to modular grid infrastructure has several advantages over traditional transmission solutions, such as rapid deployability, scalability, and redeployability. These solutions offer flexibility and adaptability in a time when the relative trajectories of generation, load, and the evolution of the grid itself are highly uncertain.

There are two classes of Smart Wires technology:

Guardian

These devices inject reactance to push power away from a given transmission circuit. Guardians are either installed on each phase conductor (PowerLine Guardian®, Figure 1a), or in a Smart Bank™ placed within the transmission right-of-way or in existing substation space (Power Guardian™, Figure 1b). The number of devices per phase is determined by the amount of compensation required as each device injects a fixed amount of reactance. The devices can be remotely controlled or programmed to activate automatically based on current set points.

Router

These devices inject a voltage waveform in quadrature to the line current to emulate either a series capacitor or inductor. Because Routers can either increase or decrease transmission line reactance, they can act to push power away from or pull power onto a given transmission circuit. The Routers are installed in a Smart Bank within the transmission right-of-way or in existing substation space (Power Router™, Figure 1c). Like the Guardian, the Router is applied to all three phases, with the number of devices per phase determined by the amount of compensation required. Routers leverage similar control schemes to those implemented for Guardians.

PowerLine Guardian



Figure 1a

Power Guardian



Figure 1b

Power Router



Figure 1c

Smart Wires has developed several methods for deploying Guardian and Router devices to navigate various operational, environmental, or spatial constraints

PowerLine (Distributed and Compact)

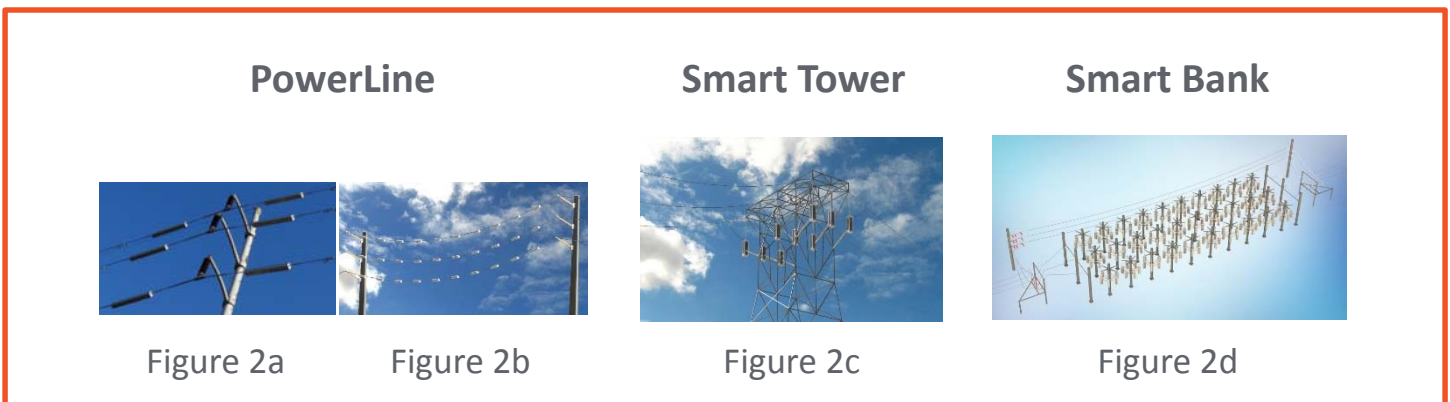
This deployment method consists of mounting PowerLine Guardians on existing transmission conductors. In a distributed deployment (Figure 2a), the devices are mounted on the conductor on either side of existing poles or towers. For large deployments or deployments with spatial, environmental, or other restrictions, the compact deployment method (Figure 2b) can be used to significantly increase the per-span unit count. Compact deployments may involve reconductoring a small line section or inserting / reinforcing select towers.

Smart Tower™

This deployment method (Figure 2c) involves inserting a limited number of dedicated lattice structures to replace or supplement existing towers within a right-of-way. These structures are designed to have the capacity to accommodate several Power Guardian or Power Router devices. This method is particularly efficient where there are existing plans to replace aging structures or there are permitting or spatial limitations.

Smart Bank

This deployment method (Figure 2d) consists of an array of steel structures, each carrying several Power Router or Power Guardian devices. This high density array can be constructed within an existing right-of-way, a substation or a dedicated parcel of land. The Smart Bank is implemented with a bypass and designed to minimize outage requirements; the Smart Bank can be quickly tied into the system once construction is complete.



About Smart Wires

Smart Wires is the industry leader in modular power flow control technology for the transmission system. We work with electric utilities around the world to optimize the flow of power through their grid – enabling them to prioritize network upgrade projects, improve the integration of renewable energy, address near-term reliability constraints, and reduce congestion. Smart Wires solutions are being deployed at leading utilities such as Pacific Gas & Electric, Minnesota Power, Southern Company, Western Power, and EirGrid. These solutions can be deployed incrementally and reconfigured as needs evolve, thereby reducing investment risk, shortening lead times, and providing flexibility in an era of increasing operational uncertainty. Smart Wires is located in the San Francisco Bay Area with offices in the United States, the United Kingdom, Australia and Ireland.