Success Story:
Silicon Valley Power

Markets Served
Utility

"When a utility invests in equipment, it is a multi-million dollar expenditure that is expected to last for 30 to 50 years. We have to be sure that the equipment is robust and reliable and that the manufacturer will support us throughout the lifetime of the equipment..."

Silicon Valley Power's Acting Electrical Engineering Division Manager Kevin Keating

Eaton's Omaha Power Center Meets the Utility Industry's Needs and Earns Silicon Valley Power's Confidence

Location:
Santa Clara, CA

Segment:
Utility

Challenge:
Design a reliable substation that can serve 20% of the utility's power load

Solution:
Innovative switchgear and expertise from Eaton's Omaha Power Center

Results:
Eaton gains Silicon Valley Power's confidence by enabling them to provide reliable power to customers

Contact Information

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Background

To provide reliable power to meet the ever-growing demand in Santa Clara, CA, Silicon Valley Power, the largest public power utility in the San Francisco Bay Area, began a modernization and substation construction program six years ago. Since then three new distribution substations have been erected. Eaton's Omaha Power Center (OPC, formerly Pedersen Power Products) provided the switchgear for one substation, while other switchgear manufacturers supplied equipment for the other two.

Silicon Valley Power then began planning a fourth distribution substation. The three bank, 12 kV, 3000 amp, 150 MVA facility, which is approximately 171 feet long containing 56 cubicles, is 50 percent larger than the other substations. Based on its experience with the earlier substations, the electrical utility assessed switchgear manufacturers' proposals as well as their past performance. They also assessed engaging in a complex project which deals with the potential for delays from any direction outside their control. The OPC manufactured substation met delivery and start up deadlines as well as quality expectations. As a result of past performance, quality of the equipment, ability to meet stringent schedule deadlines, and competitive pricing, Eaton's OPC was awarded the fourth substation project.

Challenge

The new substation will serve an area that has the potential to be 20 percent of Silicon Valley Power's utility load and includes a family recreational facility, a large sports entertainment complex, multiple data centers, and an educational facility. Since the new substation will serve many power sensitive customers, reliability is critical in addition to meeting customers' expanding needs. The strict project schedule timeline posed an added factor to the uniqueness of the project.

Given the substation's large size and technological sophistication, as well the non-standard shaped property where it is located, its design required innovative thinking and the development of a creative layout that would optimize the use of the available real estate, while at the same time meeting code requirements.

To ensure safety, the substation had to be designed to maintain minimum clearances from the edge of the property and maintain minimum clearances between pieces of equipment within the property, both of which consume real estate. In addition, complying with California's environmental and landscaping regulations also required additional space, which reduced the footprint available for the substation.

Solution

Silicon Valley Power determined that a main and auxiliary bus configuration would provide the flexibility needed for operational clearances and reduce construction fabrication and maintenance costs. Eaton's OPC used a unique bussing arrangement to meet spacing requirements. The 3000 Amp main bus and 2000 Amp auxiliary bus accommodates the utility's redundancy requirement. With this configuration, if a breaker needs to be taken out of service for any reason, power can be supplied to those feeders from another bus.

The new substation has an arc flash system that monitors cable and bus faults inside the switchgear. In the event that a fault occurs, this system shuts the affected bus/breaker down and minimizes damage to

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neighboring equipment. Since only the affected bus/breaker is shut down, this enables the substation to continue to supply power to the rest of customers on the system. Additionally, with the redundant bus system, failures can be fed from other buses to keep the "lights on".

Silicon Valley Power's Acting Electrical Engineering Division Manager Kevin Keating explains, "Our design and operating practices are what drives the substation's reliability and redundancy. OPC personnel applied those to their construction methods and used their expertise to make the switchgear as reliable and solid as possible to meet expectations for a highly reliable power infrastructure.

"The OPC team did its homework in talking with us and in learning what our issues, needs, and concerns were for a variety of factors including operations, maintenance and design criteria. They did many things to maximize their capabilities to meet our requirements and to optimize our usage of their equipment."

Given the massive number of electronic devices in the switchgear substation, the emergency back-up battery requirements grew larger and larger. As the OPC worked with Silicon Valley Power to determine switchgear and protection configuration options, it saw that system emergency back-up loads were extensive. The system had to support 56 switchgear sections as well as 11 dual relay panels.

Although the first battery rack considered for the project was a two tier, two stepped rack, the OPC developed an alternative vertically stacked battery rack configuration. The vertical stacked design would reduce construction costs since it uses less steel and also reduce the batteries' space requirements. Implementation of the vertical rack allowed the batteries to be placed in a better location in the battery room for maximum worker safety.

In rough terms, using the alternate vertically stacked battery rack saved the Silicon Valley Power about 2.5 percent additional cost for the control building, and more for site costs as the substation has very limited space. Using two racks of batteries set back to back in the middle of the control room floor optimizes floor space and improves the ability of workers to manage and maintain the battery system.

Because of the substation's site plan, the control/battery building had to be separated from the switchgear building. To accomplish connections between these two buildings, the control wiring was terminated in two cubicles that the OPC designed using unistrut. These were used for mounting the terminal boards used for these interconnects. These unistruts were also used to mount the security system panels and the fiber optic patch panels.

Another design challenge was the large cabling for the three Control Power Transformers (CPT's) that needed to connect between the switchgear building and the control building for distribution therein. The OPC collaborated with Silicon Valley Power and its consulting engineers and the decision was made to add three small cable riser cabinets to the side of the switchgear building where the cables from the CPT's could be landed and connected by electricians via underground cabling to the control building. This will result in significant savings in site labor in that these conduits would not have to run into the switchgear building foundation and could be run after the building arrives on site.

Although capacitor-rated breakers were specified and supplied on the first OPC built substation, Eaton recently released the new VCP-W medium voltage vacuum circuit breakers, which have an intrinsic capacitive current switching capability. While Silicon Valley Power had specified the capacitor-rated breakers for the new substation, OPC explained the new breaker characteristics and ratings. It demonstrated that this solution provided the performance required at a lower cost than the specialty capacitor-rated breaker. As a result, Silicon Valley Power saved approximately $60,000 while simultaneously improving quality and performance.

Results

Keating notes, "When we began our upgrade and new substation construction program, we recognized that we had an opportunity to proactively incorporate many new technologies related to personnel safety, equipment upgrades, and new technologies.

"The experience we had with the building of our first three new substations gave us dramatic insight into the critical importance of working with a supplier who offered a high quality product, since that is a key to minimizing contractor, consultant, and SVP's time to complete substation commissioning on schedule. It also demonstrated the importance of working with a supplier as a genuine partner to meet our specific requirements cost effectively. Eaton's Omaha Power Center has a strong reputation in the utility market place because of the quality of its switchgear, manufacturing processes, and understanding of the needs of utilities.

"If there is a power outage, it dramatically affects the utility's customers. Although a utility incurs a cost when locating the problem, performing restoration work, and getting customers back in service within a couple of hours, it has also lost those hours of energy sales. All of those costs can be easily quantified. However, the cost to the customer cannot be so easily quantified. Depending on the nature of the customer's business, it can mean lost production of product, R&D time, and significant clean up efforts before production can resume.

"When a utility invests in equipment, it is a multi-million dollar expenditure that is expected to last for 30 to 50 years. We have to be sure that the equipment is robust and reliable and that the manufacturer will support us throughout the lifetime of the equipment. We cannot afford the risk of less than superior quality products because our customers are relying on our ability to provide consistent and reliable power."

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