

Thank you for your comment, Nada Culver.

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Solar Energy Development PEIS  
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Comment Submitted:

Please see attached document submitted on behalf of The Wilderness Society and numerous partner organizations. [See Attachment.](#)



## THE WILDERNESS SOCIETY

July 15, 2008

*Delivered via electronic mail and overnight mail (with attachments)*

Solar Energy PEIS Scoping  
Argonne National Laboratory  
9700 S. Cass Ave. - EVS/900  
Argonne, IL 60439

**Re: Scoping Comments on the Solar Energy Programmatic Environmental Impact Statement**

To Whom It May Concern:

Please accept and fully consider these scoping comments on behalf of The Wilderness Society and the other organizations identified below. The Wilderness Society's more than 300,000 members and supporters nationwide care deeply about the management of our public lands. Founded in 1935, our mission is to protect wilderness and inspire Americans to care for our wild places. We appreciate the opportunity to submit these comments to the Bureau of Land Management and Department of Energy on the Programmatic Environmental Impact Statement (PEIS) for agency-wide solar energy programs and policy. We are submitting these comments today via the website and also forwarding a copy with attachments to you separately.

At a time when the threat of global warming, air and water pollution, and dramatically escalating fuel prices stand to force Americans to entirely rethink how we obtain and consume energy, the Bureau of Land Management (BLM) and Department of Energy (DOE) now have the opportunity to play a critical role in cutting-edge, non-polluting and renewable energy development. The Solar Energy Programmatic Environmental Impact Statement (PEIS) provides an important part of that opportunity.

We support the agencies' commitment to develop the Solar Energy PEIS and urge you to take this opportunity to commit to responsible development of solar energy resources. The PEIS process should be carried out thoughtfully, rigorously, and with a sense of urgency needed to balance the current drive to develop oil and natural gas on our public lands. Oil and natural gas companies have been given the opportunity to lease and run roughshod over some of our most precious public lands throughout the West with minimal consideration for the ecological, recreational and cultural resources that exist there. This PEIS is a chance to plan for development that does not ignore the other important uses and values of these lands.

We support development of renewable energy resources, such as solar, because doing so promotes non-polluting, sustainable energy production that will benefit Americans and our public lands in the long term and encourages a move from a fossil fuels-based economy to a renewables-based economy. America's public lands include significant solar energy resources and have a role to play in supporting utility-scale solar power plants. However, we want to emphasize that more energy development is not a standalone solution to our nation's energy needs. Reducing our energy demands through energy efficiency, conservation, and demand-side management practices is a vital first step.

Moreover, as advocates for America's wild places, we believe that, in order to minimize the impact to our public lands, they should not be the first option for industrial levels of energy development, especially when private or state land is available. Further, there are places on our public lands that are wholly inappropriate for utility-scale solar energy development. Our most pristine lands, especially those with wilderness characteristics and those that possess vast cultural and diverse biological resources, should be off-limits to solar energy development.

The BLM and DOE must take a rigorous "look before you leap" approach to how they will facilitate utility-scale solar development, seriously considering the environmental, cultural, economic and ecological impacts of large-scale solar energy development before rights-of-way are approved or other funding provided. Solar energy production should be "green" in every way – harnessing a clean and renewable energy source on public land while very minimally impacting the land and the natural resources we hold dear.

The BLM already faces a backlog of more than 130 applications representing more than 70 gigawatts of solar potential. Over the last seven years, the BLM has processed no solar permits, but managed to process more than 35,000 oil applications for permit to drill for oil and natural gas projects. We understand the BLM's decision to continue processing permits and encourage the agency to do so in a way that prioritizes projects that are likely to come to fruition, by having secured project financing and power purchase agreements, as well as in locations that are not environmentally sensitive or highly controversial. The Wilderness Society's President, William H. Meadows, wrote a July 8, 2008 letter to the House Appropriations Committee encouraging funding for this overall approach (copy attached for your reference). Because the BLM will be amending land use plans and developing a PEIS that may be relied upon for permitting projects, the bulk of our comments address the manner in which the BLM should analyze impacts and develop its solar energy development program. We also discuss considerations that the DOE should incorporate into its project funding at the end of the comments.

This PEIS is the BLM and DOE's opportunity to do energy development right on our public lands – a chance to show that the ecological integrity of the public estate is at least as important as renewable energy production. We hope that these comments will be of assistance.

<b><u>Issues Addressed</u></b>	<b><u>Page</u></b>
I. Considerations for Siting of Energy Corridors	3
A. Areas to Avoid	3
B. Maximize Use of Impaired Lands and/or Existing Infrastructure	4
C. Additional Siting Considerations	5
II. Right-of-Way Terms and Conditions	5
III. BLM Proposed Planning Criteria	8
IV. Issues for Further Analysis	19
A. Protection of Lands with Wilderness Characteristics	19
B. Protection of Wildlife Habitat	19
C. Special Management Areas	21
D. Socioeconomic Impacts	22
E. Scope of NEPA analysis	32
F. Transmission	38
V. Department of Energy Solar Energy Program	39
A. Current DOE Solar Energy Program	
B. Issues to be Addressed in the PEIS	
C. Range of Alternatives	
List of Attachments	42
References	43

## **I. Considerations for Siting of Energy Corridors**

Development of utility-scale solar power generation facilities will transform the lands upon which they are located and preclude most other uses. As noted by the BLM, other uses of these sites “are unlikely due to the intensive use of the site for PV [photovoltaic] or CSP [concentrating solar power] facility equipment.” Instruction Memorandum (IM) No. 2007-097. An inappropriately sited and constructed solar energy facility has the potential to cause significant damage to the environment and to human health. **Accordingly, it is crucial that the BLM commit to avoiding sensitive areas, obtain necessary information on lands with wilderness characteristics and consider maximizing use of existing infrastructure (where appropriate) in siting solar facilities.**

### ***A. Areas to Avoid:***

We appreciate the BLM’s acknowledgment that certain places are not appropriate for large solar energy facilities and agree that categories of lands to be avoided should be included in the PEIS. Based on their important natural values and potential for damage from the construction, use and maintenance of solar facilities, we recommend that the PEIS include a commitment to not permit siting of utility-scale solar energy facilities in the following areas on BLM lands:

1. Wilderness Areas;
2. Wilderness Study Areas (WSAs);
3. National Monuments;
4. National Conservation Areas;
5. Other lands within BLM's National Landscape Conservation System (NLCS), such as Outstanding Natural Areas;
6. National Historic and National Scenic Trails;
7. National Wild, Scenic, and Recreational Rivers, study rivers and segments, and eligible rivers and segments;
8. Areas of Critical Environmental Concern (ACECs);
9. Threatened, endangered and sensitive species habitat, as well as critical cores and linkages for wildlife habitat;
10. Citizen-proposed wilderness areas; and
11. Other lands with wilderness characteristics.

This category should also include lands that are included in pending legislation for designation in one of the above categories or would otherwise include provisions that prohibit solar energy development. Further, while we believe it is of primary importance that no solar energy facility or transmission corridor be placed directly in or through any of the types of areas listed above, it is equally important that solar energy facilities not infringe on the recreational enjoyment of certain types of areas or otherwise interfere with their natural function or other special values.

***Recommendation:*** Solar energy facilities should not be sited in the categories of lands listed above and should not be sited immediately adjacent to these areas, if doing so would degrade the viewshed for scenic areas or negatively impact the ecological values for which these areas were designated.

***B. Maximize Use of Areas That Are Already Degraded, Existing Infrastructure and Load to be Served as Appropriate***

In addition to avoiding ecologically-sensitive lands, we recommend that the PEIS require that lands that are already impaired be considered first for proposed utility-scale solar development. Abandoned mines, developed oil and gas fields, and other brownfields, which are not being restored to ecological function, provide opportunities for solar energy development without loss of other uses and values. Such sites are often close to existing infrastructure, which is another important consideration, both in conjunction with degraded sites and as a separate factor. Proximity to existing infrastructure will minimize new road construction or major roadway improvements (such as paving and widening), avoiding another set of impacts on the public lands. Further, proximity to the load that will be served by the project will limit the amount of new transmission needed and reduce related income.

DOE has already emphasized the benefits of using brownfields for solar energy development in its "Brightfields" initiative, an attempt to revitalize heavily-impacted industrial areas by turning them into large-scale renewable energy generating areas. DOE has found that such use of brownfields contributes to urban renewal, allowing communities to take advantage of locally-

produced clean power, attracting “green” businesses to the area and allowing communities to offset their use of polluting energy sources.

**Recommendation:** The PEIS should specifically prioritize use of degraded lands that are not identified for restoration and sites with proximity to existing infrastructure and load to be served to avoid unnecessary impacts on public lands.

### ***C. Additional Siting Considerations***

The PEIS should also identify additional criteria to be considered in determining whether lands are appropriate for utility-scale energy development. The BLM should consider the availability of impaired lands on private or state land as alternatives to development on public land. In addition, the agency should consider:

- the availability of water at the site or, if water is not available on-site, other sources;
- likelihood that the project is ready to proceed - status of financing, power purchase agreements and regulatory permits;
- proximity to housing for workers – to determine additional infrastructure and use of roads that may be needed.

**Recommendation:** The PEIS should require evaluation of the above factors in determining whether a site is appropriate for utility-scale solar development.

## **II. Right-of-Way Terms and Conditions**

The BLM will permit solar energy development subject to right-of-way (ROW) authorizations under Title V of the Federal Land Policy and Management Act (FLPMA) and implementing regulations, 43 C.F.R. Part 2800, which also requires a plan of development (POD). These documents should contain key terms for responsible development, including:

### ***A. Reasonable Term and Diligent Development***

While the BLM’s ROW regulations do not impose specific limits on the terms for ROWs, as acknowledged in IM 2007-097, the term for the ROW should not exceed the design life of the project, typically 30 years. Further, ROWs should also require that companies exercise reasonable diligence in developing and producing solar energy, such that the ROW can be terminated if progress is not being made and other uses of the land are not precluded without justification.

### ***B. Changes in Applicable Laws and Regulations are Incorporated***

If applicable laws and regulations change during the term of the ROW, then they should be automatically incorporated. For example, species such as the sage grouse are currently being considered for listing under the Endangered Species Act. Should such a listing occur, the terms of the ROW must be clear that compliance with activities triggered by the listing are required and are not subject to challenge.

### ***C. Monitoring, Phased Development and Adaptive Management***

Plans of development should require that a minimum footprint first be developed, so that monitoring can determine not only if the project is likely to be technically successful but also if projected damage to the environment is consistent or requires additional mitigation measures or other changes to the project before proceeding. Only once technical and environmental considerations are addressed, should the project be permitted to proceed to the next level of development.

Detailed monitoring plans should be required for the construction and operation of the project to identify key indicators of environmental effects on-site and on adjacent lands. These plans should also provide for changes to the project to be made to ensure that environmental effects do not exceed expected and acceptable levels.

### ***D. Restoration and Bonding***

Bonding should be sufficient to cover the costs of restoration, as well as the cost of compliance with other terms of the ROW grant, including actions that the agency may take if the ROW grant is terminated for noncompliance. *See*, IM No.2007-097.

Restoration of the site includes not only removal of equipment but also reclamation of surface disturbance, including the facility footprint and access roads, and revegetation with native species in a distribution comparable to that of surrounding lands. However, based on the transformation of a site connected with utility-scale solar development, barring significant changes in technology, restoration may not be feasible. Further, sites selected for development on public land should ultimately be those with the combination of the highest solar potential and most acceptable location (in terms of other ecological values). Accordingly, the BLM should consider requiring project proponents to commit to long-term use of the land for solar generation, so that the bond amount could be used to ensure that the site is suitable for transfer to a successor or converted to another technology.

### ***E. Management Practices to Limit Impacts on the Environment***

Right-of-way grants should include a standard term requiring that operations are conducted in a manner that minimizes and seeks to avoid adverse impacts to land, air and water, and to cultural, biological, visual, and other resources, as well as to other land uses and users. The BLM should also retain the right to require reasonable measures be taken to fulfill this requirement, such as modification to facility siting or design, timing and location of construction activities, and specification of interim and final reclamation measures. The agency's standard oil and gas lease terms contain a comparable term, which could be used as a starting point. However, because the ROW should also include a right to require phased development and other changes based on monitoring results, the BLM's ability to require "reasonable measures" should be more broadly defined.

