

February 5, 2010

*Delivered via electronic mail ([normanperry40@msn.com](mailto:normanperry40@msn.com)).*

**Norman Perry, Chair, Renewable Energy – Wind and Solar  
Arizona Bureau of Land Management Resource Advisory Council**

**Re: Recommendations for issues and alternatives BLM should consider for wind and solar development on public lands in Arizona**

Dear Mr. Perry:

Please accept and fully consider these recommendations for issues and alternatives the Bureau of Land Management (BLM) should consider for wind and solar development on public lands in Arizona by The Wilderness Society, Sierra Club – Grand Canyon Chapter (Arizona), Friends of Ironwood Forest, the Arizona Wilderness Coalition, and Sky Island Alliance. We appreciate the opportunity to provide input on these critical issues. Our recommendations are included as attachments to this letter, as detailed below.

#### **Introduction**

The mission of **The Wilderness Society** is to protect wilderness and inspire Americans to care for our wild places. We have worked for more than 70 years to maintain the integrity of America's wilderness and public lands and ensure that land management practices are sustainable and based on sound science to ensure that the ecological integrity of the land is maintained. With over 500,000 members and supporters nationwide, TWS represents a diverse range of citizens.

The **Sierra Club** is America's oldest, largest and most influential grassroots environmental organization. Inspired by nature, the Sierra Club's more than 750,000 members – including 12,000 plus in Arizona as part of the Grand Canyon Chapter – work together to protect our communities and the planet. The Sierra Club has been involved for many years in working to protect Arizona's public lands, wildlife, air and water. The Sierra Club is also very interested and involved in promoting renewable energy and energy efficiency as a means to reduce greenhouse gas emissions and help limit global climate change. We strongly believe that properly sited renewable energy resources are part of the solution to this most challenging issue.

It is clear that the nation's growing addiction to fossil fuels, coupled with the unprecedented threats brought about by global warming, imperil the integrity of our wildlands as never before. To sustain both our wildlands and our human communities, we believe the nation must transition to a clean energy future as quickly as possible. To do this, we must eliminate energy waste, moderate demand through energy efficiency, conservation, and demand-side management practices, and rapidly develop and deploy clean, renewable energy technologies, including utility-scale projects. These projects will have serious impacts, however, and some places are inappropriate for development of any kind. For these reasons, it is critically important to the undersigned that BLM ensure that renewable energy policy and projects are carefully managed to maximize clean energy benefits while minimizing impacts to wildlands, wildlife habitat, clean air and water, recreation, and the many other resources and values found on our public lands.

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The recommendations included as attachments to this letter are intended to help BLM achieve these renewable energy goals. We would be happy to discuss further these recommendations and any other questions or issues relating to these issues. We have also included as attachments detailed comments submitted on BLM's Solar and Wind Programmatic Environmental Impact Statements. These comment letters include details on many of the issues laid out in outline form in the attachments below.

Thank you for your consideration of our recommendations.

Sincerely,

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CC: Jim Kenna, Arizona BLM State Director

**Attachments**

**Recommendations for issues and alternatives BLM should consider for wind and solar development on public lands in Arizona:**

1. Statewide and project level – solar
2. Statewide and project level – wind

**Comments on BLM Solar and Wind Programmatic Environmental Impact Statements:**

3. TWS and partners 7/8/08 scoping comments on BLM Solar PEIS
4. TWS and partners 9/14/09 scoping comments on BLM Solar PEIS Solar Energy Study Areas
5. TWS and partners 12/10/04 comments on the Draft Wind PEIS
6. Guidelines for Reducing Impacts to Wildlife from Wind Energy Development in Arizona - Arizona Game and Fish Department, May 2009

**Attachment 1: Statewide and project level – solar**

- Analyze cumulative impacts (including likely development of other energy resources) to: land use, water, wildlife habitat, recreation, cultural resources, socioeconomics, visual resources, and other resources and values.
- Designate zones appropriate for development
  - Prioritize areas with excellent solar resources, on already degraded lands, close to existing transmission lines and other infrastructure like roads
  - Exclude inappropriate areas (e.g. ACECs, lands with wilderness characteristics, important wildlife habitat, etc.)
  - Designate only the most appropriate areas as zones, with enough acreage to meet 5-10 year demand; if necessary, new zones can be considered if demand exceeds available land
  - Incorporate information from ongoing transmission planning efforts in zone designation
- Restrict development to designated zones
- Produce a coordinated plan for additional legislative or administrative protection of lands alongside designation of development zones (similar to California Desert Renewable Energy Conservation Plan (DRECP))
- Require mitigation, including on-site to avoid and minimize impacts and off-site to off-set any impacts which cannot be avoided
- Incorporate Required Operating Procedures based on best management practices
- Require bonding for project cleanup
- Discourage the use of wet-cooled and other water intensive technologies
- Coordinate with other Governments/Agencies, including USFWS, AGFD and other federal, state, and local entities
- Coordinate with Tribal Governments
- Employ geographic and temporal phasing of projects, as well as project monitoring and adaptive management
- Compare proposed projects and prioritize for permitting and development those with the least projected impacts and best chance of success
- Provide robust opportunities for public education and involvement
- Consider and analyze climate change impacts, including anticipated benefits from solar development
- Provide a full range of alternatives for plans and projects

**Attachment 2: Statewide and project level – wind**

- Attachment 1 recommendations also apply to wind energy development, though water concerns are minimized
- Incorporate recommendations from the Arizona Game and Fish Department’s May 2009 “Guidelines for Reducing Impacts to Wildlife from Wind Energy Development in Arizona”

# **Attachment 3**



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.

*BLM Action Center, 1660 Wynkoop Street, Suite 850, Denver, CO 80202*

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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.

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**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

<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>).

<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

<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.hubbertpeak.com/Apollo2/photovoltaics/HowMuchLandNREL.pdf](http://www.hubbertpeak.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](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](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. July 1, 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

<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.

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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.

Sincerely,

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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.

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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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# **Attachment 4**

September 14<sup>th</sup>, 2009

*Delivered via electronic mail (with exhibits, through the project website) and U.S. mail (with exhibits and attachments)*

Solar Energy PEIS – Solar Energy Study Areas  
Argonne National Laboratory  
9700 S. Cass Avenue  
EVS/900  
Argonne, IL 60439

**Re: Scoping Comments on the Solar Energy Study Areas for the Solar PEIS**

Please accept and fully consider these comments on behalf of The Wilderness Society, Natural Resources Defense Council, Defenders of Wildlife, Wild Utah Project, Center for Native Ecosystems, Western Resource Advocates, New Mexico Wilderness Alliance, Arizona Wilderness Coalition, Californians for Western Wilderness, National Wildlife Federation, California Native Plant Society, Wyoming Outdoor Council, Colorado Environmental Coalition, Great Old Broads for Wilderness, Soda Mountain Wilderness Council, California Wilderness Coalition, Desert Protective Council, Sierra Club, Southern Utah Wilderness Alliance, and the Mojave Desert Land Trust.

The mission of The Wilderness Society (TWS) is to protect wilderness and inspire Americans to care for our wild places. We have worked for more than 70 years to maintain the integrity of America's wilderness and public lands and ensure that land management practices are sustainable and based on sound science to ensure that the ecological integrity of the land is maintained. With more than half a million members and supporters nation-wide, TWS represents a diverse range of citizens.

Natural Resources Defense Council (NRDC) is a non-profit environmental organization with over 1.2 million members and online activists nationwide. NRDC uses law, science and the support of its members and activists to protect the planet's wildlife and wild places and to ensure a safe and healthy environment for all living things. NRDC has worked to protect wildlands and natural values on public lands and to promote pursuit of all cost-effective energy efficiency measures and sustainable energy development for many years.

We appreciate the opportunity to submit these comments to the Bureau of Land Management on the maps of proposed Solar Energy Study Areas (SESAs), supplementing the Programmatic Environmental Impact Statement (PEIS) for agency-wide solar energy programs and policy. We are submitting these comments today via email and also forwarding a copy with attachments to you separately.

It is clear that the nation's growing addiction to fossil fuels, coupled with the unprecedented threats brought about by global warming, imperil the integrity of our wildlands as never before. To sustain both our wildlands and our human communities, TWS, NRDC and the undersigned believe the nation must transition away from fossil fuels as quickly as possible. To do this, we must eliminate energy waste, moderate demand through energy efficiency, conservation, and demand-side management practices, and rapidly develop and deploy clean, renewable energy technologies, including at the utility-scale, while keeping habitats and ecological connectivity intact.

Our public lands harbor substantial wind, solar, and geothermal resources. Developing some of these resources will be important to creating a sustainable energy economy and combating climate change. Renewable resource development is not appropriate everywhere on the public lands, however, and development that does occur on the public lands must take place in a responsible manner. TWS, NRDC and the undersigned support such careful development of renewable energy and hope these comments will assist the BLM in achieving the goal set out in Secretarial Order 3258 of "identifying and prioritizing specific locations best suited for large-scale production of solar energy."

We have organized our comments into three sections: The first section addresses cross-cutting themes and issues that address key considerations for both SESAs and the broader Solar PEIS process, including structuring a solar energy program, coordination with other on-going related processes and the need for a long term vision for the energy and conservation needs of the West. The second section discusses the SESAs that have been proposed and alternatives. The third and final section discusses issues that will arise if the other "blue lands" identified on SESA maps were opened to solar development. Exhibits with detailed comments on the BLM's proposals in each of the six states encompassed by the Solar PEIS, including maps and GIS data where available, are also included, as well as an exhibit on cultural resources in the SESAs. Please note that not all groups signed on to these broader comments are signing on to the additional state-specific and cultural resources comments attached as exhibits, so we have specifically identified those groups that are specifically signing on at the beginning of each state-specific comment exhibit and the cultural resources exhibit (exhibits 6-12).

I. Cross-cutting issues relating to SESAs and Solar PEIS

- a. Identifying the most suitable areas and focusing development in those areas before expanding development is a responsible approach to utility-scale solar development on the public lands.

We support BLM's commitment to develop clear and comprehensive guidelines for responsible solar energy development, identify lands appropriate for solar projects as open for development, and close all other lands to development as part of the Solar Energy PEIS. The release of proposed SESAs for public review and comment is an important next step showing the BLM's commitment to this approach and providing more detail on how it can be accomplished. We are encouraged by the BLM's statements that important screening criteria (including critical wildlife habitat, special management areas, and visual resources) have already been applied to SESAs. Further, establishing SESAs better enables a landscape-level analysis of solar development and associated transmission on public lands in the West.

As the SESAs are building on the information provided in BLM's original Notice of Intent for the Solar PEIS, these comments are also building on the issues we identified in our original

scoping comments, dated July 15, 2008, which are attached as Exhibit 1 and incorporated herein by reference.

We appreciate the opportunity to comment on the proposed SESAs before the release of the Draft PEIS. Conservation organizations, local jurisdictions, industry groups, and many other members of the public have valuable information that can inform identification of the most appropriate areas as SESAs on public lands, and incorporating this information into decision-making will help ensure the success of the PEIS in furthering renewable energy development on public lands while protecting the many sensitive resources and values on our public lands.

**Recommendations:** BLM should move forward with developing a comprehensive and robust PEIS for solar development that includes clear and comprehensive guidelines for responsible solar energy development, identifies lands appropriate for solar projects as open for development, and closes all other lands to development. Through comments received during the NEPA process, BLM should refine the SESAs to ensure that, when Solar Energy Zones (SEZ) are designated, they truly include only the most appropriate lands for solar development on public lands.

- b. Areas in which solar power generation is not appropriate must be clearly identified.

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. This transformation can be expected to last for decades, and some impacts will likely be permanent and cannot be mitigated. Under these circumstances, it is clear that some areas are not appropriate for this kind of development and equally that, as part of its new solar program, the BLM must identify which those areas are.

We appreciate the BLM’s commitment to avoiding the sensitive areas identified in the scoping notice, as well as requiring that the SESAs be near existing roads and existing or designated transmission routes.

We support the application of the criteria set out in the Notice of Availability (74 Fed.Reg. 31307-31308) for removing lands from consideration for SESAs. In addition, we reiterate the categories and considerations identified in our original scoping comments on the Solar PEIS (Exhibit 1). In particular, we note that the SESAs do not acknowledge the need to identify and exclude from consideration lands with wilderness characteristics that have not been previously inventoried. For instance, some of the resource management plans (RMPs) governing the lands within proposed SESAs have not completed re-inventories for wilderness characteristics. A similar approach is already being implemented in the context of transportation management, where the BLM is requiring evaluation of lands for their wilderness characteristics prior to making or changing designations for roads or motorized trails. *See*, IM No. 2009-132. The agency can conduct a similar analysis prior to designating lands to be prioritized for large-scale solar energy development.

Further, while we believe it is of primary importance that no SESA be placed directly in any of the types of areas identified by the BLM and in our previous comments, it is also important that solar energy facilities not infringe on the recreational enjoyment of certain types of areas

or otherwise interfere with their ecological functions or other special values. Units of the National Landscape Conservation System and other protected areas serve as important core areas that are part of larger ecosystems; migration corridors and other landscape-level values must be taken into account in analysis of the SESAs in the Draft PEIS.

**Supplemental Recommendations:** We support BLM’s exclusion of the categories of lands listed in the scoping notice. BLM should analyze any potential impacts from SESAs sited immediately adjacent to these areas, propose measures to minimize and mitigate those impacts, and make any necessary adjustments to SESAs if impacts are determined to be unacceptable. Lands with wilderness characteristics must not be adversely impacted by the SESAs. The SESAs should not be sited in lands BLM is managing to protect wilderness characteristics. Further, areas that have not recently been inventoried for wilderness characteristics should be inventoried before being committed to SESAs. The BLM should specifically consider the significant new information encompassed by the wilderness inventories which were attached to our original scoping comments, as well as to a letter sent by TWS to BLM on May 22, 2009 recommending avoidance of these areas. The May 22, 2009 letter and attached GIS data are included with these scoping comments as Exhibit 2 (letter, GIS data and explanatory spreadsheet attached).

- c. Maximize use of areas that are already degraded and near existing infrastructure.

In addition to avoiding ecologically-sensitive lands, we commend BLM for selecting SESAs based on proximity to existing roads and existing or designated transmission corridors. We also recommend that BLM obtain and incorporate information on lands that are already impaired and/or are slated for other development uses. Abandoned mines, developed oil and gas fields, fallow agricultural lands, undeveloped real estate parcels, 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, so these two criteria work well together.

The Arizona BLM is conducting a specific process to identify lands that are both suitable for renewable energy development and require remediation or do not have other high resource values. The Restoration Energy Design Project is seeking to identify lands such as:

- hazardous material sites;
- brownfields;
- abandoned mines;
- former landfills, mineral sites or gravel pits;
- sites damaged or disturbed to the extent that restoration potential is limited; and
- sites that otherwise have very limited productivity due to a disruption of natural processes.

The BLM could undertake a similar process in other states, both internally and by seeking information from industry and the public, to identify such lands for solar energy development. We have attached comments submitted on the Restoration Energy Design Project as Exhibit 3 to these comments and incorporate these for your consideration in incorporating suitable, degraded lands. As noted in our comments, the categories in use by the Arizona BLM could

also permit coordination with adjacent landowners, to establish coordinated management of lands so that there would be sufficient acreage to support large-scale solar energy development.

***Recommendation:*** In addition to accepting information from the public regarding areas to be excluded, BLM should solicit and incorporate information on severely degraded lands and disturbed habitat that could be additional SESAs.

- d. Areas outside designated solar energy zones should be closed to new applications and applicants should be encouraged to move into zones.

The Notice of Availability states that the SESAs are being evaluated “for the purpose of determining whether such areas should be designated as Solar Energy Zones” that are intended to be “specific locations determined best suited for large-scale production of solar energy.” Once the SEZs are designated as “best suited” in the PEIS, the BLM should give full force to those designations by limiting applications to these areas.

As the BLM well knows, there are hundreds of applications pending for rights-of-way (ROWs) for solar projects.<sup>1</sup> At the outset, we would note the recommendations in our scoping comments (Exhibit 1) and also under consideration in pending legislation that the BLM evaluate changing to a leasing program for development of renewable energy on public lands and/or incorporating more robust conditions and competitive bidding for ROWs. We reiterate the importance of these considerations in addition to the following discussion on limiting development to SEZs designated through the PEIS process.

The sheer number of the pending ROW applications, in addition to the problematic locations and speculative nature of many of them, as well as the lack of a program to manage them, have generated alarm among public land users and elected officials while complicating the BLM’s ability to proactively design a comprehensive, environmentally responsible solar program. Consequently, allowing continued filing and potential development of new applications outside SEZs *after* SEZs have been designated is inconsistent with the fundamental reason for designating such areas – i.e., to direct solar development to appropriate areas of the public lands. A BLM and/or Interior Department decision to establish a program that seeks to both authorize utility-scale solar development within SEZs identified in this PEIS process, while also continuing to permit development outside the SEZs, is certain to generate significant public opposition and controversy, and slow down the Obama Administration’s efforts to speed production of renewable energy.

Instead, the solar energy program prescribed by the Solar PEIS should require BLM field offices to move quickly to affirmatively deny pending applications that are inconsistent with its terms, including in particular applications in areas that have been put off limits to solar development, such as Areas of Critical Environmental Concern (ACECs) and critical habitat for threatened and endangered species,<sup>2</sup> as well as applications whose proponents have not met

<sup>1</sup> According to the BLM, the total number of “active” pending applications is 158. Qs & As: BLM Solar Programmatic Environmental Impact Statement (PEIS), June 29, 2009, p. 8 (hereinafter “BLM Qs & As”). In addition to these “active” applications, there are also 39 pending applications that overlap with pre-existing applications, for which they are not considered “active” by BLM.

<sup>2</sup> If any exceptions to this rule are deemed necessary, they should be as tightly constrained as possible. E.g., the only companies excepted should be those which had not only completed all required studies but also had signed power purchase agreements in hand. And, rather than merely allow these companies to develop these wholly inappropriate areas, they should be given the opportunity to apply for land within a designated zone on a non-competitive basis.

other applicable requirements such as timely submission of adequate and complete plans of development.<sup>3</sup> In addition, the new program should close all lands outside SEZs to the filing of new applications; and we strongly urge BLM to deny all *pending* applications outside delineated SEZs – with the exception of projects (including “fast-track” projects<sup>4</sup>) which meet the criteria set out in this comment letter and our July 2008 comment letter (Exhibit 1, attached), and comply with all environmental laws and permitting regulations and have either begun scoping or for which the BLM has approved a Plan of Development as of this date.

Thus, a key result of the new solar program should be the immediate closure of all public lands outside of designated SEZs to solar development, once the PEIS is completed and the Record of Decision (ROD) is signed. This goal could be achieved through amending the land use plans in question to not only designate SEZs, but also to direct that only applications within SEZs will be processed for permitting until such time as additional or enlarged SEZs are designated. A major advantage of such an amendment would be that it would simultaneously deal with the problems of pending as well as future applications.

The BLM should also set out specific standards for designating new or additional SEZs, including a requirement for a determination of need for additional megawatts (MW) of production before additional designations are considered. Moreover, the BLM should make clear as part of its new program that proposed plan amendments that would designate or expand SEZs will not be accepted from individual project proponents. 43 C.F.R. § 1601.6-3(b) (“A resource management plan may be changed through amendment [which] is initiated by the need to consider ... an applicant’s proposed action....”). If expansion of existing SEZs and/or designation of new ones is permitted through the traditional RMP amendment process, the benefits of a pro-active comprehensive approach to management will be eroded, if not completely lost.

If BLM determines not to refuse to process all pending applications outside SEZs (whether through plan amendments or otherwise), it must limit processing of such applications as strictly as possible. For example, it should provide for processing of applications outside SEZs only for those companies which meet specific criteria as of a specified date, such as companies that have completed all required biological surveys and studies, have signed power purchase agreements in hand and have evidence of independent financing. Rather than merely allow companies that meet these criteria to develop in the places they have selected outside SEZs, the new program should give them the opportunity to apply for land within a designated SEZ on a non-competitive basis.

In addition, if the BLM decides not to deny all pending applications outside SEZs, the agency should develop a suite of incentives to use to encourage any remaining applicants as well as others to move into designated SEZs. Put another way, if the BLM does not reject all applications outside SEZs, it is critical that the new program make meaningful distinctions between its handling of applications which are in SEZs and those which are not. Ensuring that

<sup>3</sup> Some of the groups submitting these comments have previously indicated their support for this and other measures such as increased fees designed to handle existing applications.

<sup>4</sup> The American Recovery and Reinvestment Act of 2009 identified renewable energy development as a priority on federal lands, and is making stimulus funding available in the form of loan guarantees for a subset of BLM’s solar, wind, and geothermal project applications. The BLM is tracking project applications that may be able to qualify for these funds. The agency has identified potential “fast-track” applications that are furthest along in their application process and have the best chance of beginning construction by the end of December 2010 - the deadline for stimulus funding.

processing of applications within SEZs will be easier and hopefully faster as the result of the PEIS is definitely one such incentive,<sup>5</sup> but others, such as prioritizing the processing of applications that have moved into designated SEZs should be explored in the PEIS and incorporated into the new program. Simultaneously, the BLM should emphasize that every project outside a SEZ will require a full EIS. While we believe that such incentives will help encourage solar developers to move into SEZs, we emphasize that standing alone they will not provide an adequate solution to the problem posed by existing and potential applications outside those areas. At a minimum, applications on excluded lands must be denied and lands outside SEZs must be closed to future applications.

**Recommendations:** The BLM should utilize the PEIS to develop an approach to pending applications that will ensure that solar development is permitted on public lands in the future only within designated SEZs. BLM should develop, preferably through an exclusion policy, resource management plan amendments or through the use of a robust set of incentives, a means to close lands outside of designated SEZs to solar applications (with the exception of projects (including “fast-track” projects) which meet the criteria set out in this comment letter and our July 2008 comment letter (Exhibit 1, attached), and comply with all environmental laws and permitting regulations and have either begun scoping or for which the BLM has approved a Plan of Development as of this date). The BLM should also set out specific standards for designating new or additional SEZs, including a requirement for a determination of need for additional MW of production before additional designations are considered.

- e. Discourage the use of wet-cooled or other water-intensive technologies.

Water is a major concern in the arid regions of the West where the proposed SESAs are located and we urge the BLM to take a proactive approach to this issue in the PEIS.

Electric generation from solar (and other) thermal power plants is most efficient when a source of cooling – typically water – is available to remove waste heat from the thermal cycle.<sup>6</sup> Unfortunately, the SESAs that are the focus of the PEIS are located in arid areas where intense competition already exists between the use of limited supplies of water for urban areas, fossil fuel production and agriculture.<sup>7</sup> Permitting water-cooled production of energy from solar resources would add to that competition.<sup>8</sup> The BLM should explore ways to avoid these results in the PEIS, including the options identified below:

- (1) *Adopt a policy which would discourage the use of wet-cooling for power plants.* Both California and Nevada have adopted such policies.<sup>9</sup> California’s policy states that the

<sup>5</sup> See, e.g., BLM Qs & As, p. 6.

<sup>6</sup> See, e.g., Renewable Energy Transmission Initiative Phase 1B Final Report (January 2009), Chapter III – Environmental Assessment of Competitive Renewable Energy Zones, p. 3-3 (hereinafter “RETI Phase 1B Report”).

