

The Green Paradox: Managing Your Solar Project to Avoid or Minimize Environmental Regulatory Roadblocks

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Ever since Thomas Edison famously declared his interest in using solar power to replace fossil energy use more than 70 years ago,¹ progress towards that goal has been slow, at least until very recently. Within the past five years, a series of state and federal legislative and regulatory initiatives has jumpstarted demand for large-scale solar power generation. However, solar projects aimed at alleviating environmental impacts can be hamstrung by the often unanticipated need to conduct water rights and air quality reviews. With a narrowing window to obtain currently authorized tax credits and an uneasiness among lenders leery of projects with associated risk, the potentially lengthy delay associated with this review may be fatal for solar projects. However, appropriate planning at the project development stage can ameliorate the risk of delay from these reviews.

A Primer on Solar Energy

2009 has seen an explosion of interest in solar and other renewable power generation in the U.S. This rush on sunshine, wind, and other renewable sources has been spurred by a host of state and federal regulatory initiatives. In February, Congress passed the American Recovery and Reinvestment Act (ARRA), which provided incentives for renewable energy investment.² In addition, several states have adopted generous subsidies for renewable energy investment and installation, as well as aggressive renewable portfolio standard (RPS) programs. The RPS programs are minimum requirements imposed on utilities for generating a specified proportion of energy from renewable energy sources. In some states, these requirements are driving a market for renewable energy credits, which can be used to meet the RPS requirements. With the potential for a federal RPS program in the new greenhouse gas legislation,³ the renewable energy market is poised to continue to expand exponentially over the next decade. Finally, the specter of costly regulation of greenhouse gas emissions looms large over the power generation industry.⁴

While photovoltaic and concentrated solar systems have been in existence for at least 30 years, it is only in the past decade that they have seen large-scale installation due to European efforts to increase renewable power generation to meet the goals of the Kyoto

Protocol. With American utilities now looking for greater renewable power, those installations have served as proof of concept for solar projects in the United States. Companies seeking to maximize their use of state and federal incentives—and to get a head start on meeting the RPS requirements and greenhouse gas targets—face tight timelines to secure the necessary Power Purchase Agreements (PPAs) and access agreements required to install renewable generation.

Solar power generation appears to be leading the charge in renewable energy projects for locations with greater access to sun than to wind or biomass. The sun provides hundreds of watts per square meter of electromagnetic energy, which can be converted to electric power without combusting fossil fuels, either through the use of solar cells or a steam turbine.⁵ The most widely known type of solar generation is photovoltaic cells—the dark colored silicon flat panels used in applications from calculators to satellites. There are a dizzying number of different types of photovoltaic cells, made using different technologies and production processes, and designed for different applications. Depending on the panel type and design, both costs and conversion efficiency (the proportion of solar energy converted to electricity) can vary substantially, with efficiency varying for thin film cells and concentrated solar power (CSP) units. Some units are also designed with tracking devices so the cells track the sun's movement throughout the day to maintain the greatest solar collection, while others utilize polished mirrors to focus sunlight on high-efficiency solar cells. These types of systems are typically utilized to provide energy to a single customer, also called distributed generation.

For large-scale power installations, the main alternative to solar cells is the use of solar thermal technology. Solar thermal plants generate power like a conventional power plant—by heating a heat transfer medium such as oil or water (or molten salt in certain demonstration projects). The heat is used to produce steam, which turns a turbine to generate electricity.⁶ Solar thermal generation has benefits and drawbacks compared to photovoltaic generation for large-scale projects. One of its greatest advantages is that the steam generated by the process may be integrated into the steam cycle at an existing steam electric generating facility, increasing the power generated at the plant with no associated increase in carbon emissions. A second advantage of certain proposed solar thermal systems is that the period of power generation may be extended for several hours after sundown by the use of a heat storage medium. One drawback is that these systems may require the use of an exterior heating source, such as a boiler, to preheat the system or to keep the heat transfer medium from freezing during cool desert nights. They may also require a simple cycle gas turbine to provide backup generation when the sun is unavailable

or for other reasons. This backup generation, often powered by natural gas, may trigger air quality permitting requirements.

Two Unexpected Obstacles: Air Pollution and Water Rights

Delays caused by unanticipated air quality permits and water quantity issues for solar projects are particularly problematic given the current regulatory and credit environments. In order to take advantage of tax incentives created by the ARRA and other programs, project developers face a tight timeline to develop and complete projects. To demonstrate the viability of a project to the lenders that will underwrite the project, the developer must enter into a PPA with one or more buyers of the renewable power. Those buyers in turn face their own pressures to identify potential renewable power sources, and may be loathe to enter into a PPA with a project locked in regulatory limbo. The uncertain timeframe required for environmental permit review or to obtain the necessary water rights could derail the construction timeline and potential cost of a proposed project. In short, these regulatory issues create uncertainty, and uncertainty can be fatal to solar energy deals.

