Utility-Scale Solar Power

Responsible Land Use

Overview

Harnessing the sun's energy and converting it to electricity offers one of the most technologically viable and cost-effective means to produce pollution-free, sustainable power. Generating electricity at the scale necessary to move the United States away from dirty fuels of the past requires long-term planning for efficient and responsible project development. Utility-scale solar projects are most cost-effective in the arid, sunny Southwest, where much of the land is public land managed by the federal government. Current utility-scale solar power technologies and related environmental policies ensure that land impact is minimized when these plants are sited.

Abundant Solar Resources

There is tremendous solar power generation potential in the United States. In five minutes, enough sunlight will shine upon the United States to satisfy America's energy demands for an entire month. The U.S. Southwest has particularly abundant and high quality resources for utility-scale solar power. After screening land for a variety of factors, including urban areas and lands deemed environmentally sensitive, the Department of Energy found nearly 7,000 gigawatts of solar generating capacity on 34 million acres of land in just seven states.[1]

Depending on the specific technology, a utility-scale solar power plant may require between 5 and 10 acres per MW of generating capacity.[2]

Like fossil fuel power plants, solar plant development requires some grading of land and clearing of vegetation. For example, many concentrating solar power (CSP) plants need to be constructed on flat land with less than 1 percent slope. [For more information, see the SEIA fact sheet on CSP Technologies.]

U.S. SOUTHWEST SOLAR CAPACITY (GIGAWATTS)	
Arizona	2,468
California	877
Colorado	272
Nevada	715
New Mexico	1,940
Texas	149
Utah	456
Total	**6,877**

Source: U.S. Department of Energy

Modular technologies, such as utility-scale photovoltaics (PV) and dish-engine systems, can utilize land with steeper slopes. Such technologies can be installed on relatively uneven land with up to 5 percent slope, minimizing the amount of land and vegetation that must be disturbed for installation.[3]

Energy and Land Use in Context

Utility-scale power plants powered by both renewables and fossil fuels require significant land for development. Coal-fired power plants, for example, require approximately 0.25 to 1 acre per megawatt (MW) of generating capacity.

But this does not include the land needed for the mining and extraction of fossil fuels. In 2008, the oil and gas industry had a total of 44.5 million acres of public lands under lease.[8]

Benefits of Utility-Scale Land Use

In order to operate most efficiently, and thus most cost-effectively, many USP plants require contiguous parcels of land. In 2005, the National Renewable Energy Laboratory released two reports illustrating how the land necessary for a utility-scale centralized power station lowers costs for consumers:

- Scaling up a parabolic trough plant from 88 MW to 220 MW significantly decreased the levelized cost of energy by more than 2 cents/kWh.[4]
- Building power plants next to each other (in this case a 4x250MW power park) resulted in an additional 10 to 12 percent reduction in the levelized cost of energy.[5]

For CSP plants, which are on the margin of cost competitiveness with conventional power, the combination of these two impacts (especially the former) can make or break a project.

Environmental Review

The estimated length of time required for an environmental review for a proposed utility-scale solar power plant on public land is approximately three to five years.[6] This time period can be less if the plant is located on private land. Siting a project on previously disturbed land can also reduce the review time.

Many areas ideal for utility-scale solar development are currently on public lands overseen by the Bureau of Land Management (BLM) within the U.S. Department of the Interior. Title V of the Federal Land Policy and Management Act (FLPMA) of 1976 authorizes the BLM to permit the development of solar and other energy projects, along with fossil fuels.

The BLM right-of-way (ROW) permits undergo a strict review process before being issued, as required by the National Environmental Policy Act of 1969. Companies provide detailed project construction plans, environmental impact assessments, and mitigation strategies.[7]

The BLM, in coordination with state and local authorities, conducts analyses of the site and holds public hearings with members of the community to gauge the impact of the project on the area. An official Environmental Impact Statement (EIS) is issued for each project before an official Record of Decision is announced.

Source: NREL

About the Solar Energy Industries Association

Established in 1974, SEIA is the national trade association of the solar energy industry. As the voice of the industry, SEIA works to make solar a mainstream and significant energy source by expanding markets, removing market barriers, strengthening the industry and educating the public on the benefits of solar energy.

For a footnoted version of this factsheet and more information, please visit www.seia.org.

[1] Wilkins, Frank (Tex). Concentrating Solar Power. February 2009. U.S. Department of Energy. Accessed online 27 July 2009. http://www1.eere.energy.gov/solar/review_meeting/pdfs/prm2009_wilkins_csp_overview.pdf

[2] Industry data.

[3] "Power to Deliver." Stirling Energy Systems, Inc. Accessed online 30 July 2009. http://www.stirlingenergy.com/advantages.htm

[4] "Analysis. Task 1: Preferred Plant Size." Nexant Parabolic Trough Solar Power Plant Systems. Subcontract report. July 2006. National Renewable Energy Laboratory. Accessed online 30 July 2009. http://www.nrel.gov/csp/troughnet/pdfs/40162.pdf

[5] "Task 3: Multiple Plants at a Common Location." Nexant Parabolic Trough Solar Power Plant Systems. Subcontract report. July 2006. Accessed online 30 July 2009. http://www.nrel.gov/csp/troughnet/pdfs/40164.pdf

[6] NEPA Environmental Impact Assessment (EIS) can take as much as 24-48 months to complete, in addition to up to 12 months for BLM application processing.

[7] See "Obtaining a Right-of-Way on Public Lands" (March 2009) and "Solar Energy Plan of Development" (July 2008). U.S. Bureau of Land Management. Accessed online 30 July 2009. http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/cost_recovery.Par.58417.File.dat/ObtainingaROWPamphlet.pdf; http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/cost_recovery.Par.96285.File.dat/Solar_POD.pdf

[8] BLM Public Lands Statistics 2008. May 2009. U.S. Department of the Interior. Accessed online 28 September 2009. http://www.blm.gov/public_land_statistics/pls08/tablecontents_08.pdf