<sup>7</sup> See, e.g., Colorado River Project, River Report – Summer 2009, p. 8. See also *id.*, pp. 4-5, 6.

<sup>8</sup> The amount of water used for wet cooling a power tower plant is about 500 gallons of water per MWh of electricity, similar to a typical coal or nuclear plant. U.S. Department of Energy, Report to Congress, “Concentrating Solar Power Commercial Application Study: Reducing Water Consumption of Concentrating Solar Power Electricity Generation, p. 4 (hereinafter “DOE Report on Water Use”) (accessible at [http://www1.eere.energy.gov/solar/pdfs/csp\\_water\\_study.pdf](http://www1.eere.energy.gov/solar/pdfs/csp_water_study.pdf)). A water-cooled parabolic trough plant consumes about 800 gal/MWh, or about four times what a combined-cycle natural gas plant consumes. *Id.* Because wet-cooled plants are more efficient than dry-cooled, see text at note 6 *supra*, more land would be required to produce a given amount of energy.

<sup>9</sup> See, e.g., California Energy Commission 2003 Integrated Energy Policy Report.

Energy Commission “will approve the use of fresh water for cooling purposes by power plants only where alternative water supply sources and alternative cooling technologies are shown to be ‘environmentally undesirable’ or ‘economically unsound’.”<sup>10</sup> There is broad acceptance of this policy in California, including among the solar industry,<sup>11</sup> where alternatives considered to date have included use of brackish water as well as dry-cooling.<sup>12</sup> Although Arizona does not have an explicit policy, it has moved to strictly regulate water use in solar projects.<sup>13</sup>

(2) *Adopt a performance standard that specifies the amount of water that is acceptable per MW generated.* Rather than tie solar development to one specific technology (i.e., dry-cooling), such an option would allow for any technology that would meet the standard and could in fact result in technology improvements.<sup>14</sup>

(3) *Adopt a technology-forcing standard that would continue to elevate the bar regarding water use and, simultaneously, encourage the use of new, innovative technologies.* For an example, the Department of Energy’s project selection criteria for renewable energy projects “seeks to give priority consideration to “new or significantly improve[d] technologies” that are not extensively used in the marketplace<sup>15</sup>.

**Recommendations:** The PEIS should examine several options related to guidelines on water use, including those described above, so that the agency and the concerned public can see the tradeoffs involved in saving fresh water, on the one hand, and the additional land that would be necessary to produce a given amount of renewable energy, on the other.

- f. Consultation with U.S. Fish and Wildlife Service is necessary at the programmatic level.

A programmatic Section 7 consultation on the Solar PEIS should be undertaken with the U.S. Fish and Wildlife Service (USFWS), as was done for the Wind PEIS. To the extent possible, this Section 7 consultation should also seek to provide project-level take coverage under the federal Endangered Species Act.

We believe that a consultation is legally required, and that the failure to consult could make the entire process legally vulnerable with potential attendant delays. The failure to commence a Section 7 consultation now will result in this key requirement being processed separately at a later date, rather than now. This will correspondingly delay the timeline for implementation of actual near-term projects.

<sup>10</sup> California Energy Commission, Preliminary Staff Assessment, Beacon Solar Energy Project, Application For Certification (08-AFC-2), Kern County (Posted April 1, 2009) (hereinafter “Beacon Staff Draft”), p. 4.9-5.

<sup>11</sup> See, e.g., RETI Phase 1B Report, p. 3-3, describing agreement of all RETI stakeholders, including solar generators, to the assumption, for RETI purposes, that dry-cooling would be used except when reclaimed water from communities of a certain size is available.

<sup>12</sup> In the case of the Beacon project, CEC analysis revealed that dry-cooling could “reduce ... consumption of potable water by up to 97 percent.” Beacon Staff Draft, p. 1-6. In addition, the analysis revealed that not only were both of these options economically feasible, but also that dry cooling might “actually result in lower project operating costs.” *Id.*, p. 4.9-48.

<sup>13</sup> *See*

<http://www.azwater.gov/AzDWR/WaterManagement/documents/SolarPowerPlantsSummaryFINALPublic.pdf>

<sup>14</sup> For additional options, *see* DOE Report on Water Use, *supra*.

<sup>15</sup> “Federal Loan Guarantees for Projects That Employ Innovative Energy Efficiency, Renewable Energy, and Advanced Transmission and Distribution Technologies,” Loan Guarantee Solicitation Announcement, July 29, 2009, pp. 35-36.

We understand that USFWS and BLM instead intend to undertake Section 7 consultations in connection with specific project proposals for which ROW applications have been filed. While some of these project-specific consultations will be pursued in parallel with the Solar PEIS effort, reducing the timeline to completion for those *particular* projects, complete reliance on those consultations alone has several disadvantages in comparison to consolidated consultation. First, project-level consultation biases siting decisions toward those sites for which applications have been filed, erasing some of the planning benefits of the Solar PEIS effort. Instead, as in the zone approach, BLM should take the lead and guide developers toward the optimum sites. Second, a single, consolidated Section 7 consultation is likely to be more efficient than multiple project-level processes. Third, such consolidation is likely to result in greater consistency across projects. Finally, a completed Section 7 consultation with incidental take coverage for particular sites will enhance the value of those sites for potential developers and maximize the return to the United States from a potential competitive process. As the BLM, USFWS, and California’s Energy Commission and Department of Fish and Game have recognized, in general a programmatic consultation with a project-level component for high priority near-term sites will best serve the goal of developing BMPs “and other appropriate ... guidelines to assist solar ... developers with siting projects in environmentally suitable locations ...”<sup>16</sup>

**Recommendations:** BLM should undertake a programmatic Section 7 consultation with the Fish and Wildlife Service in parallel with the Solar PEIS in order to comply with NEPA requirements, maximize efficiency of environmental review, and maximize consistency in the application of Section 7 analysis to projects in SESAs.

g. Integrate BLM planning with other laws and required processes.

As indicated, to address the climate challenge (as well as to obtain other economic benefits), our nation needs to develop renewable energy and to develop it quickly. In general, we believe that one of the best ways to achieve this goal is to integrate the environmental and other review processes of relevant state and federal agencies so that they can be carried out simultaneously, rather than serially. Consolidating reviews required under different environmental laws can accelerate zone designations as well as project approvals without sacrificing environmental protections.

One of the main complaints about delays involving all extractive or exploitative activities on the public lands comes from the different environmental review processes that these activities must undergo. Consultation may be required under the Endangered Species Act, conformity review may be required under the Clean Air Act, cultural resource review may be required under the National Historic Preservation Act and, even in our deserts, wetlands review may be required under the Clean Water Act. At the present time, all of these reviews frequently happen separately from the NEPA process. One of the best ways to expedite ultimate approval of SEZs and projects is to process environmental reviews at the program and project levels in a single document, or if that is not possible to process them in parallel. In addition to shortening the timeline to implementation, unified or parallel processing can promote economies of scale,

<sup>16</sup> Memorandum of Understanding Between the California Department of Fish and Game, the California energy Commission, the Bureau of Land Management, and the U.S. Fish and Wildlife Service Regarding the Establishment of the California Renewable Energy Action Team, November 17, 2008, p. 2. Accessible at <http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/pa/energy.Par.76169.File.dat/RenewableEnergyMOU-CDFG-CEC-BLM-USFWS-Nov08.pdf>

integrate cumulative and project-level analyses, and maximize flexibility in considering alternatives, among other benefits.

In 2002, the Western Governors' Association (WGA) developed a protocol with the federal government, including the Department of the Interior and the Council on Environmental Quality that provides for such a consolidated process (attached as Exhibit 4). Among other items, the protocol calls for establishment of a timeline for consolidated reviews as well as for agreements on data needs and methodologies. In California, the BLM has entered into an agreement with state agencies to prepare joint environmental reviews of renewable generation and transmission projects.

**Recommendations:** We urge the BLM to utilize the WGA protocol and the California experience to the maximum extent possible in preparing this PEIS and, in the future, in processing specific solar applications.

- h. Coordinate PEIS with other processes.

It is critical that the BLM coordinate the Solar PEIS with ongoing processes that share the same overarching goal – i.e., facilitating the development of solar (and other renewable) resources in an environmentally responsible manner. We have identified three processes underway in which the BLM has been a participant, as well as several others in which BLM may be participating.. At least one of these has clearly been taken into account in delineating the SESAs.

(1) RETI

California's Renewable Energy Transmission Initiative (RETI) is a voluntary, multi-stakeholder consensus process begun about three years ago. Its goal is to plan for the lowest cost, environmentally and economically, renewable development and transmission needed to meet the state's ambitious Renewable Portfolio Standard (RPS) goals. To date, RETI has identified 30 competitive renewable energy zones (CREZ) and developed a conceptual transmission plan that could serve those zones. At least half of the RETI CREZ are located on public lands, mostly in the California Desert Conservation Area.

RETI's CREZ were based in large part on existing ROW applications, including all applications filed on BLM-administered lands as of 2008 – even though all participants in the process understood that not all pending applications would in fact be granted. Clearly the BLM has considered RETI CREZ in developing its proposed SESAs in California: in addition to saying so,<sup>17</sup> comparison of the two kinds of areas reveals substantial overlap. Because BLM used different criteria and took into account potential resource conflicts and other information not available to or used by RETI participants, the SESAs are smaller than CREZ and some CREZ are not represented at all. As a result, it appears at this time that less renewable energy will be available from public lands in California than RETI has assumed. While this result is entirely within BLM's prerogative as the steward of those lands, it is essential that agency officials make sure that RETI participants clearly understand the PEIS process, including its timeline and the options under consideration. Further, the intergovernmental coordination underway must be strengthened to ensure the state is an active participant in the federal process. It is equally essential that RETI participants be kept fully up to date as to milestones

<sup>17</sup> BLM Qs and As, p. 3.

and the results of the process so that they can plan on the basis of complete and accurate information.

(2) Desert Renewable Energy Conservation Plan

The BLM is also participating in another California process – the DRECP. A major effort is currently underway at the California Department of Fish and Game (CDFG) to prepare this plan as directed by Governor Schwarzenegger’s November 2008 Executive Order. Although the DRECP will require an environmental impact report (EIR), under the California Environmental Quality Act, it is not proceeding on a parallel timetable with the Solar PEIS; it is a longer term effort. Still, if created as a state Natural Community Conservation Plan (NCCP) and coupled with a federal Habitat Conservation Plan (HCP), this plan could provide an appropriate framework for the kind of long-term blueprint that is needed for the California Desert Conservation Area. It could also inform processes on other public lands in other involved states as discussed below. Consequently, it is critically important that the two efforts be closely coordinated.

Coordination is particularly important in terms of the areas identified for development and the appropriate mitigation strategies for solar projects. If there are disagreements between BLM, CDFG, and/or other state (or federal) agencies regarding these key issues, they should be resolved at least tentatively in advance (subject of course to the legal obligations and discretion of each agency) and as promptly as possible. If these questions are not addressed early on, the alternative is an iterative process that could delay projects by years and require substantial revisions to early efforts to respond to later, potentially differing, regulatory processes.

At a minimum, the BLM needs to ensure that the PEIS process supports the work that CDFG is and will be doing in developing the DRECP. More concretely, the PEIS should provide information that can and should be used by CDFG in their CEQA document(s). For example, if possible, the PEIS should address state listed species such as the Mojave Ground Squirrel, and do so in a way consistent with the views of CDFG and the requirements for an NCCP. In order to facilitate CDFG’s DRECP process, it would also be helpful for the PEIS to address CEQA related issues and CEQA standards of significance, to increase CDFG’s ability to utilize the PEIS in its own CEQA process on the DRECP. Agreeing on such issues and subjects is covered in the WGA Protocol referenced above.

(3) WECC west-wide planning

BLM should be coordinating its solar efforts with transmission planning in the Western Interconnection. As BLM has recognized, transmission access is the key to unlocking and developing the West’s best renewable energy resources, including solar. To ensure sufficient transmission access for areas identified in the EIS process to best develop large-scale solar generation, BLM should therefore be coordinating closely with the key transmission planning venues in the western United States.

At the regional level for the Western Interconnection, this includes the Western Electricity Coordinating Council’s (WECC) Transmission Expansion Planning and Policy Committee (TEPPC). More detailed planning occurs at the subregional level and therefore BLM should also coordinate with the Southwest Area Transmission (SWAT) group (focused on Arizona, New Mexico and southern Nevada), the Colorado Coordinated Planning Group (Colorado and Wyoming) and the California Independent System Operator (CAISO) and related entities for

southern California. BLM should also coordinate with state-based transmission expansion processes including the Colorado Senate Bill 100 effort (transmission is being planned to CO solar areas) and the Nevada’s Renewable Energy Transmission Access Advisory Committee as it has done with California’s RETI process. Lastly, BLM should consult and coordinate with the region’s major utilities on both the resource planning and transmission expansion components to ensure markets adequate transmission for solar energy.

(4) WGA Western Renewable Energy Zones Initiative and State Renewable Energy Planning Initiatives

The Western Renewable Energy Zones Initiative (WREZ) is a cooperative initiative between the 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.”<sup>18</sup> Importantly, the WREZ effort combines solar resource data from government and industry with lands, wildlife and natural resource information from state agencies and the conservation community.

Further, all of the states within the scope of this PEIS (including California with its RETI process), 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.”<sup>19</sup>
- Colorado’s Clean Energy Development Authority is directed to “facilitate the financing of renewable energy projects in Colorado.”<sup>20</sup>
- 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.”<sup>21</sup>
- The Arizona Renewable Resource and Transmission Identification Subcommittee (ARRTIS) of the Renewable Transmission Task Force (RTTF) has “been developed to more specifically identify those areas in Arizona with the best potential for renewable generation project development. This resource information will be evaluated against specific constraint criteria including land ownership, sensitive lands, terrain and other factors that could influence the location of utility-scale generation facilities. The ARRTIS will then identify opportunities for future transmission corridors that would link these areas to the existing transmission system or to load pockets in the state.”<sup>22</sup>
- Utah’s Renewable Energy Zone Task Force was created “to promote the development of renewable energy resources to meet the goal of 20% of Utah’s electricity by 2025.” Specific objectives of the task force include the identification of renewable energy zones, identification of “policies or market mechanisms that would facilitate

<sup>18</sup> <http://www.westgov.org/wga/initiatives/wrez/>

<sup>19</sup> [www.nmreta.org](http://www.nmreta.org)

<sup>20</sup> <http://www.colorado.gov/energy/index.php?utilities/category/clean-energy-development-authority/>

<sup>21</sup> <http://gov.state.nv.us/RETAAC-II/Members.htm>

<sup>22</sup> [http://www.westconnect.com/planning\\_swat\\_rtff\\_arttis.php](http://www.westconnect.com/planning_swat_rtff_arttis.php)

transmission planning and permitting for renewable energy projects”, and identification of the transmission necessary to bring renewable energy resources to market.<sup>23</sup>

The increased focus on renewable energy in this planning area also increases the importance of the WREZ process and the state-based process occurring in the six states involved in the Solar PEIS. Accordingly, the Solar PEIS should coordinate with these parallel efforts, 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.

**Recommendations:** BLM should consistently and actively participate in all processes related to the development of renewable technologies on public lands including, but not limited to, the initiatives identified above in order to facilitate a two-way exchange of relevant learning and data. BLM should specifically coordinate with the WGA to incorporate information gathered in the WREZ process and share information produced in the development of the PEIS.

- i. Geographic and temporal phasing of development should be evaluated.

The BLM’s efforts to develop an environmentally responsible approach to managing solar generation on public lands implicates phasing in at least two respects: 1) geographically and 2) temporally. As discussed immediately below, both issues should be explored in the PEIS.

**Geographic phasing:** The SESAs identified by BLM involve three ecoregions: the Mojave, Sonoran and Central. The majority of acreage proposed in SESAs, Kilowatts, projects in SESAs and pending projects are located in the Mojave. While it may be tempting to designate SEZs only in that ecosystem, we urge the BLM instead to ensure that appropriate SEZs are designated and appropriate projects are approved in all three of these ecoregions. In this way, ecologically unique impacts of development can be identified and studied and the new knowledge incorporated into future decisions about development in each SEZ. In fact this information and knowledge is sorely needed given the lack of experience with utility scale projects. While there is a critical need to increase the generation and use of solar (and other renewable) energy to supplement even more urgently needed efforts at conservation and energy efficiency, it would be irresponsible not to learn as much as we can from these early stages of development.

**Temporal phasing:** It is essential that, as part of the new program, BLM field offices be directed to consider temporal phasing – i.e., phasing in projects. Consideration of such an approach is appropriate given that there is a lack of understanding of the on-the ground impacts of several solar technologies, both individually and cumulatively, as well as little experience with utility scale solar generally.

Under these circumstances, field offices should be directed to consider phasing in projects during the permitting process.<sup>24</sup> Such an approach may not be appropriate or feasible in all cases, but in those where it is – e.g., in cases where there are multiple power blocks or limited existing transmission capacity such that a new or upgraded line would be required for an entire proposed project – it should absolutely be explored. For instance, approving part of, rather

<sup>23</sup> [www.energy.utah.gov/Renewable\\_Energy](http://www.energy.utah.gov/Renewable_Energy)

<sup>24</sup> This recommendation is not intended to suggest that consideration of this option requires that field offices be given new authority. Rather it is intended to ensure that they use their existing authority to consider this option for reasons discussed above.

than all, of a many thousand acre proposal will help ensure that the impacts of the entire project can be better understood, avoided and mitigated.

Phasing is also appropriate given the likelihood that at least some permitted projects will not succeed for financial, technical or other reasons. Making approval of subsequent phases dependent on success of previous phases will help ensure that good sites are not tied up unnecessarily.<sup>25</sup>

**Recommendations:** The PEIS should explore and the final solar program should incorporate provisions designed to ensure that there are SEZs in all affected ecoregions in order to build knowledge and experience with solar technologies in those regions through geographic phasing. The PEIS and the new program should also incorporate temporal phasing of projects where appropriate and as practicable to address the lack of understanding of the on-the ground impacts of several solar technologies, both individually and cumulatively, as well the lack of experience with utility scale solar generally. Such an approach will accomplish the dual purposes of allowing BLM to identify unforeseen impacts and develop strategies for mitigating them as well as ensuring that areas that are appropriate for development are not tied up unnecessarily.

- j. BLM should compare and prioritize SESAs for development.

As part of the process of studying these SESAs and ultimately delineating solar development SEZs, the BLM should engage in a careful comparison and ranking of SESAs on the basis of their environmental suitability for development. This is not the same as comparing the alternatives that will be considered in the PEIS. Rather, it involves the development of criteria for use in assessing the relative environmental harms as well as benefits that will likely attend the designation of each area under consideration for solar development and then the application of those criteria to those lands. Such a comparison is critical to enabling the public to understand the tradeoffs inherent in developing one area over another. The ranking component of this exercise is essential to allow the BLM to determine which SESAs to designate as SEZs. Public understanding of both these sets of information is key to maximizing public support for the final SEZ decisions. More specifically, the public needs this kind of information to be able to conclude that the lands chosen for development are, in fact, more appropriate than lands that were not so chosen.

The criteria that should be used for such a task include, for example, relative access to transmission infrastructure, likelihood of public acceptance of designation,<sup>26</sup> number of projects proposed for development, and megawatt potential, as well as more traditional environmental indicators such as the presence or absence of federal and state-listed species, acreage of disturbed land – i.e., land that has been subjected to mechanical treatment –, and proximity to protected lands.

<sup>25</sup> To further the objective of preventing good sites from being “locked up,” we also support strong due diligence requirements, including a five year review with benchmarks for progress, and prompt termination of project/ROW approval in the event of inadequate progress or failure as stated in our original scoping comments.

<sup>26</sup> In California, the task of applying this suggested criterion is made easier by the document entitled “Renewable Siting Criteria for California Desert Conservation Area” that was previously submitted to the Bureau by a large group of environmentalists and desert activists in that state.

**Recommendations:** The BLM should compare the relative impacts of the SESAs to each other in order to assess which areas are likely to have the least environmental impacts and resource conflicts, and then rank the SESAs to prioritize development.

- k. BLM should complete a comprehensive cumulative impacts analysis.

As discussed in detail in our scoping comments on the PEIS (Exhibit 1), NEPA requires agencies to consider the cumulative impacts of proposed actions. In the context of the Solar PEIS, we want to reiterate the importance of considering other projects underway on public lands and, specifically, the development of wind and geothermal projects on public lands, which are reasonably foreseeable future actions that will have significant impacts on natural and cultural resources. There are currently 321 wind power project applications filed on public lands nationwide and 253 geothermal projects. Each of these projects will have individual impacts and taken together, in conjunction with the more than 200 solar project applications currently on file, will have significant *cumulative* impacts on our public lands. With the establishment of state RPS and, ultimately, a national RPS these renewable sources are going to become a bigger percentage of our energy portfolio over time. It is imperative that the BLM look *now* at the scope of cumulative impacts from these projects if renewables development on public lands is truly going to be environmentally responsible.

**Supplemental Recommendations:** The BLM should include the impacts of all forms of renewable energy development, not just solar, in its cumulative impacts analysis in the PEIS.

- l. Develop a comprehensive, system-wide mitigation program.

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.” IM No. 2007-097.

BLM is obligated to manage the public lands to protect their varied natural and cultural resources. As discussed in detail in our original scoping comments on the Solar PEIS (Exhibit 1), the Federal Land Policy and Management Act requires the BLM to “minimize adverse impacts on the natural, environmental, scientific, cultural, and other resources and values (including fish and wildlife habitat) of the public lands involved.” 43 U.S.C. §1732(d)(2)(a). Further, NEPA requires consideration of measures to mitigate potential environmental consequences. 40 C.F.R. § 1502.16. In order for BLM to rely on mitigation to reduce potentially significant impacts, NEPA requires that BLM make a firm commitment to the mitigation and discuss the mitigation measures “in sufficient detail to ensure that environmental consequences have been fairly evaluated...”<sup>27</sup> NEPA defines “mitigation” of impacts (at 40 C.F.R. § 1508.20) to include:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or

<sup>27</sup> *Communities, Inc. v. Busey*, 956 F.2d 619, 626 (6th Cir. 1992).

- Compensating for the impact by replacing or providing substitute resources or environments.

Simply identifying mitigation measures, without analyzing the effectiveness of the measures violates NEPA. BLM must “analyze the mitigation measures in detail [and] explain how effective the measures would be . . . A mere listing of mitigation measures is insufficient to qualify as the reasoned discussion required by NEPA.”<sup>28</sup> NEPA also directs that the “possibility of mitigation” should not be relied upon as a means to avoid further environmental analysis. *Forty Most Asked Questions Concerning CEQ’s National Environmental Policy Act Regulations*.<sup>29</sup>

- (1) Mitigation measures must be mandatory.

BLM should specify in the land use plan amendments based on the PEIS as well as in the ROD that mitigation measures (such as “best management practices” in technology) are required to be included in each and every permit as long as certain circumstances are present. Unless the mitigation measures are guaranteed to be applied, BLM cannot rely upon them to avoid or lessen potential impacts from siting projects.

**Recommendations:** The PEIS and the ROD should include language requiring that the mitigation measures and other applicable measures be included in land use plan amendments and in all grants of rights-of-way or other permits for construction solar energy projects.

- (2) Mitigation measures must be based on credible science.