Other management practices that will limit the overall impact of utility-scale solar development should also be included in the terms of the ROW, such as:

1. locating roads and maintaining the site to avoid erosion and sedimentation, limit number of roads needed, minimize habit disruption;
2. preconstruction surveys for threatened and endangered species, as well as state listed species;
3. protection plans for adjacent habitat and species;
4. off-site mitigation where habitat disruption is unavoidable;
5. locate facilities in proximity to existing transmission infrastructure, roadways and sources of other necessary resources;
6. minimize the overall size of the facility;
7. minimize use of water;
8. include avian protection plans (*see* [www.aplic.org](http://www.aplic.org)) for all related transmission lines;
9. periodically assess feasibility of incorporating technological advances that improve efficiency and/or reduce impacts on wildlife and other natural resources.

#### ***F. Termination for Noncompliance***

Should the ROW holder fail to comply with any of the terms set out in the grant or the plan of development, the BLM should have the ability to terminate the ROW if the failure continues for 30 days after written notice. The ROW grant should also explicitly provide that, in the event of termination, the BLM has the right to use the bonded funds to dispose of the facility and restore the site. Once again, while the agency's standard oil and gas lease contains a comparable term, it is important that the ROW grant for development of utility scale solar energy contain explicit remedies for not only termination but also for restoring the land to its previous condition.

***Recommendation:*** The BLM should develop an expanded set of standard terms that will be set out in the PEIS and incorporated into all ROWs and plans of development where applicable.

#### ***G. Revisions to BLM's ROW Process***

The BLM's right-of-way process was designed primarily for short-term uses and linear ROWs, such as pipelines, or ROWs with a relatively limited footprint, such as communication sites. Even in the case of ROWs for wind energy projects, there is still land that is not in active use and is available for other uses. ROWs for utility-scale solar energy development will be long-term and will encompass total disruption of the land to the virtual exclusion of all other uses, as acknowledged in IM No. 2007-097. Accordingly, the agency should consider revisions to the ROW process, both procedures and regulations, to address this important difference.

For instance, the federal government is currently compensated for ROWs by a relatively low cost monthly payment per acre of land. Due to the way that federal land will be exclusively devoted to the solar project, the agency could consider revising the payment scheme to reflect this reality and could include some form of royalty payment to acknowledge the profits that will be made by solar energy developers and/or to compensate the public for the loss of use of the land developed. More comprehensive revisions could also assess whether the ROW structure should be maintained for solar projects, or whether a lease or purchase approach might be more suitable.



Further, as discussed above, because sites for utility-scale solar development on public lands should be those that are most productive and most suitable, the agency should consider requiring that sites continue to be used for solar energy production. This approach could include limiting a project proponent's ability to obtain a ROW for a new project if the same proponent is seeking to abandon another site.

In addition, the BLM's current ROW policy is to process applications on a first-come, first-serve basis. However, this approach may not yield the best return for the agency and also may not lead to the most thoughtful development of parcels – for instance, where a wind energy project and a solar energy project could both be served by the same area or one project may have less environmental impacts. As the BLM acknowledges in IM No. 2007-097, the ROW regulations (43 CFR § 2804.23(c)) provide authority for offering public lands under competitive bidding procedures for solar energy right-of-way authorizations. Competitive bidding and comparison of projects based on their likely success, taking into account the ability to limit environmental effects, the applicant's technical and financial capability, and the amount of power to be generated, could be used to improve the process of awarding ROW grants to ensure that the best use is made of our public lands when they are provided for energy development.

**Recommendation:** The BLM should consider revisions to its ROW process to address the current explosion in applications for ROWs for both solar and wind development, as well as the particularly high impacts of utility-scale solar development, including through adjustments to the pricing and/or structure of ROWs and through providing a mechanism to choose amongst competing projects.

### **III. BLM Proposed Planning Criteria**

The Notice of Intent identifies a list of planning criteria for amendment of applicable land use plans to incorporate the BLM's solar energy program. We agree that many of these criteria, reproduced below, will be necessary in properly analyzing solar energy development and have identified additional issues and clarification for the BLM to consider under each criterion; we have organized our comments by restating in summary fashion each of the proposed planning criteria listed in the Notice of Intent.

#### ***A. Comply with Applicable Laws and Policies***

In complying with applicable laws and policies, the BLM should take the initiative to consult with the U.S. Fish and Wildlife Service to fulfill the requirements of the Endangered Species Act, instead of deferring consultation until specific projects are proposed. Further, per Executive Order 12898, BLM is required to assess the potential for disproportionately high and adverse human health or environmental impacts on minority and/or low-income populations. As discussed throughout these comments, development of utility-scale solar energy has the potential to degrade natural areas and to inflict market and non-market costs on local communities, as well as affect water supply and quality. The agency should consider the manner in which these costs might disproportionately affect minority or low-income populations in proximity to development and take appropriate steps to address potential environmental injustice.

## ***B. Use PEIS as Analytical Basis for Amending Land Use Plans***

In order for BLM to support amendment of land use plans and to tier to the PEIS in connection with subsequent decision-making processes, the analysis conducted under the National Environmental Policy Act (NEPA) must be sufficiently robust to support the determination that specific lands are suitable for development. The PEIS and subsequent amendment should also require site-specific environmental review prior to approval of projects with opportunities for public comment.

## ***C. Develop Reasonable Foreseeable Development Scenario and Identify Lands Available for Development, Lands Available for Development with Restrictive Stipulations, and Lands Not Available***

### 1. RFD scenario

We commend the BLM for developing a reasonable foreseeable development scenario (RFD) for solar energy development, which provides a projection of expected levels of development as a basis for evaluating and managing environmental effects. The RFD should project development for each resource management plan (RMP) that is amended by the PEIS and associated surface disturbance, including from associated infrastructure, such as roads and transmission. In addition, the RMP amendments established by the PEIS must include methods for monitoring impacts to other resources managed by BLM and a specific plan for conducting further NEPA review should the RFD appear likely to be exceeded. The specific applications for solar projects that the BLM is currently reviewing can serve as models for the PEIS and can provide valuable information for assessing the RFD. BLM should incorporate the specifics of these projects into the PEIS to provide examples for detailed impact analysis.

### 2. Identification of available lands

Due to the nature of large-scale solar energy production, mitigation measures and restrictive stipulations are severely limited. The most important aspect of mitigation for solar energy will be establishing lands that are closed to development. Therefore, the PEIS must specifically identify lands open to solar and lands closed to solar in addition to best management practices.

## ***D. Limit Amendments to Utility-Scale Solar Energy Development and Associated Transmission Issues***

After analyzing impacts from solar energy projects on other resources, it may become necessary for BLM to change management prescriptions for other resources in order to best protect them in the context of making lands available for utility-scale solar energy development. These additional prescriptions can and should be included in the RMP amendments.

### ***E. Continue to Manage Other Resources Based On Current Terms of RMPs***

The PEIS should address whether current RMP terms are satisfactory for protecting other resources after potential impacts from solar development have been analyzed and make changes as appropriate as part of the RMP amendments. We have included more information on potentially affected resources in Section IV.

### ***F. Recognize Valid Existing Rights***

While we realize the obligation of the BLM to recognize existing rights, BLM often has the ability to make changes in current conditions of use without foreclosing those rights and can also engage in negotiations and/or cooperative collaboration to effectuate important changes.

### ***G. Coordinate with Other Governments/Agencies and Seek Consistency***

FLPMA requires that the BLM's guidance and management policies shall "be consistent with officially approved and adopted resource related policies and programs of other Federal agencies, State and local governments and Indian tribes." 43 U.S.C. § 1712(c)(9); 43 C.F.R. § 1610.3-2. There are currently three major planning processes underway in the Western United States that we wanted to highlight for the BLM to address in the Solar PEIS because of the potential overlap in goals: the state of California's Renewable Energy Transmission Initiative (RETI), the Western Governors Association's (WGA) Western Renewable Energy Zones (WREZ), and the West-wide Energy Corridors PEIS.

RETI is a California "statewide initiative to help identify the transmission projects needed to accommodate renewable energy goals, support future energy policy, and facilitate transmission corridor designation and transmission and generation siting and permitting." (*see* <http://www.energy.ca.gov/reti/index.html>). RETI is relevant to the Solar PEIS because it will establish transmission projects that should be completed throughout the state of California for the purpose of connecting renewable energy projects to the statewide grid. RETI also considers opportunities in neighboring states, including Arizona and Nevada. Therefore, solar projects in California and neighboring states should be situated in accordance with the RETI results. The PEIS should state that solar projects in California and neighboring states will be assessed in accordance with their proximity to the RETI corridors.

WREZ is a cooperative initiative between the Western Governor's Association (WGA) and the US Department of Energy. It is a project to address transmission barriers to increased renewable energy production in the West. WREZ intends to "generate (1) reliable information for use by decision-makers that supports the cost-effective and environmentally sensitive renewable energy development in specified zones, and (2) conceptual transmission plans for delivering that energy to load centers" (*see* <http://www.westgov.org/wga/initiatives/wrez/>) Importantly, the WREZ effort will combine solar resource data from government and industry with lands, wildlife and natural resource information from state agencies and the conservation community. Most of the states within the scope of this PEIS have initiatives to identify locations and provide incentives for renewable energy development and transmission:

- New Mexico’s Renewable Energy Transmission Authority was created to “stimulate clean energy production and create high-paying jobs, capital investment and greater economic development in rural areas.” ([www.nmreta.org](http://www.nmreta.org))
- Colorado’s Clean Energy Development Authority is directed to “facilitate the financing of renewable energy projects in Colorado.”
- Nevada’s Renewable Energy Transmission Access Authority is tasked to “propose recommendations for improved access to the grid system by which renewable energy industries can set up and have market access in Nevada and neighboring states.”

The increased focus on renewable energy in this planning area also increases the importance of the WREZ process, which will incorporate information and address these issues on a west-wide scale. Accordingly, the Solar PEIS should coordinate with this parallel effort, and in particular, incorporate information and data when there is consensus reached between the environmental, renewable energy industry and utility and other stakeholders on zones/areas that are appropriate for large-scale solar energy development on public lands.

The West-wide Energy Corridors PEIS is a joint planning process among the DOE, BLM, USFS, and DOD. It intends to designate appropriate transmission corridors on public lands in the West. The West-wide Energy Corridor PEIS is of particular relevance to the Solar PEIS. These two processes should be viewed as an opportunity for synergy and as an opportunity to bring more renewable energy into the American electricity grid while minimizing environmental degradation. If both energy corridors and solar energy development projects are properly sited and renewable technologies such as solar, wind, and geothermal energy are given preference in new transmission rights-of-way within the corridors, these efforts together can help America reduce its reliance on the fossil fuels responsible for global climate change. Currently, the West-wide Energy Corridor PEIS is the subject of significant controversy, due to the failure to assess the need for corridors to support renewable energy, as well as the failure to avoid ecologically important areas.

In considering how areas suitable for solar development will relate to designated west-wide energy corridors, it would be better to coordinate the current WWEC PEIS with the Solar PEIS and have a set of energy corridors that focuses on delivering renewables to major market centers. In other words, analyzing in the current Solar PEIS whether “additional” or “separate” west-wide energy corridors should be designated to facilitate solar development may lead to duplicative corridors and unnecessary lands, wildlife and natural resource impacts.

In addition, the WGA has recently produced the Wildlife Corridors Initiative Report (available at <http://www.westgov.org/wga/publicat/wildlife08.pdf>), which identifies important wildlife corridors and habitats in the western states and makes recommendations for best protecting these crucial areas. BLM should consult this report for information on the areas identified and/or confer with the WGA Western Wildlife Habitat Council while preparing the PEIS.

The aforementioned planning projects and others currently underway in the West provide the BLM with an important opportunity in the form of a plethora of reliable information and planning partners. These resources should be utilized in order to maximize efficiency of solar energy while minimizing impacts to landscapes and wildlife.

## ***H. Coordinate with Tribal Governments and Provide Strategies for Protection of Traditional Uses***

BLM should make diligent efforts to consult with Native American tribal governments to determine whether there are sites or specific areas of particular concern, including sites of traditional religious and cultural significance, and incorporate this information into the PEIS. Tribes can also benefit economically from clean energy development and this is a good alternative to traditional extractive industries and the environmental and health impacts they have on native people. *See, e.g.*, <http://www.grandcanyontrust.org/programs/native/programs2.php> for a discussion of beneficial wind energy projects on tribal lands.

