



Power Engineering Professional Services Case Study – Mojave Solar

Client Profile:

The Mojave Solar plant is a 280MW utility-scale solar thermal electric plant located about 100 miles northeast of Los Angeles, near Barstow, CA. The plant is owned by Atlantica Yield, and is operated by Abengoa, and international sustainable power developer, with offices in the U.S. The financing for this plant was facilitated by a \$1.2B loan guarantee from the U.S. Department of Energy. The plant became operational in December 2014, and the output is sold to Pacific Gas & Electric (PG&E) through a 25-year Power Purchase Agreement (PPA).

Solar thermal electric technology uses mirrors to concentrate solar energy to drive a conventional steam turbine. Mojave uses a new parabolic trough technology that is more efficient and cost effective. Two twin, independently operable 140MW solar fields cover about two square miles with 2,200 mirrored parabolic trough collectors and 1.5M square meters of reflective area. Collectors concentrate the sun's energy onto receiver tubes which deliver the heat to the central power plant via a heat transfer fluid. Electricity is then generated with two conventional 140MW steam turbines. The sun provides 100% of the power for this plant, but there are a few small natural gas/diesel generators on-site for emergency and fire protection purposes.



Safety First

Scope of Work:

Power Analytics has been the primary electrical engineering consultant for the Abengoa Mojave Solar plant since March 2014. Our team has completed multiple discrete power engineering projects for this plant, including in-depth safety assessments during its construction, commissioning, and daily operations. Our services, which continue today, include:

- Modeling the power system, using our Paladin® DesignBase™ software suite;
- Performing simulations and studies, including power flow, protective relay coordination studies (including coordination improvement of prior vendor studies), device settings' review and improvement, short circuit analysis, and arc flash analysis of both the plant systems and the solar field equipment; and,
- Updating electrical one-line diagrams, schematics, and management dashboards and reports.

Future Mission Critical Challenge:

Ensure the moment-by-moment safety of the employees, the equipment, and the facility, by providing real-time power flow, short circuit, and arc flash monitoring and analysis capability.

Raleigh, NC Houston, TX

Nationwide Toll-Free 844-367-2572 www.poweranalytics.com

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Power Analytics Case Study – Mojave Solar Safety First - Made Easy with Paladin® Software



Process, Analysis, and Solution:

Power Analytics will soon install its patented, Paladin® Real-Time Arc Flash™ (RTAF) software at the Mojave Solar plant to enable workers to make up-to-the minute assessments of safety threats as they emerge. RTAF maintains an uninterrupted, 360-degree view of the facility and its potential arc flash hazards, continually checking all components, equipment, and systems. RTAF provides detailed, updated advisories for site personnel regarding the appropriate safety procedures and protective gear recommended to work in a given vicinity, and it makes recommendations about where potential arc flash hazards could emerge and the potential severity of those hazards. RTAF is based upon IEEE 1584 and NFPA 70E standards, and is the only such software of its kind.

By creating a power model of the entire power system, using our Paladin DesignBase software, Power Analytics can run power flow studies in real time and provide an analysis of the system's active power, reactive power, magnitude and phase angle of voltages/currents of all equipment, and total system losses. And, by running simulated, "blackboard" contingency analysis against the power model, site workers can evaluate the system's ability to withstand potential cascading component failures and take preventive and corrective actions.

The reliability and safety of the power system also depends on an accurate and thorough knowledge of possible short-circuit fault currents, and on the ability of protective devices to satisfactorily interrupt these currents. Short circuit analysis is required to ensure that existing and new equipment ratings are adequate to withstand the short circuit energy available at each point in the electric system. Short circuit analysis helps ensure that personnel and equipment are protected by establishing the proper interruptible ratings of the protective devices. Short circuit calculations must be maintained and periodically updated to protect the workers, the equipment, and the facility's ability to meet its long-term PPA obligations without financial penalty.

Value Provided:

The Power Analytics professional engineers, and our patented power safety software, enabled the owners of the Mojave Solar plant to meet all the safety specifications of the California Bureau Veritas during plant construction, and all necessary approvals of the California PUC when this facility was being commissioned. Today, Power Analytics continues to serve the site personnel and owners of the Mojave Solar plant through services and software that allow this plant to operate safely, efficiently, and profitably, while providing reliable, renewable power to PG&E.

**For more information or to request a demonstration, contact
Sales, Power Analytics**

sales@poweranalytics.com (919) 882-0300