Both NEPA and the Data Quality Act require the agencies to use and present information of sufficient scientific quality. Thus, NEPA’s hard look at environmental consequences must be based on “accurate scientific information” of “high quality.” 40 C.F.R. § 1500.1(b).

Essentially, NEPA “ensures that the agency, in reaching its decision, will have available and will carefully consider detailed information concerning significant environmental impacts.”<sup>30</sup> The Data Quality Act and BLM’s interpreting guidance expands on this obligation, requiring that influential scientific information use “best available science and supporting studies conducted in accordance with sound and objective scientific practices.”<sup>31</sup>

**Recommendations:** The PEIS must assess and present the scientific basis for the proposed mitigation measures in order to show they will be effective.

- (3) Monitoring and adaptive management approaches must include specific standards and commitments.

<sup>28</sup> *Northwest Indian Cemetery Protective Association v. Peterson*, 764 F.2d 581, 588 (9th Cir. 1985), *rev’d on other grounds*, 485 U.S. 439 (1988).

<sup>29</sup> Available on-line at: <http://www.nepa.gov/nepa/regs/40/40p3.htm>; the U.S. Court of Appeals for the Tenth Circuit has found that the “Forty Questions” are “persuasive authority offering interpretive guidance” on NEPA from CEQ, *Davis v. Mineta*, 302 F.3d 1104,1125 (10<sup>th</sup> Cir. 2002).

<sup>30</sup> *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989).

<sup>31</sup> Treasury and General Government Appropriations Act for Fiscal Year 2001, Pub.L. No. 106-554, § 515. See also Bureau of Land Management, Information Quality Guidelines, available at [http://www.blm.gov/nhp/efoia/data\\_quality/guidelines.pdf](http://www.blm.gov/nhp/efoia/data_quality/guidelines.pdf).

In order to fulfill the BLM's obligations to protect the natural and cultural resources of our public lands and to comply with NEPA's requirements regarding mitigation measures, the PEIS must include, and the ROD must require, that BLM's permits for projects contain concrete commitments to specific monitoring actions, including definitive standards, timing and details for actions that will be taken based on the results of monitoring and a discussion of BLM's basis for relying on their success, including likely funding. This approach will also support the phasing of projects discussed above.

All such mitigation programs should also identify the existing condition of resources, standards for when management change will be triggered and the use of a "fallback prescription" where adaptive management is not suitable or funding for necessary monitoring is not sufficient. All data should be identified in terms of their source, location, and time. Furthermore, data, and their application, should be available for independent review and evaluation; data should be formalized and standardized to allow for sophisticated and accurate aggregate understanding of the landscape and the impacts of management practices within the landscape to enhance agency credibility and accountability. The BLM should disclose not only the results of a given analysis, but the underlying methodology and data management practices used. The focus of data collection should be on the impacts – whether adverse or beneficial – caused by particular activities and not the activity itself.

The management framework for monitoring and adapting management of approved projects should be based on best available science and should include the following elements:

- ***Ensure adequate baseline prior to starting adaptive management and identify indicators.***

Projects can only be approved along with a requirement for a detailed analysis of current inventory status to accompany the environmental analysis, which clearly specifies resources that may be affected by various activities and their baseline conditions, then identify indicators for resources or groups of resources that will demonstrate the effects of management decisions.

- ***Set out a detailed monitoring plan and ensure agency commitment to fund monitoring.***

A detailed monitoring plan is crucial for assessing potential impacts on resource conditions, ensuring that indicators are measured at regular and consistent intervals. Commitment of adequate resources should be firm and sufficient to support the full implementation of adaptive management. Funding for adaptive management should not be dependent on shifting the financial and personnel burden to various user interests or other cooperating community groups.

- ***Include defined limits of acceptable change in resource conditions and specify actions to be taken if change reaches or exceeds those limits.***

For all indicators, the PEIS and ROD must require that, for all projects, BLM prepare an identification of range of acceptable change from the baseline condition, using best available science, and specify those actions that will be taken in the event that unacceptable levels of change are identified.

- ***Have a "fallback" plan should monitoring or other aspects of the adaptive management process not be fully carried out.***

Adaptive management must include requirements for when and how the proposed outcome will be reevaluated if it is not being met. BLM's ability to reevaluate or amend desired outcomes should not be the sole fallback if either the adaptive management process is not working or outcomes are not being met. The PEIS and ROD should require BLM to build into

project analysis and approvals provisions to address situations based on new information, circumstances, regulatory requirements, or discontinued agency funding for monitoring that would trigger a plan amendment or revision under a new EIS.

**Recommendations:** The PEIS should set out specific commitments, including timelines, for preparation and implementation of inventorying and monitoring programs, and standards for when monitoring as part of management is not appropriate, that are to be incorporated in permits for projects; the ROD should make incorporation an explicit requirement for all permits.

(4) Mitigation of impacts to individual resources and values.

In addition to NEPA’s general requirement to mitigate environmental impacts, other laws and policies require specific consideration of mitigation for impacts to certain resources and values. For example, federal agencies are required to conserve species listed under the Endangered Species Act. *See, e.g.*, 16 U.S.C. § 1536(a)(1). Recovery plans for endangered species can help provide guidance on appropriate mitigation measures. Similarly, impacts to cultural resources require mitigation under the National Historic Preservation Act. *See, e.g.*, 36 C.F.R. §§ 800.1(a), 800.2(a)(4). Additional regulations may require specific mitigation measures to other individual resources and values.

**Recommendations:** BLM must comply with all regulations requiring mitigation of impacts from solar energy development on individual resources and values.

(5) Mitigation for the loss of availability for multiple-use on public lands.

Unlike many activities on public lands which allow for multiple uses, solar development is a single use of the land which preempts any other activities or uses. For this reason, it is critical that BLM mitigate for the effective loss of any lands approved for solar development from the public domain. Onsite mitigation for solar development is extremely important, and all efforts should be made to mitigate impacts onsite. However, since the opportunity for effective mitigation of onsite impacts to many resources and values is limited for solar development, off-site mitigation will also need to be considered for all projects. This mitigation should also compensate for the loss of other resources, values and uses of those lands, such as recreation, scenic vistas, wildlife migration corridors and habitat for other plants and animals.

IM 2008-204, which sets out BLM’s current policy on off-site mitigation, defines off-site mitigation as “compensating for resource impacts by replacing or providing substitute resources or habitat at a different location than the project area.” The guidance also acknowledges the priority of onsite mitigation, such that “[o]ffsite mitigation is supplemental to onsite mitigation and is used to enhance the BLM’s ability to fulfill its mission of providing multiple uses on the public lands, while ensuring its resource management objectives are met.” Further, like other mitigation measures, the agency must be able to show the mitigation will be effective. The guidance reiterates: “[w]hen proposed offsite mitigation is geographically distant from the project area, and particularly when it occurs on non-Federal land, the connection to resources for which the BLM is responsible should be clear.”

Accordingly, although off-site mitigation is likely to play a key role in addressing the loss of use resulting from solar energy development, these measures must still be developed so that they have a clear connection to the resources that the BLM is managing.

Key considerations for off-site mitigation should include:

- **Identification of uses, resources and values associated with the project site.**

Establishing the connection between off-site mitigation and the resources of the public lands will require detailed understanding and knowledge of the values and uses present on the project site before development occurs, such as wildlife habitat, various recreational uses (ranging from hunting to birdwatching to all terrain vehicle use) and scenic values. BLM should require that necessary inventory of the project site be completed prior to developing off-site mitigation measures.

- **A “no net loss” or a “net gain” requirement for resources and values.**

BLM should ensure that any loss of resources or values on a solar development site is compensated with the addition and protection of equivalent or better resources and values off-site. For instance, backcountry hunting experiences would be re-established by identifying lands with suitable big game habitat and ensuring those lands are managed to maintain wildlife populations and protect a non-motorized experience. These lands might also be able to replace scenic values and hiking or horseback riding opportunities, depending on management. BLM should also make a determination about the value of the habitat to be impacted and adopt direction for mitigation requirements for the specific habitat types impacted. For example, for high quality habitat which is relatively scarce or becoming scarce on a national basis or in the ecoregion section, BLM policy should ensure no net loss of in-kind habitat value.

Additions of lands and resources should equal or exceed the value of any resources or values which are lost. Additions could be gained through some combination of three primary mechanisms; however, requirements should ensure that the majority of mitigation efforts be focused on the first two mechanisms, with the highest priority given to the first mechanism:

- 1) Purchase of additional private lands to be put in the federal estate under conservation management to guarantee the maintenance of the equivalent or better values and resources lost on the project site, or
- 2) Additional conservation designations on existing federal lands which would protect the equivalent or better resources and values lost on the project site, or
- 3) Restoration and research efforts to improve the quality and quantity of equivalent resources and values off-site.

Mitigation for impacts to water resources could be addressed by purchase and retirement of water rights to offset groundwater pumping by the project.

- **Requirements for project developers to fund mitigation efforts based on the amount and value of the land impacted from development.**

Project developers should be required to make deposits to a mitigation fund based on the amount of land used for the project and the fair market value of that land. The funds should be required to be spent on the three mechanisms outlined above.

- **Requirements for project developers to mitigate the ongoing pressure for energy development on the public lands.**

Since project developers will profit from the development of solar energy on the public lands, they can also be obligated to lessen the future demands to be made upon these lands. Project developers can present proposals to achieve these goals by providing financial support for specific distributed generation efforts, energy efficiency measures, demand reduction programs, or equipment upgrades in the region. We recommend that developers be required to identify megawatts of demand mitigation that equate to a percentage of the megawatts they expect to generate.

- **A centralized body should be established to oversee the funds and maximize the effectiveness of their use.**

BLM should establish a centralized body comprised of BLM staff, and other federal and state agencies with expertise and interest to oversee the distribution of funds and maximize the effectiveness of their use. This body should be required to take into consideration recommendations from the public in the distribution of funds.

- **Off-site mitigation should be required to take place in the same ecoregion as the project site.**

The World Wildlife Fund defines an ecoregion as a "large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions".<sup>32</sup> Ecoregional health is critical for maintaining the health of individual ecosystems within the ecoregion. In addition to ensuring that off-site mitigation meets a "no net loss" requirement for resources and values lost on the project site, BLM should require that mitigation take place in the same ecoregion as the project site, to ensure the continued health of the overall ecoregion. In situations where availability of private lands for purchase and addition to the federal estate under conservation protection is limited (in Nevada, for example, where the vast majority of lands are already in the federal domain), additional conservation designations on existing BLM land, as well restoration, research, and other mitigation measures, will be necessary.

**Recommendations:** Because of the extremely limited ability to mitigate impacts from solar development on-site, BLM should require off-site mitigation for impacts which cannot be mitigated on-site. Off-site mitigation should follow the guidelines described above including: 1) a "no net loss" or a "net gain" requirement for resources and values; 2) requirements for project developers to fund mitigation efforts based on the amount and value of the land impacted from development; 3) a centralized body should be established to oversee the funds and maximize the effectiveness of their use; and 4) off-site mitigation should be required to take place in the same ecoregion as the project site.

- m. The PEIS needs to address "hybrid" solar plants.

The groups submitting these comments are concerned about the possibility that some companies may try to portray what are truly fossil fuel (i.e., natural gas) plants as renewable energy projects. These purported renewable energy projects could severely undermine public support for the solar program once it is established. This problem could be prevented by adopting a definition of a "renewable solar project" for use in the new program. According to several technology experts whom we consulted, under current financial regulations, including the Investment Tax Credit, projects that use more than 25% natural gas are not considered "renewable."

<sup>32</sup> [http://www.panda.org/about\\_our\\_earth/ecoregions/about/what\\_is\\_an\\_ecoregion/](http://www.panda.org/about_our_earth/ecoregions/about/what_is_an_ecoregion/)

**Recommendation:** The PEIS should consider and the final solar program should adopt a definition of a renewable solar project that will ensure that lands that are appropriate for “real” solar projects are not usurped by projects that are actually natural gas plants.

- n. Development of a long-term vision for the necessary contribution of public lands to the nation’s renewable energy needs will assist in determining the need for solar energy development on the public lands.

There is an urgent need for a comprehensive energy vision and renewable energy goal for the West (as well as the nation) that will help focus the agency on the contributions from solar energy (and other renewable resources) to meeting multiple forward-thinking scenarios. Such a goal will also help in the creation of a common set of expectations about the scope of development envisioned for the public lands that, in turn, will help BLM manage stakeholder expectations and concerns.. We urge the BLM to be an advocate for and a participant in the development of such a vision and goal within the Administration and, in particular, with DOE, the Council on Environmental Quality and the DOD as well as with the western states, utilities, transmission planners and the public.

The main driver for these scenarios must be an energy resource mix for the West that moves the region forward in addressing climate change. Other drivers include: 1) long term energy security at both consumer and national levels; 2) diversity for generation portfolios to manage risks (particularly fossil fuel price risks); 3) net reductions in environmental costs, criteria pollutants, and health costs; and 4) coal plant alternatives and retirements. The scenarios developed should be responsive to all drivers, and should focus on science-based targets for CO2 reductions in the electricity sector, in addition to emissions reductions possible through electrification of a portion of our transportation fleet. Such scenarios could include meeting various state Renewable Portfolio Standards, a uniform national standard, or achieving 80% CO2 reductions from 2005 levels by 2050– and 40% reductions by 2030 as a preliminary target and planning tool.

**Recommendations:** We recognize that this larger vision will require a comprehensive effort outside the PEIS. The BLM, with the assistance of the agencies identified above, should engage in a scenario development exercise to determine a target for megawatt production of renewable energy on public lands under its stewardship. We have detailed the manner in which the BLM could develop scenarios to define the contribution needed from the public lands in Exhibit 5, attached.

## II. SESAs identified by the BLM and alternatives.

- a. Selection of study areas needs clarification.

In its “Qs and As” document, the BLM purported to identify the criteria that were used to identify and select SESAs.<sup>33</sup> In fact, different states used different criteria as was made clear in connection with a teleconference held on August 24, 2009 by BLM officials with environmental advocates. We recognize that there may be important regional differences, such that one single set of criteria might not be sufficient for all states identifying SESAs.

<sup>33</sup>*Qs & As: BLM Solar Programmatic Environmental Impact Statement (PEIS)*, available on-line at: [http://www.doi.gov/news/09\\_News\\_Releases/SolarEnergyOA.pdf](http://www.doi.gov/news/09_News_Releases/SolarEnergyOA.pdf)

Nonetheless, we do believe that all states should use a consistent set of core criteria and that BLM is obligated to explain why each of those criteria was included. Further, we believe that BLM needs to make public all the criteria used by each state along with explanations for inclusion of non-core criteria. All of these criteria must be publicly applied to the SESAs that have been proposed, using maps and links to GIS data. The same criteria should also be applied to the additional SESAs considered as alternatives in each state. All of this information must be included in the Draft PEIS.

**Recommendations:** The Draft PEIS must include complete information about how the SESAs were selected and must apply the same selection criteria to all alternative SESAs that are considered.

- b. SESAs should be included in all “action alternatives” in the Draft PEIS.

Inclusion of SESAs in all “action alternatives” in the Draft PEIS is critical to ensure that the benefits of identifying SESAs and designating them as SEZs in the Final PEIS and ROD are realized. Further, to achieve the goal of a robust set of SEZs with adequate acreage for development of the solar energy deemed necessary, it is critical that BLM consider additional SESAs identified by industry, conservation groups and others as part of the PEIS process. This is particularly important in Arizona, where the acreage of the SESAs identified in the scoping notice is extremely limited. We understand that five of the eight SESAs originally identified by Arizona BLM were not included in the scoping notice because they had existing applications in them, despite the fact that overlap with existing applications was not a criterion for exclusion of an area as a potential SESA. We also understand that in some states, including Nevada, lands with existing oil and gas leases were excluded from SESAs. Because oil and gas leases are not permanent, these lands should not be excluded. These lands and other areas nominated for consideration as SESAs could be appropriate for inclusion, pending application of the screens outlined above, and should be considered.

**Recommendations:** BLM should include consideration of SESAs in all alternatives other than the No Action Alternative in the Draft PEIS, and the Final PEIS and ROD should designate appropriate SESAs as SEZs, open for solar development. BLM should analyze and consider additional SESAs identified by the public and BLM state offices to ensure that adequate acreage necessary to meet the solar development needs identified through the analysis outlined in section I n is included.

- c. Comments on SESAs and alternatives for each State.

We are including as a separate document detailed comments on the BLM’s proposals in each of the six states encompassed by the Solar PEIS, including maps and GIS data where available. Again, please note that not all groups signed on to these broader comments are signing on to the additional state-specific and cultural resources comments attached as exhibits, so we have specifically identified those groups that are specifically signing on at the beginning of each state-specific comment exhibit and the cultural resources exhibit (exhibits 6-12).

The state-specific and cultural resources exhibits are as follows:

- Arizona – Exhibit 6
- California – Exhibit 7
- Colorado – Exhibit 8

- Nevada – Exhibit 9
- New Mexico – Exhibit 10
- Utah – Exhibit 11
- Cultural Resources – Exhibit 12

Since GIS analysis of many of the SESAs and other areas identified on the maps in relation to citizen-proposed wilderness, wildlife habitat and other resources of concern is continuing, we anticipate that additional information may be developed and will submit supplemental comments.

**Recommendations:** BLM should fully consider the information and recommendations included in the attached exhibits.

- III. Analysis of lands outside SESAs identified on the maps for potential solar development should not proceed unless they meet the criteria for and are incorporated in SESAs.

As described above in Section II c., one of the most important outcomes from the development of the PEIS will be designation of appropriate lands as SEZs, closure of other lands to new applications, and either denial of existing applications outside the SEZs or serious efforts to incentivize developers to move existing applications to within the SEZs. These steps are crucial not only in guiding development to the most appropriate places, but also in avoiding the unacceptable impacts which solar development would have on lands outside the SEZs.

The recent letter submitted by the BLM Las Cruces District Office recommending the elimination of the Mason Draw and Red Sand SESAs because of recently-discovered conflicts with wildlife habitat underscores the need for the BLM to focus its analysis on SESAs and the importance of closing lands outside of SEZs to development. Although the SESAs were identified through the BLM New Mexico officials' screening for areas potentially appropriate for development based on guidance from BLM Washington Office, subsequent analysis by the BLM identified unacceptable conflicts, highlighting the type of conflicts that can arise in those areas that met the threshold SESA criteria. Additional lands that do not meet these threshold standards for prioritization as SEZs are even more likely to have such conflicts. Although statewide maps and GIS data for lands identified on the SESA maps in light blue and in the legend as "BLM Lands Being Analyzed for Solar Development in the PEIS" (referred to as non-SESA lands) have not been made available, rough analysis of the lands shown in the SESA maps already indicate many areas of high conflict, further supporting the closure of lands outside SESAs to solar development.

For example, in New Mexico, non-SESA lands identified on the maps overlap with Otero Mesa, one of the most ecologically intact and treasured landscapes in the Southwest. The values of Otero Mesa and the importance of protecting it have been advocated by the State of New Mexico, religious leaders, local governments, sportsmen and conservationists; further, the U.S. Court of Appeals for the 10<sup>th</sup> Circuit recently acknowledged its values as a Chihuahuan Desert grassland, as home to rare species, as essentially roadless, and as housing the substantial freshwater Salt Basin Aquifer, pointing to the "importance of this valuable resource."<sup>34</sup> In addition, the area contains lands with wilderness characteristics, as identified by the New Mexico Wilderness Alliance, which the BLM is in the process of re-inventorying as part of the

<sup>34</sup> *State of New Mexico v. BLM*, Case Nos. 06-2352, 06-2353, 06-2354 (10<sup>th</sup> Cir. - April 28, 2009).

TriCounty RMP revision (highlighting the need to ensure that such inventories and/or re-inventories are conducted prior to designating SESAs).

Solar development would clearly cause lasting and irreparable damage to the rich values and resources of Otero Mesa, and is absolutely inappropriate for the area.

An example non-SESA lands with major conflicts with solar development in Utah is the Parowan Gap area. This area contains petroglyphs and an incredible prehistoric astronomical site. Given the cultural importance of this site, no development of any kind should occur here. From the extent of the light blue areas on the visible portion of the Utah SESA Map, it is likely that other such conflicts exist in the light blue areas in southwestern Utah and throughout the state.

Examples of other non-SESA lands equally inappropriate for solar development but which have been identified on the SESA maps for potential analysis can be expected in the other 4 states included in the PEIS. These examples clearly demonstrate the need to identify appropriate SESAs, designate them as SEZs through the PEIS process, and restrict solar development to those SEZs which are included in the Final PEIS and ROD.

**Recommendations:** To avoid unacceptable and irreparable damage to areas like Otero Mesa and other lands which are currently identified in the SESA maps as non-SESA lands under consideration for solar development, BLM should identify appropriate SESAs, designate them as SEZs through the PEIS process, and restrict solar development to those SEZs which are included in the Final PEIS and ROD unless and until a need for additional development areas is shown.

As more information becomes available on the SESAs or additional lands, we will continue to provide data and recommendations to the BLM. We look forward to continuing working with BLM in the development of the Solar PEIS.

cc: Linda Resseguie, BLM Washington Office, [linda\\_resseguie@blm.gov](mailto:linda_resseguie@blm.gov)

Sincerely,

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**Exhibits**

1. Solar PEIS scoping comments
2. CWP recommendations letter, spreadsheet, and GIS data
3. Arizona Restoration Energy Design comments
4. Protocol developed by WGA with the federal government, including the Department of the Interior and the Council on Environmental Quality that provides for a consolidated permitting process
5. Scenario Development for Identifying Megawatt Target
6. Arizona SESAs-specific comments
7. California SESAs-specific comments
8. Colorado SESAs-specific comments
9. Nevada SESAs-specific comments
10. New Mexico SESAs-specific comments

**1012**

- 11. Nevada SESAs-specific comments
- 12. Cultural resources SESAs-specific comments

# **Attachment 5**

1012

**CALIFORNIANS FOR WESTERN WILDERNESS • CENTER FOR NATIVE  
ECOSYSTEMS • DEFENDERS OF WILDLIFE • JACKSON HOLE CONSERVATION  
ALLIANCE • POWDER RIVER BASIN RESOURCE COUNCIL • SAGEBRUSH SEA  
CAMPAIGN • SAN JUAN CITIZENS ALLIANCE • SOUTHERN UTAH WILDERNESS  
ALLIANCE • THE WILDERNESS SOCIETY • WESTERN RESOURCE ADVOCATES  
WYOMING OUTDOOR COUNCIL •**

December 10, 2004

*Sent via first-class mail, postage pre-paid.*

BLM Wind Energy Programmatic EIS  
Argonne National Laboratory, EAD/900  
97900 S. Cass Avenue  
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Re: Wind Energy Development Draft Programmatic EIS  
**PUBLIC COMMENTS**

Dear Reviewers:

Thank you for this opportunity to comment on the Wind Energy Development Draft Programmatic EIS (“Wind DPEIS”). The undersigned commentors are actively involved in energy issues currently facing the Interior West, and they remain vitally interested in the government’s commitment to developing wind energy resources on lands administered by the Bureau of Land Management (BLM).

We applaud the BLM’s interest and initiative in examining renewable sources of energy. The dual purposes of the DPEIS are to assess the environmental, social, and economic impacts of wind energy development in the western states, and to evaluate alternatives to determine best management approach for mitigating impacts and facilitating wind energy development. DEIS at 1-1. We feel that this EIS is a strong first step toward developing renewable energy sources on our federal lands. We also feel that it is important that “green power” such as wind energy development also be green on the ground, as bad planning or inappropriate siting will set the cause back for this renewable resource by eroding public support for wind. Smart decision-making and project siting – including protection of habitat and special places – is in everybody’s best interests.