## ***I. Take Into Account Protection of Cultural Resources and Engage in Required Consultation***

FLPMA obligates the BLM to protect cultural, geologic, and paleontologic resource values. 43 U.S.C. §§ 1701(a)(8) 1702(c). In the context of historical and cultural resources, the National Historic Preservation Act of 1966 (“NHPA”) (16 U.S.C. § 470 et seq.) affords heightened protection to these resources, establishing a cooperative federal-state program for the protection of historic and cultural resources. In particular, the review process set out in Section 106 (16 U.S.C. § 470f) obligates the BLM to consider the effects of management actions on historic and cultural resources listed or eligible for inclusion under NHPA. Additionally, Section 106 requires the BLM to consider the effects of its management actions on all historic resources and to give the Advisory Council on Historic Preservation an opportunity to comment before the BLM takes action. Section 110 of the NHPA requires the BLM to assume responsibility for the preservation of historic properties it owns or controls (16 U.S.C. § 470h-2(a)(1)), and to manage and maintain those resources in a way that gives “special consideration” to preserving their historic, archaeological, and cultural values. Section 110 also requires the BLM to ensure that all historic properties within the National Monument are identified, evaluated, and nominated to the National Register of Historic Places. *Id.* § 470h-2(a)(2)(A).

Further, the President’s “Preserve America” initiative (*See* Exec. Order 13287, March 3, 2003) requires the BLM to advance the protection, enhancement, and contemporary use of its historic properties. The BLM must ensure that “the management of historic properties in its ownership is conducted in a manner that promotes the long-term preservation and use of those properties as Federal assets.”

The BLM should take the opportunity to proactively consult and obtain information on cultural and historical resources in the areas proposed to be available for solar development so that there irreplaceable resources are identified and protected.

***J. Recognize Special Importance of Public Lands to People Who Live in Nearby Communities and to Nation as a Whole***

Extensive research exists demonstrating the key role that wildlands play in the vitality of nearby communities. The Wilderness Society released a report in 2007 entitled “Natural Dividends: Wildland Protection and the Changing Economy of the Rocky Mountain West” (available at [www.wilderness.org](http://www.wilderness.org) and attached) that documents the importance of wilderness landscapes to western economies and provides additional references. Wildlands are also valued as places to visit and learn about for all Americans. The PEIS should acknowledge these values and take them into account as part of considering whether the benefits from use of an area of public land for solar energy development are sufficient to justify the long-term loss of that same land to citizens. A more detailed socioeconomic analysis is provided in Section IV.

***K. Encourage Public Participation***

We encourage BLM to maximize public involvement in preparation of the Solar PEIS. In addition to the public comment periods required by NEPA and BLM’s regulations, there are other opportunities throughout the planning process for public involvement, which are used by many BLM offices. Public involvement allows the public to provide useful information and bring concerns to BLM’s attention throughout the planning process, which improves the planning process and also can avoid controversy.

The BLM has identified the need to ensure sufficient data is available. In this context, we would also note that other BLM offices have made inventory data available to the public to assist in identifying new data needs and also made base data available for public use, and encourage BLM to take similar action in preparing the solar PEIS. By way of example, along with its release of the Draft RMP, the BLM’s Arizona Strip Field Office provided zipped GIS files for all data layers needed to create the maps contained in the Draft RMP (and can be viewed on-line at <http://www.blm.gov/az/GIS/files.htm#strip>). The server space required for this operation is minimal and without this information, effective public participation in this process is severely hampered. GIS data for the West-wide Energy Corridors PEIS was also released to the public, allowing for more informed participation. This type of public participation is also consistent with the BLM’s Land Use Planning Handbook (H-1601-1), which states that, “Documentation supporting the AMS [analysis of the management situation] should be maintained in the field office for public review” (Section III.A.4) and that, “Alternatives should be developed in an open, collaborative manner, to the extent possible” (Section III.A.5).

Many offices are providing a preliminary range of alternatives prior to formally releasing a Draft RMP, which gives the public a chance to provide input. After the comment period on the Draft, making analyses available before issuing the Final PEIS is another excellent way to increase public understanding of and participation in the PEIS process. The Kemmerer (Wyoming) Field Office, for example, has made their analysis of comments submitted on the Draft RMP and their ACEC evaluations public by posting them on their website, even though they have not yet issued the Proposed RMP/FEIS<sup>1</sup>. Making such analyses available to the public before the publication

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<sup>1</sup> <http://www.blm.gov/rmp/kemmerer/docs.htm>

of the Draft PEIS will better prepare participants to understand the complex analyses and large amounts of data in the Draft PEIS and increase the relevance and usefulness of comments and other public participation. Making sure the public fully understands the proposed plans will also decrease conflict later in the process. We hope to see these types of opportunities provided to the many members of the public who are interested in the development of the solar PEIS.

The BLM should make every attempt to encourage the public to participate in the PEIS process including holding workshops, providing interim information regarding inventories of wilderness-quality lands and visual resources, posting GIS files, and posting analysis of comments submitted on the Draft PEIS to the PEIS website.

***L. BLM Can Develop Protective Management Prescriptions for Lands with Wilderness Characteristics and Will Consider Public Input Regarding Lands to be Managed to Maintain Wilderness Characteristics***

The Solar PEIS presents an opportunity for the BLM to consider information that it has received regarding lands with wilderness characteristics in the six states included in the PEIS, including inventorying these lands. The lands at issue in this PEIS contain numerous areas proposed for wilderness designation in citizen's wilderness inventories and/or found to have wilderness characteristics. Applicable law and current BLM policy provide for ongoing inventory of wilderness characteristics and management to protect wilderness characteristics through management prescriptions or other administrative designations on BLM lands, including as a priority over other uses.

Further, the April 2003 settlement agreement (Utah Settlement) between Secretary of the Interior Norton and the State of Utah (in which BLM abdicated its authority to designate any additional Wilderness Study Areas (WSAs)), does not affect BLM's obligation to value wilderness character or its ability to protect it, including in management prescriptions which would also merit exclusion of solar energy projects. We maintain that this agreement is invalid and will ultimately be overturned in pending litigation. Recently, a federal court in Utah revoked its approval of the Utah Settlement, stating that its approval of the initial settlement was never intended to be interpreted as a binding consent decree. Recognizing that the court's decision undermined the legal ground for the Utah Settlement, the State of Utah and the Department of Interior have now formally withdrawn the settlement as it was originally submitted. *See*, Motion to Stay Briefing and for a Status Conference, September 9, 2005, copy attached. This casts serious doubt upon BLM's current policy not to consider designating new WSAs. Because the State of Utah and the Department of Interior have withdrawn their settlement and do not intend to seek a new consent decree, there is currently no binding consent decree and the BLM has not even issued any updated guidance seeking to continue applying this misguided, and illegal, policy.<sup>2</sup>

The Instruction Memoranda (IMs) 2003-274 and 2003-275, which formalize BLM's policies concerning wilderness study and consideration of wilderness characteristics in the wake of the settlement contemplate that BLM can continue to inventory for and protect land "with wilderness

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<sup>2</sup> Consequently, IM Nos. 2003-274 and 2003-275, which are explicitly based on an April 2003 settlement that no longer exists, are arguably invalid and do not apply to restrict BLM from designating new WSAs.

characteristics,” such as naturalness or providing opportunities for solitude or primitive recreation, through the planning process. The IMs further provide for management that emphasizes “the protection of some or all of the wilderness characteristics as a priority,” even if this means prioritizing wilderness over other multiple uses. This guidance does not limit its application to lands suitable for designation of WSAs; for instance, the guidance does not include a requirement for the lands at issue to generally comprise 5000-acre parcels or a requirement that the lands have all of the potential wilderness characteristics in order to merit protection. IM 2003-274 states that “BLM may continue to inventory public lands for resource or other values, **including wilderness characteristics**” and that the agency can “**manage them using special protections** to protect wilderness characteristics.” (emphasis added). Further, IM 2003-275, Change 1, reads:

The BLM can make a variety of land use plan decisions to protect wilderness characteristics, such as establishing Visual Resource Management (VRM) class objectives to guide the placement of roads, trails, and other facilities; establishing **conditions of use to be attached to permits, leases, and other authorizations to achieve the desired level of resource protection**; and designating lands as open, closed, or limited to Off Highway Vehicles (OHV) to achieve a desired visitor experience. (emphasis added).

Accordingly, administrative protection can and should be considered for lands not currently protected. In addition, the information submitted regarding citizen-proposed wilderness constitutes significant new information that must be addressed in this RMP revision. This information has not yet been analyzed in the existing land use plan, so NEPA requires analysis of the potential environmental direct, indirect and cumulative effects of oil and gas development on these areas and consideration of protection for them. *See*, 40 C.F.R. § 1502.9(c); Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 374 (1989). In a recent decision, the U.S. District for the District of Utah found that information regarding wilderness characteristics that was not considered in the existing land use plan was:

**a textbook example of significant new information** about the affected environment (the **wilderness attributes and characteristics** of the Desolation Canyon, Floy Canyon, Flume Canyon, Coal Canyon, and Flat Tops unit) that would be **impacted by oil and gas development**; information that was **not reflected in BLM’s existing NEPA analyses**.

Southern Utah Wilderness Alliance v. Norton, 457 F. Supp. 2d 1253 (D. Utah 2006) (attached). A compliant NEPA analysis requires not only assessment of potential impacts but also a consideration of potential mitigation measures, such as protecting lands with wilderness characteristics. 40 C.F.R. §§ 1502.14, 1502.16. The PEIS can and must consider protective measures tailored specifically to protect lands with wilderness characteristics as part of the RMP amendments.

Prior to identifying sites appropriate for solar development, we recommend that the agencies assess information received regarding wilderness characteristics, including inventorying lands identified, and exclude lands with wilderness characteristics, citizen-proposed wilderness, and



wilderness inventory units from the lands available for consideration of siting solar energy projects.

***M. Environmental Protection and Energy Production are Both Desirable and Necessary, Not Mutually Exclusive***

While we agree that these goals are not mutually exclusive, BLM is legally obligated to ensure protection of the environmental resources which it manages. For instance, FLPMA requires that: “In managing the public lands the [Secretary of Interior] shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands.” 43 U.S.C. §1732(b). FLPMA also mandates that the public lands be managed “without permanent impairment of the productivity of the land or quality of the environment.” 43 U.S.C. 1702(c). Similar obligations to prioritize protection of the environment and other resources of the public lands arise are contained in the Clean Air Act, Clean Water Act, Endangered Species Act, and National Historic Preservation Act. In complying with these laws, environmental protection must be given priority.

***N. Consider and Analyze Climate Change Impacts, Including Anticipated Benefits from Solar***

We support the BLM’s recognition of the importance of analyzing the effects of its action on climate change. Global climate change is now acknowledged to be a major consideration for effects of major federal actions. The Supreme Court has concluded that “[t]he harms associated with climate change are serious and well recognized.” Massachusetts v. E.P.A., 127 S.Ct. 1438, 1455 (2007). Further, the Supreme Court has held that while agency action may not completely reverse global warming, it does not relieve the agencies of the responsibility to take action to reduce it. Id. at 1458. In fact, an order issued by the Secretary of the Interior requires that:

Each bureau and office of the Department will consider and analyze potential climate change impacts when undertaking long-range planning exercises, when setting priorities for scientific research and investigations, when developing multi-year management plans, and/or when making major decisions regarding the potential utilization of resources under the Department’s purview.

U.S. Dept. of the Int., Sec. Order No. 3226 (Jan. 19, 2001), Section 3.

While there are many anticipated benefits to solar energy production over fossil fuels, the PEIS must address the potential for solar energy to have adverse impacts on climate change. For example, many western landscapes are already becoming increasingly fragile due to global climate change – especially desert landscapes that also have solar energy potential. In addition, these landscapes have important value as carbon “sinks,” which could be lost if they are developed.<sup>3</sup> Further, undeveloped land has value as potential habitat as wildlife migrates to respond to climate changes. The destruction of these lands for solar energy production would thus contribute to the negative impacts of climate change. The PEIS should seek to mitigate

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<sup>3</sup> See, e.g., *Have Desert Researchers Discovered a Hidden Loop in the Carbon Cycle?*, Science, Vol. 320, pp. 1094-140 (June 13, 2008) (attached).

negative impacts on climate change through the designation of appropriate lands open to solar energy development.

In order to properly analyze the impact solar development will have on climate change, the process must be considered as a whole. The savings in carbon emissions that a solar energy project provides may be significantly reduced or cancelled out depending on how much carbon is emitted in the construction phase or in transporting workers and supplies to a site. Therefore, in assessing impacts to climate change, BLM must analyze *net* emissions. An additional factor to consider is whether fossil fuels will be transmitted on lines designated for solar energy.

BLM must analyze net impacts of solar energy development on climate change and include consideration of landscapes and wildlife that already are or have the potential to be affected by climate changes. BLM should establish best management practices to mitigate potential climate change impacts. The Natural Resources Defense Council has included a detailed discussion of climate change in its comments and we incorporate those by reference herein.

