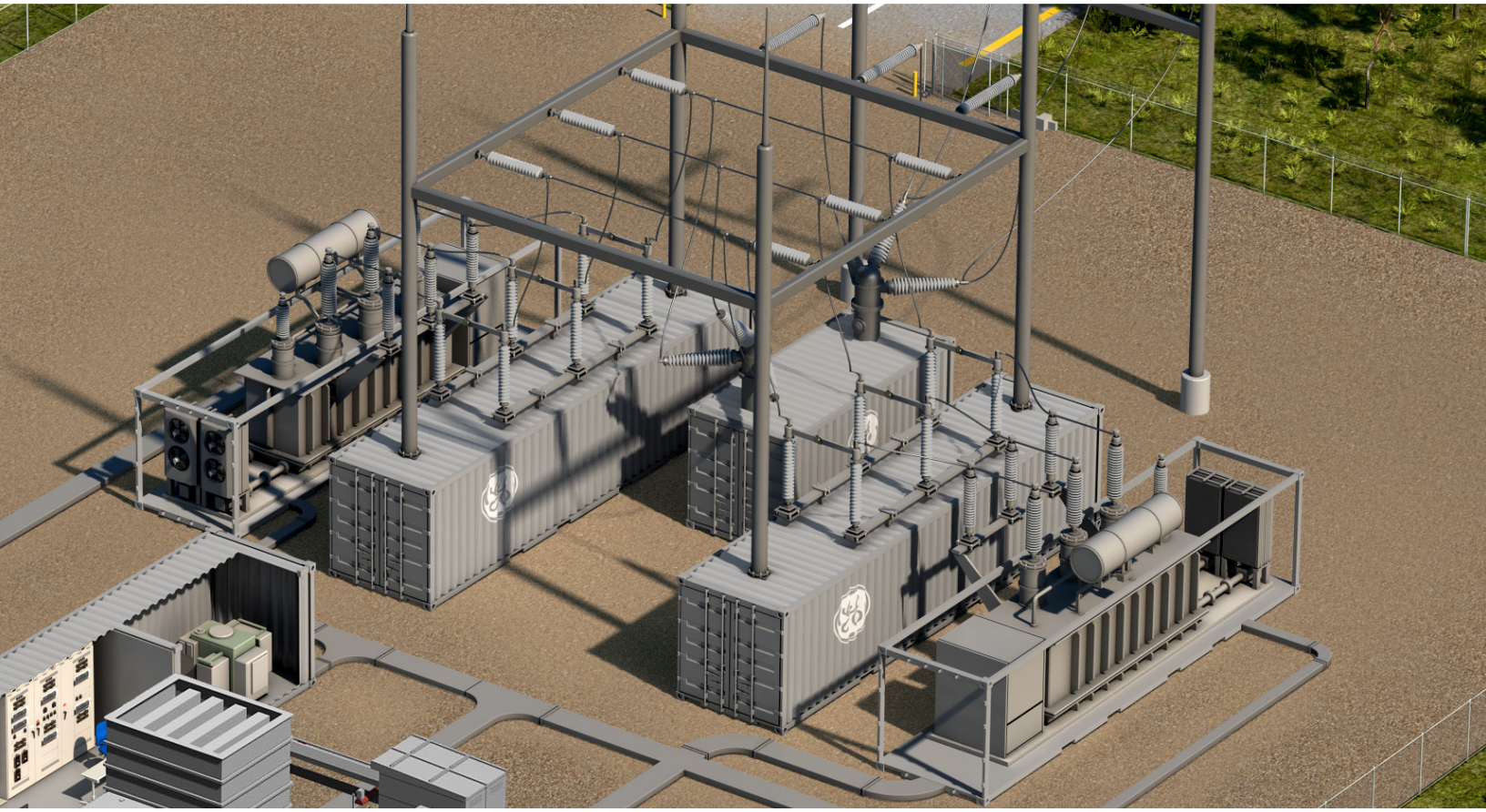


GE
Digital Energy

Electrical Balance of Plant Solutions Packaged Substations for TM-2500 Application



imagination at work

Today's Environment

The power generation environment is evolving rapidly due to electricity demand in emerging markets, regulatory reform, unpredictable global weather patterns, political unrest, and the grid impact of renewable and distributed power. This creates a need for Electrical Balance of Plant (EBoP) systems in the Distributed Power segment that address the following challenges in order to quickly deploy reliable power.



