7 ANALYSIS OF DOE'S ALTERNATIVES

Through this programmatic environmental impact statement (PEIS), the U.S. Department of Energy (DOE) is evaluating two alternatives: a proposed action (action alternative) and a no action alternative (see Section 2.3).

Under the proposed action (action alternative), DOE would develop programmatic guidance to further integrate environmental considerations into its analysis and selection of solar projects that it will support. DOE would use the information about environmental impacts provided in this PEIS to appropriately amend its programmatic approaches to facilitate the advancement of solar energy development. This proposed action has been developed to support DOE in meeting the mandates discussed in Section 1.1.1 that provide the purpose and need for agency action. Specifically, these mandates are established by Executive Order 13212, "Actions to Expedite Energy-Related Projects" (*Federal Register,* Volume 66, page 28357, May 22, 2001); Executive Order 13514, "Federal Leadership in Environmental, Energy, and Economic Performance" (*Federal Register,* Volume 74, page 52117, Oct. 5, 2009); and Section 603 of the Energy Independence and Security Act of 2007 (EISA) (Public Law 109-58). Collectively, these mandates require DOE to promote, expedite, and advance the production and transmission of environmentally sound energy resources, including renewable energy resources and solar energy and, in particular, cost-competitive solar energy systems at the utility scale.

Under the no action alternative, DOE would continue to conduct environmental reviews of DOE-funded solar projects on a case-by-case basis. It would not develop programmatic guidance, with explicit environmental practices and mitigation recommendations to apply to DOE-funded solar projects.

This chapter presents an analysis of DOE's two alternatives in terms of their effectiveness in meeting the mandates established for the agency. Specifically, the alternatives are analyzed in terms of their potential to affect the pace and cost of solar energy development, environment, and socioeconomic setting.

Sections 7.1 and 7.2 present the analysis of the two alternatives. Section 7.3 discusses the cumulative impacts of the alternatives. Section 7.4 discusses the other NEPA considerations related to the proposed action, including unavoidable adverse impacts, short-term uses of the environment and long-term productivity, irreversible and irretrievable commitment of resources, and mitigation of adverse impacts.

7.1 IMPACTS OF DOE'S PROPOSED ACTION

Under DOE's proposed action, the department would develop guidance to amend its programmatic approaches, as appropriate, to facilitate the advancement of solar energy development. Investment and deployment strategies would incorporate guidance with recommended environmental practices and mitigation measures into the decision-making process; the guidance would be based on information concerning environmental impacts and potentially applicable mitigation measures provided in this PEIS. With this guidance, DOE would have the tools for making more informed, environmentally sound decisions on projects.

One advantage of the guidance would be to better enable DOE to comprehensively determine where to make technology and resource investments to minimize the environmental impacts of solar technologies. For example, the guidance would promote investments in projects that address water requirements and total land disturbance of specific technologies. Over time, such investments could result in the development of commercially deployable technologies with reduced environmental impacts. Projects using such technologies might be more quickly approved by regulatory agencies, as well as more acceptable to stakeholders.

A second element of the guidance would enable DOE to establish environmental mitigation recommendations to be considered by project proponents seeking financial assistance from DOE. These recommendations, which would be based upon the analysis of impacts of solar energy development and potentially applicable mitigation measures presented in Chapter 5 of this PEIS, would help DOE ensure that environmental impacts of DOE-funded solar projects would be avoided, minimized, or mitigated. In addition, promoting the application, as appropriate to DOE projects, of a comprehensive set of mitigation measures consistent with the mitigation requirements that the BLM proposes to establish through its new Solar Energy Program (see Section 2.2.2) would likely streamline project-specific environmental impact analyses and bring consistency to the application of mitigation measures to DOE-supported projects.

Collectively, streamlined environmental reviews, quicker project approval processes, and reduced opposition to solar energy development would likely increase the pace of such development and reduce the costs to industry, regulatory agencies, and stakeholders. These outcomes would support the mandates of Executive Orders 13212 and13514 and Section 603 of the Energy Independence and Security Act of 2007 (EISA).

Increasing the pace of solar energy development would, in turn, translate into other benefits. As discussed in Section 5.11.4, utility-scale solar energy development would result in reduced emissions of greenhouse gases (GHGs) and combustion-related pollutants, if the development offsets electricity generation by new fossil fuel power plants. If the pace of solar energy development is faster as a result of DOE's proposed action, the potential beneficial impacts of reduced GHG emissions would be realized at a faster rate.

As discussed in Section 5.17.2, utility-scale solar energy development would result in local and regional economic benefits in terms of both jobs and income created. The associated transmission system development and related road construction would also translate into new jobs and income. These benefits would occur as both direct impacts, resulting from the wages and salaries, procurement of goods and services, and collection of state sales and income taxes, and indirect impacts, resulting from new jobs, income, expenditures, and tax revenues subsequently created as the direct impacts circulate through the economy. Increasing the pace of solar energy development would cause these economic benefits to be realized at a faster pace as well.