***O. BLM Will Use Geospatial Data in GIS to Facilitate Discussions of Affected Environment, Formulation of Alternatives, Analysis of Environmental Consequences, Display of Results***

1. Lands with wilderness characteristics and proposed wilderness: GIS layers needed to complete the PEIS.

Prior to identifying areas appropriate for solar energy development as part of the PEIS, it is imperative that the agencies gather the necessary information to ensure that wilderness quality lands are not disturbed. The agencies have before them a unique opportunity to act as stewards of the public domain on a southwest-wide scale. By collecting and using appropriate GIS data layers before considering appropriate places for solar development, the agencies can ensure that they avoid disturbing our nation’s wild places. **We recommend that the agencies collect and use the following GIS data layers to map areas that are unacceptable for siting corridors and in siting corridors to avoid impacting the identified areas:**

Citizen Proposed Wilderness Areas: The attached GIS layers document the most current citizen wilderness proposals and wilderness inventory units for Arizona, California, Colorado, New Mexico, and Utah. No comprehensive GIS layer exists for Nevada, so BLM should consult with the Nevada Wilderness Project (contact information below) to ascertain current proposal boundaries and areas of concern.

State	Contact Information
Nevada	<p><b>Address:</b> John Tull Nevada Wilderness Project 8550 White Fir Street Reno, NV 89523</p> <p><b>Phone:</b> (775) 746-7850</p> <p><b>Email:</b> <a href="mailto:john.tull@wildnevada.org">john.tull@wildnevada.org</a></p> <p><b>Website:</b> <a href="http://www.wildnevada.org">http://www.wildnevada.org</a></p>

Many lands with wilderness characteristics have been inventoried and mapped by BLM field offices as part of RMP revisions. BLM should use this data to identify exclusion areas for solar development. Further, in identifying additional lands with wilderness characteristics, BLM should use GIS mapping to identify exclusion areas, and the agency should make these data layers available to the public as part of their PEIS.

## 2. Other GIS layers needed to complete the PEIS

As stated above, because the siting of solar energy development will have significant and long lasting impacts on public lands, it is critical that the agency gather, analyze, and make available to the public any GIS layers which describe sensitive or protected areas. In addition to the lands with wilderness characteristics, citizen proposed wilderness, and wilderness inventories discussed above, we recommend that the agencies **collect and use the following GIS data layers to map areas that are unacceptable for siting solar energy projects and in siting projects to avoid impacting the identified areas:**

1. Designated Wilderness Areas;
2. Wilderness Study Areas;
3. National Monuments;
4. National Conservation Areas;
5. Other lands within BLM's NLCS;
6. National Historic and National Scenic Trails;
7. National Wild, Scenic, and Recreational Rivers, study rivers and segments, and eligible rivers and segments;
8. ACECs;
9. Threatened, endangered and sensitive species habitat (available from USFWS<sup>4</sup>, state wildlife agencies and, for BLM lands, from NatureServe<sup>5</sup>; critical cores and linkages for wildlife habitat (available from USFWS and state wildlife agencies, including in State Wildlife Action Plans, as well as the Wildlands Project and its affiliated regional organizations<sup>6</sup>) important bird areas (available from BLM and the National Audubon Society<sup>7</sup>); and
10. Riparian areas (available from SWReGAP<sup>8</sup>, except for California, which is available from the UCSB Biogeography Lab<sup>9</sup>).

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<sup>4</sup> [http://www.fws.gov/southwest/es/newmexico/ES\\_home.cfm](http://www.fws.gov/southwest/es/newmexico/ES_home.cfm)

<sup>5</sup> NatureServe was contracted to identify and map locations of threatened and endangered species habitat that exist only on BLM lands – making these areas even more critical to the survival of the species. This data can be found at [www.natureserve.org](http://www.natureserve.org)

<sup>6</sup> <http://www.twp.org/cms/page1158.cfm>

<sup>7</sup> <http://www.audubon.org/bird/IBA/>

<sup>8</sup> <http://ftp.nr.usu.edu/swgap/>

<sup>9</sup> [http://www.biogeog.ucsb.edu/projects/gap/gap\\_home.html](http://www.biogeog.ucsb.edu/projects/gap/gap_home.html)

**Recommendations:** The PEIS should apply the proposed planning criteria with the additional clarification provided above.

#### **IV. Issues for Further Analysis**

As stated in the Notice of Availability:

As currently envisioned, the PEIS will evaluate direct, indirect, and cumulative impacts to wildlife, wildlife habitat, threatened and endangered species, and vegetation; proximity to wilderness or other special management areas; and impacts to cultural, paleontological, socioeconomic, visual, and water resources. These resources are recognized as significant issues associated with utility-scale solar energy development.

We support the issues identified above and in the proposed planning criteria as those that could lead to significant impacts and/or merit further, in-depth analysis in the PEIS. We have highlighted certain additional issues below for further discussion of the analysis required.

##### ***A. Lands with Wilderness Characteristics***

As discussed above, the Solar PEIS provides an opportunity for the BLM to evaluate information regarding lands with wilderness characteristics and to take necessary steps to protect those characteristics.

**Recommendation:** The PEIS should evaluate information on wilderness characteristics and, where necessary, inventory its lands to confirm the existence of wilderness characteristics, then consider alternatives to protect some of all of these characteristics, and incorporate appropriate management prescriptions into the PEIS and resulting RMP amendments.

##### ***B. Protection of Wildlife Habitat***

Significant portions of the land that will be considered for solar energy development in the PEIS contain core habitat areas and migration linkages between those core areas, all of which need to be preserved in order for the regional ecosystems to continue to function. Fragmentation of wildlife habitat affects the ecological composition, structure, and functions of a landscape. Habitat fragmentation has been defined as the “creation of a complex mosaic of spatial and successional habitats from formerly contiguous habitat” (Lehmkuhl and Ruggiero 1991). **Although fragmentation can be difficult to measure, there are a variety of metrics that can be used to assess the degree of existing habitat fragmentation and the condition of the landscape, then applied to available data regarding distribution of wildlife and habitat, and ultimately used to make decisions regarding appropriate locations for energy corridors. We recommend that the agencies complete such an analysis as part of the PEIS.**

Existing road density can be calculated by measuring the length of linear features in a given sub-area at regular intervals and then reported as miles of route per square mile (mi/mi<sup>2</sup>). The degree of habitat fragmentation, the distribution of unroaded areas, or core areas, can also be measured and calculated based on the amount of land beyond a given distance or effect zone, from transportation routes (Forman, 1999). Wildlife species respond to disturbances related to this type of network at varying distances, so determining the size distribution of core areas for a

range of effect zones (i.e., of 100ft, 250ft, 500ft and 1320ft) from all routes is also important. Wildlife literature will yield information on the effect zones for different species. For instance, an ongoing study by Sawyer et al. (2005, 2004, 2001) of GPS collared deer on the Pinedale Anticline observed that deer utilized habitat progressively further from roads and well pads over three years of increasing gas development and showed no evidence of acclimating to energy-related infrastructure. Birds are also impacted by roads and management practices associated with energy development, due to fragmentation, changes in vegetation and noise (Mabey and Paul, 2007; Robel, et al., 2004).

In addition to solar energy plants themselves, habitat fragmentation can be caused by transmission corridors, which will be necessary to transmit solar power to electricity grids. Wildlife habitat fragmentation caused by transmission lines (including branch powerlines), pipelines (including feeder pipelines) and roads generally fall into three broad categories:

1. Construction impacts (access, right-of-way clearing, construction of towers, stringing of cables);
2. Line maintenance impacts (inspection and repair); and
3. Impacts related to the physical presence and operation of the transmission line.

As such, wildlife habitat must be examined on an individual project and site-specific basis. The only way to accomplish this requirement is to ensure that each individual solar project is spatially evaluated for direct, indirect and cumulative impacts.

Specific activities that negatively impact wildlife and cause destruction of core habitat or habitat fragmentation include the construction of facilities, blading and scraping of the ground, disturbance of soil by the use of heavy machinery, noisy machinery during construction and maintenance, noise from helicopters, removal of vegetation, blasting, filling depressions (a.k.a. recontouring the landscape), disposal of waste and chemicals on site, use of herbicides, and the use of borrow pits.

The effects of these activities on wildlife can be severe and include removal of habitat, fragmentation of habitat, and the creation of edge effect vegetation and habitat (changes in composition, structure, microclimate, etc. of area adjacent to facility and transmission corridor). Species shown to avoid edges include red-backed vole, snowshoe hare, pine marten and red squirrels. In addition, it is logical to suspect that construction of facilities and transmission in previously undisturbed areas will lead to a direct loss of life to wildlife during construction, operation and service of transmission lines.

We have included The Wilderness Society's most recent Science and Policy Brief, "Habitat Fragmentation from Roads: Travel Planning Methods to Safeguard BLM Lands" (Appendix 1). Also included in Appendix 1 are four scientific reports prepared by TWS and discussed in the habitat fragmentation report. These include *Fragmenting Our Lands: The Ecological Footprint from Oil and Gas Development*, *Protecting Northern Arizona's National Monuments: The Challenge of Transportation Management*, *Wildlife at a Crossroads: Energy Development in Western Wyoming*, and *Ecological Effects of a Transportation Network on Wildlife*. In addition to summarizing the four reports included, "Habitat Fragmentation from Roads: Travel Planning

Methods to Safeguard BLM Lands” provides a summary of available scholarly and government reports and studies on the impact of habitat fragmentation on wildlife, provides methods for calculating habitat fragmentation, and provides recommendations on how to integrate fragmentation analysis into management.

***Recommendation:*** BLM should use the information provided in Appendix 1 (as well as related information from State Wildlife Action Plans, Audubon Important Bird Areas, and the Wildlands Network) to identify core areas, measure habitat fragmentation, conduct a thorough fragmentation analysis, and inform decisions regarding designation of lands as available for solar energy in the PEIS, as well as incorporating these requirements into the PEIS to guide analysis of specific projects.

### ***C. Special Management Areas***

The Notice of Availability identified a number of different types of special management areas where utility-scale solar development is not appropriate. Areas in the National Landscape Conservation System are governed by other laws requiring protection as a priority.

- National Monuments are generally reserved by Presidential proclamation under the Antiquities Act of 1906 (16 U.S.C. § 432) to protect objects of historic or scientific interest, and must be managed to protect those values as a priority over other uses.
- National Conservation Areas are designated for the express purpose of protecting other natural values and management priorities are set out in enabling legislation.
- Section 10(a) of the Wild and Scenic Rivers Act provides similar management direction for wild and scenic river segments:

Each component of the national Wild and Scenic Rivers System shall be administered in such manner as to **protect and enhance the values which caused it to be included in said system** without, insofar as is consistent therewith, **limiting other uses that do not substantially interfere with public uses and enjoyment of these values.**

- National Historic Trails closely follow a historic trail or route of travel of national significance in order to identify and protect their history for public enjoyment. National Scenic Trails provide maximum outdoor recreation potential and to support the conservation and enjoyment of the various qualities – scenic, historical, natural, and cultural – of the areas they pass through. *See, e.g.,* BLM website on National Scenic and Historic Trails (<http://www.blm.gov/nlcs/nsht/>). The purpose for which the trails were created, as summarized in the National Trails System Act, is “to promote the preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the Nation.” 16 U.S.C. § 1241(a).
- BLM is obligated to manage the WSAs in accordance with the Interim Management Policy (IMP) for Lands Under Wilderness Review (BLM Manual H-8550-1), which requires that WSAs are managed to protect their wilderness values. The IMP requires the BLM to manage WSAs in accordance with the nonimpairment standard, such that no activities are allowed

that may adversely affect the WSAs' potential for designation as wilderness. As stated in the IMP, the "overriding consideration" for management is that:

. . . preservation of wilderness values within a WSA is paramount and should be the primary consideration when evaluating any proposed action or use that may conflict with or be adverse to those wilderness values. (emphasis in original)

The IMP also reiterates that WSAs "must be managed to prevent unnecessary or undue degradation."

- FLPMA requires the BLM to "give priority to the designation and protection of areas of critical environmental concern [ACEC]." 43 U.S.C. § 1712(c)(3). ACECs are areas "where special management is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes." 43 U.S.C. § 1702(a).

***Recommendation:*** The BLM is required to prioritize management to protect and enhance conservation values for special management areas, which is inconsistent with the development of solar energy development; these areas should be excluded from availability.