Time to Revenue

Temporary power providers cannot produce electricity or generate revenue until site installation and commissioning is complete. Short project cycles are needed to meet fast power delivery requirements.



Logistics

Equipment that requires special transportation increases the cost and complexity of tracking and transporting that equipment to site. Simplified, standard methods and cost effective logistics are needed to ship and transport system packages.



Cost and Risk

Substation projects can fail to meet schedule and cost expectations due to engineering, fulfillment, and transportation time/cost variation. There is a need for a repeatable system solution with guaranteed cost, schedule and system performance that consistently meets customer requirements.



Labor Availability

Skilled labor can be difficult to find and expensive to contract, particularly in developing nations or those with tight labor markets. Minimizing the amount of required skilled labor for installation and commissioning is needed to control high labor costs and schedule risks.

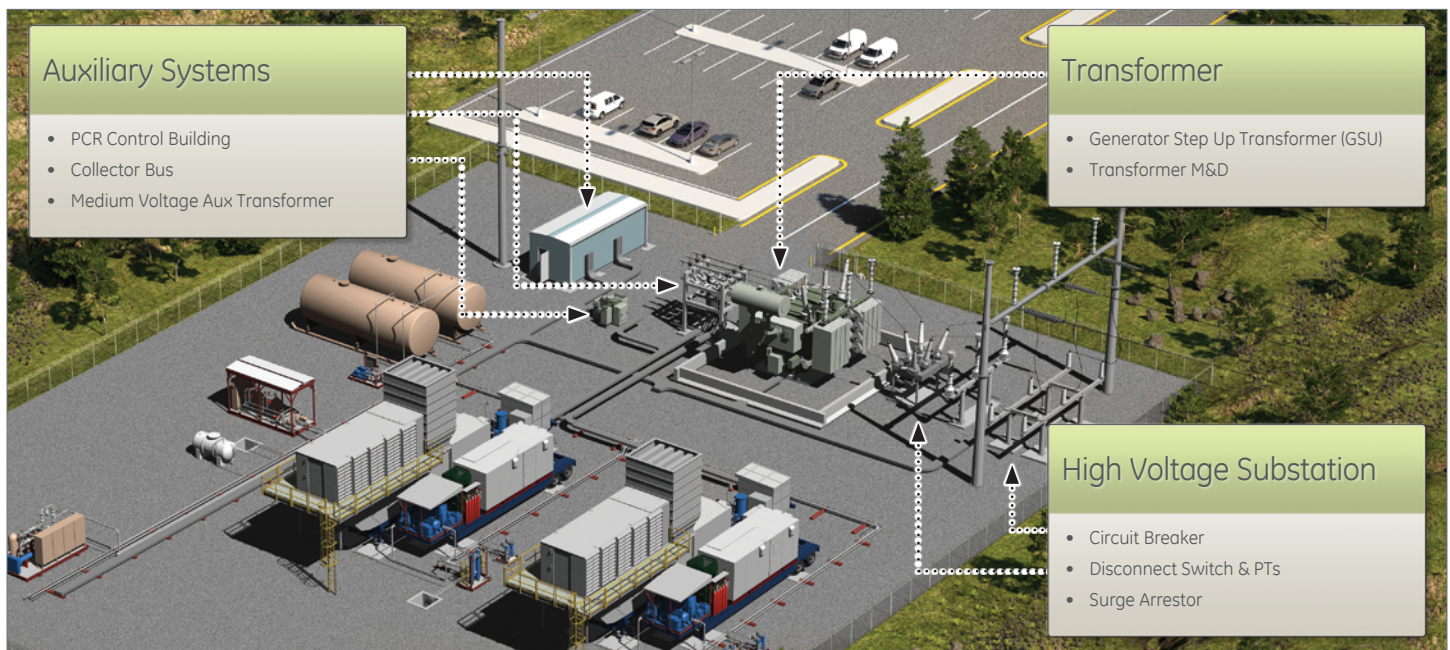
GE's Solution: Packaged Substations for TM-2500 Application

Packaged Substations for TM-2500 Application is a turnkey switchyard solution for 145kV class, 2-TM2500+ power delivery applications. Traditional substations incorporate custom design-and-build high voltage (HV) switchyard and medium voltage (MV)/low voltage (LV) auxiliary systems. GE's Packaged Substations are pre-engineered, pre-packaged and pre-tested to provide full HV, MV, and LV functionality in modular ISO® standard shipping containers.