Air Quality Concerns and Permitting Requirements

Given the common viewpoint that solar energy is "clean" energy, an obstacle not anticipated by many companies planning these types of projects is that emissions from the solar energy generating facility could trigger the requirement to obtain an air pollution control permit. While appearing somewhat nonsensical—*an emission control permit? for a solar plant?*—the review requirement is founded in long-standing air quality policy.

1. Air Permitting and Solar Projects

Under the Clean Air Act, existing facilities with more than *de minimis* emissions are required to obtain operating permits that specify the types of activities allowed at the facility and the types of emissions controls required.⁷ New facilities, and new projects at existing facilities that will have substantial emissions, are also required to obtain construction permits, the purpose of which is to evaluate project emissions and to ensure that a project will not significantly impact air quality.⁸ In areas where particulate matter emissions exceed air quality standards—such as portions of Arizona and California—regulations establish tight limits on any increase in particulate matter emissions.

As it turns out, the cooling towers associated with some concentrated solar plants and access roads at solar installations are both sources of particulate matter emissions. Like coal or nuclear power plants, some types of concentrated solar power systems must release

waste heat at the end of the steam cycle. This heat is released by either wet or dry cooling towers. Although dry cooling towers have no emissions, use of dry cooling can be more costly and can generate less power than facilities using wet cooling towers.⁹ Wet cooling towers use evaporation to transfer heat from the process to the air passing through the cooling tower.¹⁰ Through that transfer process, liquid water droplets may be entrained in exhaust released by the tower, which is known as "drift".¹¹ Regulatory agencies classify the particulate matter included in drift droplets as an emission. Photovoltaic cells do not use cooling towers, and do not directly cause any emissions. However, photovoltaic installations may require the construction of unpaved roads, which are recognized to be a source of particulate matter emissions from the rolling wheels and air turbulence of cars traveling over them.¹²

2. Managing Air Permitting Concerns

There are three major issues encountered at solar projects that may trigger air quality regulations. Those three issues are: (1) type of solar energy technology used, (2) connection of a solar energy project to an existing permitted facility; and (3) change in usage or operation of the existing permitted facility as a result of the project.

With respect to the type of solar energy technology used, care should be taken to understand the possible air quality implications of that technology. For example, as previously noted CSP projects may result in emissions from cooling tower drift, from the use of a boiler used to keep the heat transfer medium flowing during cool temperatures, or from installation of additional unpaved access roads at the facility. There may also be issues with the transfer medium (usually some type of oil) used in some CSP technologies, whereby the transfer medium loses its heat retention properties over time and must be bled off and replaced with new medium. For those systems utilizing oil, substances such as benzene can be generated which could trigger air quality review requirements. For some photovoltaic facilities, emissions may result if additional unpaved access roads need to be installed at the project.

The connection of a solar energy project to an existing permitted facility may also trigger air quality review, even if it would not trigger review for the solar project standing alone. Locating a solar generation facility adjacent to an existing fossil fuel power plant and highlighting common ownership and common control over the property and projects could delay actions at the solar generation facility as the regulatory agency might try to include the solar generation as part of the fossil fuel generating plant's permit. Thus, it is important to devise a mechanism to exclude the solar generation from the fossil fuel plant's permit.

Finally, changes in usage of the existing facility due to the project may trigger review. Such triggers of air quality permitting include describing the project as improving the efficiency or dispatch of existing fossil fired units, and describing the project as a "modification" of an existing facility, or as an expansion of the same. It is important to understand that there are implications for how a solar project is described, especially when adjacent to an existing facility.

As is the case with most regulatory programs, the best way to manage potential delay caused by air quality review is to evaluate the project design and project development documents for potential regulatory triggers, and to develop a strategy at the front end to address any questions about regulatory review. Given the large costs of delay and the small costs of an upfront evaluation, project developers are well advised to have their proposed project evaluated by knowledgeable and experienced air pollution control consultants and legal counsel to assess project air quality impacts, and to spot any items more easily changed at the planning stage than after commencement of construction. In addition, project documents and regulatory submissions should be scrutinized to determine whether they inadvertently include language potentially triggering air permitting requirements.

Water Rights Issues

In addition to unanticipated air quality concerns, many solar projects also face substantial concerns regarding the amount of water needed to keep the plants in operation. Although the amount of water required for solar power generation varies by technology, having access to adequate water and water rights is crucial to a viable solar energy project.

