

# Environmental Assessment of Utility-Scale Solar Energy Development

*Argonne's Environmental Sciences Division (EVS) is collaborating with the U.S. Bureau of Land Management and the Department of Energy in conducting a Solar Energy Development Programmatic Environmental Impact Statement to evaluate potential impacts associated with the development and implementation of agency-specific, utility-scale solar energy programs in six western states.*

## PROBLEM/OPPORTUNITY

The Energy Policy Act of 2005 (P.L. 109-58) requires that, within 10 years the U.S. Bureau of Land Management (BLM) should seek to have at least 10,000 megawatts of non-hydropower renewable energy electricity approved on public lands. The BLM and the Department of Energy (DOE) have jointly identified utility-scale solar energy development as a potentially critical component in meeting these mandates. These agencies have further determined that the establishment of specific agency-wide solar energy programs and related mitigation requirements constitute major Federal actions, as defined by the National Environmental Policy Act and, thus, they have decided to jointly prepare a Programmatic Environmental Impact Statement (PEIS). A PEIS evaluates the environmental impacts of broad agency actions, such as the development of programs.

The Solar Energy Development PEIS will focus on six western states (Arizona, California, Colorado, New Mexico, Nevada, and Utah) that have the greatest potential for solar energy development on federal lands.

## APPROACH

The specific agency-wide solar energy programs will consist of guidelines and mitigation requirements applicable, for DOE, to solar energy projects funded by DOE and, for BLM, to solar energy projects located on BLM-administered lands. As a part of the PEIS, the BLM proposes to amend its land use plans to accommodate its new program and identify lands where solar project applications will be accepted. Future site-specific environmental reviews are expected to be tiered to the PEIS and to be more effective and efficient because of the PEIS.

Currently, three alternatives are planned for consideration in the PEIS: Under a no-action alternative, the BLM would continue to accept and process applications under its 2007 policy, which requires EIS-level National Environmental Policy Act (NEPA) analysis for all applications and individual land use plan amendments. Required mitigation measures would be developed during the site-specific EIS process.

A maximum land alternative would allow application for development on all BLM lands in the six-state area that meet technological requirements (these are defined as lands with slope of 5% or less) and are not excluded, by statute, from development (for example, Wilderness Areas or Wild and Scenic Rivers). Impact assessment will be based, in part, on a reasonable foreseeable potential development scenario (RFPDS) for future deployment of utility-scale solar energy over a 20-year study period, and land use plans for the available lands would be amended to accommodate the new solar energy program.

Under a limited land alternative, lands with specific environmental sensitivity (for example, critical habitats and areas of critical environmental concern) would be excluded from application for development, and fewer land use plans would be amended.



*Utility-Scale Solar Energy Technologies*

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## RESULTS

The two basic technologies that have been selected for evaluation in the Solar Energy PEIS are concentrating solar power (CSP) technologies and photovoltaic (PV) technologies. CSP technologies convert the light energy in sunlight to heat energy. The heat energy is then used to perform work, for example, heating water. Utility-scale CSP technologies use mirrors to concentrate the sun's rays to heat fluids or solids, and the heat is used to drive steam turbines or other devices to generate power. PV technologies convert the sun's radiant energy directly to electricity by using solar panels. Some of the CSP technologies offer the potential to store the energy in the working fluid until demand from the grid calls for conversion to electrical energy. The PV technologies do not have the capacity for direct storage. For newly constructed solar energy power plants, new or upgraded high-voltage transmission lines and associated facilities may be required. The range of environmental impacts associated with construction, operation, and decommissioning of these transmission lines and facilities will also be evaluated in the PEIS.

A number of environmental factors have been identified for consideration in the Solar Energy PEIS. For example, solar power plants can reduce the environmental impacts associated with combustion in fossil fuel power generation such as greenhouse gases and other air pollution emissions. However, concerns have been raised over several types of environmental impacts that could be associated with solar energy development, such as land disturbance, visual impacts, and the use of water in some solar systems. For example, all utility-scale solar energy facilities

require relatively large areas for solar radiation collection when used to generate electricity at a commercial scale. The large arrays of solar collectors may interfere with natural sunlight, rainfall, and drainage, which could have a variety of effects on plants and animals. Also, because they are generally large facilities with numerous highly geometric and sometimes highly reflective surfaces, solar energy facilities may create visual impacts. Parabolic trough and central tower systems typically use conventional steam plants to generate electricity; these plants commonly consume water for cooling. In arid settings, the increased water demand could strain available water resources. These environmental considerations, as well as impacts to wildlife, wildlife habitat, cultural resources, socioeconomics, and other areas will be addressed in the PEIS. Measures that potentially can be implemented to avoid or mitigate impacts will also be identified.

## FUTURE

The DOE and BLM anticipate releasing the Draft Solar Energy PEIS in the summer of 2009. Public comments will be accepted during a formal comment period. Argonne will support development of a Final Solar Energy PEIS, working with the agencies to incorporate public comments, as appropriate. A Final Solar Energy PEIS is anticipated in the summer of 2010, with records of decision to follow.

## REFERENCES

<sup>1</sup> Solar Energy Development PEIS Information Center, <http://solareis.anl.gov/index.cfm>.