Major components of GE's Packaged Substations include:

- Generator Step Up Transformers (GSU)
- Current and Voltage Transformers
- Gas Insulated Switchgear (GIS)
- 61850 Compliant Process Bus Network
- High Voltage Disconnect Switches
- HV Surge Arresters, Insulators
- Protection and Control System
- Networking Connectivity
- Cabling Systems
- Monitoring and Diagnostics (M&D)
- Human Machine Interface (HMI)

Conventional Approach to Substation Construction



Key Benefits

Accelerate Revenue

- Time to Commercial Operations (COD) reduced, accelerating revenue up to \$1.2MM
- Standard pre-engineered design drives shorter equipment lead times
- Installation and commissioning reduced from 3-4 months to 3-4 weeks

Lower Cost and Risk

- Pre-fabricated construction reduces site installation cost up to 50%
- Performance of pre-SAT testing prior to shipment expedites on-site commissioning activity
- Substation and EBoP substantially de-risked within overall project plan

Simplify Logistics

- ISO containers simplify shipping logistics and reduce permitting
- Modular design supports flexible site arrangement, minimal foot print
- Site prep is minimized and system can be moved from site to site

Require Less Skilled Labor

- Plug-and-play installation and standard cables/connectors eliminate point-to-point field wiring
- Skilled labor requirements reduced for installation and commissioning

Overview

The System is designed for the 145kV voltage class with two GE TM2500 power generation units and can operate at 138/132kV and 115/110kV voltage levels. 72.5kV and 245kV voltage class systems are also being developed.

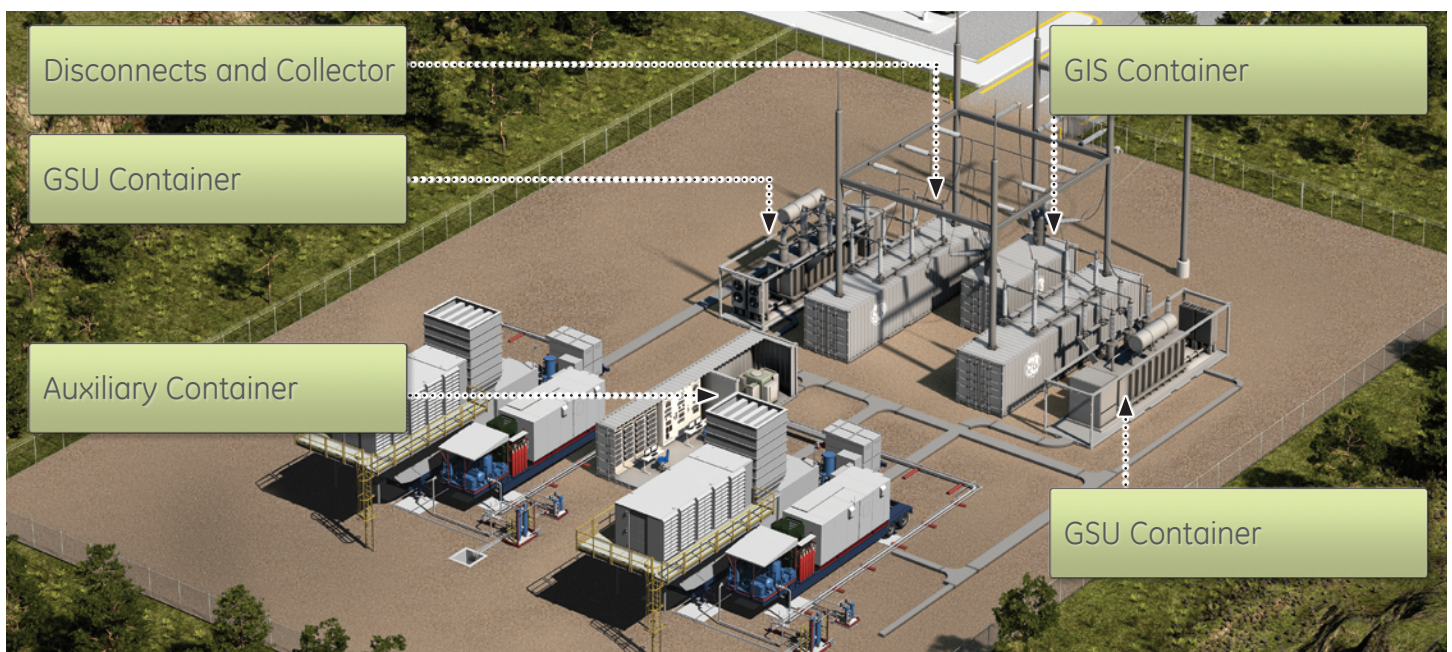
The System consists of the following containers:

- 1 GIS container
- 2 x 42MVA GSU containers
- 1 two-container HV collector with disconnect switches
- 1 auxiliary container (including MV/LV auxiliary power and protection/control/monitoring system)
- Container shipping and storage for all cabling and required on-site tools for installation

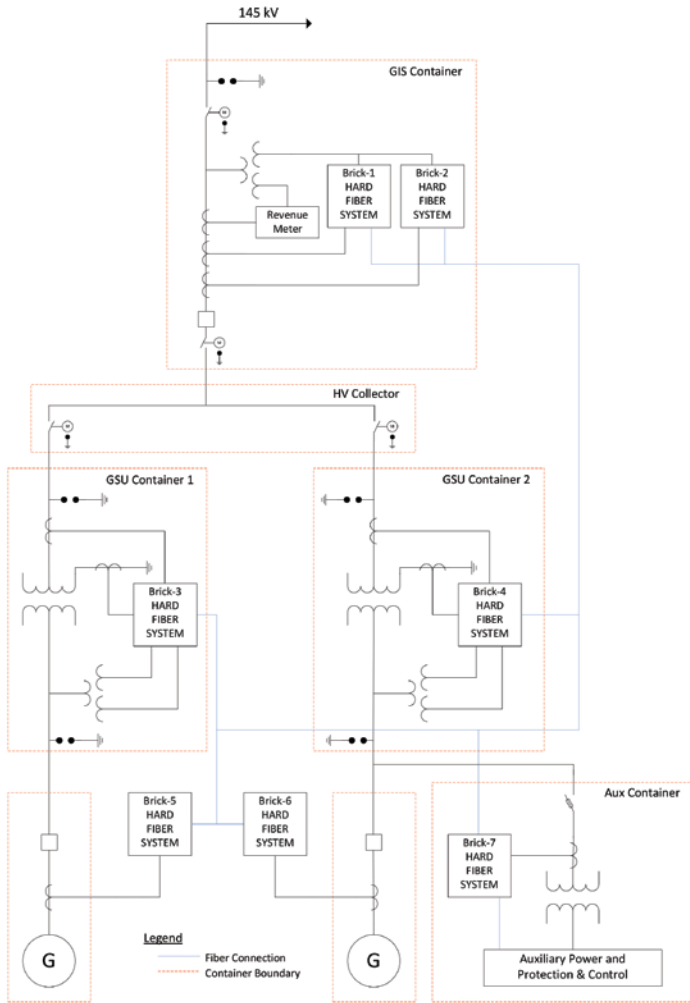
Key features include:

- Standard system solution
- Pre-engineered, pre-packaged, pre-tested
- Standard ISO shipping containers
- Plug-and-play connection system for MV/LV power/control/fiber cables with minimal interface points
- Advanced protection and control scheme utilizing 61850 communication protocols and the GE's HardFiber Brick system with redundancy
- Remote monitoring with advanced M&D platform
- Easy mobilization and de-mobilization

GE's Fast Cycle, Containerized Approach to Substation Construction



Single Line Diagram



TM-2500 Packaged Substations Specification

Maximum system line to line voltage, continuous (kV)	145	
Nominal system line to line operating voltage (kV)	138/115	132/110
System frequency (Hz)	60	50
Basic impulse insulation level (BIL), kV crest	650	
Minimum creepage distance (in)	310	
Continuous current (A)	420	
Short circuit current (kA)	40	
GSU secondary voltage (kV)	13.8	11.5
System MVA capability (per TM)	42	35
Standards	IEC® & IEEE®	
Transformer oil type	Mineral	
Substation automation protocol	IEC 61850	
Site layout	Green & Brown Field	

For more information about
GE's Electrical Balance of Plant Solutions visit
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