St. Joseph’s Hospital

CHP Electrical Design

Presented by:
Nik Terpak, PEng | CHA
Electrical Project Engineer – High Voltage Electrical Group
Agenda

- Project Background
- Design Features
- Equipment Layout Challenges
- Existing Equipment modifications
- Utility Interconnection
- Overall Single Line
In 2008, St. Joseph’s Hospital Health Center broke ground on a monumental $220 million expansion.

Demands on the local grid were projected to "max out" the capacity of the existing electricity infrastructure.

Keeping with the hospital’s intent on sustainable development and energy conservation, cogeneration (or CHP), generating both electricity and thermal energy from a single fuel source, would fit their needs.
The adoption of CHP allows the hospital to generate its own power and steam, reduce demand on the grid, improve reliability, lower costs, and reduce greenhouse gas emissions.

Meeting the hospital’s goals, CHP allows St. Joseph’s to generate their own power – improving reliability; reducing greenhouse gas emissions by 11,676 tons/year; and reducing the annual utility budget.
Design Features

• Major Equipment
  • Solar Mercury 50 Gas Turbine rated at 4.6 MW, 13.2kV @ 0.8 p.f.
  • Rentech 45,000 lb/hr Heat Recovery Steam Generator
  • PCS (Plant Control System) with LMS (Load Management System)
  • New 15kV Switchgear, 480V Switchgear, MCCs
  • BSG (Black Start Generator, 480V, 750kW, 0.85 p.f.
  • Gas Compressor 350 hp, 480V
Design Features

- SJH has the capability of islanding and running off grid.
- SJH utility breakers can synch back to the grid after islanded operation.
- SJH has Automatic Loadshedding capabilities by utilizing the LMS.
- The LMS consists of two panels i.e. Main and Slave panel.
- SJH can be started under complete black start condition i.e. when the utility and the GTG is completely down.
• With limited open space on campus, finding an open site to accommodate the footprint of the plant was problematic.

• The project team “looked upwards” to find a volume of space tucked beneath one of the wings of patient rooms over existing loading docks, to house the plant.
Equipment Layout Challenges

- Finding available space for the plant was a major hurdle in getting the project off the ground
- No availability of open ground on hospital’s highly developed city block
- The team discovered unused “volume of space” adjacent to existing boiler plant, sandwiched between hospital’s loading dock and patient rooms above
Existing Equipment Modifications

- R540 and R590 breakers protection was redone to satisfy National Grid
- R540 and R590 new PTs added for Synchronization purposes for Line and BUS side
- New protective relays i.e. SEL 751 and SEL 351 were added for better application of IEEE 1547 and ESB 756 document by National Grid
- New Basler BE1-11f relay was added to two incoming utilities to measure proper import and not let any export of kW
Utility Interconnection Challenges

- The utility required DTT Direct Transfer Trip, but the requirement was replaced by adding Basler Relays for better accuracy and not to allow the export of Power to the Grid.
- Lighting arrestors and Glastic Barriers were added as per utility requirement and was very challenging to install but the switchgear Vendor did a great job.
Utility Interconnection Challenges Cont’d

- All the synch checks were done in Delta V of the Voltage difference for the Line and Bus side.
- Close transitioning between the Main Tie Main was done in 30 cycles and the scheme resided in the protective relays.
- Directional current 67 and 67G was added and coordinated with the upstream utility owned device.
- Extra test switches were added for all protective relay I/Os. Those were a lot of test switches.
Overall Single Line
Overall Single Line
St. Joseph’s Hospital

CHP Electrical Design

Thank You.