As discussed in Section 5.17.1.1, there may be some adverse socioeconomic impacts resulting from changes in recreation, property values, and environmental amenities (e.g., environmental quality, rural community values, or cultural values), and disruption potentially associated with solar development. There could also be beneficial socioeconomic impacts in these areas resulting from economic growth and a positive reception to the presence of a renewable energy industry. At the programmatic level, it is difficult to quantify these impacts. Increasing the pace of solar energy development would also speed up the pace of these types of socioeconomic changes.

In summary, the guidance that DOE would develop under its proposed action would be used specifically to promote the reduction of environmental impacts of solar energy development and to streamline environmental reviews for DOE-funded projects. As a result, the pace of solar energy development could increase and the associated costs could decrease. More rapid penetration of utility-scale solar energy development would likely result in quicker decreases in GHG emissions and combustion-related pollutants and quicker realization of economic benefits at both the regional and local levels.

7.2 IMPACTS OF THE NO ACTION ALTERNATIVE

Under the no action alternative, DOE would continue its existing case-by-case process for addressing environmental concerns for DOE-supported solar projects. It would not develop programmatic environmental guidance to apply to DOE-funded solar projects. As a result, DOE would not undertake any specific efforts to programmatically promote (i.e., programmatic environmental guidance) the reduction of environmental impacts of solar energy development or streamline environmental reviews for DOE-funded projects. Such achievements, and the potential benefits in terms of increased pace of solar energy development and decreased associated costs, might occur under the no action alternative, but they would not be explicitly promoted by DOE (by issuance of programmatic environmental guidance with recommended environmental practices and mitigation measures).

7.3 CUMULATIVE IMPACTS

As discussed in Section 6.5, the purpose of this cumulative impact assessment is to determine how the environmental, social, and economic conditions within the six-state study area may be incrementally affected by DOE's alternatives over the next 20 years. The Council on Environmental Quality (CEQ), in its regulations implementing the procedural provisions of the National Environmental Policy Act of 1969 (NEPA; 40 CFR 1500-1508), defines cumulative effects as follows:

> "... the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7).

Typically, the "incremental impact of the action" is characterized in terms of a specific, quantifiable set of activities. In a programmatic impact analysis, this type of characterization might be based on a projected amount of development expected to occur as a result of the proposed action. DOE and the BLM developed a reasonably foreseeable development scenario (RFDS) for solar energy development in the six-state study area over the next 20 years (see Section 2.4), which projects the amount of solar energy in megawatts that might be developed in each state by about 2030. The RFDS analysis also estimates how many acres of land might be required to support the projected development. The projected levels of development and estimated acres developed are presented in Table 2.4-1. Across the six-state study area, the RFDS projects between about 6,000 to 32,000 MW of solar energy capacity would be developed over the next 20 years on BLM-administered lands as well as other federal, state, Tribal, or private lands. On the basis of the highest projection, assuming 9 acres/megawatt, this amount of development could require approximately 285,500 acres (1,155 km^2) of land.

Although DOE certainly has an influence over the amount of solar energy development that occurs in the United States and it has designed its proposed action specifically to shape some aspects of its influence, it is not possible to calculate how much of the projected RFDS development and associated land use would be directly attributable to DOE's proposed action. Conversely, because the BLM is evaluating a new Solar Energy Program that would determine how it manages such development on BLM-administered lands, including the identification of lands that would be excluded from and lands that would be available for development, the RFDS identifies which portion of the projected development might occur on BLM-administered lands over the next 20 years. It is assumed that this development would be facilitated in large measure by the BLM's new program, and therefore the development is considered to be a result of the BLM's proposed action. Of the total 32,000 MW of solar capacity projected by the RFDS, 75%, or approximately 24,000 MW, is assumed to be developed on BLM-administered lands; this equates to about 214,000 acres (866 km^2) of land.

The cumulative impact analysis of BLM's alternatives, presented in Section 6.4, evaluates the full amount of development projected by the RFDS. It defines the "incremental impact" of the agency's action as that portion of the RFDS projected on BLM-administered lands (i.e., 24,000 MW of solar energy capacity and 214,000 acres [866 km^2]), and the rest of the RFDS projected development as the "reasonably foreseeable" solar energy development resulting from the actions of others. Consequently, the full RFDS projected level of development is considered in the cumulative impact analysis of BLM's alternatives.

In all likelihood, only a small percentage of utility-scale solar energy development projected in the RFDS would be directly attributable to DOE's proposed action. While the cumulative impact analysis presented in Section 6.4 is not representative of what would occur as a result of DOE's proposed action, it does present an upper bound description of potential cumulative impacts related to solar energy development in the six-state study area. Consequently, a separate cumulative impact analysis has not been prepared for DOE's alternatives.