In developing the FEIS and implementing its recommendations, we urge the BLM to work closely with the visionary Governors who are positioning the Interior West to move beyond the fossil fuel economy and its associated boom and bust cycles, by calling for a speedier transition to a sustainable energy economy. These local leaders, such as New Mexico Governor Bill Richardson, are deeply and genuinely committed to establishing an energy economy that will serve the region long after fossil fuels supplies are exhausted. The Western Governors’ Association recently approved a resolution calling for 30,000 megawatts of clean energy and

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December 10, 2004

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*Comments on Wind Energy Development  
Draft Programmatic EIS*

renewable power production to be built in the region by 2015, and calling for increasing energy efficiency in the region 20% by 2020. Several of these Governors are, at the same time, raising questions about the impacts of gas drilling on wilderness-quality landscapes, wildlife, water, and other vital resources. These actions by western governors show a commitment to developing clean energy resources in the West, and they demonstrate that the political will exists to capitalize on the West's wind resources. Simply put, these elected officials present a significant opportunity to move forward the proposals contained in this EIS and need to be listened to.

As we said in scoping comments, the BLM should bear in mind the importance of continued popular support for wind energy development. At least as much as the economic and technology issues, the future of wind energy development depends on its continued perception as an environmentally-friendly and renewable power source with minimal environmental impacts. Accordingly, BLM must ensure that wind projects are carefully designed and sited to reduce and mitigate impacts, by assuring full public participation throughout the planning process. A poorly sited or designed project with highly-publicized negative impacts could unnecessarily set back the cause of renewable energy generation from public lands. Therefore, we encourage BLM to err on the side of caution with regard to the siting, design, and public involvement with respect to wind energy development projects.

While we applaud the BLM's efforts with regard to regional planning of wind energy development, we also encourage the BLM to undertake a similarly comprehensive regional EIS that looks at oil, natural gas, and coal exploration and development on federal lands of the Interior West. The impacts from fossil fuel development and power plants are generally greater than those associated with wind, making a compelling case for a broader Programmatic EIS. The emphasis in the National Energy Policy on natural gas production in the Rockies region establishes an urgent need for such a region-wide programmatic look that analyzes the various combinations of energy sources to determine which makes the most sense – economically, socially, and ecologically – for the West and the nation.

**The Final Programmatic EIS Must Ensure that Existing Legal Requirements and Planning Processes are neither Undermined nor Ignored.**

The Interior West possesses an abundance of wind energy potential that can make a significant contribution to the region's electric resource mix. Good wind areas, found on approximately 6% of the land in eleven Western states, could supply more than five times the region's current electricity consumption.<sup>1</sup> Wind resources are a clean energy source and provide an excellent opportunity for the West to reduce its reliance on environmentally-harmful fossil fuels such as coal and natural gas. Wind energy affords the benefit of a cleaner environment because, as opposed to fossil fuel combustion, wind generation and transmission produces no air emissions that endanger public health, results in no greenhouse gas emissions which contribute to global warming, and requires very limited water use. If developed and sited properly, wind energy has fewer and less significant impacts to land, air, and water than fossil fuel extraction and combustion. Wind energy offers the opportunity to shift the balance of energy development on public lands from high-impact fossil fuel technologies that create boom-bust economic cycles

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<sup>1</sup> See *Renewable Energy Atlas of the West*, available at [www.energyatlas.org](http://www.energyatlas.org), at 8.

to lower-impact, sustainable technologies that make lasting economic contributions to local communities.

That said, wind energy projects should be treated the same as any other proposed use of federal lands, subject to thorough, site-specific analysis and public participation. All laws and regulations applicable to other projects on the federal lands must be complied with, including the National Environmental Policy Act, the Federal Land Policy and Management Act, the Endangered Species Act, the Migratory Bird Treaty Act, and other federal laws. Importantly, the BLM may not use this Programmatic EIS to avoid the duties of site-specific analysis that attach to individual wind energy development projects, such as the requirements to consider a reasonable range of alternatives, to analyze the direct, indirect, and cumulative impacts of each of these alternatives, and to solicit and respond meaningfully to public input. Moreover, whether the BLM is considering wind, oil and gas, coal, or other energy development, the agency is required to heed the letter and spirit of the provisions in FLPMA that provide for the “multiple-use and sustained yield” and the avoidance of “unnecessary and undue degradation” of public lands, which means that the level of energy development – even wind energy development – must be compatible with other uses of the federal lands and cannot result in marked degradation of healthy functioning ecosystems.

**a. The Final EIS Should Ensure that Project-Level NEPA Analyses Are Sufficiently Thorough and Site-Specific.**

The DEIS provides that the level of environmental assessment that will be required for individual wind power projects will be determined at the Field Office level, may be limited to an environmental assessment (EA) and may tier off of the Programmatic EIS for potential environmental impacts. DEIS at 2-7. This direction, however, is inconsistent with NEPA’s requirement for BLM to consider the direct, indirect, and cumulative impacts of a project. 40 C.F.R. §1508.8. To the extent the BLM purports to authorize tiering to this Programmatic EIS for “issues and concerns” associated with specific wind energy development proposals, *see* DEIS at 2-7, such tiering is proper only where the analysis of impacts in this EIS is sufficiently site-specific and detailed. This broad, regional programmatic impact statement cannot substitute for the detailed analysis of direct, indirect, and cumulative impacts required under NEPA.

The assessment of environmental impacts set out in Section 6 of the DEIS is necessarily general due to the regional nature of this analysis, identifying the typical impacts of a wind energy development project (as described in Section 3) on various resource values. However, the 11-state study area included in the PEIS is widely diverse in terms of topography, wildlife and plant species, climate and amount of existing development. All potential sites will be characterized by unique resources, uses, impacts and public concerns. As a result, the impacts analysis in the Programmatic EIS will likely be insufficient to satisfy NEPA’s directive to consider the impacts of a particular proposal. A substantial site-specific analysis of the impacts resulting from a particular wind development proposal should be conducted pursuant to NEPA.

In Section 2.2.3 and Section 6.1.2, BLM commits to requiring incorporation of best management practices (BMPs) into Plans of Development and Right-of-Way (ROW) grants as stipulations. Additional mitigation measures will be applied, also as stipulations, “to address

site-specific and species-specific issues.” PEIS, p. 2-6. We support BLM’s commitment to incorporating both the standard BMPs set out in Section 2.2.3.2 and site-specific measures as stipulations in the Plan of Development and/or ROW grant, such as those discussed in Section 5 of the PEIS.

In order for BLM to rely on mitigation of environmental impacts when considering a specific proposal, NEPA requires that BLM make a firm commitment to the mitigation measures, discuss the mitigation measures in sufficient detail to ensure that environmental consequences have been fairly evaluated, and fully assess their effectiveness at the proposed project location. Thus the effectiveness of the BMPs and mitigation measures set out in this Programmatic EIS will depend on the context of the project location. For example, the likelihood of successful restoration of vegetation will be significantly reduced in dry areas populated by desert grasslands, which are sensitive to disturbance and have shallow topsoil. The BMPs and mitigation measures identified in this Programmatic EIS are an important first step toward minimizing adverse environmental impacts from wind energy projects, and they will be helpful in providing general guidance to land managers. Nonetheless, the FEIS should clarify that in the context of a specific wind energy development proposal, mitigation measures incorporated as stipulations must be carefully tailored to site-specific conditions and rigorously analyzed as to the likelihood that they will reduce environmental impacts in the context of the wildlife, vegetation, land type and other site-specific characteristics.

We also recommend that the FEIS advise land managers that an EIS may well be required for analyzing the impacts of individual wind energy development projects. Any commercially viable wind energy project is virtually certain to have the potential for significant environmental impacts, because the long-term nature the project and the substantial potential adverse impacts to wildlife, habitat, vegetation, open landscapes and other uses and users of the public lands. Commercial wind farms will have a large footprint and require a substantial support infrastructure. In light of the long-term presence of a wind energy project, public participation in reviewing and commenting on BLM’s analysis and decisions is especially important. In the rare situation where BLM determines that an EIS may not be required, BLM should mandate that EAs for wind energy development projects be subject to meaningful public review and comment. NEPA requires that the public have an opportunity to review and comment on an EA where the EA is addressing a new or unusual resource use or may be subject to scientific or public controversy. 40 C.F.R. § 1501.4(2); see also CEQ’s *Forty Most Asked Questions*, 46 Fed. Reg. at 18037. Wind energy is a new use that meets this standard. Because of the potential harm to avian and bat species alone, in no case will the siting of even a single turbine be appropriate for consideration as a categorical exclusion.

**b. The Final EIS Should Ensure that Land Use Plan Amendments to Accommodate Wind Energy Projects Include Public Participation and Consideration of Environmental Impacts.**

In the DEIS, the BLM commits to amending certain land use plans (LUPs) to adopt provisions of the Wind Energy Development Program and to identify land available or unavailable for wind energy development. DEIS at 2-7. BLM also states that an EA may be sufficient for approval of a wind power project.

We commend BLM's acknowledgement that amendment of existing LUPs will be necessary where developable wind resources are potentially located. See DEIS Appendix C. Such an LUP amendment is required for a change in resource uses and change of decisions from the current plan, such as permitting wind energy development. See 43 C.F.R. §1610.0-5(b), §1610.5-5; BLM *Land Use Planning Handbook*, H-1601-1, Section VII.B. These proposed amendments include adoption of the proposed programmatic policies and BMPs and identification of specific areas where wind energy development would not be allowed. It is important that such LUP amendments be subject to thorough public review and comment, as they represent a change from historic land management direction and could serve to allow the long-term presence of wind energy projects.

The BLM should also direct in the FEIS that, where a land use plan will be amended to accommodate a wind energy development proposal, not only will the standard BMPs from this Programmatic EIS apply but also specific additional mitigation measures must be evaluated for Plans of Development and ROW grant stipulations for the area. Further, as discussed above, in the context of a plan amendment, the analysis of environmental consequences of wind energy development should not simply tier off the discussion of BMPs or the mitigation measures contained in the Programmatic EIS. Rather, the Programmatic FEIS should clarify that the potential mitigation associated with various stipulations that might be mandated in a LUP amendment must be fully analyzed in the context of the area-specific landscape and other conditions in which the mitigation measures will actually be applied.

#### **The Final Programmatic EIS Must Ensure Proper Siting of Wind Energy Projects.**

Wind energy projects, as with all other types of development, are not appropriate for all public lands. As the BLM acknowledges, some federal land areas must be off-limits to wind energy projects. The DEIS provides that BLM will not permit wind energy development where it is "incompatible with specific resource values." DEIS at 2.6. We agree with and support BLM's recognition that wind energy development and its associated infrastructure is incompatible with and should be excluded from the specially-designated areas identified, including National Landscape Conservation System areas (National Monuments, National Conservation Areas, Wilderness Areas, and Wilderness Study Areas) as well as Areas of Critical Environmental Concern. We propose that BLM add to this list Native American sacred sites, citizen-proposed wilderness areas, areas of critical habitat, and habitats important for imperiled species. Finally, we urge BLM also to recognize that wind energy development and its associated infrastructure is incompatible with and should be excluded from areas that are designated or proposed for management to protect wilderness characteristics, and to recognize the impacts of wind energy development and its infrastructure to such areas as part of any analysis of environmental consequences.

The April 2003 "no more wilderness" settlement does not affect BLM's obligation to value wilderness character or its ability to protect it, including in management designations which would also merit exclusion of wind energy development. BLM has not only claimed that it can continue to protect wilderness values, but has also committed to doing so. 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 characteristics,” such as naturalness or the ability to provide 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.<sup>2</sup> As applied to this EIS, BLM’s policies for wind energy development should also require a specific assessment of the potential impacts of wind energy development to lands with wilderness characteristics, whether or not these lands are already designated for management to protect wilderness characteristics or have been identified by the agency or the public for consideration for further protection.

A thorough analysis of a reasonable range of alternatives will be absolutely essential to the proper siting of wind projects. We can envision scenarios where factors such as avian migration corridors, Native American sacred sites, or important wildlife habitat would counsel against selection of the exact site initially proposed by the project proponent, but there might be lands in the vicinity with equal potential for wind production that would avoid the unacceptable impacts of the proposed site. In such scenarios, comprehensive analysis of multiple siting alternatives would allow the project to proceed without causing undue harm, whereas narrowly construing the range of alternatives would result in poor decision making. NEPA’s requirement that agencies study a reasonable range of alternatives was designed to resolve controversy and to balance competing public needs. We recommend that the FEIS advise land managers of the importance of thoroughly evaluating a reasonable range of alternatives when presented with a proposal for a particular wind energy development project.

Moreover, meaningful involvement by state, tribal, and local governments, other agencies, and the public will generally require at least a 90-day comment period for a commercial wind farm. This is a relatively short period when compared to proposed projects with a duration of several decades. The benefits of comprehensive analysis and public review will pay off in future dividends: good siting and design decisions will minimize controversy and attendant delays and will ultimately result in successful and commercially-viable projects that enjoy strong public support. We recommend that the FEIS advise land managers to provide for 90-day comment periods for consideration of commercial wind farms.

With respect to visually sensitive areas, VRM Class I and II objectives are, respectively, to “preserve” or “retain” the existing character of the landscape. Siting decisions for wind energy projects can be modeled on provisions of the Surface Mining Control and Reclamation Act “designating areas unsuitable for surface coal mining.” See 30 U.S.C. §1272.<sup>3</sup> Federal wind

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<sup>2</sup> The BLM Arizona State Office has formalized this guidance by providing for a land use allocation called “Management for Wilderness Characteristics.” See AZ- IM-2004-021. Similarly, the recently-released Draft RMP/EIS for the Roan Plateau (prepared by BLM’s Glenwood Springs Field Office in Colorado) includes managing certain areas to protect wilderness characteristics as a priority over other uses. See, 69 Fed.Reg. 68970. Further, in the Draft RMP/EIS for the Price Resource Area in Utah, the BLM included lands outside Wilderness Study Areas that have or are likely to have wilderness characteristics in the analysis of potential impacts. See, e.g., pp. 4-21 – 4-22, 4-480 – 4-484.

<sup>3</sup> The National Academy of Sciences recommended policies to maintain healthy ecosystems and protect wilderness quality lands from oil and gas leasing and development in *Land Use Planning and Oil and Gas Leasing on Onshore Federal Lands* (1989). Specifically, the NAS study (at 115) recommended that, prior to leasing, other

projects should also ensure compliance with local zoning laws and land-use regulations. Moreover, siting should avoid incompatible land uses. Wind farms are most appropriately located where there are existing compatible land uses, such as agriculture. Initial site evaluation will be an important aspect of the planning process. Western Resource Advocates has published the *Renewable Energy Atlas of the West: A Guide to the Region's Resource Potential (2002, www.energyatlas.org)* that provides baseline data and maps showing the potential for wind and other renewable energy sources in the West.

New road construction is also a concern with respect to new wind energy projects, including both wind farms and associated transmission capacity. New road construction and major improvements (such as paving and widening two-track dirt routes) should be minimized and existing routes relied on where possible. Best management practices on everything from road location to grading and maintenance should be required to minimize erosion, sedimentation of surface waters, forage losses, invasive species and habitat disruption. The measures in the DEIS for “traffic management plans” and road construction are a good start, see DEIS at 2-13 and 2-18, although more specific measures should be included in the FEIS to ensure that new roads are in fact minimized and, where they are necessary, are built in the most environmentally-protective manner possible. For example, the admonition in the DEIS to use existing roads “to the extent possible,” see DEIS at 2-18, is not particularly helpful in guiding future transportation decisions. The BLM’s “Gold Book” of Surface Operating Standards for Oil and Gas Exploration and Development might provide helpful guidance for the proper siting and construction of roads associated with wind energy development.<sup>4</sup>

Transmission issues are another important aspect of wind energy development. Projects should be sited to take advantage of existing transmission capacity, minimize power loss during transmission, and minimize the construction of new transmission infrastructure. The *Renewable Energy Atlas of the West* is a useful resource for transmission planning in the Interior West, as it inventories resources in reference to existing infrastructure, such as transmission lines and substations.

We encourage the BLM to include in the Final Programmatic EIS clear and enforceable standards to guide future siting decisions that make clear that wind energy projects are inappropriate and should not be authorized in the areas set forth above. We urge BLM to include in the Final EIS enforceable standards for visually sensitive areas in order to “preserve” or “retain” the existing character of the landscape. We urge BLM to adopt standards applicable to road construction, including best management practices for road location, grading, and maintenance. Finally, we urge BLM to include standards that will guide the use of existing transmission capacity and minimize the construction of new transmission infrastructure.

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resources should be analyzed to determine whether oil and gas development can be regulated to control its impacts on other values to acceptable levels, with such stipulations as the planning process indicates are required to protect those other values. We urge BLM to adopt these recommendations for its fluid minerals program.

<sup>4</sup> See [www.mt.blm.gov/oilgas/operations/goldbook/GoldBook.pdf](http://www.mt.blm.gov/oilgas/operations/goldbook/GoldBook.pdf) at 12-20.

**The Final Programmatic EIS Must Consider Specific Resources and Impacts.**

Specific resources and impacts that should be considered for individual wind power projects include:

1. The FEIS should provide for the thorough consideration of wildlife and wildlife habitat, with special attention to any threatened, endangered or other special-status species and essential wildlife migration corridors. The FEIS should also provide adequate buffers for certain habitat such as nest and lek locations. Moreover, the FEIS should accord full protection to vital winter range which is shrinking across the West.
2. The FEIS should ensure the thorough consideration of plants and plant habitat where wind energy development projects are to be considered, with special attention to any threatened, endangered or other special status species as required by law.
3. The FEIS should provide for the thorough evaluation of impacts to avian species -- especially migratory birds, raptors and bats -- and important flyways and raptor concentration areas. The FEIS should ensure that project siting and design minimize bird and bat mortality. The FEIS should include standards that ensure that projects are sited to avoid key migration routes of both birds and bats. The FEIS should also ensure through adoption of a BMP that the siting and design of turbines, supports, and associated powerlines avoid creating perching opportunities for birds. Raptors, for example, use human-made perches to prey on prairie-nesting species such as the prairie chicken, a species that has seen adverse impacts from such towers in recent years. In this regard, columns are generally better than lattice towers, and power lines should be buried to avoid both perching and electrocution. See DEIS at 2-18. Also, the FEIS should include standards to ensure that turbines are not placed on escarpment edges, as well as standards to ensure that the sweep point of the blades of any wind development project is higher than the apex of nuptial flights for birds in the area. Finally, we urge the BLM to carefully consider the potential impacts to birds and bats and the mitigation measures suggested in research conducted by Western EcoSystems Technology, Inc. See [www.west-inc.com/wind\\_reports.php](http://www.west-inc.com/wind_reports.php).
4. The FEIS should provide for the thorough consideration of the visual environment, including scenic view-sheds, and establish specific standards to guide siting with respect to viewsheds. The BMPs with regard to Visual Resources in the DEIS should be retained or strengthened. See DEIS at 2-12.
5. The FEIS should ensure that the agency's consideration of wind energy development projects complies with the National Historic Preservation Act (NHPA), including its requirements that all tribes and tribal organizations that may have an interest in the area are consulted and a cultural resources management plan is developed where necessary. The FEIS should ensure that the requirement that the agency protect culturally important sites and archeology is made clear. One way of doing so would be for the FEIS to make clear that the consideration of a proposed wind energy

project is an “undertaking” within the meaning of the NHPA. See 16 U.S.C. §470f. The DEIS’s discussion of Cultural Resources in Chapter 4 and the BMPs for consultation and cultural resource protection should be retained or strengthened. See DEIS at 4-50 and 2-14, respectively.

6. To avoid creating an aural nuisance, the FEIS should limit decibel levels to acceptable standards, and it should establish an acceptable distance for the siting of wind energy projects from the nearest residences or recreational use areas. The direction in the DEIS that stationary construction equipment such as compressors and generators “should be located as far as practicable from nearby residences,” see DEIS at 2-20, is insufficient to guide future siting decisions. The FEIS should establish minimum setbacks, along with specific standards to describe instances when the setbacks may be found to be inappropriate.
7. In our scoping comments, we requested that the DEIS thoroughly consider electro-magnetic interference. The DEIS mentions the conflicting science as to the adverse health effects of exposure to electro-magnetic fields, and then simply states that more research is needed. DEIS at 3-18. The DEIS’s statement that definitive data is not available does not appear to satisfy the BLM’s duties of disclosure. See 40 C.F.R. 1502.22 (imposing procedural duties with respect to incomplete information).
8. The FEIS should direct land managers making wind energy project siting decisions to thoroughly consider the proximity of potential wind energy projects to areas such as and National Parks and Wilderness Areas. BLM officials should carefully weigh public comments on wind energy projects near these specially-designated areas and consult with agency officials responsible for the management and protection of National Parks and Wilderness Areas.

**The Final EIS Should Discuss Energy Self-Sufficiency, Ensure Adequate Comprehensive Monitoring, and Evaluate the Economic and Ecological Tradeoffs Resulting From Wind Energy Development**

The FEIS should provide that the agency will evaluate and consider wind energy projects with an eye toward maximizing power production from the resource and minimizing the environmental impacts of its development. In doing so, the FEIS should evaluate the role of wind power generally in achieving a greater measure of energy self-sufficiency in the Interior west and in reducing our reliance on imported fuels. Moreover, the FEIS should provide that once built, wind energy development projects will be rigorously monitored and evaluated in order to minimize that projects’ impacts as well as to improve the siting and design of future projects. We support adequate funding for monitoring, maintenance, evaluation, and conduct of scientific studies relating to wind energy development projects.

The FEIS should also include a comparative analysis of the costs and impacts associated with wind versus the region’s increased reliance on coal. Wind energy development does not occur in a vacuum, and in light of the fact that several new coal-fired power plants have been proposed across the West, the BLM should look at the comparative regional costs and benefits of

developing these two resources. Wind energy is a free, renewable resource and a source of clean, non-polluting electricity. The FEIS should include and thoroughly discuss comparative data on wind energy's tradeoffs, including its offset of fossil fuel consumption, the land and water impacts of fossil fuel development, the emissions from conventional power plants, and greenhouse gases associated with fossil fuels. Accordingly, the FEIS should thoroughly discuss and evaluate the energy conservation and greenhouse gas potential of each alternative discussed, as required by the Council on Environmental Quality regulations implementing NEPA. See 40 C.F.R. §1502.16(e), (f).

#### **The BLM Should Prepare a Similar Regional Programmatic EIS Examining Region-Wide Natural Gas Development**

The BLM's preparation of the Programmatic EIS analyzing wind energy development on a region-wide basis calls into question the BLM's failure, to date, to prepare a regional Natural Gas Programmatic EIS on the impacts of implementing the National Energy Policy on federal lands in the Rocky Mountain states of the Interior West (Montana, Wyoming, Colorado, Utah, and North Dakota). Most of the reasons that a Programmatic EIS to discuss and evaluate wind energy development is a good idea apply with equal or greater force to the need for a Natural Gas Programmatic EIS.