#### ***D. Socioeconomic Impacts***

The socioeconomic impacts of potential solar energy development go far beyond the value of the electricity produced by such projects or the construction, operation and maintenance jobs which may be created. While certainly beneficial in our national quest for renewable energy and our important goal of reducing global warming pollutants, solar energy projects (as is the case with all industrial developments) will leave permanent impacts on the landscape of the West – a landscape which is both iconic and an important economic driver in this region. The public lands that may be impacted by solar energy projects enabled by the Solar PEIS are likely to include places which are important and valuable to all Americans. Development of these lands for solar energy development should be considered carefully and should account for all their potential values – both market and non-market. Only those projects that result in the highest and best use of our valuable open lands should be pursued.

Several specific areas of analysis which we feel should be addressed in the Solar PEIS are noted here and discussed in more detail below.

1. In developing criteria and priorities for approval of solar energy projects on public lands, the BLM and DOE should favor those projects which provide the greatest net benefits to the American public, by accounting for all the potential costs and benefits associated with such development.
  - a. The Solar PEIS should address the potential benefits to the local area economies that arise from these undeveloped public lands, and which will be impacted by the development of solar energy projects and related transmission corridors.
  - b. All opportunity costs of energy development on public lands should be fully examined in the Solar PEIS. The relative impacts of different power-generation

techniques should be compared and evaluated to ensure that net socioeconomic value of a project is maximized.

- c. The Solar PEIS should include an assessment of the potential benefits of siting utility scale solar projects on private lands compared with development on public lands. The potential fiscal returns to the American public from siting on public lands should be compared with the potential fiscal benefits that might accrue to a private landowners through siting solar facilities on private lands (ROW, rental fees)
  - d. The Solar PEIS should consider the benefits as well as mitigation of costs by siting solar energy facilities on Brownfields. By avoiding costs to the ecological integrity and outdoor opportunities, the net benefits of siting a solar project on contaminated lands may be considerable.
2. The Solar PEIS should account for all conceivable non-market values, including the impacts on local quality of life, which are associated with the undeveloped public lands that may be impacted by solar energy development.
  3. The socioeconomic analysis in the Solar PEIS should avoid the use IMPLAN and economic base models to assess the economic impacts of the proposed solar energy development and related transmission corridors on local communities. If the use of such models is unavoidable, these should not be the sole analytical tool for assessing the economic impacts. The socioeconomic analyses should assess the potential impacts of utility-scale solar energy projects and related transmission corridor development on local economies and residential and other private property values.
    1. Utility-scale solar energy development should maximum net public benefits.

In developing criteria and priorities for approval of solar energy projects on public lands, the BLM and DOE should favor those projects which provide the greatest net benefits to the American public, by accounting for all the potential costs and benefits associated with such development.

We expect that the Solar PEIS will recognize that solar energy development, like any industrial development sited on public lands, will have negative impacts on these lands. These impacts may be as great as those associated with other energy development; however, we also recognize that the production and use of solar energy, if it replaces that of fossil fuel energy, will also have benefits. These include the lessening of greenhouse gas emissions from electricity production which, in turn, will be beneficial to undeveloped public lands by reducing the already measureable impacts of climate change.

At the same time, in light of climate change, undeveloped public lands are also increasingly important as a source of habitat for species impacted by climate change, as a source of forest and other vegetation which acts as a "carbon sink" and is thus important for mitigation of climate change. Undeveloped lands are also a source of increasingly scarce clean water and other ecosystem services. Solar energy development projects sited on undeveloped lands (both public and private) will reduce these benefits. These costs should be included in the Solar PEIS's assessment of net public benefits.

The Solar PEIS should recognize that not all solar energy development projects will produce the same type and level of public benefits and costs. Emphasis and priority should be given to those



projects which produce the largest net benefits, accounting for both market and non-market impacts on the public, the ecosystem, and the climate change mitigating abilities of western lands, both public and private.

*a. Benefits to the Local Economy from Undeveloped Public Lands*

The Solar PEIS should address the potential benefits to the local area economies that arise from undeveloped public lands which may be impacted by the development of utility-scale solar energy projects and related transmission corridors. The mere presence of undeveloped public lands and the natural and recreational amenities that they provide produce measurable economic benefits for local communities.

The Solar PEIS should fully address the impacts that utility-scale solar energy development on undeveloped public lands will have on the local economies throughout the study area. The economic benefits of undeveloped lands for local economies is well documented and has grown in importance as the U.S. moves from a primary manufacturing and extractive economy to one more focused on service sector industries. This shift means that many businesses are free to locate wherever they choose. The “raw materials” upon which these businesses rely are people, and study after study has shown that natural amenities attract a high-quality, educated and talented workforce – the lifeblood of these businesses.

As the economy of the West evolves, public lands, especially areas protected from development, are increasingly important for their non-commodity resources – scenery, wildlife habitat, wilderness, recreation opportunities, clean water and air, and irreplaceable cultural sites. A vast and growing body of research indicates that the economic prosperity of rural Western communities depends more on the natural amenities found on public lands and less on the extraction of natural resource commodities.<sup>10</sup> In a letter to the President and the Governors of all the Western states, 100 economists from universities and other organizations throughout the United States pointed out that, "The West's natural environment is, arguably, its greatest long-run economic strength" (Whitelaw et al. 2003).

New residents in the rural West often bring new businesses, and these are rarely tied to resource extraction. Some are dependent directly on the recreation opportunities on the surrounding public lands. Entrepreneurs are also attracted to areas with high levels of natural amenities. The Federal Reserve Bank of Kansas City has found that the level of entrepreneurship in rural communities is correlated with overall economic growth and prosperity (Low 2004). These businesses may be harmed or deterred if the quality of the scenic and natural amenities is degraded due to solar energy developments. The Solar PEIS must assess the value of undeveloped public lands and include criteria which will ensure that the economic role of these lands is not deterred when solar energy developments and any associated transmission lines are constructed.

Retirees and others who earn non-labor income are also important to rural western communities. Non-labor income makes up an average of 27% of total personal in the six-state region covered

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<sup>10</sup> See Whitelaw and Niemi 1989, Rudzitis and Johansen 1989, Johnson and Rasker 1993 and 1995, Freudenburg and Gramling 1994, Snepenger et al. 1995, Deller 1995, Power 1995 and 1996, Bennett and McBeth 1998, Duffy-Deno 1998, McGranahan 1999, Nelson 1999, Rudzitis 1999, Morton 2000, Lorah 2000, Deller et al. 2001, Johnson 2001, Shumway and Otterstrom 2001, Lorah and Southwick 2003, Rasker et al. 2004, Holmes and Hecox 2004 and Reeder and Brown 2005, Sonoran Institute 2006, and Barrens et al. 2006 for some examples. See Haefele et al. (2007) for a detailed description of the research on the amenity economy and the ways in which local economies benefit from protected public lands.

by the Solar PEIS.<sup>11</sup> If investment and retirement income were considered an industry it would be one of the largest in all of the states potentially impacted by proposed utility-scale solar energy development. Retirees are attracted by natural amenities that are available on undeveloped public lands. The potential impact that solar energy development will have on this source of income and economic activity must be accounted for in the Solar PEIS.

Growth in the professional and service sector is also tied to the natural and other amenities in the area. Protected public lands in the region enhance the West's attractiveness for both skilled workers and employers. Protected public lands provide indirect support for local and regional economies, a fact that is increasingly being recognized by communities throughout the West. These lands provide a scenic backdrop, recreation opportunities and a desirable rural lifestyle, and many other tangible and intangible amenities that attract new residents, businesses and income to the rural West. Many businesses are able to conduct national or international commerce from any location they choose. Other entrepreneurs simply choose to live in a particular place and build businesses in response to local needs. Research conducted by The Center for the Study of Rural America, at the Federal Reserve Bank of Kansas City (the Rural Center) has found that entrepreneurship is a strong indicator of rural economic health (Low 2004, Low et al. 2005, Thompson et al. 2006). The Rural Center has included entrepreneurship along with several other indicators of rural economic potential into a set of Regional Asset Indicators. These indicators include the natural and human amenities of a region – many of which are closely tied with undeveloped public lands (Weiler 2004). The six states included in the proposed Solar PEIS all have levels of human and natural amenities which are higher than the national average due in part to protected and undeveloped public lands. The role of these lands in the area's economy and the potential impact that solar energy development might have should be addressed in the Solar PEIS (Center for the Study of Rural America 2006a).

Research into what motivates entrepreneurs and businesses to choose particular locations consistently finds that amenities and quality of life top the list (Rasker and Hansen 2000, Snepenger et al. 1995, Rasker and Glick 1994, Whitelaw and Niemi 1989). Developing the proposed utility-scale solar energy projects on undeveloped public lands may hinder western communities ability to attract more small businesses into the region to further enhance this sector.

These findings together point to the value of public lands to strong local economies. Development of solar energy projects on these western lands could be seriously problematic, and this must be addressed in the Solar PEIS. To site solar energy development in a way that impairs these natural amenities would be short-sighted at best. The Solar PEIS should address this issue and provide detailed criteria to protect the economic benefits associated with undeveloped public lands.

***Recommendations:*** The Solar PEIS must include a thorough examination of the full socioeconomic impacts likely to occur if utility-scale solar energy projects impact undeveloped lands. Some suggested analyses and sources of data can be found in “*Socio-Economic Framework for Public Land Management Planning: Indicators for the West's Economy*” (attached).

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<sup>11</sup> In Arizona, investment and retirement income is 27% of total personal income. This income is 25% in California, 24% in Colorado, 31% in Nevada, 27% in New Mexico and 24% in Utah. Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System (<http://www.bea.gov/>)

b. *Opportunity costs*

All relative costs of solar energy development on public lands should be fully examined in the Solar PEIS, especially benefits to the public and local economies. As discussed above, there is potential for the loss of economic opportunity from tourism, hunting, fishing, wildlife viewing, and other forms of recreation if solar facilities are installed on lands that hold special value to people, wildlife, and other elements of the ecosystem. These costs should be assessed by the BLM or the DOE for every site on which there is a plan to construct and operate a solar power facility.

However, local communities can certainly benefit from the presence of new power-generating infrastructure. Temporary jobs are created to manufacture parts and to construct the power facility. Once up and running, permanent positions are also needed to operate and maintain the facilities. Table 1 presents estimates on employment information for different types of power-generating facilities.

**Table 1. Annual Jobs Created Per Megawatt of Generating Capacity**

Energy Source	Temporary Jobs(per MW)	Permanent Jobs(per MW)
Solar-PV <sup>a</sup>	1.2 <sup>1</sup> -33 <sup>3</sup>	0.25 <sup>1</sup> -2.5 <sup>3</sup>
Solar-CSP <sup>b</sup>	3.25 <sup>4</sup> -10 <sup>5</sup>	0.275 <sup>4</sup> -1.0 <sup>5</sup>
Central Solar*	3.42 <sup>2</sup>	1.62 <sup>2</sup>
Wind	0.15 <sup>1</sup> -0.88 <sup>1</sup>	0.1 <sup>1</sup>
Coal	0.21 <sup>1</sup> -3.57 <sup>4</sup>	0.5 <sup>4</sup> -0.59 <sup>1</sup>
IGCC Coal	2.54 <sup>6</sup>	0.36 <sup>6</sup>
Gas	0.21 <sup>1</sup>	0.6 <sup>1</sup>

a) PV: Photovoltaic

b)CSP: Concentrated Solar Power

\*Central Solar makes use of both PV and CSP technologies

<sup>1</sup> Daniel M. Kammen, Kamal Kapadia, and Matthias Fripp (2004) *Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?* RAEL Report, University of California, Berkeley. P. 10.

<sup>2</sup> Navigant Consulting, Inc. estimates, June 2006.

<sup>3</sup> Clean and Diversified Energy Initiative. Solar Task Force Report. January, 2006. Western Governors' Association.

<sup>4</sup>Suemedha Sood. *Harnessing the Sun: The Future of Green Jobs.* April 11, 2008. The Washington Independent. <http://washingtonindependent.com/view/harnessing-the-sun>

<sup>5</sup> Dr. Franz Trieb. Powerpoint: Concentrating Solar Power Now: Clean Energy for Sustainable Development. German Aerospace Center. P. 11. 2007

<sup>6</sup> Frequently Asked Questions. FutureGen Alliance, Inc. 2006. <http://www.futuregenalliance.org/faqs.stm>

Typically, construction of a power plant takes between 2 and 3 years. Even if we assume that a coal/gas power plant takes 30% longer to construct, solar facilities still provide more employment hours per MWh produced (Kammen, et al.). In addition, for every MW of power capacity, solar plants employ a greater number of workers than do fossil fuel-based facilities.

