

2008 IEEE PES Substations Committee Annual Meeting
TECHNICAL TOUR #1
-Monday April 7, 2008-

**PG&E's Martin Substation – 230 kV Switchable Reactor and
MPAC building (integrated control house)**

4:00PM – 6:30PM



PG&E's Martin Substation is situated just south of San Francisco and acts as the main transmission supply to the City. To bolster long-term power reliability, a new 230 kV underground line was installed in 2006, requiring expansion of the 230 kV Breaker-and-a-Half (BAAH) bus and a second 230/115 kV 420 MVA transformer.

In addition to the shunt reactance requirement to balance the underground cable capacitance, series reactors were also employed to balance the parallel 230 kV sources into Martin. More so, because of the variable local peak generation scenarios and need to effectively limit line loading, these series reactors were designed with onload tap switching capability using 3-pole circuit switchers.

At the same time, all the 230 kV relays and controls were replaced with PG&E's latest integrated relay schemes in a new modular control house (MPAC) near the 230 kV bus. PG&E is currently engaged in a 10-year strategy to replace existing, outdated relays controls and buildings across its transmission system with MPAC buildings.

Coincidentally the 115 kV bus is currently being replaced and converted into a new BAAH scheme, also with new MPAC buildings. And the distribution feeder breakers and 12 kV bus are being replaced with new outdoor, metal-enclosed switchgear.

For safety, please wear the proper attire when entering an electrical substation:

- Over-the-ankle **boots** (this can be a trail shoe with a slip-resistant sole)
- Long sleeved **natural fiber** shirts and pants (i.e. cotton or wool)
- Eyeglasses or sunglasses

Hard hats and safety goggles will be provided

2008 IEEE PES Substations Committee Annual Meeting
TECHNICAL TOUR #2
-Tuesday April 8, 2008-

Solar Panels – US Postal Service Center

6:00PM – 8:00PM

Clean Energy Project

U.S. Postal Service Mail Processing Facilities
San Francisco, California



U.S. Postal Service San Francisco
Processing & Distribution Center

Overview

As part of the United States Postal Service's national program to optimize efficiency and conserve natural resources, Chevron Energy Solutions completed major energy efficiency upgrades and a unique hybrid alternative power plant – combining two solar photovoltaic (PV) technologies and hydrogen fuel cell generation – at the Postal Service's largest processing and distribution facilities in San Francisco.

Together the two mail facilities – the San Francisco Processing & Distribution Center (P&DC) and Embarcadero Postal Center (EPC) – comprise 1.2 million square feet, employ about 3,000 people and process 7.5 million pieces of mail

daily. Both facilities operate 24 hours a day, 365 days a year.

Implementation

Chevron Energy Solutions developed, engineered and constructed numerous energy efficiency measures, including new energy management and compressed air systems, lighting retrofits and comprehensive heating, ventilation and air conditioning system upgrades.

At the P&DC, a 680,000-square-foot facility, Chevron Energy Solutions also installed high-efficiency natural gas cooking equipment in the cafeteria, and a new hybrid solar/fuel cell power plant comprised of a 250-kilowatt high-temperature hydrogen fuel

cell; a 185-kilowatt solar PV sun-tracking system mounted on a parking canopy; and a 100-kilowatt roof-mounted solar PV system composed of flexible, amorphous-silicon panels.

Benefits

The improvements at both facilities will lower total annual electricity purchases by \$1.2 million or 10 million kilowatt-hours – a 46% reduction. In addition, the energy efficiency upgrades will reduce the P&DC's and EPC's heating needs by 69% and 28%, respectively.

The \$15 million cost of the project was wholly funded by energy savings, contributions from the Postal Service's CFC refrigerant replacement program, and nearly \$2.6 million in grants and incentives from the State of California and the U.S. Department of Defense Climate Change Fuel Cell Program.

The San Francisco project is part of a larger Postal Service contract with Chevron Energy Solutions to install energy efficiency improvements at mail facilities throughout Northern California – improvements that will save the Postal Service more than \$2 million per year in energy costs.



The solar photovoltaic system at the San Francisco P&DC is mounted on a parking canopy that tracks the movement of the sun.