For example, the National Energy Policy targeted selected BLM Resource Management Plans across the region as "Time-Sensitive Plans" requiring urgent revision to facilitate stepped-up exploration and development of natural gas. Ever since the BLM began implementing the National Energy Policy in the Rockies, leasing, seismic exploration, and drilling projects have surged. BLM, however, has neglected to study the cumulative impacts of this new natural gas activity across the region.<sup>5</sup> Even within mineral basins, BLM has violated NEPA by arbitrary bifurcating its planning efforts according to state lines or administrative boundaries – for example within the San Juan and Powder River basins, or in the Red Desert/Great Divide region. In light of the fact that Western watersheds, airsheds, and migration corridors do not follow the same administrative boundaries as BLM Resource Areas, the BLM has not adequately collected or studied the cumulative impacts of its new natural gas policies and the new natural gas policies on a regional or even sub-regional basis. Conservationists have articulated comprehensive, regional visions for the ecologically-linked lands in the Interior West, and we encourage the BLM to do the same.<sup>6</sup>

BLM and other federal agencies have taken concrete steps to facilitate natural gas development in the Rockies, such as preparing time-sensitive plans, promulgating new policies, directives, and Instruction Manuals, and forming the inter-agency Rocky Mountain Energy Council. The public, however, was not allowed to participate in the formation of the National Energy Policy and it was never made subject to public review or comment. In fact, the

<sup>5</sup> See *Drilling in the Rocky Mountains: How Much and at What Cost?*, The Wilderness Society, presented at 2004 North American Wildlife and Natural Resources Conference.

<sup>6</sup> See *Southern Rockies Wildlands Network VISION: A Science-Based Approach to Rewilding the Southern Rockies*, a publication of the Southern Rockies Ecosystem Project, Denver Zoo, and Wildlands Project (July 2003). See also *Heart of the West Conservation Plan*, a spatial analysis by the Wild Utah Project of the relative importance of various wildlife habitat cores and linkages throughout the Wyoming Basins Ecoregion (Spring, 2004).

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administration has continued to stonewall in the face of public efforts to obtain the release of government documents associated with the development of the National Energy Policy. Should the BLM act proactively to programmatically address the regional impacts and alternative strategies to meet the projected increases in energy demand, it could reduce public controversy and assist with analysis when approving specific projects.

Thank you for this opportunity to comment on the Draft Programmatic EIS for wind energy development. We look forward to continued participation in this process. Should you have any questions or concerns, please do not hesitate to contact us at the address below.

Sincerely,

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December 10, 2004

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*Comments on Wind Energy Development  
Draft Programmatic EIS*

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P.S.

The contact information for the submitter of these comments is:

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I will furnish contact information for other signatories who wish to be on the contact list to receive information, updates, and documents as this Programmatic EIS proceeds.

# **Attachment 6**

**GUIDELINES FOR REDUCING IMPACTS TO  
WILDLIFE FROM WIND ENERGY  
DEVELOPMENT IN ARIZONA**

Arizona Game and Fish Department

May 2009



**ABSTRACT**

These *Guidelines* provide information to help reduce impacts to bats and birds from wind energy development in Arizona. They include recommendations on: 1) preliminary screening of proposed wind energy projects, 2) pre-construction study design and methods, 3) assessing direct, indirect, and cumulative impacts to bats and birds in accordance with state and federal laws, 4) developing avoidance and minimization measures, 5) establishing appropriate mitigation, and 6) post-construction operations monitoring, analysis, and reporting methods.

**ACKNOWLEDGEMENTS**

These *Guidelines* are closely based on the guidelines: “California Energy Commission and California Fish and Game, 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. California Energy Commission, Renewables Committee, and Energy Facilities Siting Committee, and California Department of Fish and Game, Resources Management and Policy Division. CEC-700-2007-008-CMF”. The authors would like to thank the California Energy Commission and California Department of Fish and Game for the approval to use their guidelines to create this document.

**DISCLAIMER**

The Arizona Game and Fish Department (AGFD), its employees, contractors, and subcontractors make no warrant, express or implied, and assume no legal liability for the information in this report; nor does any party represent that the use of this information will not infringe upon privately owned rights. This report has been reviewed and endorsed by AGFD as guidance. The recommendations and protocols discussed in this report are intended to be guidance for developers and local permitting agencies to avoid, minimize, or mitigate their impacts to Arizona’s wildlife. These *Guidelines* are voluntary and are not intended to implement, replace, duplicate, interpret, amend, or supplement any current statute or regulation. Adherence to these *Guidelines* does not ensure compliance with any local, state, or federal statute or regulation, nor does failure to follow these *Guidelines* necessarily imply a violation of state laws.

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## EXECUTIVE SUMMARY

These *Guidelines* are recommendations and protocols to be used by wind energy developers and local permitting agencies in Arizona, and as a resource for other parties involved in the permitting process. Local governments are encouraged to integrate the recommended study methods described herein with biological resource information and research unique to their region. The Arizona Game and Fish Department (AGFD), acting on behalf of the Arizona Game and Fish Commission, encourage the use of the *Guidelines* for the biological assessment, mitigation, and monitoring of wind energy projects in Arizona.

This document provides a science-based approach for assessing the potential impacts a wind energy project may have on bat and bird species and includes suggested measures to avoid, minimize, and mitigate identified impacts. The focus is primarily on bat and bird species because they are most likely to be affected by wind energy development. However, wind energy development can also impact other wildlife; therefore, general guidance to avoid, minimize, and mitigate these impacts is covered in [Chapter 4](#).

The document is organized around five basic project development steps:

1. Determine wildlife protection laws and the permitting process.
2. Gather preliminary information and conduct site screening.
3. Collect pre-construction data using standardized monitoring protocol.
4. Identify potential impacts to wildlife and mitigation.
5. Collect post-construction monitoring data using a standardized monitoring protocol.

Information in the *Guidelines* was specifically designed to employ adaptive management to address local and regional concerns and site-specific conditions. This information includes: frequency and type of bat and bird use, terrain, and the availability of scientifically accepted data from nearby sources. Decisions on the intensity of survey effort need to be made in consultation with AGFD.

The *Guidelines* do not duplicate or supersede any/or other legal requirements. This document does not mandate or limit the types of studies, mitigation, or alternatives an agency may decide to require.

## INTRODUCTION

The purpose of the *Guidelines for Reducing Impacts to Wildlife from Wind Energy Development in Arizona (Guidelines)* is to outline Arizona Game and Fish Department's (AGFD) recommendations to lessen the potential impacts on wildlife by: 1) describing methods to assess and evaluate wildlife activity at proposed wind projects, 2) design pre-construction and post-construction monitoring plans, and 3) develop avoidance and mitigation measures. Using these *Guidelines* will promote scientifically sound cost-effective study designs, produce comparable data among studies within Arizona, allow for analyses of trends and patterns of impacts at multiple sites, and improve the ability to estimate and resolve impacts to wildlife populations locally and regionally.

This document focuses primarily on bat and bird species because those species have been highly impacted by wind energy development. However, wind energy development may impact other wildlife species as well. For example, pronghorn antelope are particularly sensitive to human-caused habitat modifications and fragmentation (e.g. roads, mechanical movement) and they are listed as an AGFD Species of Greatest Conservation Need. General guidance to avoid, minimize, or mitigate these impacts are covered in [Chapter 4](#).

### ***Organization of the Document***

The *Guidelines* are split into five chapters:

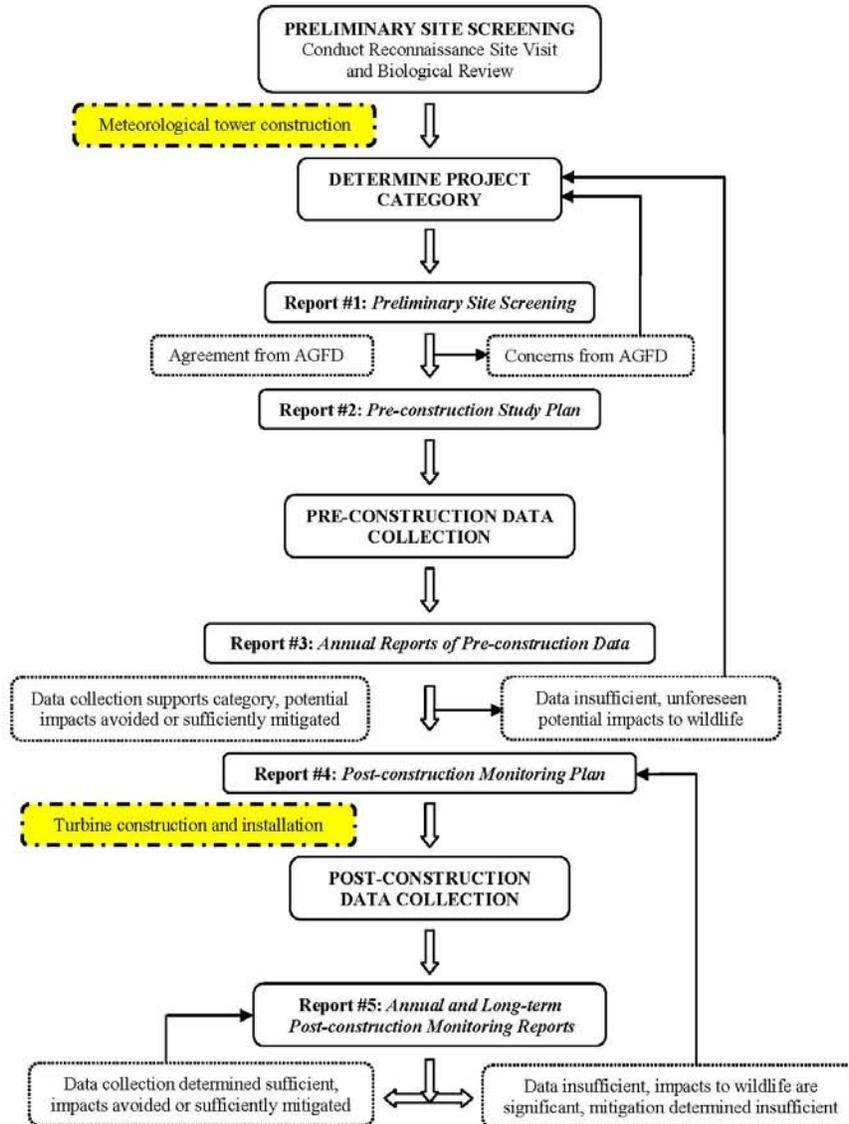
- Chapter 1, “Wildlife Protection Laws and The Permitting Process,” offers information on wildlife protection laws to facilitate completion of the permit process.
- Chapter 2, “Preliminary Site Screening,” discusses the actions a developer should take to assess the biological resources of a potential wind energy project and to determine which studies would adequately evaluate the impacts on bats and birds.
- Chapter 3, “Pre-construction Survey Protocols,” offers standardized survey methods, protocols, and recommendations for conducting the studies identified by preliminary site screening.
- Chapter 4, “Impact Assessment and Mitigation,” discusses how to assess impacts discovered during the pre-construction studies and suggests avoidance and mitigation measures to incorporate into the planning and construction of the wind energy project.
- Chapter 5, “Post-construction Monitoring and Reporting,” recommends standardized survey and monitoring techniques for collecting, interpreting, and reporting bat and bird fatalities and wildlife use data after construction.

Within each Chapter is a reporting requirement. Reporting is crucial to assess if: 1) wind projects have undergone accurate methods of understanding the effects on biological resources in the area, 2) whether the impacts can be avoided and/or minimized, and 3) whether mitigation measures are appropriate. Monitoring reports are most useful when they follow a standard scientific reporting format and provide sufficient detail to allow agency and peer reviewers the ability to evaluate the methods used, understand the basis for conclusions, and independently assess conclusions. Thus, AGFD recommends permitting agencies and/or project proponents draft separate reports for each Chapter. This information can also be found in Appendix D.

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Below is a flowchart of the process.

### WIND GUIDELINES FLOWCHART



***Where to Submit Reports***

All reports should be submitted to the AGFD’s Project Evaluation Program (PEP) by email at [pep@azgfd.gov](mailto:pep@azgfd.gov), or mailed to:

Arizona Game and Fish Department  
Project Evaluation Program - WMHB  
5000 W. Carefree Highway  
Phoenix, AZ 85086-5000

***The Future of This Document***

These *Guidelines* reflects the current state of knowledge about the impacts of wind energy development on bats and birds. AGFD will continue to update and revise portions of the document as new research findings and user feedback suggests the current recommendations may need revision. For questions about this document or to contribute information to the current body of knowledge, please contact the PEP at (623) 236-7600.

## CHAPTER 1: WILDLIFE PROTECTION LAWS AND THE PERMITTING PROCESS

Various federal, state, and local laws regulate the permitting requirements for wind energy development in Arizona. This chapter clarifies the permitting process and offers suggestions for completing the process by:

- Providing an understanding of the regulatory framework of environmental laws and processes governing siting and permitting.
- Providing an understanding of the agencies and other stakeholders who should be engaged in the process.
- Encouraging consistent use of pre-construction assessment methods to assess impacts and develop mitigation.

With the exception of wind energy development occurring on federal and state lands, compliance with these *Guidelines* is voluntary, but all native wildlife are protected under state law (see *State Laws*). AGFD strongly encourages adherence to these *Guidelines* to ensure impacts to wildlife populations are minimized from wind energy development and operations. Although it is not possible to absolve individuals and entities from liability for unlawfully taking wildlife under state law, AGFD will take compliance with these guidelines into consideration when considering law enforcement action. AGFD also encourages those involved in wind energy development to follow the recommendations set forth by the U.S. Fish and Wildlife Service (USFWS) in their ‘*Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines*’ (USFWS 2003) as they have similar prosecutorial discretion for species protected under federal laws.

### Initiating the Permitting Process

Permitting decisions are made by the appropriate land management agency dependant on project location. We encourage all permitting authorities to adopt these *Guidelines* as part of the permit requirements. Examples of permitting requirements for wind development include the following:

- Private lands require a county or city land use permit. Permittees should contact the appropriate county/city early in the process to determine if there are standard conditions for addressing natural resource impacts. Compliance with these *Guidelines* during the permitting process is recommended, but is at the discretion of the county/city to require within their permit.
- Arizona State Trust Lands require a permit (e.g., commercial lease or right-of-way) from the Arizona State Land Department (ASLD) and a land use permit from the appropriate county. ASLD is required to consult with AGFD on all projects per an inter-agency Memorandum of Understanding. AGFD will recommend adherence to these *Guidelines*.
- Federal lands are governed by the federal land management agency where the development is being proposed. Each federal agency has its own permitting process which is subject to their laws, regulations, and policies, as well as the National

Environmental Policy Act (NEPA). Through NEPA, federal agencies must make diligent efforts to involve the public in preparing and implementing their NEPA procedures [40 CFR 1506.6(a)]. This includes coordination with the States and adherence to these *Guidelines* as well as the USFWS Guidelines (USFWS 2003) will be recommended.

- Tribal lands fall under the jurisdiction of the tribal authority, and do not require AGFD consultation. However, AGFD encourages coordination where projects are adjacent to other federal, state, or private lands. Projects proposed on non-tribal lands owned or leased by tribes follow similar consultation procedures as projects proposed on private or state lands.

Permitting agencies and project proponents should consult with AGFD to identify any potential impacts to Special Status Species and other wildlife in the project area. AGFD consultations typically follow these steps:

1. The permitting agency or project proponent obtains a Special Status Species List from the [Arizona On-line Review Tool](#) or through the AGFD Project Evaluation Program (PEP).
2. The permitting agency or project proponent initiates an AGFD project review through PEP. PEP provides policy, technical and environmental law compliance guidance and oversight, and coordinates an internal review of land use projects affecting fish and wildlife resources in Arizona. PEP will advise the permitting agency or project proponent if coordination with the USFWS and/or AGFD is likely necessary to avoid, minimize, or mitigate wildlife impacts.
3. AGFD encourages permitting agencies and project proponents to continue coordination throughout the preliminary site screening, pre-construction assessment, impact analysis and mitigation, and operations monitoring and reporting phases.

Federal and state wildlife laws can influence project siting and operations. For example, wind energy projects which have the potential to “take” federally listed or protected species are subject to permitting requirements under the Endangered Species Act (ESA), the Migratory Bird Treaty Act (MBTA), and the Bald and Golden Eagle Protection Act (BGEPA). In addition, there are Arizona state laws protecting wildlife and their habitats (see below). Project proponents and permitting agencies should be familiar with these laws during the permitting process to ensure impacts to wildlife are minimized and/or mitigated for in order to avoid violating state and federal law.

The permitting agency and project proponent should coordinate frequently with AGFD and USFWS throughout the process, and particularly during development of permit conditions. Permitting agencies should structure permit conditions to clearly define the obligations of the developer and to establish triggers for mitigation beyond what is required upon project approval. Requirements for additional mitigation may include contributions to AGFD for research.

***Involving and Communicating with Regulatory Agencies and Stakeholders***

Project proponents should contact permitting agencies, landowners, AGFD, and USFWS early in the permitting process to obtain critical input on site development decisions, including any surveys that must be completed before permits may be issued and construction may begin. In

addition, initiating pre-construction surveys early will help to avoid unnecessary delays during permitting (particularly in cases where NEPA compliance documentation is required).

## Navigating Local, State, and Federal Laws

### *County Ordinances / Regulations*

Some Arizona counties are presently considering the adoption of wind resource policies as part of their general plans or zoning ordinances. These future wind resource policies would create county siting and zoning regulations to establish areas where wind development could potentially be located. However, all counties currently (August 2008) permit wind development through a Conditional Use Permit. This county permit allows a wind energy project to operate under existing zoning ordinances so long as certain conditions (e.g. setbacks, height, noise, safety, aesthetics, wildlife protections) are met. Some county general plans include language, or direct planning staff to work with local, state, and federal agencies to ensure wind energy projects avoid, minimize, and mitigate direct impacts to fish, wildlife, and botanical resources wherever practicable. Some county general plans address assessment of impacts to wildlife and other natural resources, but none provide specific guidance on studies or programs necessary to quantify, mitigate, or monitor such impacts. The creation of these *Guidelines* is intended to fill this void in the planning/permitting process.

### *AGFD Policy*

Although AGFD enforces Arizona's state wildlife laws, AGFD is not a permitting authority for wind energy development. Rather, AGFD makes recommendations to avoid, minimize and/or mitigate impacts to wildlife, and elects to support or oppose wind energy projects in consultation with the permitting agency. In making a decision to support or oppose a project, AGFD uses its *Wildlife and Wildlife Habitat Compensation Policy* (Commission Policy A2.16, Department Policy I2.3, authorized under A.R.S. 17-211) and its biological expertise to analyze impacts to wildlife from the proposed project activities. AGFD recommends project proponents follow this policy.

The *Wildlife and Wildlife Habitat Compensation Policy* guides the agency in evaluating habitat loss from development projects such as wind energy. This policy requires AGFD to work with developers and permitting agencies to develop adequate mitigation plans for habitat losses resulting from land and water projects. Criteria used to identify general mitigation goals fall into four categories (not to be confused with the Project Categories defined in Chapter 2):

- **Resource Category I:** Habitats in this category are of the highest value to Arizona Wildlife species and are irreplaceable on a statewide or regional basis.  
Goal: No loss of existing in-kind habitat value.  
Guideline: All potential losses of existing habitat values will be prevented. Insignificant changes may be acceptable provided they will have no significant cumulative impacts.

- **Resource Category II:** Habitats in this category are of high value for Arizona wildlife and are relatively scarce or becoming scarce on a statewide or regional basis.  
Goal: No net loss of existing habitat value, while minimizing loss of in-kind value.  
Guideline: Losses be avoided or minimized. If significant losses are likely to occur, AGFD will recommend alternatives to immediately rectify, reduce, or eliminate these losses over time.
- **Resource Category III:** Habitats in this category are of high to medium value for Arizona wildlife and are relatively abundant.  
Goal: No net loss of habitat value.  
Guideline: AGFD will recommend ways to minimize or avoid habitat losses. Anticipated losses will be compensated by replacement of habitat values in-kind, or by substitution of high value habitat types, or by increased management of replacement habitats, so no net loss occurs.
- **Resource Category IV:** Habitats in this category are of medium to low value for Arizona wildlife, due to proximity to urban development or low productivity associated with these sites.  
Goal: Minimize loss of habitat value.  
Guideline: AGFD will recommend ways to avoid or minimize habitat losses.

### ***State Laws***

Arizona State Statutes and AGFD Commission Policies have been established to maintain, protect, restore, and enhance fish and wildlife populations and their habitats. Project proponents should be familiar with these statutes and policies to ensure their projects are consistent with the intent of these laws and policies. Several Arizona state statutes and AGFD Commission policies, some of which are discussed below, are relevant to wind energy projects. Violation of these laws or other policies can result in criminal prosecution and/or civil liability.

- Pursuant to A.R.S. § 17-102, wildlife is the property of the state, and can be taken only as authorized by the Arizona Game and Fish Commission.
- “Wildlife” is defined in A.R.S. § 17-101(A)(22) as “all wild mammals, wild birds, and the nest or eggs thereof, reptiles, amphibians, mollusks, crustaceans, and fish, including their eggs or spawn.”
- “Take” is defined in A.R.S. § 17-101(A)(18) as “pursuing, shooting, hunting, fishing, trapping, killing, capturing, snaring or netting wildlife or the placing or using of any net or other device or trap in a manner that may result in the capturing or killing of wildlife.”
- It is unlawful to “take, possess, transport, buy, sell or offer or expose for sale wildlife except as expressly permitted” under A.R.S. § 17-309(A)(2)..
- A.R.S. § 17-235 authorizes the Arizona Game and Fish Commission to regulate the taking of migratory birds in accordance with the MBTA, described below.
- Under A.R.S. § 17-236(A), “it is unlawful to take or injure any bird or harass any bird upon its nest, or remove the nests or eggs of any bird, except as may occur in normal horticultural and agricultural practices and except as authorized by commission order”.

- No state or federal lands can be closed to hunting or fishing without the consent of the Arizona Game and Fish Commission, and no person may lock a gate blocking access to state lands pursuant to A.R.S. § 17-304 and Arizona Administrative Code R12-4-110. Permittees should contact the AGFD Ombudsman at AGFD Headquarters for information regarding filing a petition with the Arizona Game and Fish Commission where a project requires the closure of state or federal lands to hunting or fishing.

### ***Federal Laws***

The following federal laws apply to protecting wildlife from the impacts of wind energy development. For more detailed information on federal laws and guidelines, refer to the USFWS *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (2003).