Integrated Gasification Combined Cycle (IGCC) coal power plants, however, are an exception. They have the potential to offer up to 3.4 more manufacturing/construction jobs per MW capacity than either normal coal or gas plants. This is directly linked to greater initial capital costs for an IGCC coal plant.<sup>12</sup> An IGCC coal facility requires the manufacture of more complex equipment, which also may require skilled installation. All of this raises the costs of providing electricity, which is then passed on to the consumer. However, as discussed above and below, clean energy such as solar power is likely to have higher net public benefits when the impacts associated with lower pollution levels are also considered.

The absence of harmful effluence is another serious benefit of implementing solar energy. For a single megawatt-hour (MWh) of energy, a coal plant may produce between 0.3 and 1.5 tons of carbon dioxide (Carma.org). Over a year at a run-of-the-mill coal plant, this comes to about 3.7 million tons of CO<sub>2</sub> and thousands of tons of other effluent.<sup>13</sup> Natural gas combined cycle plants are one of the leading “clean” fossil fuel-based energy producers. Still, they emit about 1900 tons of CO<sub>2</sub>, 0.045 tons of CO, and 0.075 tons of NO<sub>x</sub> per MW of total capacity.<sup>14</sup> IGCC coal facilities boast near-zero emissions from the technologies they implement. CO<sub>2</sub> effluence is largely eliminated, and SO<sub>2</sub> and NO<sub>x</sub> effluence is considerably lower than standard coal/gas power plants. However, it is still effluence that could be curbed completely by using solar energy systems. In general, for every 1 MW of coal/gas power replaced by a renewable source: approx. 3,640 tons CO<sub>2</sub>, 9.2 tons SO<sub>2</sub>, 11.2 tons NO<sub>x</sub> is avoided.<sup>15</sup>

These emissions have costs beyond the impairment of ecological services. Each year, effluence affects people across the country. Annually, there are hundreds of thousands of hospital visits and millions of lost worker days attributed to gases and particulate emitted by fossil fuel-based power plants.<sup>16</sup>

There are a number of additional costs to coal/gas power facilities. First, the fuel required to generate electricity is a resource into which considerable resources must be invested. Recovering gas/oil/coal often requires seismic analysis to locate the resource. Then the fuel must be extracted, processed, and transported to where it is needed. Solar power plants require only natural sunlight, which costs nothing to locate or transport. Coal power plants also use copious quantities of water. Traditional facilities annually use about 4.4 million gallons of water for every MW of capacity.<sup>17</sup> IGCC plants may be worse, requiring up to 2500 gallons every minute.<sup>18</sup> Even if significant water recycling is performed, the need still adds up. Furthermore, both traditional and IGCC coal facilities release waste water. Even if this waste water complies

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<sup>12</sup> EnergyJustice.net. Fact Sheet: “Clean Coal” Power Plants (IGCC).  
<http://www.energyjustice.net/coal/igcc/factsheet-long.pdf>

<sup>13</sup> Environmental Impacts of Coal Power: Air Pollution. Union of Concerned Scientists. August 18, 2005.  
[http://www.ucsusa.org/clean\\_energy/coalvswind/c02c.html](http://www.ucsusa.org/clean_energy/coalvswind/c02c.html)

<sup>14</sup> L. Stoddard, J. Abiecunas, and R. O’Connell. Economic, Energy, and Environmental Benefits of Concentrating Solar Power in California. National Renewable Energy Laboratory. April, 2006.

<sup>15</sup> Concentrated Solar Power. American Solar Energy Society, Solar Electric Division.  
[www.ases.org/divisions/electric/facts\\_csp.pdf](http://www.ases.org/divisions/electric/facts_csp.pdf)

<sup>16</sup> Data for U.S. Moving Toward Ban on New Coal-Fired Power Plants. Earth Policy Institute. February 14, 2008.  
[http://www.earth-policy.org/Updates/2008/Update70\\_data.htm](http://www.earth-policy.org/Updates/2008/Update70_data.htm)

<sup>17</sup> Environmental Impacts of Coal Power: Water Use. Union of Concerned Scientists. August 18, 2005.  
[http://www.ucsusa.org/clean\\_energy/coalvswind/c02b.html](http://www.ucsusa.org/clean_energy/coalvswind/c02b.html)

<sup>18</sup> Frequently Asked Questions. FutureGen Alliance, Inc. 2006. <http://www.futuregenalliance.org/faqs.stm>

with EPA standards, contaminants are still released into natural water systems.<sup>19</sup> On the other hand, a 100 MW CSP plant only requires about 815,000 gallons of water every year, and there is very little waste water.<sup>20</sup>

Land is another finite resource that is necessary for all types of infrastructure, including power facilities. Table 2 shows estimates of the acreage needed for every MW of capacity for different facilities.

**Table 2. Acres Per Megawatt of Generation Capacity**

Energy Source	Acres/MW
Solar-PV	2.47 <sup>7</sup> -12.36 <sup>7</sup>
Solar-CSP	5.0 <sup>10</sup> -12.33 <sup>8</sup>
Wind	24.71 <sup>7</sup> -50 <sup>9</sup>
Coal	0.35 <sup>9</sup> -1.1 <sup>11</sup>
IGCC Coal	1.31 <sup>12</sup> -2.36 <sup>12</sup>
Gas	0.29 <sup>13</sup> -0.41 <sup>13</sup>

<sup>7</sup> PV FAQ's. U.S. Department of Energy, Energy Efficiency and Renewable Energy. National Renewable Energy Laboratory. ([www.hubbartpeak.com/Apollo2/photovoltaics/HowMuchLandNREL.pdf](http://www.hubbartpeak.com/Apollo2/photovoltaics/HowMuchLandNREL.pdf))

<sup>8</sup> Concentrating Solar Power: From Research to Implementation. European Commission. European Communities, 2007. ([ec.europa.eu/energy/res/publications/doc/2007\\_concentrating\\_solar\\_power\\_en.pdf](http://ec.europa.eu/energy/res/publications/doc/2007_concentrating_solar_power_en.pdf))

<sup>9</sup> Cure for the Common Coal: Can Wind Power Replace Traditional Fossil Power? Time2Time. June 3, 2008. (<http://uva72.blogspot.com/2008/06/cure-for-common-coal-can-wind-power.html>)

<sup>10</sup> Concentrating Solar Power. U.S. Department of Energy, Energy Efficiency and Renewable Energy. National Renewable Energy Laboratory. ([solareis.anl.gov/documents/docs/NREL\\_CSP\\_1.pdf](http://solareis.anl.gov/documents/docs/NREL_CSP_1.pdf))

<sup>11</sup> Jonah Lamb. Killer Coal. Salt Lake City Weekly. May 3, 2007. (<http://www.slweekly.com/index.cfm?do=article.details&id=1CA7B2DC-2BF4-55D0-F1FC484A425B4016>)

<sup>12</sup> Final Site Selection Report. FutureGen Industrial Alliance, Inc. Submitted to Department of Energy, Dec. 18, 2007.

<sup>13</sup> Eleanor Charles. A Flurry of Proposals for Gas-Fired Power Plants. The New York Times. October 24, 1998. (<http://query.nytimes.com/gst/fullpage.html?res=9507E6D8123DF937A15753C1A96E958260&sec=&spon=&page=wanted=all>)

In this category, fossil fuel-based power facilities appear to more efficient. However, the land necessary to extract and process their respective fuel sources should be reviewed in any adequate cost/benefit breakdown. There are also the costs of reclaiming sites where coal, oil, and gas have been extracted. These cost taxpayers hundreds of millions of dollars every year.<sup>21</sup> Without considering all of the costs behind every unit of power produced, any analysis of costs and benefits is insufficient.

Regardless of the type of facility, there are some means of abating the costs of installing a power plant. Undeveloped lands may be worth considerably more to recreational purposes and the ecosystem than are lands that have already been disturbed from their natural states. Therefore,

<sup>19</sup> EnergyJustice.net. Fact Sheet.

<sup>20</sup> Ivapah Solar Electric Generating System. The California Energy Commission. July1, 2008. <http://www.energy.ca.gov/sitingcases/ivanpah/index.html>

<sup>21</sup> Data Tables and Figures. 2006 Annual Report. OSM/DOI Strategic Plan Measures. Office of Surface Mining. 2006. <http://www.osmre.gov/annualreports/06AR11.pdf>

locating new facilities and corridors near existing infrastructure keeps essentially all of the benefits of a facility located anywhere while simultaneously reducing the market and non-market costs of installing the new infrastructure.

**Recommendations:** In order to ensure that any proposed utility-scale solar energy development results in maximum net public benefits, the analysis of such development must account for the all opportunity costs. This includes the costs associated with siting utility-scale solar energy development on undeveloped public lands, and the resulting loss of economic benefits, as well as the potential jobs and income to local communities. The analysis should also compare the relative costs of other forms of energy development

*c. Benefits of siting on private lands*

Within a consideration of reasonable alternatives, the BLM should consider whether siting a power facility on private lands has greater potential benefits than the equivalent project on public holdings.

The goal of installing any type of power-generating facility is to benefit the public as much as possible. If installed on public lands, annual ROW rents are collected by the BLM. If installed on private lands, payments would more often go directly to the local community, and through multiplier effects, would contribute to the vitality of local economies (and in turn the respective state and then federal economies) more than if the rent were collected by the federal government. It is therefore necessary to consider the direct impact on local economies from a new power facility being sited on private as opposed to federal land within the larger socioeconomic analysis.

**Recommendations:** The Solar PEIS should include an analysis of the relative benefits of siting utility-scale solar energy developments on private lands rather than on public lands. If the financial return to a private landowner would be higher, the agency should give a higher priority to siting on private lands.

*d. Benefits as well as mitigation of costs by siting on Brownfields*

There are millions of acres of contaminated lands in the U.S.<sup>22</sup> Serious potential exists for installing renewable power generation infrastructure on these lands.

The conditions of many brownfields are particularly well-suited for the development and operation of power facilities. There are many sites where the ground is relatively level and significant vegetation is absent; much of this was done when these sites were originally established. In addition, most brownfields are located within 5 miles existing electricity transmission infrastructure, reducing the need to further impact the nearby area by developing transmission corridors.<sup>23</sup> Furthermore, most of these sites already exist in a “heavy industry” zoning classification that a power facility requires. This also provides access to established waste streams.<sup>24</sup>

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<sup>22</sup> Powerpoint: Land-Based Initiatives and Climate Change. SRA International. EPA Land Revitalization Staff Office. June, 2007. <http://www.authorstream.com/Presentation/Margherita-45877-NARUC-Pres-July-15-Land-Based-Initiatives-Climate-ChangeJune-2007-Opportunities-GHG-Education-ppt-powerpoint/>

<sup>23</sup> Ibid.

<sup>24</sup> Energy Department Announces National Initiative to Redevelop Brownfields with Renewable Energy. U.S. Environmental Protection Agency. April 4, 2008. <http://www.epa.gov/brownfields/html-doc/brightfd.htm>

Installing renewable power infrastructure on brownfields also avoids many of the costs associated with developing open public and private lands. Ecological integrity and opportunities for recreation are already largely absent. In fact, many of these contaminated land sites can be improved. Progressive land restoration would improve environmental conditions and help to mitigate carbon emissions.<sup>25</sup>

**Recommendations:** The Solar PEIS and consideration of individual projects should include an analysis of the relative benefits of siting utility-scale solar energy developments on brownfields and other degraded lands, both public and private. The analysis should examine the net public benefits of siting on these lands relative to siting on undeveloped lands, especially undeveloped public lands which may be more important for the climate change mitigation properties, the provision of recreation opportunities, their role in local economies and their provision of passive use and other non-market values.

## 2. Non-market values should be included in the economic analyses

One of the most important purposes of public lands, including those administered by the Bureau of Land Management, is the provision of public goods or non-market goods. Opportunities for solitude, outdoor recreation, clean air, clean water, the preservation of wilderness and other undeveloped areas would be underprovided if left entirely to market forces.

In the assessment of the socioeconomic impacts of solar energy development, the Solar PEIS must account for the non-market values associated with undeveloped wild lands. The agencies implementing the Solar PEIS have an inherent responsibility to see that these lands are not impaired in order to ensure that the public goods they produce continue to be provided and in quantities that meet the demand of all U.S. citizens.

Non-market values have been measured and quantified for decades. There is a well-established body of economic research on the measurement of non-market values, and the physical changes (which result in decreases in the source of these values) brought about by development are very easy to measure quantitatively.