1. Solar Power and Water Usage

Some types of concentrated solar power stations consume water through the use of wet cooling towers, while photovoltaic cells must be cleaned periodically to maintain peak efficiency. Several large-scale CSP projects have faced substantial criticism regarding their water use. In 2007, Congress ordered the Department of Energy to prepare a report addressing ways to reduce water consumption by CSP facilities.¹³ More recently, as an example, objections were raised to a \$1 billion, 484 megawatt CSP facility proposed for construction in Nevada, based in part on the amount of water the plant reportedly would consume.¹⁴ Even photovoltaic projects have faced scrutiny regarding their potential water use requirements. It has been estimated that 6.8 million gallons of water will need to be trucked to the sites of two proposed photovoltaic generating facilities in Nevada for

purposes of cleaning the panels twice a year.¹⁵ Both projects are proposed for construction on federal lands managed by the Bureau of Land Management.

In short, water use can be a hidden trap when planning a large-scale solar energy project. Water availability, water rights, and impacts to water resources, which in the Southwest primarily involve impacts to groundwater resources regulated under State law, can be a significant and unanticipated obstacle to a proposed facility. Concerns about depletion or diversion of water resources can also lead to substantial, unanticipated opposition to "green" solar projects by the environmentalist community and neighboring landowners and water users.

2. Managing Water Rights Concerns

When using sun for energy, water use may not come to mind as a potential obstacle. The key is to be aware of these issues at the planning stages. When siting a project, water rights and availability, and the potential for opposition to a project based on water use, must be considered in the analysis of project viability. Projects on private land may be advantageous from the water use perspective because in many cases, private water rights are available and the use of groundwater for solar energy instead of agriculture can be characterized as having a net benefit in terms of water use (because solar energy facilities typically consume less water than commercial crops). However, it is critical to determine in accordance with State law whether adequate water supplies will be legally and physically available for the life of the project and to secure appropriate groundwater withdrawal authority before committing to project construction. Projects proposed for construction on federal land may not be able to take credit for a reduction in water consumption, and may require a more in-depth analysis of water rights and availability in order to justify a project, including investigations into potential adverse effects on water resources and dependent ecosystems as part of the federal review process. In addition, the choice of the type of solar generation technology and its water needs should be thoroughly assessed during the project planning stages. Care should be taken to understand why a particular technology is chosen, its water consumption, and whether it may ultimately be the best choice for the project at its intended location.

Conclusion

It is sometimes said in the power industry that given the uncertainties involved with untested projects or new designs, every company wants to be first to build the fifth plant. In light of the regulatory and technical obstacles to new projects, that sentiment is

understandable. However, the push to satisfy state RPS programs and the ticking clock for ARRA tax incentives means that in this case, a go-slow approach will not succeed. As a result, companies pioneering solar generation projects very well may have to address air permitting and water quantity questions head on. It is important to note that air and water issues are not the only impediments to solar energy projects. There may be many other obstacles, including land use issues, endangered species laws, transmission line siting and even historic preservation laws. Understanding these obstacles requires the proper knowledge and expertise to ensure the project comes to fruition successfully. With careful planning at the front end of a project, the risks of delay associated with such issues can be managed or minimized, and the promise of solar generation may finally be realized.

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¹ James Newton, *Uncommon Friends: Life with Thomas Edison, Henry Ford, Harvey Firestone, Alexis Carrel & Charles Lindbergh*, at 31 (1987).

² American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115.

³ American Clean Energy and Security Act of 2009, H.R.2454, 111th Cong. (as passed by the House on Jun. 26, 2009) [hereinafter H.R. 2454].

⁴ H.R.2454.

⁵ Report to Congress, U.S. Dept. of Energy, Concentrating Solar Power Commercial Application Study: Reducing Water Consumption Solar Power Electricity Generation (2007), available at http://www1.eere.energy.gov/solar/pdfs/csp_water_study.pdf.

⁶ *Id.*

⁷ Note that air quality regulations are jurisdiction-specific and vary from state to state.

⁸ 42 U.S.C. §§ 7475, 7503.

⁹ Robert Glennon, *Is Solar Power Dead in the Water?*, Washington Post, Jun. 7, 2009, <http://www.washingtonpost.com/wp-dyn/content/article/2009/06/05/AR2009060501988.html>.

¹⁰ Env'tl. Protection Agency, *Compilation of Air Pollutant Emission Factors AP-42, Vol. 1: Stationary Point and Area Sources*, § 13.4 Wet Cooling Towers (5th Ed. 1995), available at <http://www.epa.gov/ttn/chief/ap42/index.html>.

¹¹ *Id.*

¹² *Id.* at § 13.2.2 Unpaved Roads.

¹³ See Treasury and General Government Appropriations Act for Fiscal Year 2001, at § 515, Pub. L. 106-554, 114 Stat. 2763 (2000).

¹⁴ John G. Edwards, *About 70 attend solar meeting*, Las Vegas Review-Journal (Aug. 25, 2009), <http://www.lvrj.com/news/54703827.html>.

¹⁵ Stephanie Tavares, *Dirty Detail: Solar Plants Need Water*, Las Vegas Sun, Sept. 18, 2009, <http://www.lasvegassun.com/news/2009/sep/18/dirty-detail-solar-panels-need-water/>.