- The National Environmental Policy Act and the regulations promulgated there under (42 U.S.C. § 4321, *et seq.*, 40 CFR § 1500.1, *et seq.*) require the federal government to assess the environmental impacts of any “federal action,” which includes actions undertaken (1) on federal land, (2) by a federal agency, (3) with federal funds, or (4) where the federal government will be issuing a permit. In some cases, federal agencies must prepare detailed Environmental Impact Statements or Environmental Assessments assessing the environmental impact of, and alternatives to, federal actions significantly affecting the environment. An example of a wind energy project falling under NEPA jurisdiction would be the proposed placement of wind turbines or associated transmission lines on U.S. Forest Service or Bureau of Land Management land. NEPA requires federal agencies to cooperate with state and local agencies in analyzing environmental impacts of proposed federal actions. More details on NEPA can be found at <http://www.nepa.gov/nepa/regs/nepa/nepaeqia.htm>
- The Endangered Species Act, 16 U.S.C. §1531, *et seq.*, provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. The ESA, among many other things: 1) authorizes the determination and listing of species as endangered or threatened; 2) prohibits unauthorized taking, possession, sale, and transport of endangered species (including land-use activities that “harm” or “harass”); and 3) authorizes the assessment of civil and criminal penalties for violating the Act or regulations. ESA authorizes permits for the take of protected species if the permitted activity is for scientific purposes, is to establish experimental populations, or is incidental to an otherwise legal activity. Section 7 of the ESA requires federal agencies to insure that any action authorized, funded or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat. More information on the ESA can be found at <http://www.fws.gov/endangered/policy/index.html>.
- Migratory Bird Treaty Act, 16 U.S.C. § 703, *et seq.*, prohibits taking, killing, possessing, transporting, and importing of migratory birds, including their eggs, parts, and nests, except when specifically authorized by USFWS. Slightly more than 400 species of birds that are protected by the MBTA are either resident or at least occur annually in Arizona during certain seasons of the year (winter, summer, or during migration). The MBTA authorizes permits for some activities, including but not limited to scientific collecting, depredation, propagation, and falconry. No permit provisions are available for incidental take for any project-related incidental take, including take associated with wind energy

development. For more information on the MBTA, go to <http://www.fws.gov/permits/mbpermits/regulations/mbta.html>.

- Bald and Golden Eagle Protection Act, 16 U.S.C. §668, *et seq.*, protects the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the take, possession, and commercial use of such birds. More information on the BGEPA can be found at <http://www.fws.gov/laws/lawsdigest/baldegl.html>.

Federal wildlife protection laws prohibit most instances of take, although each law may provide for exceptions. Under these laws, unauthorized take may be penalized, even if the offender had no intent to harm a protected species. Direct consultation with the USFWS should occur early in the project development process to ensure each project is reviewed and permitted appropriately under these federal laws. When the project occurs on federal lands, the Federal land management agency is responsible for this consultation.

## CHAPTER 2: PRELIMINARY SITE SCREENING

Wind energy developers need information to assess the biological sensitivity of the proposed project site early in the development process. This preliminary information gathering, or site screening, consists of a reconnaissance field survey and data collection from databases, federal and state agencies, and local experts. This information is used to identify species potentially at risk and the impact questions that must be addressed. Site screening is the first step in determining the kinds of studies developers will need to conduct and allows the project proponent the opportunity to seek a different site if significant, unavoidable impacts seem likely despite careful turbine siting.

This section is intended to provide guidance to wind energy developers to determine the biological significance of a site. It also includes recommendations on developing a scientific pre-construction study and assessing the level of effort required for such studies. For more information regarding the scope and nature of wildlife issues associated with wind energy projects, developers and project biologists should reference the Wildlife Society's Technical Review: *Impacts of Wind Energy Facilities on Wildlife and Wildlife Habitat* (Arnett et al. 2007).

### Reconnaissance Site Visit, Meteorological Tower Construction, and Initial Biological Assessment

Once the landowner has granted permission to access the proposed wind energy site, the project proponent needs to arrange for a qualified wildlife biologist who is knowledgeable about the biology of bats and birds in the region to conduct a reconnaissance survey. The purpose is to obtain information on the vegetative communities and significant topographic features which will help determine the wildlife community using the project site. The biologist should prepare for the survey by securing recent aerial photography of the site (e.g. Google Earth imagery). In addition, the biologist should consult topographic maps to assess landscape level habitat features such as water or riparian features and/or significant geological features which may indicate high potential use of the area by wildlife. Surveys should be of sufficient duration and intensity to adequately address all habitat types in, and immediately adjacent to, the project area and provide a basis for predictions about species occurrence at the site throughout the year.

One of the first steps in determining whether a site has a wind resource sufficient for a wind development is to collect data through the installation of meteorological towers (met towers). AGFD requests project proponents recognize that the period of wind resource data collection (i.e. when met towers are operating) coincides with the pre-construction data collection period. Depending on the project timeline, AGFD requests project proponents consider initiating pre-construction monitoring (See [Chapter 3, Pre-construction Survey Protocols](#)) during the meteorological data collection phase.

Met towers usually collect wind data for a period of at least 1-2 years prior to wind tower construction. Many of these towers are considered temporary; however, a number of towers become permanent throughout the life of a wind project. Met towers (whether temporary or permanent) and their associated infrastructure have the potential to cause avian and bat

mortalities resulting from mid-flight strikes with the tower guy wires. Studies have shown guy-wired towers can cause four times more bird mortality than towers without guy wires (Young et al., 2003. [http://www.west-inc.com/reports/fcr\\_final\\_mortality.pdf](http://www.west-inc.com/reports/fcr_final_mortality.pdf)). While bats can also strike guy wires, the occurrence is much less frequent. In addition, the visibility of met towers is important for the safety of aircraft pilots at low flight elevations. To reduce the potential for bat and bird collisions, and to provide guidance for keeping pilots and personnel safe, AGFD has developed these recommendations. These guidelines can also be found in [Appendix C](#).

- AGFD requests all *permanent* met towers be unguyed, free standing structures. If possible, AGFD also requests temporary met towers be unguyed, free standing structures.
- If guy wires are present, AGFD recommends the applicant attach Bird Flight Diverters (BFDs) **at 10-meter intervals along the length of each guy wire** (Note: There are several manufacturers of BFDs: TYCO, Preformed Line Products, Dulmison, etc.). Research shows the attachment of BFDs can reduce bird collisions by as much as 86-89% (Pope et al., 2006. [http://www.chelanpud.org/documents/Burch\\_Final\\_Report\\_V1.pdf](http://www.chelanpud.org/documents/Burch_Final_Report_V1.pdf)).
- AGFD recommends all temporary towers are only on site for the minimum amount of time needed to monitor the wind resource. If towers are on site for more than 1 year, AGFD recommends carcass searches be implemented, especially during the bird migration period (see [Chapter 5, Post-construction Monitoring and Reporting](#)).
- If a temporary tower is going to become a permanent structure for the life of the project, AGFD recommends the tower(s) be included as part of the longer term (pre-construction and post-construction) monitoring program.
- AGFD recommends the applicant place acoustic monitoring stations on met towers in the proposed project area (**Note:** This will help collect bat activity information needed for pre-construction analysis). An acoustic monitoring station is defined as two AnaBat detectors, one at “ground level” (approximately 1.5 meters above ground) and the other with an elevated microphone, ideally within the future rotor swept zone, but not less than 30 meters high. Reynolds (2006) and Lausen (2006) provide detailed guidelines for detector deployment and operation. Rainey et al. (2006) provides an in depth discussion of acoustic monitoring systems. Acoustic monitoring should be intensified during bat migration periods (August 16 – October 31). Acoustic data collection objectives should strive to collect as much acoustic information as is feasible across seasons with an emphasis on migration periods.
- Work with AGFD to determine the number of acoustic monitoring stations needed to adequately cover the project area. The number of acoustic stations will depend on project footprint and habitat complexity.
- When siting met towers, avoid habitat features that congregate wildlife such as water resources, habitat edges, etc.

#### ***AGFD Personnel Safety***

- Low-level aerial flights can occur outside routine wildlife survey routes. GPS locations of all towers need to be provided to AGFD prior to construction to allow survey aircraft to avoid the towers. In addition, AGFD requests project proponents notify the Department when met towers are removed.

- For all monopole towers  $\geq 50$  feet tall, paint the top 30 feet of the tower in alternate orange and white paint. This does not apply to lattice towers or lit towers, both of which are more visible than monopoles.

### **Data Resources for Biological Information**

AGFD Natural Heritage Program, Heritage Data Management System (HDMS) is an efficient and cost-effective source of biological information. HDMS is part of a global network of more than 80 Natural Heritage Programs and Conservation Data Centers. It identifies elements of concern in Arizona and consolidates information about their status and distribution throughout the state. Species lists are available by common name, scientific name, taxon, and county, and can be found at: [http://www.azgfd.gov/w\\_c/edits/hdms\\_species\\_lists.shtml](http://www.azgfd.gov/w_c/edits/hdms_species_lists.shtml). Species abstracts are also available on the web at: [http://www.azgfd.gov/w\\_c/edits/hdms\\_abstracts.shtml](http://www.azgfd.gov/w_c/edits/hdms_abstracts.shtml).

Another useful source of information is the Arizona Online Environmental Review Tool (<http://www.azgfd.gov/hgis/>). The Online Tool uses HDMS data to provide species lists based on the project area to gather initial biological data. However, obtaining a species list does not constitute a review of the project by AGFD. In addition, HDMS data does not include potential distribution of special status species. Be aware that occurrences are only recorded in HDMS if the site has been previously surveyed during the appropriate season, detection was made, and the observation was reported and entered into the database. As such, do not use the absence from the HDMS of an occurrence in a specific area to infer absence of special status species. It is also important to evaluate known occurrences of sensitive species and habitats near the site and in comparable adjacent areas.

In addition, AGFD has completed a State Wildlife Action Plan (formerly called the Comprehensive Wildlife Conservation Strategy) which should be used by wind developers to identify species and threats within their habitats. The State Wildlife Action Plan includes a list of Species of Greatest Conservation Need in Arizona by habitat type, outlines threats to species and habitats, and recommends actions which could be taken to address those effects.

### ***Federal and State Agencies as Resources***

Early consultation with both AGFD and USFWS will assist project proponents in determining the applicability of other state and federal laws, including the ESA, BGEPA, MBTA, and Arizona State Statutes and Arizona Game and Fish Commission Rules dealing with bat, bird, and raptor protection. Appendix A provides contact information for the six AGFD regional offices and headquarters. The USFWS has developed lists of federally Threatened, Endangered, and Candidate species arranged by county are available from the Ecological Services Offices at <http://www.fws.gov/southwest/es/Arizona/Threatened.htm> - [CountyList](#). Information on birds which are high priorities for conservation action, and other general migratory bird information can be found at <http://www.fws.gov/migratorybirds/>. USFWS biologists can also offer information about listed species and designated critical habitat (see Appendix B for contact information). Early coordination with USFWS biologists will help identify potential impacts to federally listed and migratory species that are high priorities for conservation. The USFWS Arizona Ecological Services Field Office website is also a good source for guidance on the ESA,

species documents, county lists of Threatened and Endangered Species and Critical Habitat information (<http://www.fws.gov/southwest/es/Arizona/>).

#### ***Local Experts and Other Resources***

Other helpful sources of information include contacts with biologists familiar with the area, including staff from universities, colleges, bird observatories, and Audubon chapters (<http://www.audubon.org/states/index.php?state=AZ>), as well as local bat experts and birders. National Audubon Society Christmas bird count data (<http://www.audubon.org/bird/cbc>) and North America Breeding Bird Survey data (<http://www.mbr-pwrc.usgs.gov/bbs/>) can provide useful information about species and abundance of birds during winter and spring in portions of Arizona. Audubon Arizona has mapped 30 officially identified areas in the state that they consider “Important Bird Areas” (<http://www.aziba.org/>). Additional information on raptor migration can be found at Hawk Watch International (<http://www.hawkwatch.org/home/>). Cities and counties may also have useful information on local bat and bird populations.

#### **Framework for Determining Bat and Bird Study Effort (Categories)**

With information from the preliminary site assessment, proposed project sites can be grouped into one of four categories to provide a general framework to assist in determining the duration and intensity of study needed for pre-construction and operations monitoring. Assigning projects to categories may not always be a clear-cut process, and projects may shift from one category to another as information from the pre-construction studies either reveals unanticipated issues or resolves expected concerns about potential impacts. Thus, AGFD recommends project proponents assess their project’s category before, or at the time of, met tower construction. **Due to a paucity of data on effects of wind projects on wildlife resources, AGFD anticipates most proposed projects will be considered Category 3 or 4.**

For all categories of projects, recommendations to conduct more or less than one year of pre-construction surveys should be accompanied by a well-supported rationale and justification for the recommendation. The burden of proof rests with the party advocating the deviation from the standardized pre-construction survey effort. Caution is warranted in concluding a project will have low impacts to bats or birds based on preliminary site screening data because currently little is known about the range and distribution of Arizona bat populations, their migratory routes, and population variation from year to year. Additionally regional raptor migration pathways are poorly understood and annual populations can vary with changes in climate and fluctuating prey bases (e.g. prairie dog colonies, rabbits). Consider the following questions when assessing the project category:

1. Which species of bats and birds use the project area and how do their numbers vary throughout the year?
2. Are any of the following known, or likely to occur, on or near the proposed project site? (Note: “Near” refers to a distance within the area used by an animal in the course of its normal movements and activities.)

- a. Species listed as federal “Threatened” or “Endangered” (or candidates for such listing)?
  - b. Special status bat or bird species?
  - c. Bald or Golden eagles?
3. Is the site near a raptor nest, or are large numbers of raptors known or likely to occur at or near the site during portions of the year?
  4. Is the site on or near important staging or wintering bird areas?
  5. Are there prey species such as prairie dog colonies and high insect prey bases attracting wildlife populations to the area?  
(Note: Species that may not appear to have a direct conflict with wind development may result in greater impacts to raptors due to the area’s importance as a foraging site.)
  6. Is the site likely to be used by birds whose behaviors include flight displays (e.g. common nighthawks, horned larks) or by species whose foraging tactics put them at risk of collision (e.g. contour hunting by golden eagles)?
  7. Is the site near a known or potential bat roost, recognizing some species of bats will fly over 20 miles each way to forage?
  8. Are there physical features such as ridgelines, cliff faces, caves (or cracks and fissures), unique vegetation communities, riparian areas, water or forage sources attracting and concentrating wildlife populations (e.g. foraging, roosting, breeding, or cover habitat)? Is the site near a known or likely migrant stopover site?
  9. Is the site regularly characterized by seasonal weather conditions such as dense fog or low cloud cover which may increase collision risks to bats and birds, and do these events occur at times when birds may be concentrated?
  10. If the site has characteristics which concentrate wildlife, what potential design and mitigation measures could reduce impacts?

***Category 1 – Project Sites with Available Wildlife Data suggesting No Significant Impacts to Wildlife***

Most Category 1 projects will require one year of data collection. For those Category 1 projects which have at least one year of information regarding the use of a site by resident and migratory species, as well as credible mortality data, reduced pre-construction study effort may be appropriate. Category 1 may be appropriate for projects surrounded by or near existing wind energy projects which have been studied sufficiently and/or for which there is little uncertainty as to the level of impact. Factors to consider in determining whether or not data from an adjacent facility would allow a project to be considered for Category 1 include:

- Whether the field data were collected using a credible sample design.
- Where the data were collected in relation to the proposed site.

- Whether the existing data reflect comparable turbine type, layout, habitat, suitability for migratory species, physical features, and winds.
- Whether the data are scientifically defensible and still relevant.

Consultation with USFWS, AGFD, biologists with specific expertise, and other appropriate stakeholders (i.e. a conservation organization representative) is recommended when considering whether a project qualifies as Category 1. Caution is warranted in extrapolating existing data to unstudied nearby sites. Slight topographical or habitat variations can make substantial differences in bat and bird site use and potential impacts. In addition, technological changes including use of large turbines, variations in turbine design or layout, increased operating times, and use of different lighting may require new or additional data gathering. Pre-construction studies for Category 1 projects should focus on information gaps and particular species of concern, if any; and the cumulative impact analysis should address the effects of the proposed project combined with surrounding sites. These studies should build upon and expand existing data about those species from nearby wind resource areas.

***Category 2 – Project Sites with Little Existing Information and No Indicators of High Wildlife Impacts***

If the preliminary site assessment for a project area indicates there are no potential issues (i.e. known occurrence of special status species, knowledge of significant raptor or bat migration through the project area, or high levels of fatalities at nearby wind projects) and no substantial body of information from nearby projects indicates high potential for wildlife impacts, the project area is likely to be categorized as Category 2. Pre-construction surveys should be conducted a minimum of one year. This will allow for an assessment of how bats and birds use the site during spring, summer, fall, and winter, and may require additional years of survey if data from the first year is inconclusive.

***Category 3 – Project Sites with High or Uncertain Potential for Wildlife Impacts***

Project sites with high levels of bat and/or bird use or risk, presence of special status species, or considerable uncertainty regarding potential wildlife impacts will need a minimum of two years of study to help understand and formulate ways to reduce impacts. Characteristics which may put a proposed project site in Category 3 include: high prey abundance such as rodents or prairie dog colonies (current or historic) within, or immediately adjacent to, project areas that could attract resident and migratory raptors; known avian migration stopovers such as water bodies within or immediately adjacent to the project; high insect abundance that may increase potential as a bat foraging area; special status species occurring on or adjacent to a proposed site; or high concentrations of migrating, wintering, and/or breeding raptors. Projects for which little information is available on bat and bird use potential risk are also included in Category 3.

For most Category 3 projects, two years of data collection are recommended because one year will not adequately characterize bat and bird use due to high variability in seasonal populations from year to year. Additionally, in areas of seasonal importance (e.g. known or expected bat and raptor migration areas) the standard timing and frequency of surveys (e.g. weekly) may be inadequate to characterize overall use during these critical periods.

The number and size of turbines and the extent of the area covered by the project may also influence the need for more or less study because of a direct relationship between the number of turbines and the magnitude of the potential impact to bat and bird populations. Development of numerous projects over large geographical areas, or those covering a heterogeneous mix of habitats and terrain, may need additional specialized or multi-year studies if these areas have never been surveyed. Such large-scale studies may be best addressed with a collaborative research approach encompassing a number of different projects within a region.

#### ***Category 4 – Project Sites with Significant Impacts to Wildlife***

Wind development proposed within designated wilderness areas, national parks or monuments, state parks, regional parks, and wildlife or nature preserves should be considered Category 4. Some projects for which preliminary information gathering or existing data indicates potential for unacceptable risk of bat or bird fatalities may also be appropriately classified as Category 4, particularly if no feasible avoidance or mitigation measures are available to reduce impacts. In Arizona, Category 4 areas include riparian corridors and areas of significant topographic relief. AGFD will not support Category 4 wind energy projects unless a minimum of three years of data indicate the suspected impacts to wildlife populations are not significant.

If a Category 4 project moves forward despite indications that high levels of bat or bird fatalities may occur, and operations avoidance and minimization options to reduce the impacts are limited, then the project may require costly, ongoing re-assessment of impacts and adjustment of mitigation including potential operational shutdown. The most critical component and progressive need in wind development planning today, and one which best addresses cumulative impacts, is the avoidance of areas where unacceptable risk to wildlife occurs. For those areas, mitigation is no substitute for poor site placement (e.g. Altamont Pass, CA).

## **Reporting**

### ***Report #1: Preliminary Site Screening***

This report should include data from the initial reconnaissance visit as described in this Chapter. Include information on the assessment of the potential for bats and birds to occur at the site and a preliminary evaluation of collision risk. This report should contain sufficient data to conclude with a data-driven framework the Category to which the potential project may be designated. Submit the report to AGFD for concurrence. This should be completed prior to the development and submittal of the pre-permitting study plan.

Information in this report should include but not be limited to:

- A description of the vegetation community and major topographical features.
- Information gathered from state and federal agencies on wildlife populations in the area including any Threatened and Endangered species, raptors, and significant bat populations (especially known migration and/or colonies).
- Any information on known or suspected migratory corridors for bats and birds.
- Analysis of potential impact and mitigation to avoid impacts to wildlife (possible direct, indirect, and cumulative effects).

***Where to Submit Bat and Bird Data and Reports***

AGFD encourage data owners to share raw data and reports by submitting results to the PEP. Please e-mail a complete dataset with metadata and reports to [pep@azgfd.gov](mailto:pep@azgfd.gov) or mail on a CD to the following address:

Arizona Game and Fish Department -WMHB  
Project Evaluation Program  
5000 W. Carefree Highway  
Phoenix, AZ 85086

Please specify any viewing restrictions or applications required and any information which may be considered proprietary or confidential. AGFD requests the following necessary elements of data submittals: 1) electronic format, 2) geographic locations of biological observations including projected or geographic coordinate system and datum, 3) attributes defining observational data, 4) metadata and 5) monitoring reports (preferably in PDF format).

## CHAPTER 3: PRE-CONSTRUCTION SURVEY PROTOCOLS

This chapter provides guidance to developers on collecting biological information to assess the potential direct and indirect impacts to bats and birds at proposed wind energy sites. It also describes the study methods available for bat and bird field studies and recommended protocols for using the methods. These methods are a synthesis of other state and federal agency recommendations, wildlife literature, and recommendations based on local data from Arizona habitats and wildlife populations. While the techniques for quantifying effects to wildlife may be standardized, certain techniques may work better at some sites than others. Therefore, it is recommended each site develop a site-specific pre-construction study plan developed in coordination with AGFD and USFWS. Several good examples which can be used for assisting in developing a study plan can be found at West, Inc website, <http://www.westinc.com/reports/>. In the spirit of adaptive management, it is expected these *Guidelines* will undergo revisions and adjusted to remain current with the best available and accepted science that is pertinent to an individual site and/or region.

### Developing a Pre-construction Study Plan

An important component in the development of a pre-construction study plan is early consultation with AGFD, USFWS, the Federal land management agency (if applicable), and other stakeholders with an expressed interest in the project. Project proponents and/or permitting agencies should consult with AGFD to evaluate pre-construction study designs, assess impacts, and establish permit conditions for operations monitoring protocol and mitigation. Many scientific questions generated by a wind energy project proposal can be addressed with input from this collaboration.

Developing a detailed pre-construction study plan involves asking questions about the potential for bats and birds to occur at the site, how bats and birds may use the site, and whether they may be at risk of colliding with wind turbines. Development begins with a clear identification of the impact questions which must be addressed, and then establishing a study design appropriate for answering those questions. The pre-construction study will provide the basis for an impact assessment and subsequent recommendations for micro-siting or other impact avoidance, minimization, or mitigation measures. Project proponents should base the duration and focus of pre-construction studies on the availability of site-specific baseline wildlife and habitat data needed to answer impact questions, the species potentially affected, and the magnitude of the anticipated effect. The questions used to determine the project's category ([Chapter 2, Preliminary Site Screening](#)) will aid in the development of the pre-construction study plan.

In addition, the National Wind Coordination Committee (NWCC) provides detailed information about the metrics and methods for designing pre-construction studies for diurnal birds (Anderson et al., 1999). Smallwood (2007) provides important information on quantifying bird mortality from wind turbines. Kunz et al. (2007) developed guidelines to address nocturnally active bat and bird species in relation to wind energy development. AGFD recommends the project

proponent consult each of these documents in the course of developing pre-construction and operations study design. While the above mentioned documents are current at the time these *Guidelines* are being written (2009), wind energy and the science evaluating wildlife impacts related to wind energy projects demand current literature searches be conducted.

### Nocturnal Bat Survey Methods

Avian collisions with wind turbines have been a source of concern for almost two decades, but only recently have researchers turned their attention towards the impacts to bats. Compared to birds, much less is known about the life histories, habitat requirements, behavior, and geographic ranges of Arizona's 28 bat species, making an assessment of wind project impacts to bats a difficult subject to address in pre-construction studies. Bats are long-lived mammals with few predators and low reproductive rates (Kunz, 1982). Therefore, sustained, high fatality rates from collisions with wind turbines could have significant impacts to bat populations (Racey and Entwistle, 2000). Current and historic population figures for most species of bats remains elusive, but many populations are believed to be in sizeable decline (Arnett et al., 2007). Due to the levels of bat fatalities at some wind projects, and as population estimates for many species remain unknown, cumulative impacts must be considered for bat species (Kunz et al., 2007).