This analysis is especially important when considering actions which would degrade or damage roadless areas or other lands with wilderness characteristics since these lands produce benefits and values that are seldom captured in the existing market structure. The literature on the benefits of wilderness and other undeveloped lands is well-established and should be used by the BLM and DOE to estimate the potential value of these lands where utility-scale solar energy development is proposed. Krutilla (1967) provides a seminal paper on the valuation of wilderness and has led the way for countless others who have done additional research all providing compelling evidence that these lands are worth much more in their protected state. Morton (1999), Bowker et al. (2005), Krieger (2001) and Loomis and Richardson (2000) provide overviews of the market and non-market, use and non-use values of wilderness and wildlands. See Walsh et al. (1984), Bishop and Welsh (1992), Gowdy (1997), Cordell et al. (1998), Loomis and Richardson (2001) and Payne et al. (1992) for several more examples.

Peer-reviewed methods for quantifying both the non-market and market costs of changing environmental quality have been developed by economists and are readily applicable to solar energy development. For a catalog of these methods see Freeman (2003). For a complete socioeconomic analysis, agencies implementing the Solar PEIC should adapt these methods to

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<sup>25</sup> Land-Based Initiatives and Climate Change. 2007.

conditions in each of the proposed solar energy locations to obtain a complete estimate of the economic consequences of development.

The socioeconomic analysis in the Solar PEIS must also adequately address the potential impacts on the quality of life for residents of communities that will be impacted by solar energy development. The quality of life in many communities with abundant protected public lands is often tied inextricably with those lands. Any negative impacts on these lands from solar energy development may deteriorate aspects of the western quality of life. As discussed above, such a decline will create more than simply emotional or psychological impacts. Areas with high quality of life are better able to attract the entrepreneurs, skilled and creative workers, retirees and others who are important economic drivers of many western communities.

**Recommendations:** The Solar PEIS must measure and account for changes in non-market values associated with solar energy development. To do otherwise omits a very important socioeconomic impact that would directly result from solar energy development. The analysis must assess the non-market economic impacts to all Americans, including the passive use values of undeveloped public lands.

The Solar PEIS must also include an assessment of impacts on the local quality of life that are may result from utility-scale solar energy development on surrounding public lands. The potential resulting economic impacts of any decline in quality of life must also be assessed in order to fully evaluate the proposed development.

### 3. Recommended methods for socioeconomic analyses

#### a. Economic base models

The use of economic base models such as IMPLAN is insufficient to predict future economic impacts from solar energy development. While these models can be useful as a tool to develop static analyses of the regional economy, the agencies developing the Solar PEIS and local communities potentially impacted must be aware of the shortcomings and poor track record of such models as predictive tools. Economic base models do not consider the impacts of many important variables that affect regional growth in many rural communities, especially in the West. Attributes such as natural amenities, high quality hunting, fishing and recreational opportunities, open space, scenic beauty, clean air and clean water, a sense of community, and overall high quality of life are not measured or accounted for in economic base models, however these amenities are associated with attracting new businesses and migrants as well as retaining long-time residents. Many residents of Western communities (both long-time and new) earn retirement and investment income, and while it is technically possible, most economic base models completely fail to consider the important economic role of retirement and investment income.

Many economists have offered constructive critiques of the such models. See for example: Krikelas (1991), Tiebout (1956), Haynes and Horne (1997), Hoekstra, et al. (1990), Richardson, 1985 and the Office of Technology Assessment (1992). The ease of data acquisition for estimating the impacts of manufacturing, construction and resource extractive sectors combined with the difficulty of estimating the impacts of recreation and tourism underscores the potential bias favoring development in economic base models. The concern over the accuracy of these models combined with concern over the use of such models for planning, suggests that it is not



only inappropriate but a disservice to rural communities to rely on economic base analyses to estimate the economic impacts of public land management on rural communities.

***Recommendations:*** We recommend that the analysis performed for the Solar PEIS not rely solely on IMPLAN or on other models derived from economic base theory to predict the economic impacts of solar energy development. As these comments demonstrate the relationship between public land management and local and regional economic prosperity and growth is far more complex than these models assume, and given the potentially significant impacts on many of the region's public lands, use of such models will result in an incomplete and inadequate analysis of the socioeconomic impacts.

*b. Estimation of the impacts to property values*

There is a large body of work which looks at the positive impacts of open space and protected public lands on property values. These studies can be applied to infer the inverse decline in property values associated with the loss of protected public lands and open spaces that may occur when solar energy projects are sited on such lands. Numerous studies show that there is a positive correlation between property values and open spaces and protected public lands. Given that solar energy development may impact public land and open space throughout the six-state area, it is likely to have negative impacts on the property values in the region.

Several examples of such studies include Earnhart (2006), Bengochea Moranco (2003), Espey and Owosu-Edusei (2001), Bolitzer and Netusil (2000), Lutzenhiser and Netusil (2001), Geoghegan et al. (2003), Geoghegan (2002), Acharya and Bennett (2001), Irwin (2002), Tajima (2003), Luttik (2000), Loomis et al. (2004) and Breffle et al. (1998). McConnell and Walls (2005) provide a good overview of both property values and non-use values associated with open spaces. All of these studies provide empirical evidence of the potential losses to western citizens from the conversion of open space to industrial use.

***Recommendations:*** The Solar PEIS should include an examination of the impacts of solar energy development on residential and other property values. The agencies should make a quantitative assessment of these potential impacts.

***E. Scope of NEPA analysis***

NEPA requires the agencies to take a "hard look" at the potential environmental consequences of this proposed action, so that they must assess impacts and effects that include: "ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative." 40 C.F.R. § 1508.8.

1. Analysis of environmental impacts should be conducted at the landscape level.

The scope of NEPA analysis must be appropriate to the scope of the proposed action. Kern v. United States Bureau of Land Management, 284 F.3d 1062, 1072 (9<sup>th</sup> Cir. 2002). **In the context of this PEIS, the agencies should look to the overall effect on the landscape of these six connected Western States, and the many resources it contains.** A landscape level analysis of proposed energy corridors will take into account the distribution of resources across the affected

states, complying with the agencies' legal obligations to truly assess potential impacts and yielding management decisions that will balance and protect the multiple resources of these public lands. The placement of and conditions placed on energy corridors can define which areas will remain or become roadless, and which areas will be disturbed and how. By affecting the fragmentation of the landscape, energy corridors can affect how naturally or unnaturally a landscape will behave in terms of water flow and quality, wildlife migration, and species composition and function. In considering the potential impacts of permitting an entire network of energy corridors, the agencies must consider how this placement will change the landscape and interfere with species' ability to migrate and survive.

The correct scope of analysis necessitates consideration of the connected landscapes of these states. For instance, as documented in the *Heart of the West Conservation Plan* (available at: [http://wildutahproject.org/files/HOW\\_Executive\\_Summary.pdf](http://wildutahproject.org/files/HOW_Executive_Summary.pdf)) -- a science-based spatial analysis of the relative importance of various wildlife habitat cores and linkages throughout the Heart of the West ecoregion -- the areas of northeastern Utah, northwestern Colorado, and southwestern Wyoming are inextricably linked in an ecoregion with core habitat areas and key migratory linkages. As a result, impacts to wildlife habitat in one part of the Heart of the West ecoregion will affect wildlife viability throughout the ecoregion. Similarly, there are basin-wide impacts, in terms of changes to the water quantity and quality in the Green River system, and cumulative impacts to the common airshed, all of which affect the entire Heart of the West ecoregion. Other ecoregions in the planning area addressed by this PEIS are similarly interconnected. *See, e.g.*, the Wildlands Network - <http://www.twp.org/cms/page1158.cfm> .

A landscape approach is supported by NEPA guidance on cumulative impacts, which requires that the entire area potentially affected be included in a cumulative analysis and holds that a failure to include an analysis of actions within a larger region will render NEPA analysis insufficient. *See, e.g., Kern v. U.S. Bureau of Land Management*, 284 F.3d 1062, 1078 (9<sup>th</sup> Cir. 2002) (analysis of root fungus on cedar timber sales was necessary for entire area).

Thus, in order to accurately evaluate the potential environmental consequences of west-wide designation of energy corridors, the cumulative impact analysis would necessarily look at the cumulative impacts on all of the directly and indirectly affected landscapes. The Environmental Protection Agency, in providing direction to its reviewers, emphasizes the importance of ensuring that the cumulative impact analysis is based on “geographic and time boundaries large enough to include all potentially significant effects on the resources of concern. The NEPA document should delineate appropriate geographic areas including natural ecological boundaries, whenever possible, and should evaluate the time period of the project's effects.” U.S. Environmental Protection Agency, 1999, *Consideration Of Cumulative Impacts In EPA Review of NEPA Documents*. (emphasis original).

The Council for Environmental Quality's (CEQ) guidelines on cumulative effects analysis provide the following steps for determining the appropriate geographic boundary of cumulative impact analysis:

1. Determine the geographic area that will potentially be directly affected by an action – known as the “project impact zone”;
2. Identify resources in the project impact zone that could be affected by the action;

3. Determine the geographic areas occupied by the resources outside the project impact zone.
4. Identify the appropriate area for analysis of cumulative effects based on the largest of the areas determined in step 3. Council on Environmental Quality, 1997, *Considering Cumulative Effects Under the National Environmental Policy Act*.

For the energy corridors, the geographic area of impact will include the resources, such as wildlife, within areas of proposed development and their habitat extending outside such areas. The agencies can and should take the overall impacts of the corridors on the affected landscapes into account when considering their potential environmental consequences. *See, e.g., Newmont Mining Corp.*, 151 IBLA 190 (1999) (Where the Bureau of Land Management could take into account the overall degradation from existing and connected proposed operations, a cumulative analysis of all impacts was required); *Kern v. United States Bureau of Land Management*, *supra*. (BLM must perform cumulative impact analysis of reasonably foreseeable future timber sales on spread of root fungus before approving single proposed sale). A landscape level analysis is an important part of a programmatic EIS, even if site-specific analysis might be deferred until authorization of specific projects. For instance, the U.S. Court of Appeals for the Ninth Circuit has held that analyzing the overall environmental risks involved in transporting oil from off-shore leases was appropriate and necessary in a PEIS, although specific analysis of individual pipeline locations could be deferred. *County of Suffolk v. Secretary of Interior*, 562 F.2d 1368, 1376-1377 (2<sup>nd</sup> Cir. 1977) (It was “essential to consider and weigh the environmental aspects of transportation, as well as of exploration and production.”). In order to fulfill the mandate of NEPA that the agencies make an informed assessment of the environmental consequences of its actions, the landscape level effects of an expanded large-scale corridor system must be assessed.

2. Cumulative impact analysis should include other pending programmatic efforts and additional development to be supported by new corridors.

As noted above, NEPA requires the agencies to consider the cumulative impacts of the proposed corridors. The CEQ’s NEPA regulations define “cumulative impact” as:

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**. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

40 C.F.R. § 1508.7. (emphasis added).

The analysis of impacts included in the PEIS must address the cumulative impacts of both the development of utility-scale solar energy projects and other foreseeable connected activities within the same general areas. The resources that allow an ecosystem to function often share a common geography, such that changes to the water quantity and quality in a river system or impacts to an airshed (which may be affected by activities such as oil and gas drilling), all contribute in common. Similarly, changes to these resources may affect the core habitat and linkages that are critical for survival of wildlife and vegetation in a region. Accordingly, where

there are shared environmental resources that can act as indicators of the health of ecosystems, the agencies must analyze all of the direct and indirect impacts that affect them.

The Environmental Protection Agency provides the following guidance to its reviewers on assessing the range of other activities to be considered in cumulative impacts analysis:

1. the proximity of the projects to each other either geographically or temporally;
2. the probability of actions affecting the same environmental system, especially systems that are susceptible to development pressures;
3. the likelihood that the project will lead to a wide range of effects or lead to a number of associated projects; and
4. whether the effects of other projects are similar to those of the project under review.
5. the likelihood that the project will occur -- final approval is the best indicator but long range planning of government agencies and private organizations and trends information should also be used;
6. temporal aspects, such as the project being imminent. U.S. Environmental Protection Agency, 1999, *Consideration Of Cumulative Impacts In EPA Review of NEPA Documents*.

**In this case, the BLM's obligation to analyze impacts must encompass not only the proposed and projected solar energy projects, but also the cumulative impacts of the projects, taken together with the impacts of existing, proposed, or reasonably foreseeable projects, on the environment. Thus, the BLM must analyze the cumulative impacts not just of the solar development projects, but also of other projects that will impact resources in common with this proposed action.** As discussed above, there are other initiatives to support development and transmission of renewable energy projects and it is critical that the BLM coordinate with these processes and consider the cumulative impacts, which presumably can be reduced by proactive coordination, as well.

