



Department of Energy

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FROM: DONG KIM, CHIEF ENGINEER  8/4/2010
TECHNICAL AND PROJECT MANAGEMENT DIVISION

SUBJECT: FIRST SOLAR (NEXT LIGHT) ANTELOPE VALLEY SOLAR RANCH ONE
TECHNICAL ELIGIBILITY RE-EVALUATION

The Loan Guarantee Program Office Origination Division requested a reevaluation of the Antelope Valley (AV) Solar Ranch Project eligibility under EPACT Section 1703(a) (2) because First Solar, Inc. acquired Next Light, LLC, on April 28, 2010, effectively acquiring the Next Light projects submitted under the 2009 Renewable Solicitation. Section 1703(a) (2) requires a project to "...employ new or significantly new technologies as compared to commercial technologies in service in the United States..." The amorphous silicon technology initially proposed for Agua Caliente and the crystalline silicon solar generating facility on single axis trackers for AV Solar Ranch would be replaced with First Solar cadmium telluride photovoltaic (PV) cells - an already commercially available product that would not meet the requirements of Section 1703(a) (2).

The Technical Division concluded in a memorandum dated June 1, 2010, that both projects were eligible under Section 1703 (a) (2). They found that the Agua Caliente project still proposed new and innovative components other than the First Solar cadmium telluride photovoltaic cells and that AV Solar Ranch One utilized similar features now proposed



within the Agua Caliente project. However, AV Solar Ranch differs enough from Agua Caliente as to warrant continuing forward with due diligence.

AV Solar Ranch will deploy three new technologies: a new inverter system technology referred to as "Fault Ride-Through Technology;" a new method of voltage regulation referred to as "Dynamic Voltage Regulation;" and the incorporation of 50MW of single axis tracking rarely used commercially with CdTe modules. Below is a description of each.

- Fault Ride-Through Technology ensures that the inverters stay on-line even through the intermittence of the sun. In a solar plant using standard inverters, when the grid varies outside of the window of expected operating conditions, the inverters are designed to shut down until grid power is restored to normal conditions. Typically, the inverter does not return to the grid for 5 minutes after the grid returns to the proper voltage and frequency window. The new inverter technology will improve the reliability of the electric power system by maintaining array and inverter operation during "transient" conditions when the grid is outside of the voltage and frequency tolerance range of the inverters. By doing so, the solar inverter "rides through" these momentary fault conditions rather than tripping off-line and then waiting for 5 minutes to re-synchronize to the grid when it returns to the proper voltage and frequency window. The new inverters detect fault conditions on the grid and react immediately allowing the control board to remain powered through the low voltage fault, thus keeping the plant on-line. This provides more reliable energy and increases predictability even during disturbances such as intermittent cloud cover. Solar inverters are currently in development by major equipment manufacturers such as GE, Siemens, and SMA and will be available for use by the Project in 2010. Agua Caliente will be the first and AV Solar Ranch will be the second solar project in the country to use this important new technology.
- Dynamic Voltage Regulation requires the use of new and innovative solar inverters coupled with a new and innovative supervisory control and data acquisition system (SCADA). Dynamic voltage regulation is an improvement over the traditional voltage regulation in solar projects. Traditionally, large solar projects are required only to provide a "static" form of voltage regulation, a requirement met through the installation of capacitor banks in the substation or switchyard. Voltage on the electric power system varies throughout the day due to activities such as faults, large loads coming on-line, and generators coming on-line. To maintain the highest level of reliability, the system operator must maintain voltage as consistent as possible to prevent large voltage swings when one or more of these situations occur. Dynamic voltage regulation, through the use of innovative solar inverter technology coupled with the SCADA system, provides a higher level of reliability to the electric power system.
- Single axis tracking technology allows the solar panels to track the sun throughout the day, thereby significantly increasing the amount of solar energy captured per unit surface area of the solar panels throughout the day. With the single axis

trackers, the solar panels will generate more electricity over the course of the day, generate significantly more power during peak hours (higher capacity factor), and increase project income by allowing First Solar to take advantage of Time-of-Day (TOD) rates under which the utilities pay higher prices for electricity delivered during peak hours. Utilities prefer to purchase power from solar plants with trackers because the solar plants have higher capacity factors and qualify for increased levels of Resource Adequacy with the California Independent System Operator. A preliminary cost/benefit analysis indicates a positive outcome in the investment in tracker technology. The total cost of adding trackers to 50 MW of the project (net of tax incentives) is estimated to be approximately \$18 million, which will generate an incremental 12% increase in electrical output. Based on the terms of the 25-year PPA, which includes a TOD factor, this will generate approximately an incremental \$60 million over 25 years, offset by an estimated \$4 million in maintenance costs, for a potential incremental benefit of \$38 million. The excellent solar resource at the site (>2000 kWh/m² GHI) contributes to make the AV Solar Ranch site optimal for the first large installation of thin film on trackers.

The Technical Division reviewed the two First Solar's Desert Sun and Project Topaz Projects submitted under the FIPP program. Technical eligibility reviews indicate that they use commercial technology and meet the 1705 (a) (1) eligibility requirements criteria. Neither is proposing to deploy the new technology systems that are being proposed for the Agua Caliente Project or the AV Solar Ranch Project.

Therefore, the Technical Division concluded that the AV Solar Ranch One is eligible under Section 1703 (a) (2) and should proceed to due diligence.