Bat mortality at wind developments in the U.S. was first reported in Minnesota (Johnson et al. 2003, Osborn et al. 1996), and fatalities have been documented at wind developments in at least 10 other states (Johnson 2004 and 2005). Of these fatalities, most have been migratory tree bats (i.e. hoary, red and silver-haired bats). In Arizona, the species at greatest risk of being impacted by wind development include: hoary bats (*Lasiurus cinereus*), silver-haired bats (*Lasionycteris noctivagans*), western red bats (*Lasiurus blossevillii*), Mexican free-tailed bats (*Tadarida brasiliensis*), and lesser long-nosed bats (*Leptonycteris yerbabuenae*). Other species which likely migrate, but whose migratory patterns are poorly understood in Arizona include: Western mastiff bats (*Eumops perotis*), pocketed free-tailed bats (*Nyctinomops femorosaccus*), and big free-tailed bats (*Nyctinomops macrotis*). Arizona has a different bat species assemblage than the Northeast where the most extensive bat fatality studies have been conducted. While north-south bat migration has been at least locally documented for several species, pathways of migration are poorly known. Given the diversity and complexity of bat movements within the state, and the uncertainty surrounding potential impacts of wind turbines on bat populations, pre-construction studies are necessary at all proposed wind energy sites to investigate the presence of migratory or resident bats and to assess collision risk. The primary methods used to assess bat activity/behavior and potential threats are provided below. For additional information, project proponents should consult *Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document to design project and site-specific assessments* (Kunz et al., 2007).

Some of the methods provided below are not recommended for every project, but may be needed to answer particular questions about size, species composition, behavior, and activity patterns of roosts, or to further investigate habitat features which may attract bats. Table 1 summarizes each survey method and describes appropriate usage. Biologists with training in bat identification, equipment use, and data analysis and interpretation should design and conduct all studies

discussed below. Mist-netting and other activities involving capturing and handling bats require a special license (Scientific Collecting Permit) from AGFD (R12-4-418). The objectives of bat surveys during the pre-construction phase should be designed to determine: 1) species occurrence and diversity; 2) activity levels including relative abundance and daily/seasonal timing; and 3) potential migration corridors.

#### ***Acoustic Detection for Bats***

Acoustic detection involves the use of specialized acoustic equipment (i.e. AnaBat, Pettersson, ABAT) which allow an experienced user to identify bat species by comparing recorded calls to a reference library of known calls. The objective of acoustic surveys is to determine relative abundance, activity patterns, and species or species group identification. Broadband detection systems covering the frequency range that bats use can provide an index of activity from echolocation calls. Acoustic monitoring provides information about bat presence and activity, as well as seasonal changes in species composition, but does not measure the number of individual bats or population density. Acoustic monitoring only records detections, or bat passes, defined as a sequence of two or more echolocation calls, with each sequence or pass, separated by one second or more (Hayes, 1993). Furthermore, there is some question about how much bats use echolocation while migrating as opposed to during foraging or while navigating among obstacles; so caution is necessary when assessing bat use of an area based only on acoustic monitoring data. Passive acoustic surveys can provide useful pre-construction information by establishing baseline patterns of seasonal bat activity at proposed wind energy sites. Researchers should be aware that with the current state of knowledge about bat-wind turbine interactions, a fundamental gap exists regarding links between pre-construction assessments and operations fatalities. There is evidence that bats might be attracted to newly created wind developments and their associated nacelles and blades (Kunz et al, 2007).

Project proponents should conduct acoustic monitoring for bats at all proposed wind energy sites unless defensible, site-specific data are available indicating that the project is unlikely to pose a risk to bats. Monitoring for a full year is recommended because little is known about the timing of bat migratory activity in many parts of the state, and some bat species overwinter in Arizona and can be active throughout the year. Year-round surveys are particularly important at proposed project sites if the sites are likely to support resident bat populations and include habitat features conducive to general bat activity (e.g. nearby roosts, water bodies). If year-round surveys are not feasible, acoustic monitoring should include at least spring and fall migration, the periods that pose the greatest risk to bats. Data on environmental variables such as temperature, precipitation, and wind speed should be collected concurrent with the acoustic monitoring so these weather data can be correlated with bat activity levels. Project proponents should consult bat experts, AGFD, and USFWS to make a determination as to the credibility and applicability of any existing data and when surveys should be conducted. In general, the objective of the acoustic survey is to augment the mist net surveys by detecting species which have not been captured, help to determine relative abundance of bats in the area, and collect data on migratory activity. Acoustic stations should be distributed evenly over the project site to maximize the ability to collect data, but in sites with varied topography, they should also be placed to sample varied habitats.

Mortality generally occurs in the rotor-swept area, therefore, AnaBat microphones should be placed as high above the ground as possible, at least 30m. Existing met towers or temporary towers can be used to allow AnaBat detector microphones to be hoisted high above the ground. All AnaBats at a site need to be at a consistent height so that data are comparable. Place two acoustic detectors at each met tower in the proposed project area, one at “ground level” and one elevated. Place the ground level detector approximately 5 feet (1.5 meters) above the ground to avoid acoustic interference from low-lying vegetation. Place the elevated detectors as high as possible on met towers without interfering with weather monitoring equipment, ideally at the future rotor-swept zone, but not less than 30m. Reynolds (2006) and Lausen (2006) provide detailed guidelines for detector deployment and operation. Rainey et al. (2006) provides an in-depth discussion of acoustic monitoring systems.

Some acoustic monitoring systems are designed to run unattended for long periods of time using solar power and collect data passively by storing bat calls for later analysis. Once the detectors have been established on towers, monitor nightly. Analysis of the data, however, can be conducted on a subset of the recordings by making a preliminary screening of the data to look for spikes of activity, with the remainder stored for later analysis if warranted. Project proponents should make decisions on the level of effort needed for screening and analyzing the pre-construction acoustic data in consultation with a bat biologist experienced in acoustic analysis.

Bat studies and research beyond those recommended in the *Guidelines* are needed to: 1) assess species composition and relative abundance of bats at proposed wind energy sites, 2) assess migration routes and the timing of migration, and to 3) help researchers understand temporal and spatial patterns of bat activity at facilities that encompass diverse landscapes (Kunz et al., 2007). The NWCC Wildlife Workgroup’s publication, *Wind and Wildlife Key Research Topics* (May 2008, [http://www.nationalwind.org/pdf/NWCC\\_ResearchPriorities.pdf](http://www.nationalwind.org/pdf/NWCC_ResearchPriorities.pdf)) provides an overview of current issues and research needs. AGFD may request to include contributions toward this research as mitigation for proposed wind energy projects. These contributions would be in addition to the pre-construction monitoring recommended here. Wind developers are urged to participate in research to develop better bat risk assessment methodologies by making their project sites available to researchers, by collaborative funding of research efforts, and by releasing study results.

#### ***Mist-Netting for Bats***

Mist-netting is the most common survey method for capturing bats. However, bat biologists and experts generally do not consider mist-netting for bats to be an effective method for assessing potential risk to bats at a proposed wind energy site (Kunz et al., 2007). Since many bats fly above mist-net heights, surveying from the ground is not the best way to determine a wind energy project’s potential impact to bats. In addition, not all wind energy sites offer conditions that are conducive to netting. Most mortalities occur when turbine blades strike bats flying at heights greater than 20m. Therefore, mist-netting alone is inappropriate for assessing bat activity at proposed wind energy installations and should be considered a low priority method for establishing the type of baseline data needed for pre-construction surveys (Lausen et al. 2006). With these limitations in mind, mist-netting does have a role among survey methods because this

technique helps to establish a species list for an area, including species that are difficult to identify or detect acoustically as well as age, sex, and reproductive status of local bat populations. Mist-netting must be conducted on no- or low-wind nights without precipitation because bats detect and avoid moving nets. Dark nights, closest to new moon, are best. Mist-netting should be conducted on multiple nights, July through October to account for natural fluctuations in activity. A survey is defined as a single night mist netting at a site. Surveyors should attempt to sample within different habitats at the site with the goal to maximize species captures. Surveys should begin at sunset and continue for a minimum of 3 hours, or until an hour after the last bat was captured, whichever is longer. A variety of factors influence capture success on any given night, so it is important to recognize mist net surveys may only provide a partial list of species in the area, and augment acoustic surveys.

Mist-netting and acoustic monitoring are complementary techniques that, when used together, can provide an effective means of inventorying the species of bats present at a site (O'Farrell et al. 1999). If mist-netting is to be used to augment acoustic monitoring data at a project site, trapping efforts should concentrate on potential commuting, foraging, drinking, and roosting sites. Methods for assessing colony size, demographics, and population status of bats can be found in O'Shea and Bogan (2003). Kunz et al. (1996) provide detailed guidelines on capture techniques for bats, including mist-nets and harp traps.

#### ***Roost Surveys for Bats***

Pre-construction survey efforts should include an assessment to determine whether nearby mines, caves, bridges, buildings, or other potential bat roosts occur near proposed wind turbine sites. If active roosts are detected during this assessment, exit counts and roost searches can provide additional information about the size, species composition, and activity patterns for any bat-occupied features near project areas.

**Exit counts** require a skilled observer, equipped with a bat detector and call storage system, as well as night vision equipment and supplemental infrared illumination, watching a bat roost exit at dusk when bats are leaving for their nightly foraging. Recording and later viewing of the exodus with one or more properly placed infrared video cameras (with supplemental infrared illumination) can allow a single biologist to cover large structures or abandoned mines with several portals. Rainey (1995) provides a guide to options for exit counts. Many bat species are long-distance fliers and can forage in areas 50 miles or more from known roost and maternal sites. Therefore, it is important to assess significant regional roost sites (e.g. Grand Canyon) and their relationships via foraging and movement patterns within a proposed wind development site.

**Roost searches** can document bat species that are difficult to detect acoustically or with mist-net capture. Roost searches are conducted by looking into or entering potential bat roosts (usually using artificial illumination) with the intent of finding roosting bats or bat "sign," including guano, culled insect parts, and urine staining. Conduct roost searches cautiously because roosting bats are sensitive to human disturbance (Kunz et al., 1996). Never conduct a roost search at known maternity roosts. Searches of abandoned mines or caves can be dangerous and should only be conducted by experienced researchers. For mine survey protocol and guidelines for protection of bat roosts, see the appendices in Pierson et al. (1999).

### ***Visual Monitoring of Bats***

The tools and survey techniques available to help understand how, when, where and why bats collide with wind turbines each have their own strengths, limitations, and biases, making it critical to use a combination of survey methods to assess activity levels in a given area. Use of nocturnal visual survey equipment can aid researchers in determining bat activity level at a site. In general, the equipment used for recording or observing nocturnal activity include night-vision equipment, thermal infrared equipment, and Radio Detection and Ranging (Radar). Kunz (2004) and Kunz et al. (2007) provide detailed discussions of available and emerging technology for observing nocturnal behavior of bats and analyze the uses, advantages, and disadvantages of each.

**Night-vision** goggles, scopes, and cameras make it possible to follow and identify night flying bats and birds. Improvements in technology have increased the ability of researchers to detect and identify animals. Night-vision equipment is most useful for assessing general activity patterns, flight direction and altitude, and behavior.

**Thermal infrared imaging** cameras are designed to detect heat emitted from objects in a field of view without the need for artificial illumination (Kunz et al. 2007). Thermal imaging can be used to obtain information on the temporal aspects of bat or bird migration in addition to quantification of avian movements. The variability in the quantity of migration over a project area coupled with the occurrence of weather conditions that cause migrants to fly at low altitudes can be used to estimate the number of occasions per season when collision events could theoretically occur. Thermal imaging results are best compared with other methods like acoustic detection and radar.

**Radio Detection and Ranging (Radar)** surveys are useful for investigating nocturnal migrants passing through a proposed project area. Common types of Radar used to study bats and birds include large weather radars (e.g. NEXRAD), tracking radar systems, and marine radar. NEXRAD Doppler radars are weather surveillance tools that can determine general migratory pathways, migratory stopover habitat, roost sites, nightly dispersal patterns, and the effects of weather on migration (Gauthreaux and Belser, 2003; Kunz, 2004). NEXRAD is not useful, however, for characterizing high resolution passage rates or altitude data over small spatial scales. Tracking radar systems can provide information on flight paths of individual insects, bats, and birds; however, it does not provide a broad view of migration over a given site and is not widely available. Horizontally mounted marine navigation radar allows accurate mapping of the trajectories of bats or birds, while vertically mounted scanning radar provides information on flight altitude. Mobile, low-power, high resolution marine surveillance radar has been used since 1979 to monitor collision risks of birds near power lines (Gauthreaux, 1985). Marine radar's advantage over Doppler and tracking radars is they are relatively inexpensive, available, dependable, easy to operate, and portable (Kunz et al. 2007). Radar surveys cannot identify bat or birds to the species level or reliably distinguish bats from birds, but can help identify use of a site by nocturnal migrants, making it suitable as an additional tool for site assessment.

**Table 1. Nocturnal Bat Survey Techniques for Pre-Construction Studies**

Technique	Purpose	When to Use	Seasons	No. Years Recommended
<b>Acoustic Detection</b>	Acoustic monitoring provides information about bat presence and activity, as well as seasonal changes in species composition, but does not measure the number of individual bats or population density.	Conduct acoustic monitoring for bats at all proposed wind energy sites.	Surveys should be intensified during migration ( <b>August 16 – October 31</b> ); Year-round surveys will yield additional information.	Cat. 1: 1 year min Cat. 2: 1-2 years Cat. 3: 2 year min Cat. 4: 3 years
<b>Mist-Netting</b>	This capture technique can help to distinguish species that are difficult to identify or detect acoustically and to gather additional information such as species, age, sex, and reproductive status of local bat populations that no other source, short of collecting the bat, can provide. Such information may be relevant in pre-construction studies if the goal is to evaluate potential project impacts to a local bat population.	Use with acoustic monitoring to provide an inventory of the species of bats present at a site (O’Farrell et al., 1999).	In general, April – October. See mist-netting section above for survey details.	Cat. 1: 3 survey min Cat. 2: 5 surveys min Cat. 3: 7 surveys annual Cat. 4: 9 surveys annual
<b>Roost Surveys</b>	Include an assessment to determine whether known or likely bat roosts in mines, caves, bridges, buildings, or other potential roost sites could occur near proposed wind turbine sites. If active roosts are detected during this assessment, <b>exit counts</b> and <b>roost searches</b> can provide additional information about the size, species composition, and activity patterns for any bat-occupied features near project areas.	Use where potential roost sites occur near proposed wind turbine sites.	<b>Internal Roost Survey:</b> anytime, use caution if the roost could be a hibernaculum or maternity colony; <b>External Roost Survey:</b> Conduct a minimum of 1 survey each season – recognize that absence of activity does not indicate absence of bats	For each category: surveys should be conducted until such time that the roost use can be described
<b>Visual Monitoring</b>	<b>Night-vision, thermal infrared imaging, and radar</b> can be used to augment the information from above survey methods.	Use when data from above survey methods are insufficient.	Should be conducted in conjunction with other surveys within a similar time frame	Should be conducted in conjunction with other surveys within a similar time frame

## Diurnal Bird Survey Methods

Descriptions of avian survey techniques are provided below. Table 2 summarizes each and describes appropriate usage. All of the survey techniques require experienced surveyors who are skilled at identifying the birds that are likely to occur in the project area and who are proficient at accurately estimating vertical and horizontal distances. Kepler and Scott (1981) provide details on training observers to estimate distances and testing surveyors for their abilities to identify birds by sight and sound. Analysis of data from surveys should include suitable measures of precision of count data such as standard error, coefficient of variation, or confidence interval (Rosenstock et al., 2002).

### *Large Bird Use Counts*

The large bird use count (LBUC) is a modified point count that involves an observer recording bird detections from a single vantage point for a specified time period. This survey technique provides information on bird species composition, relative abundance, and bird behavior that may enhance vulnerability to collisions with wind turbines. Bird use counts are especially useful to provide quantitative data on larger birds like raptors, ravens, waterfowl, and other waterbirds, but can provide limited information on smaller bird activity.

Project proponents should select LBUC sample sites at vantage points that offer unobstructed views of the surrounding terrain and corresponding airspace. The number of selected observation points depends on: 1) the number and spacing of potential turbines or turbine strings, 2) the ability to observe several potential turbine locations from a single point (Morrison, 1998), 3) whether larger or smaller birds are the study focus, and 4) the heterogeneity of terrain and habitats. Establishing sufficient sample points to achieve an average minimum density of 1 to 1.5 sample points every one square mile (2.6 square kilometers) is normally adequate for large birds. Mark the observation points in the field with a labeled stake and geo-reference using global positioning system (GPS).

On large projects, a randomized sampling method, such as a systematic sample with a random start, is one way to help reduce bias and achieve independence of sample points. For example, if the proposed project consists of nine or fewer turbines, sample each turbine site; however, if the proposed project includes many turbines (e.g. 50 or more), a systematic sample selecting every third turbine may be used. The goal is to create enough sample points to meet analytical and statistical variance objectives and to completely cover the area occupied by the proposed turbine locations. On sites that support multiple habitat types, systematically stratify sampling among the habitats to ensure sufficient analysis of habitat variability. Particular emphasis should be given to unique habitat features that are known to attract a higher diversity of species and greater abundance of individuals. Categorize habitat according to the descriptions in ReGAP, <http://fws-nmcfwru.nmsu.edu/swregap/pubs>, and Arizona Partners in Flight Bird Conservation Plan, [http://www.azgfd.gov/pdfs/w\\_c/partners\\_flight/APIF%20Conservation%20Plan.1999.Final.pdf](http://www.azgfd.gov/pdfs/w_c/partners_flight/APIF%20Conservation%20Plan.1999.Final.pdf).

Conduct LBUCs at each point location for 30 minutes once every week during spring migration, summer breeding, and fall migration. Sequence observation times to cover most daylight hours (for example, alternate each week with morning and afternoon surveys) and different weather conditions, such as windy days. Monitoring data collected at each LBUC point should include:

- Time
- Species
- Number
- Estimated distance from the observer to each bird
- Activity
- Habitat
- Flight direction
- Flight height estimated to the nearest meter

Weather and environmental data to record at each visit include:

- Temperature
- Wind speed and direction
- Visibility
- Barometric pressure
- Cloud cover
- Precipitation

For consistency in comparing bird use, report the results of bird use surveys as number of birds per a specified time period. The bird use per 30-minute metric allows for comparison with other past studies. This metric can be used to discuss bird use at the project site and in the rotor-swept area out to some distance, time spent in the area of interest, and bird use at some height above ground. This information can be broken down to groups of birds or individual species if desired.

### ***Raptor Nest Searches***

AGFD recommends raptor nest searches be done at all proposed project sites to determine the number of nesting raptors that will be impacted. Raptor nest searches will provide baseline information to aid in micro-siting decisions and disturbance buffers around raptor nesting territories. Surveys should be conducted during the breeding season within a radius of at least two miles of proposed turbine locations, and document the number of nesting pairs, activity status, and their location. Search distances can vary depending on the target raptor species and vegetation community. Consult with AGFD, USFWS, and the Federal land management agency (if applicable) to establish the list of target raptor species for nest surveys.

Nest surveys can be conducted from the ground or air. If the area to be covered is large and/or inaccessible due to difficult terrain or private property considerations, helicopters are a useful way to survey for nests. Coordinate with landowners/land managers to ensure helicopter use would be permitted. Helicopters are also a particularly efficient means of surveying for nests in open country such as grassland or desert. For both aerial and ground nest searches, researchers should avoid approaching the nest within 1000ft to minimize nest disturbance, particularly when surveying from helicopters during the breeding season (February to August). When conducting foot surveys during the breeding season caution is warranted as site fidelity is weakest during the courtship and egg laying period. Therefore, if active nests are found, limit disturbance by remaining in the area for the shortest time possible to record the data. AGFD should be notified prior to conducting nest surveys as ongoing surveys and research in several areas of the state

may be impacted by multiple surveyors. Also, contact AGFD, USFWS, and the Federal land management agency (if applicable) for species-specific protocols that may be available.

***Migration Counts for Birds***

Migration counts are recommended when there is evidence suggesting the site has potential for high rates of bird migration (e.g. within or near known migratory corridors, abundance of major prey (prairie dogs), or along prominent north-south topography and habitat features). Birds flying through or stopping over in the project site during migration are at risk of colliding with turbines. This may represent the greatest overall and cumulative threat to some taxa (e.g. raptors) in Arizona from wind energy development. Estimating risk to nocturnal migrants requires specialized techniques, which are discussed below, but daytime migration counts can help assess the number and flight height of diurnal birds flying through or over an area. Arizona is within the Pacific Flyway, one of four major north-south migratory corridors that cross the North American continent between Alaska and Central America. Every spring and fall millions of birds fly through this corridor on their way to and from their breeding and wintering grounds. Much of the state is in the Intermountain Flyway, a regional area of the Pacific Flyway delineated by Hoffman et al. (2002). The Intermountain flyway maintains one of the largest known concentrations of migrating raptors in the western U.S. and Canada (Smith and Neal, 2008). Annual totals range from 6,100 to 12,300 raptors of nineteen species.

Migration rates vary considerably from one day to the next, depending on weather conditions; therefore, conducting multiple surveys per week for the migration counts provides a more complete picture of risk to diurnal migrating birds than using only LBUCs. If the project site is within a likely migration route for raptors or other diurnal migratory birds, migration counts are a relatively simple technique to assess species composition and relative abundance and to estimate flight height of migrants. To conduct a migration count, establish vantage points (stations) along ridges or passes within the wind resource area that offer wide fields of view (360 degrees). Place surveyors throughout the wind resource area approximately every one mile along an east-west axis extending one mile beyond the wind project footprint. Start observations around 1000 hours for a six-hour period, two days per week, for six weeks between September 15 and October 31 to assess large bird migrations. This will ensure good coverage and allow results to be compared with existing data. Data recorded for each bird observation should include:

- Time
- Species
- Number
- Activity
- Habitat
- Flight direction
- Estimated flight height

***Small Bird Use Counts***

Small bird use counts (SBUCs) should be conducted when one or more small birds of special status or species of concern are thought to breed in, or adjacent to, the project area. SBUCs are essentially LBUCs conducted at a greater density of smaller-radii point count circles. SBUC

sampling sites can consist of LBUC sites but must apply a smaller radius, ranging from 160 to 330 feet (50 to 100 meters), depending on habitat type (Savard and Hooper 1995).

SBUC sampling points should be at least 820 feet (250 meters) apart to reduce the probability of double-counting individual birds (Ralph et al., 1995). If turbine locations are known, establish SBUC sites among turbines. If turbine locations are not known, but the general area where turbines will be placed is known, locate the SBUC sites in a grid pattern in the general area. The exact number of required sample sites depends on the size and extent of the project site, but sampling intensity should adequately estimate breeding small bird composition and abundance within the project area. Permanently mark the observation points in the field with a labeled stake and geo-referencing using GPS.

