



Spare Equipment and Grid Resilience

Protecting the nation's energy grid and ensuring a reliable supply of electricity are top priorities for the electric power industry. The energy grid is a complex, interconnected network of generation, transmission, distribution, control, and communication technologies. The components of this network can be damaged by natural events—such as severe storms and earthquakes—and by malicious events—such as cyber and physical attacks.

Energy companies plan for all types of contingencies, and they own and have access to spare equipment as part of their business continuity planning. For example, companies, on an individual basis, own hundreds of additional spare transformers, and other equipment. In addition, just as energy companies share crews as part of the industry's voluntary mutual assistance programs to restore power, they also regularly share transformers and other equipment.

The Spare Transformer Equipment Program (STEP) and SPAREConnect are two programs that promote equipment sharing following emergency events. In addition, the newly created Grid Assurance company and the North American Transmission Forum's (NATF) Regional Equipment Sharing for Transmission Outage Restoration (RESTORE) program have been established to provide additional access to spare equipment in extreme events. While the four initiatives have varying characteristics, they all promote meaningful partnerships within the industry. Most important, they all strive to maintain a secure and resilient energy grid.

The Spare Transformer Equipment Program (STEP)

The Spare Transformer Equipment Program (STEP) provides a ready mechanism for participating entities to share assets in the event existing equipment is deliberately destroyed. Each participating energy company enters a binding contract that provides legally enforceable rights to access hard-to-replace transformers that have been committed to STEP. STEP members commit to share specific assets in voltage classes within which they operate. Because the equipment used to operate in each voltage class is generally interchangeable, committing these assets to STEP provides participating companies with ready access to a large pool of recovery assets that they otherwise would not be entitled to use.

More than 50 energy companies that are geographically dispersed across the country and engaged in bulk power transmission services are members of STEP. This number continues to grow as additional companies participate to ensure greater resilience and reliability. STEP also underscores the importance of partnerships within the industry as it fosters meaningful relationships among its members. Members of STEP meet regularly to administer the program, perform drill exercises, and share technical expertise.

STEP's commitment requirements are reviewed and updated annually to ensure that all voltage classes have an adequate number of spares. The transfer of spare equipment pursuant to STEP has been approved by the Federal Energy Regulatory Commission (FERC) and, to the extent necessary, STEP participants secure pre-approval from their state regulators when they first join STEP. As a result, no additional regulatory approvals are necessary to access STEP's spare capacity during a declared state of emergency by the President of the United States.

SPAREConnect

SPAREConnect provides an online tool for transmission asset owners and operators to connect and to share transmission and generation step-up (GSU) transformers and related equipment— including bushings, fans, and auxiliary components—with other SPAREConnect members. SPAREConnect establishes a confidential, unified platform to efficiently communicate equipment needs in the event of an emergency or other non-routine failure. SPAREConnect

establishes an additional, trusted network of participants who are uniquely capable of providing assistance concerning equipment availability and technical resources.

SPAREConnect does not create or manage a central database of spare equipment. Instead, SPAREConnect provides decentralized access to points of contact at companies so that, in the event of an emergency, SPAREConnect members can connect quickly with other members in affected voltage classes. Once connected, those SPAREConnect participants who are interested in sharing equipment work directly with each other.

SPAREConnect's membership currently represents the major sectors of the North American electricity industry, including U.S. investor-owned energy companies, electric cooperatives, joint action agencies, federal power marketing agencies, merchant generators, and Canadian public and private energy companies.

Grid Assurance

Grid Assurance seeks to address a critical national security need – supporting the resiliency of the bulk power system in the event of a catastrophic event – by making critical replacement equipment readily available for the transmission grid. The availability of dedicated, incremental long-lead-time critical spares, housed in strategically located, secure domestic warehouses, will allow for faster restoration following attacks on the grid, natural disasters, and other events that damage critical transmission equipment. This 'first of its kind' spare equipment service is designed to help shield consumers from the devastating impacts of prolonged transmission outages. In particular, Grid Assurance (1) maintains an incremental inventory of new and dedicated critical long lead-time spare transformers, circuit breakers, and related transmission equipment, (2) provides secure domestic warehousing of the inventory of spares in strategic locations, and (3) maintains up-to-date, executable preplanned transportation and logistics plans that support expedited delivery of spare equipment to subscribers as needed to respond to emergencies.

Formally launched in May 2016, Grid Assurance is a stand-alone company founded, owned, and operated by major power companies who understand the challenges to operate and maintain a highly reliable grid. The current Grid Assurance subscription profile covers transmission owners in 23 of the lower 48 mainland states and has a secure inventory of high voltage transmission equipment spanning across seven different equipment (transformer and circuit breaker) voltage classes.