In determining the appropriate scope of environmental analysis for an action, the Government must consider not only the single proposed action, but also three types of related actions:

- (1) Connected actions - Actions which are closely related and:
  - (i) Automatically trigger other actions which may require environmental impact statements.
  - (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously; or
  - (iii) Are interdependent parts of a larger action and depend on the larger action for their justification.
- (2) Cumulative actions – Actions, which when viewed with other proposed actions, have cumulatively significant impacts.
- (3) Similar actions – Actions, which when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental

consequences together, such as common timing or geography. 40 C.F.R. § 1508.25. Under any of these classifications, the coordinated actions that the agencies are taking through this PEIS trigger a broader assessment of the cumulative impacts.

The increased level of solar energy development projects that will follow the completion of this PEIS are also connected to new transmission projects that are likely to trigger preparation of an EIS. Impacts from transmission projects include direct affects to lands, wildlife and natural resources from the construction, ongoing maintenance and monitoring of transmission infrastructures and rights-of-way (ROW). These impacts include direct impacts to soils and vegetation due to clearing ROW, as well as direct wildlife impacts in terms of avian collisions and electrocutions. Indirect impacts include wildlife displacement, increased raptor prey opportunities on vertical structures and habitat fragmentation impacts on a variety of wildlife species. Additional transmission/ROW impacts to consider include noise, EMF, visual and aesthetic concerns.

In addition, the clustering of solar energy development projects with projects to develop more traditional forms of energy in order to access the new transmission corridors proposed in the West-wide Energy Corridor PEIS are likely to have a cumulatively significant effect on the resources in the area. And, since the energy corridors and new transmission will be tied, at least to some extent, on the location of developable energy sources, including solar, these projects are certainly similar in terms of geography. Both the various programs and the increased development projects will have a connected and cumulative effect on resources ranging from elk and pronghorn herds to bird of prey populations, sage grouse populations, air quality, water quality (and erosion and sedimentation), and overall potential for primitive recreation. Therefore, their combined impact should be taken into account as part of the analysis of cumulative impacts associated with this PEIS.

With the western U.S. already possessing over 100,000 linear miles of power lines, the Solar PEIS should analyze opportunities to maximize current grid assets to transport newly developed solar energy instead of new power lines in new ROW. In addition, the PEIS should analyze opportunities at the major population centers to reduce generation import (and therefore transmission) needs by maximizing efficiency, distributed generation resources and other demand-reducing efforts.

3. Site- and use-specific analysis must be conducted prior to designation and approval of energy corridors.

As noted above, the scope of NEPA analysis must be appropriate to the scope of the proposed action. Kern v. United States Bureau of Land Management, 284 F.3d at 1072. In the context of this PEIS, the future approval of individual solar development projects must be based on specific analysis of the proposed locations and uses of the corridors. If the PEIS will not seek to approve individual projects or take the place of site-specific analysis, then the scope of NEPA analysis can be focused more on the general types of impacts and the overall effect of this policy initiative, as is most common for a programmatic EIS. See, Northcoast Env't'l v. Glickman, 136 F.3d 660, 688 (9<sup>th</sup> Cir. 1998) (Programmatic EIS is used to examine “an entire policy initiative.”). However, if the PEIS will commit the BLM to a specific course of action, such as

authorizing actual projects, then a site-specific and use-specific analysis of each corridor must be completed. *See, State of California v. Block*, 690 F.2d 753, 765 (9<sup>th</sup> Cir. 1982); *County of Suffolk v. Secretary of Interior*, 562 F.2d at 1378.

**We recommend that the PEIS include definitive commitments to conduct site-specific NEPA analyses when individual project locations and specifications are identified.** In fact, BLM's resource management plans and project-level EISs often state that site-specific analysis is not possible until a particular activity, such as a pipeline, is proposed. This approach would also be consistent with the NEPA regulation governing tiering environmental analysis for a site-specific action to a broader programmatic EIS. The regulation envisions that agencies can tier to a "broad environmental impact statement" so that the subsequent environmental document "shall concentrate on the issues specific to the subsequent action." 40 C.F.R. § 1502.20. In the context of the PEIS, this broader programmatic document should analyze the general effects of an increased level of development of utility-scale solar development. However, tiering to this type of analysis cannot support the approval of projects, which would require a NEPA analysis of the environmental consequences, as "specific to the subsequent action," be included in the PEIS.

#### 4. Range of alternatives

The range of alternatives is "the heart of the environmental impact statement." 40 C.F.R. § 1502.14. NEPA requires BLM to "rigorously explore and objectively evaluate" a range of alternatives to proposed federal actions. *See* 40 C.F.R. §§ 1502.14(a) and 1508.25(c).

NEPA's requirement that alternatives be studied, developed, and described both guides the substance of environmental decision-making and provides evidence that the mandated decision-making process has actually taken place. Informed and meaningful consideration of alternatives -- including the no action alternative -- is thus an integral part of the statutory scheme.

Bob Marshall Alliance v. Hodel, 852 F.2d 1223, 1228 (9<sup>th</sup> Cir. 1988), cert. denied, 489 U.S. 1066 (1989) (citations and emphasis omitted).

An agency violates NEPA by failing to "rigorously explore and objectively evaluate all reasonable alternatives" to the proposed action. City of Tenakee Springs v. Clough, 915 F.2d 1308, 1310 (9<sup>th</sup> Cir. 1990) (quoting 40 C.F.R. § 1502.14). This evaluation extends to considering more environmentally protective alternatives and mitigation measures. *See, e.g., Kootenai Tribe of Idaho v. Veneman*, 313 F.3d 1094, 1122-1123 (9<sup>th</sup> Cir. 2002) (and cases cited therein); *see also Env'tl Defense Fund., Inc. v. U.S. Army Corps. of Eng'rs*, 492 F.2d 1123, 1135 (5<sup>th</sup> Cir. 1974); City of New York v. Dept. of Transp., 715 F.2d 732, 743 (2<sup>nd</sup> Cir. 1983) (NEPA's requirement for consideration of a range of alternatives is intended to prevent the EIS from becoming "a foreordained formality."); Utahns for Better Transportation v. U.S. Dept. of Transp., 305 F.3d 1152 (10<sup>th</sup> Cir. 2002), modified in part on other grounds, 319 F.3d 1207 (2003); Or. Env'tl. Council v. Kunzman, 614 F.Supp. 657, 659-660 (D. Or. 1985) (stating that the alternatives that must be considered under NEPA are those that would "avoid or minimize" adverse environmental effects).

The current range of alternatives does not contain a sufficient range of alternatives that avoid or minimize environmental effects. Both the “no action” alternative and the “limited development” alternative are ways to proceed with considering solar application on a case-by-case basis. The “facilitated development” alternative (the proposed action) provide for the BLM to develop a solar energy program. There is no consideration of alternatives that would ensure more environmentally responsible approaches to solar energy development. In order to comply with the requirements of NEPA, the PEIS should include additional alternatives that consider:

- A facilitated program with exclusions for all lands with wilderness characteristics, critical habitat and migration corridors in addition to those exclusion areas identified in the Notice of Availability;
- A facilitated program that would be limited by disturbance of only a specific percentage of lands with solar potential at any given time – both for the entire planning area and for the individual field offices affected – to ensure that ecological functions are preserved. Additional disturbance would only be permitted once affected lands with existing disturbance had been restored;
- A facilitated program that prioritizes projects that can show that they will have a net benefit in impacting climate change; and/or
- A facilitated program that would only permit construction of solar projects in close proximity (i.e., within 5 miles) to existing transmission lines or within zones being designated through the RETI or WREZ processes.

**Recommendations:** NEPA analysis in the PEIS should be conducted at the landscape level, address cumulative impacts, set out standards for additional site-specific analysis for proposed projects, and include more environmentally protective alternatives.

#### ***F. Transmission***

The Notice of Intent states: “The PEIS will consider whether designation by BLM of additional electricity transmission corridors on BLM-administered lands is necessary to facilitate utility-scale solar energy development.” As discussed in detail above, the designation of new corridors should be considered in relation to not only existing transmission lines and the corridors currently being planned by the West-wide Energy Corridors PEIS, RETI, and WREZ processes, as well as others. If the BLM is going to designate new corridors in the PEIS, then BLM must complete all of the necessary NEPA analysis for those corridors, including a thorough discussion as to why the ongoing corridor designation processes will not be sufficient. In making a determination about the need for additional corridors, the BLM should commit to first coordinating with the ongoing designation processes and prioritize using those corridors, instead of designating still more corridors without coordination.

**Recommendations:** The PEIS must clearly address whether it is merely determining the potential need for new corridors to facilitate new solar energy projects or if the PEIS will also be designating corridors based on projected development. We would recommend that the PEIS focus on using existing and planned corridors, and coordinate with ongoing designation processes to ensure that corridors to support project solar energy development are being designated, instead of designating new corridors.

## V. Department of Energy Solar Energy Program

Like the BLM, the DOE must adequately assess all impacts, market and non-market, associated with the development of the agency's solar energy program.

### A. Current DOE Solar Energy Program

DOE should disclose the types of solar projects that it currently funds, as well as the specific environmental concerns that are currently addressed by the DOE Solar Energy Technologies Program. This will foster public understanding and participation in the PEIS process. DOE should also establish which program offices, in addition to the Solar Energy Technologies Program, will potentially utilize the PEIS in decision-making.

### B. Issues to be Addressed in PEIS

The DOE should incorporate the planning criteria and significant issues identified by the BLM and also those listed in Section IV above for analysis in developing principles for awarding funding for solar energy projects. The scope of DOE's analysis and categories of lands and resources should be broader, however, since the agency's programs can fund projects sited on federal, state, private and tribal lands. For the same reason, socioeconomic impacts are of particular concern. As discussed within the socioeconomic section above, there may be various benefits (social, ecological, and economic) to placing a solar project on private lands or even state or tribal lands, which should be identified in an analysis of potential projects to be funded.

DOE should commit to only supporting solar projects that fully meet the criteria recommended in these comments. Environmentally protective stipulations should be included in all DOE grants; failure to comply with these criteria at any stage in the project should result in loss of funding. The Draft PEIS should include specific mitigation measures and best management practices that the agency, industry, and stakeholders will be expected to adhere to. It's essential that the public has the opportunity to review and comment on these practices during the PEIS process.

### C. Range of Alternatives

The DOE should provide a broader range of alternatives than BLM because the agency can fund projects on tribal, state, private, and other federal lands in addition to BLM-administered lands and has no affirmative obligation to process ROWs. These alternatives can include prioritizing projects that have economic benefits, prioritizing projects that are the least environmentally destructive, and prioritizing projects on already degraded lands such as Brownfield or Superfund sites. The Draft PEIS should establish a range of alternatives for the agency to analyze and the public to comment on.

**Recommendations:** DOE should use this opportunity to mirror the process and analysis being conducted by the BLM, so it can develop a comprehensive set of principles for funding solar projects.



Thank you for considering these scoping comments and for your collective commitment to supporting renewable energy. Please include all of the undersigned in your list of interested persons for this PEIS.

We look forward to continuing to participate in this process. Please feel free to contact us if you have any questions or need additional information. We would also welcome the opportunity to meet with you to present and discuss these comments in person.

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**Attachments**

1. Letter from William H. Meadows, President of The Wilderness Society, to the House Appropriations Committee, July 8, 2008.
2. Haefele, M., P. Morton, and N. Culver. 2007. *Natural Dividends: Wildland Protection and the Changing Economy of the Rocky Mountain West*. Washington DC: The Wilderness Society.
3. Motion to Stay Briefing and for a Status Conference, September 9, 2005.
4. Southern Utah Wilderness Alliance v. Norton, 457 F. Supp. 2d 1253 (D. Utah 2006).
5. *Citizen-Wilderness Proposals*, CD of GIS Data.

6. The Wilderness Society. 2006. *Socio-Economic Framework for Public Land Management Planning: Indicators for the West's Economy*. Washington DC: The Wilderness Society.
7. *Have Desert Researchers Discovered a Hidden Loop in the Carbon Cycle?*, Science, Vol. 320, pp. 1094-140 (June 13, 2008).

#### Appendix 1

- a. *Habitat Fragmentation from Roads: Travel Planning Methods to Safeguard BLM Lands*
- b. *Fragmenting Our Lands: The Ecological Footprint from Oil and Gas Development*
- c. *Protecting Northern Arizona's National Monuments: The Challenge of Transportation Management*
- d. *Wildlife at a Crossroads: Energy Development in Western Wyoming*
- e. *Ecological Effects of a Transportation Network on Wildlife*

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