7.4 OTHER NEPA CONSIDERATIONS

7.4.1 Unavoidable Adverse Impacts

Utility-scale solar development would result in some unavoidable adverse impacts, as follows:

- Short-term air quality impacts due to dust generated during site preparation and construction, and noise impacts due to use of heavy construction equipment;

- Short-term influx of workers and transportation related impacts (e.g., increased traffic) during the construction phase;

- Long-term loss of grazing allotments;

- Long-term reduction in available water supply (relatively insignificant for photovoltaic [PV] facilities);

- Long-term loss of soil, vegetation, and habitat for wildlife (including sensitive species) and, potentially irreversible impacts on biological soil crusts;

- Long-term impacts on some species, both at the population level and to individual organisms;

- Long-term visual impacts on residents of communities near solar facilities, users of roads passing near solar facilities, and patrons of specially designated areas within the viewshed of solar facilities; and

- Long-term noise impacts for solar dish engine facilities and trough or power tower facilities employing thermal energy storage.

The magnitude of these adverse impacts would to some degree depend on a specific project and would be decreased through mitigation, although the extent to which this is possible cannot be assessed except at the project level, and it is possible that these impacts could not be avoided completely.

7.4.2 Short-Term Use of the Environment and Long-Term Productivity

For this assessment, short-term uses are defined as those occurring over a 2- to 3-year period, generally applicable to the site characterization/preparation and construction phases. Long-term uses and productivity are those occurring throughout the 20-year time frame considered in this PEIS.

Although land disturbance within the footprint of solar energy generation facilities would be long-term, additional areas affected during the construction of the generation facilities and related infrastructure (e.g., roads, transmission lines, and natural gas or water pipelines) would result in relatively short-term disturbance. Land clearing and grading and construction and operation activities would disturb surface soils and wildlife and their habitats, and affect local air and water quality, visual resources, and noise levels within and around the solar facility areas and on additional lands used for project-related infrastructure. Short-term influxes of construction workers would affect the local socioeconomic setting.

The lands used for solar facilities long term would produce electricity generated from a renewable source and would result in reduced emissions of GHGs and combustion-related pollutants, assuming the solar facilities offset electricity generated by fossil fuel power plants. These facilities would generate stable jobs and income for nearby communities (although at a lower rate than during the short-term construction phase), sales and income tax revenues, and income for the Federal Government in the form of ROW rental revenues over the life of the projects.

7.4.3 Irreversible and Irretrievable Commitment of Resources

Solar energy development would result in the consumption of sands, gravels, and other geologic resources, as well as fuel, structural steel, and other materials, some of them special-use materials (i.e., metals used in PV solar cells). At decommissioning, some of these materials would be available for reuse.

Water resources would be consumed during the construction phase and during operations, with the extent of water use varying by technology selected; this would be an irreversible and irretrievable loss.

For most plant and animal species, population-level effects would be unlikely, based on the assumption that mitigation measures would be implemented; however, population-level effects are possible for some species. Additionally, during construction, operation, and decommissioning, individual plants and animals would be affected. Site-specific and species-specific analyses conducted at the project level for all project phases would help ensure that the potential for such impacts would be minimized to the fullest extent possible. There would be long-term reductions in habitat due to fencing of large areas during the operational period; this impact would be partially mitigated through siting in locations that do not contain critical habitat. Additional mitigation measures (e.g., conducting long-term monitoring and related additional mitigation) would reduce the impacts over time, if implemented. However, it is unknown whether irreversible and irretrievable impacts on species would occur.

Biological soil crusts are fragile and damage to them could constitute an irreversible and irretrievable impact. When removed, the underlying soils may be subject to increased erosion by both wind and water. Mitigation measures that minimize the amount of land disturbance could be applied to reduce the impacts on these resources.

Cultural and paleontological resources are nonrenewable. Impacts on these resources would constitute an irreversible and irretrievable commitment; however, implementation of appropriate mitigation measures would minimize the potential for these impacts to the extent possible.

Impacts on visual resources in specific locations could constitute an irreversible and irretrievable commitment. Implementation of appropriate mitigation measures would minimize the potential for these impacts to the extent possible; additional mitigation efforts would be undertaken at the project level with stakeholder input.

7.4.4 Mitigation of Adverse Effects

Under the proposed action, DOE would develop programmatic environmental guidance with recommended environmental best management practices and mitigation measures that could be applied to all DOE-funded solar projects. These recommended measures would likely be consistent with the mitigation requirements that would be adopted by the BLM under its action alternatives. BLM's proposed requirements are presented in Section A.2 of Appendix A. By recommending a comprehensive set of mitigation measures, the DOE would help ensure that impacts from solar energy development would be mitigated to the fullest extent possible. Any potential adverse impacts that could not be addressed by DOE's programmatic guidance would be addressed at the project level, where resolution of site-specific and species-specific concerns are more readily achievable.

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