Grid Assurance provides a cost-effective approach by pooling the aggregate needs of all subscribing companies into an equipment inventory level adequate to meet the needs of all subscribers. Subscribers of Grid Assurance can confidently plan for recovery following a catastrophic event because they will know the equipment specifications, pre-planned transportation routes, and all details necessary to make the equipment operational for their grid. Grid Assurance has expanded rights to call upon equipment under "qualifying events," (physical attacks, electromagnetic pulses, solar storms, cyberattacks, earthquakes, severe weather events, and many other events which are caused by external forces), allowing for fast and flexible access to these critical assets when needed.

Grid Assurance requested and received five positive regulatory declarations from FERC providing clarity and certainty on issues related to prudence, compliance, ratemaking, and affiliate pricing. For companies subject to FERC's jurisdiction, no additional FERC approvals are required for subscription. Grid Assurance has also assisted subscribers seeking requisite state-level regulatory approvals (where applicable). To date, subscribers have filed and received approvals from multiple state commissions.

NATF's Regional Equipment Sharing for Transmission Outage Restoration (RESTORE)

The NATF's RESTORE program is designed to enhance the resiliency and reliability of the energy grid by providing additional sources for obtaining critical equipment following disastrous events. This optional, self-funding program is available to NATF members for a minimal additional cost. The program establishes a voluntary-but-formal agreement between transmission owners to commit to share (own, maintain and sell to one another) available spare equipment (e.g., spare transformers and other transmission equipment) for an event that results in major damage to the

transmission grid. RESTORE is supplemental to, and not intended to be a replacement for, any current industry programs, such as EEI's Spare Transformer Equipment Program (STEP) or Grid Assurance.

To participate in RESTORE, parties must be an NATF member and sign appropriate agreements. The NATF provides website services, secure databases, and general administration of the program for participants. RESTORE currently includes 18 total companies (40 individual utilities) and provides for exchanges of spare transformers across seven different voltage classes. Each participant is responsible for acquiring, storing, and maintaining its own equipment committed to the program, but it could still be used for the participant's internal needs or other sharing programs. When a triggering event occurs, each participant will be required to sell the specified equipment to affected utilities as needed to recover from the event.

Summary of Programs Supplementing Existing Spare Equipment Inventories

Energy companies own and maintain hundreds of additional spare transformers and other equipment as part of their business continuity planning. In addition, the industry has developed several programs that are designed to supplement companies' access to their own existing spare inventories in the event of an emergency. These programs are summarized in the chart below.

	Spare Transformer Equipment Program (STEP)	SPAREConnect	Grid Assurance	Regional Equipment Sharing for Transmission Outage Restoration (RESTORE)
Equipment Covered	Transmission to transmission transformers.*	Transmission to transmission/subtransmission transformers, generation step-up (GSU) transformers and related equipment, including bushings, fans, and other auxiliary components, distribution transformers and related equipment, including bushings, fans, and auxiliary components, towers, poles, conductors, cables, and other equipment.	Transformers, circuit breakers, and other difficult-to-obtain equipment vital to the operation of the grid.	Transformers and transmission equipment.
Trigger	Act of terrorism and presidential declaration of emergency or grid security emergency.	In the event of an emergency or other non-routine failure.	Self-declared qualifying events like physical attacks, electromagnetic pulses, solar storms, cyberattacks, earthquakes, and severe weather events.	Catastrophic event or physical attack within service territory resulting in loss of load or affecting grid stability.
Structure	Each participating member enters a binding contract that provides legally enforceable rights to access hard-to-replace transformers that have been committed to STEP.	Voluntary online networking tool that provides access to other asset owners and operators at participating companies. Participants who are interested in providing additional information or sharing equipment work directly with each other on the specific terms and conditions of any potential equipment sale or other transaction.	Industry-based initiative that owns and maintains equipment at secure, strategically located warehouses, and provides pre-planned logistics to expedite equipment transportation to impacted sites. Grid Assurance is not FERC regulated, but charges a cost-based subscription fee, the same as FERC-regulated transmission tariffs, to facilitate subscribers' ability to recover expenses.	Voluntary formal mutual assistance type program between transmission asset owners.
Participants	Transmission-owning entities	Transmission & generation-owning entities	Transmission-owning entities	Transmission-owning entities
*Including the following 8 voltage classes: 500-230kV, 345-161 kV, 345-138 kV, 345-115 kV, 230-138 kV, 230-115 kV, 230-069 kV, 138-069 kV				