To determine which birds are breeding on the project site, conduct SBUCs three times at approximately two-week intervals during the appropriate time of year (April through July is the breeding season at higher elevations in Arizona, and February through May in lower [<2000 feet elevation] desert regions). Conduct surveys no earlier than a half-hour before and no later than four hours after sunrise. Time spent at each count station should be 10 minutes (Ralph et al., 1995). At each point, observers should record all birds detected by sight or sound during the survey period. Data recorded for each bird observation should include:

- Time
- Species
- Number
- Estimated distance from the observer to each bird
- Activity
- Habitat
- Flight direction
- Flight height estimated to the nearest meter

#### ***Area Searches for Birds***

Area searches should be conducted only when secretive or difficult to detect special status or species of concern are thought to occur within or near the project area. For example, researchers may use an area search if they are concerned that a special status bird species may be present in the project area, but undetected by BUCs because the bird is secretive or the sampling sites do not include appropriate habitat. This would include riparian habitat which is infrequently represented in point counts since it constitutes a small, linear proportion of the project area. Standardize the area search by specifying the search duration and the size of the area being searched to quantify species numbers and abundance (Ralph et al., 1993; Watson, 2003). Standardized area searched should provide species richness data that can be compared between different project areas or for sites within a single large wind resource area.

#### ***Winter Bird Counts***

Some species of birds concentrate in larger groups and flocks during the winter with the specific localities varying annually depending on the availability of vegetative cover, roosts, and/or food resources. Winter flocking species in Arizona include waterfowl, sandhill cranes (*Grus canadensis*), pinyon jays (*Gymnorhinus cyanocephalus*), common ravens (*Corvus corax*),

American crows (*Corvus brachyrhynchos*), horned larks (*Eremophila alpestris*), American robin (*Turdus migratorius*), bluebirds (*Sialia spp.*), sparrows (*Ammodramus spp.*), longspurs (*Calcarius spp.*), meadowlarks (*Sturnella spp.*) and blackbirds (*Xanthocephalus* and *Agelaius spp.*). In areas with pinyon pine and juniper stands, periodic bumper crops of pine nuts and juniper berries will entice wintering flocks of American robins, bluebirds, and pinyon jays to congregate in flocks numbering in the 1000s. Therefore, wind energy sites in this habitat periodically have the potential of taking a heavy toll on local foraging bird populations. Similarly, when prey densities are high and weather favorable, raptors also frequently congregate in exceptional number in areas during the winter, particularly in grasslands and agricultural areas.

Winter bird counts are recommended in grasslands, agricultural areas, pinyon pine/juniper habitats where they are within a ½ mile of an open body of water (e.g. earthen tanks, ring tanks, and springs) from mid-November through mid-March to assess the potential impact of wind energy installations. See Small Bird Use Counts for methodology, except conduct surveys every two weeks between sunrise and four hours after sunrise.

#### ***Nocturnal Migratory Birds***

Although there are currently no accurate survey methods for detecting nocturnal migratory birds, it is important to be aware of the potential for significant wind energy impacts on bird species with this behavior. Most songbirds, waterfowl, shorebirds, herons, and egrets migrate at night (Kerlinger and Moore, 1989) and radar studies have yielded some insight into general patterns of night flying behavior. Nocturnal migrants generally take off soon after sunset, ascend to their cruising altitude between 300 and 2,000 feet (90 to 610 meters) and land before sunrise (Kerlinger, 1995). Current turbine designs place rotor-swept areas within the “cruising altitude” of these nocturnal migrants. In general, studies show that the paths of high elevation nocturnal migrants are less affected by topography or habitat, but some studies suggest that landforms can have a significant guiding effect for birds flying below 3,300 feet (1000 meters) (Williams et al., 2001). Low cloud cover or head winds can reduce the above ground level altitude of migrants, bringing more birds within range of turbine blades (Richardson, 2000).

Once nocturnal migrants descend from their flying altitude and select a site for cover, foraging, and resting, local landforms and habitat conditions may play a role in determining where they alight (Mabey, 2004). Biologists knowledgeable about nocturnal bird migration and familiar with patterns of migratory stopovers in the region should assess the potential risks to nocturnal migrants at a proposed wind energy project site. Features that may strongly concentrate nocturnal migratory birds into an area, and thus should be avoided when selecting potential wind energy sites, include riparian areas (including heavily wooded washes in otherwise sparsely vegetated landscapes), open water bodies, and isolated homesteads with shade trees or agricultural windbreaks.

**Table 2. Diurnal Bird Survey Techniques for Pre-construction Studies**

Technique	Purpose	When to Use	Seasons	No. Years Recommended
<b>Large Bird Use Counts</b>	To provide baseline data on bird species composition, occurrence, frequency, and behavior to compare with operations use and fatality data, to inform micro-siting decisions; to provide estimate of potential collision risk based on time spent in rotor-swept area; to provide an estimate of spatial and temporal use of site by all diurnal birds, but primarily large birds (raptors, vultures, corvids, and waterfowl).	Use on all proposed wind energy projects.	April – July	Cat. 1: 1 year min Cat. 2: 1-2 years Cat. 3: 2 year min Cat. 4: 3 years
<b>Raptor Nest Searches</b>	To provide baseline data on location and activity level of nesting raptors in relation to proposed wind turbine sites, microsite turbines to reduce potential impacts to nesting raptors, to develop appropriate buffer zones around breeding territories, and to develop mitigation measures for impacts to raptors.	Use on all proposed projects wind energy projects.	January – May below 4000 ft. elev. and April – July above 4000 ft. elev.	Cat. 1: 1 year min Cat. 2: 1-2 years Cat. 3: 2 year min Cat. 4: 2 years
<b>Migration Counts</b>	To provide baseline data on species, abundance, and timing of annual fall migration routes in relation to proposed wind turbine sites; to microsite turbines to reduce potential impacts to migration birds, to develop appropriate buffer zones away from migration pathways, and to develop mitigation measures for impacts to migratory birds.	Use when a migratory corridor is thought to occur on or near the project site.	September 15 – October 31	Cat. 1: NA Cat. 2: NA Cat. 3: 2 years Cat. 4: 3 years
<b>Small Bird Use Counts</b>	To provide a relative density estimate of breeding songbirds, to determine whether a project poses a significant indirect impact to songbird populations, such as displacement, avoidance, or loss of special status or species of concern breeding habitat.	Use when one or more small birds of special status or species of concern is thought to occur on or near project site.	April – July (most of AZ); February – May at lower elevations (<2000 ft) in desert regions	Cat. 1: NA Cat. 2: 1 year Cat. 3: 2 years Cat. 4: 3 years
<b>Area Searches</b>	To sample the entire avifauna of a wind resource area, including small and local habitats.	Use when one or more secretive or otherwise difficult to detect special status or species of concern is thought to occur on or near the project site.	April – July	Cat. 1: NA Cat. 2: 1 year Cat. 3: 2 years Cat. 4: 3 years
<b>Winter Bird Counts</b>	To sample the project area for birds known to concentrate in high numbers during the winter in Arizona.	Use at project sites in or near grasslands, agricultural areas, pinyon pine/juniper habitats, where open bodies of water occur within a ½ mile of the project footprint.	Mid-Nov – mid-March	Cat. 1: NA Cat. 2: 2 year Cat. 3: 3 year Cat. 4: 3 year

**Minimum Pre-construction Bird Surveys by Project Category**

**Category 1:**

Large Bird Use Counts	1 year
Raptor Nest Searches	1 year
Migration Counts	NA (If a migration route occurs within or near project (or topography indicates it may), it is no longer Category 1)
Small Bird Use Counts	NA (If special status or species of concern are thought to occur on or near project, it is no longer Category 1)
Area Searches	NA (If special status or species of concern are thought to occur on or near project, it is no longer Category 1)
Winter Bird Counts	NA (If your project occurs in or near grasslands, agricultural areas, pinyon pine/juniper habitats where open bodies of water occur within a ½ mile of the project footprint or open bodies of water, it is no longer Category 1)

**Category 2:**

Large Bird Use Counts	1-2 years
Raptor Nest Searches	1-2 years
Migration Counts	NA (If a migration route occurs within or near project (or topography indicates it may), it is no longer Category 2)
Small Bird Use Counts	1 year (Only if special status or species of concern thought to occur or unexpectedly discovered during LBUC)
Area Searches	1 year (Only if secretive special status or species of concern are missed during LBUC or SBUC)
Winter Bird Counts	2 year (Only if your project occurs in or near grasslands, agricultural areas, pinyon pine/juniper habitats where open bodies of water occur within a ½ mile of the project footprint or open bodies of water)

**Category 3:**

Large Bird Use Counts	2 years
Raptor Nest Searches	2 years
Migration Counts	2 years (Only if a migration route is thought to occur within or near project)
Small Bird Use Counts	2 years (Only if special status or species of concern thought to occur)
Area Searches	2 years (Only if secretive special status or species of concern are missed during LBUC or SBUC)
Winter Bird Counts	3 years (Only if your project occurs in or near grasslands, agricultural areas, pinyon pine/juniper habitats where open bodies of water occur within a ½ mile of the project footprint or open bodies of water)

**Category 4:**

Large Bird Use Counts	3 years
Raptor Nest Searches	2 years
Migration Counts	3 years (Only if a migration route is thought to occur within or near project)
Small Bird Use Counts	3 years (Only if special status or species of concern thought to occur)
Area Searches	3 years (Only if secretive special status or species of concern are missed during LBUC or SBUC)
Winter Bird Counts	3 years (Only if your project occurs in or near grasslands, agricultural areas, pinyon pine/juniper habitats where open bodies of water occur within a ½ mile of the project footprint or open bodies of water)

## Reporting

### ***Report #2: Preliminary Site Screening***

Once the project category has been designated and the *Preliminary Site Screening Report* has been completed and AGFD and other appropriate agencies have agreed to its conclusions, project proponents should draft a study plan for measuring pre-construction data on bats and birds. The study plan should be drafted in coordination with, and submitted to, AGFD and appropriate federal agencies. Tables 1 and 2 in Chapter 3 should guide project proponents on types of data to collect and the duration the data needs to be collected, depending on which Category a project is deemed. Proponents should use the most current scientific data to determine methodologies for data collection as previously outlined in this chapter. Some of the data collected may include:

- *Bats*: acoustic detections, mist netting, roost surveys, and visual monitoring.
- *Birds*: bird use counts, migration counts, raptor nest searches, small bird counts, area searches, and/or winter bird counts.

### ***Report #3- Annual reports of pre-construction data***

Once a pre-construction study plan has been evaluated, AGFD recommends project proponents draft annual reports for ongoing pre-construction data collection and submit those within six months from the last season data collection occurred. Information in the annual reports should include but not be limited to:

- A yearly/seasonal synthesis of bat and bird data separated out by technique used to measure these variables.
- A discussion of the effectiveness of the techniques and whether the study plan needs to be modified.
- A re-evaluation of the impact analysis.
- A discussion on mitigation measures should there be potential effects to wildlife.
- A discussion and/or justification of the Category chosen.

### ***Where to Submit Bat and Bird Data and Reports***

AGFD encourage data owners to share raw data and reports by submitting results to PEP. Please e-mail a complete dataset with metadata and reports to [pep@azgfd.gov](mailto:pep@azgfd.gov) or mail on a CD to the following address:

Arizona Game and Fish Department -WMHB  
Project Evaluation Program  
5000 W. Carefree Highway  
Phoenix, AZ 85086

Please specify any viewing restrictions or applications required and any information that may be considered proprietary or confidential. AGFD requests the following necessary elements of data submittals: 1) electronic format, 2) geographic locations of biological observations including projected or geographic coordinate system and datum, 3) attributes defining observational data, 4) metadata and 5) monitoring reports (preferably in PDF format).

## CHAPTER 4: IMPACT ASSESSMENT AND MITIGATION

This chapter discusses approaches to assess impacts to bats and birds that surveys revealed during the pre-construction phase of the wind energy project and to select the best measures for avoiding, minimizing, or mitigating those impacts. AGFD encourages project proponents to avoid impacts whenever possible. When not possible, minimization and mitigation are necessary conservation measures to counter the effects the project may have on wildlife and their habitats.

### Evaluation and Determination of Impacts

This section provides a description of the types of impacts associated with wind energy development. Impacts can be categorized as “direct,” “indirect,” or “cumulative.”

#### *Direct Impacts*

For purposes of these *Guidelines*, “direct” impacts refer to bat and bird collisions with wind turbine blades and met towers. Direct impacts are determined by reviewing all of the pre-construction data to evaluate which species may collide with turbines and which non-biological factors (e.g. topographic, weather, and turbine design features) may contribute to this risk. The presence of special status species may be enough to determine that there are potential impacts. Turbine design characteristics and proposed siting locations are two factors known during the impacts analysis and should be considered in assessing potential risk. Some factors are presented with the understanding that information is lacking about their contribution to fatality risk, so it is incumbent upon biologists making impact determinations to be up to date on the latest research. To learn of research advances, regularly consult the NWCC Wildlife Workgroup website ([www.nationalwind.org/workgroups/wildlife/](http://www.nationalwind.org/workgroups/wildlife/)) and Bat and Wind Energy Cooperative website (<http://www.batsandwind.org/>).

#### *Indirect Impacts*

Indirect impacts to bats and birds from wind energy projects can include disturbance of local populations, displacement or avoidance of the site, and disruption to migratory or movement patterns (NWCC, 2004). To date, displacement and site avoidance impacts have not been evaluated in Arizona, but have been in other areas. Several studies have been published on the displacement of grassland breeding songbirds and other birds (e.g. shorebirds, waterfowl) due to wind development. Some studies have documented decreased densities and avoidance by grassland songbirds, while others have looked at the relationship between nest occupancy and placement of turbines. Most of these studies do not conclusively establish that a reduction in use of an area is due to avoidance (indirect impact) versus the reduction in a local population due to collisions with turbines (direct impact). Whether it was a direct or indirect impact, studies have documented a reduction in nest occupancy near turbines.

In contrast to avoidance, indirect impacts may also result in the attraction of wildlife species due to construction and operations activities as well as changes in land use (e.g. changes in grazing practices, disturbance of soil, or introduction of weeds) attracting prey species such as insects

and small mammals. These prey species may in turn attract bats, raptors, and insectivorous birds to the vicinity of wind turbines, putting them at increased risk of collision. Biologists should be aware of these potential impacts and recommend construction and management practices to minimize activities attracting prey and predators to the wind turbine site.

### ***Cumulative Impacts***

A cumulative impact analysis considers a project's incremental impacts combined with the impacts of other land use projects. If the lead permitting agency finds a particular project's incremental impacts to be significant, then the project proponent should mitigate for its portion of the cumulative effect. The findings of the analysis should be reported to the AGFD and USFWS so appropriate mitigation and avoidance measures can be identified. AGFD will review the report for identification of avoidance measures.

Assessing cumulative impacts to bats and birds is difficult because population viability data are not available for most species. Furthermore, it is difficult to establish an appropriate geographic scope for a cumulative impact analysis, to secure comprehensive information on existing and planned projects, and to gauge the relative contribution of a project's impacts compared to past, present, and future projects. Cumulative impact analyses for wind energy projects should focus on potential impacts to bat or bird populations over the entire estimated operational life of the project. The level of detail in a cumulative analysis does not need to be as great as the project's direct impact analysis, but should reflect the severity and likelihood of occurrence of the potential impacts. Standards of practicality and rationality should guide the cumulative impact discussion. While the cumulative impacts of a project may be difficult to determine, do not discount the impacts of a project based on relative size. The addition of one small wind energy project in an existing wind resource area may seem trivial, but requires evaluation of the potential cumulative impacts of an increasing number of projects, regardless of project size. An adequate analysis of cumulative impacts on special status bat or bird species should include the following steps:

1. Identify the species warranting a cumulative impact analysis, including any species which a determination of potentially significant impacts exists. Assess the baseline population of the relevant species, as well as whether the population is resident, seasonally breeding, migratory, or wintering and whether it is stable, increasing, or decreasing. The assessment should include a discussion of natural and anthropogenic factors contributing to population trends.
2. Establish an appropriate geographic scope for the analysis and provide a reasonable explanation for the geographic limitations used. The geographic scope of the analysis will generally include a larger area than the project site. Cumulative impacts could apply to the bats and birds within and immediately adjacent to the wind project, migratory pathways or in populations or subpopulations some distance away due to changes in immigration and emigration.
3. Compile a summary list of past, present, and future projects within the specified geographical range that could impact the species, including construction of transmission lines and other related wind energy infrastructure. The list of projects should include other wind projects as well as other projects which may involve habitat loss, collision fatalities, or blockage of migratory routes that could impact species under consideration.

- The project summary should describe the environmental impacts of each individual project on the species and provide references for information about other projects.
4. Assess the impacts to the relevant bat or bird species from past, present, and future projects. The analysis should use population trend information and regional analyses available for the species.
  5. Identify impact avoidance, minimization, or mitigation measures to the species, and make a determination regarding the significance of the project's contributions to cumulative impacts. The determination should include an evaluation of the cumulative impacts the project and neighboring projects may have on the local or regional species population or the species as a whole. For some projects, the only feasible mitigation for cumulative impacts may involve the adoption of ordinances or regulations or implementation of a regional mitigation plan, rather than the imposition of conditions on a project-by-project basis.

### Impact Assessment Approaches

The goal of collision risk assessment is to determine whether overall bat and avian fatality rates are low, moderate, or high relative to other projects, and to provide measures of overall bat and avian casualties attributable to collisions with wind turbines. Information on bat and bird use from the pre-construction studies can be used to perform a qualitative assessment of risks. A qualitative risk assessment determines whether high bat or bird use may represent a fatal flaw of a proposed project and helps to develop studies to better evaluate risk. The next level of a risk analysis is to make the assessment more quantitative by collecting data on the abundance, spatial, and temporal distribution and behavior of bats and birds in areas where they may be at risk of collision. This information is then compared to existing data on fatalities at wind resource areas. For all quantification of risk and fatality estimates, apply a uniform metric of bat or bird fatalities per megawatt (MW) of installed capacity per year.

### Avoiding or Minimizing Impacts

Wind development has the potential to directly and indirectly affect wildlife species. Examples of these effects are: small and large scale habitat fragmentation, displacement, introductions of invasive plant species, behavior modifications, and direct loss of habitat. Avoidance criteria are best applied during pre-construction site selection (macrositing) and during micrositing. Good macrositing decisions are essential for choosing an acceptable site or portion of a site.

Once a site is selected, micrositing efforts, such as appropriate placement of turbines, roads, power lines, and other infrastructure can avoid or reduce potential impacts to bats, birds, and other biological resources. Each wind energy project site is unique, and no one recommendation will apply to all pre-construction site selection and layout planning. However, consideration of the following elements in site selection, turbine layout, and development of infrastructure for the facility can be helpful to avoid and minimize impacts. In addition to the recommendations described below, consult the NWCC's *Mitigation Toolbox*, [www.nationalwind.org/publications/wildlife/Mitigation\\_Toolbox.pdf](http://www.nationalwind.org/publications/wildlife/Mitigation_Toolbox.pdf), for a compilation of mitigation measures which can be used to minimize or eliminate impacts to wildlife resulting from the design, construction, and operation of the wind project (NWCC, 2007).

***Map Baseline Information***

Pre-construction studies must be sufficiently detailed in order to create maps of special status species habitats (e.g. wetlands or riparian habitat, oak woodlands, large, contiguous tracts of undisturbed wildlife habitat, raptor nest sites) as well as other local species movement corridors (e.g. bats, birds, deer, elk, pronghorn, prairie dogs, badgers, gray/kit fox den sites) that are used daily, seasonally, or year-round, and winter bird concentrations. Use these maps, as well as others, to show the location of sensitive resources, to establish the layout of roads, fences, and other infrastructure to minimize habitat fragmentation and disturbance. Listed below are Best Management Practices for avoiding, minimizing, and mitigating impacts to wildlife:

***Minimize Habitat Disturbance and Fragmentation***

- Avoid using or degrading high value or large intact habitat areas. Use agriculture lands or other disturbed areas when possible.
- When disturbed areas are not an option, high quality wildlife habitat should be avoided (e.g. wetlands or riparian habitat, oak woodlands, large, contiguous tracts of undisturbed wildlife habitat, raptor nest sites). Disturbed areas should be returned to the original grade and revegetated following construction.
- Staging areas and construction sites should be located in previously disturbed areas and revegetated when construction is completed.
- Use existing roads for met tower and/or turbine access when possible.
- When new roads or two-tracks must be constructed, minimize habitat fragmentation by:
  - i. creating the road through cross-country travel versus blading (check local land management agency for cross-country travel regulations);
  - ii. constructing the minimum footprint (road width) and number of roads needed to maintain the facility.
- Close, obliterate and revegetate any roads constructed for the project which are not necessary for facility maintenance after tower construction.
- Roads will be located, designed, constructed, reconstructed, used, maintained and reclaimed so as to:
  - i. control or prevent erosion, siltation, and air pollution by vegetating or otherwise stabilizing all exposed surfaces;
  - ii. control or prevent damage to fish, wildlife, or their habitat and related environmental values;
  - iii. prevent or control damage to public or private property.
- Any new road access or restriction (year-round or seasonal) should be coordinated with AGFD, especially where disturbance to wildlife and their habitat may occur as a result of public use of the road, or when hunting season is occurring.

***Vegetation Removal and Reclamation***

- Coordinate plant salvage efforts with the Arizona Department of Agriculture, in accordance with the Arizona Native Plant Law.

- Do not plant aggressive, non-native grasses (e.g. intermediate wheatgrass, pubescent wheatgrass, crested wheatgrass, smooth brome) in seed mixes. Use native species which approximate the pre-disturbance plant community composition.
- Contact the applicable land management agency regarding guidelines for revegetation efforts.
- Fence livestock out of newly reclaimed areas until proper vegetation cover is achieved (consult AGFD for wildlife friendly fencing standards).

***Noxious Weed Management***

- Develop an Adaptive Weed Management Plan.
- Assume immediate responsibility for the control of all noxious weeds resulting from surface disturbances.
- Sanitize undercarriages of vehicles to remove weed seeds, and limit weed transport to other sites.

***Establish Buffer Zones to Minimize Collision Hazards***

If pre-construction studies show the proposed facility could pose a bat or bird collision hazard, establish non-disturbance buffer zones to protect raptor nests, bat roosts, areas of high bat or bird use, special status species habitat, or wintering bird concentrations. For example, proposed wind energy project sites near water and/or riparian habitat in an otherwise dry area could increase the number of bat and bird collisions; therefore, projects should not be placed in these types of areas. Determine the extent of the buffer zone in consultation with AGFD, USFWS, the Federal land management agency (if applicable), and biologists with specific knowledge of the affected species.

***Seasonal Timing Limitations***

Construction of wind development infrastructure could temporarily or permanently displace breeding and/or wintering wildlife species. Due to the difference in elevation across Arizona, wildlife species breed and/or winter at different times across the state. Therefore, project proponents should work with AGFD for site-specific breeding and wintering seasonal timing limitations for species such as mule deer, pronghorn, and elk.

***Reduce Impacts with Appropriate Turbine Layout***

Pre-construction studies must be sufficiently detailed to establish normal movement patterns of bats and birds in order to make micrositing decisions about turbine configuration. Turbine alignments separating bats or birds from their daily roosting, feeding, or nesting sites, or those located in high bat or bird use areas can pose a collision threat.

Assessing the impacts of turbine siting and determining appropriate turbine placement requires a thorough understanding of the distribution and abundance of bats and birds at the proposed site, as well as site specific knowledge of how wildlife interacts with landscape features. Wind turbine siting along certain topographic features contributes substantially to bat and bird fatalities (e.g., ridgelines, mountain saddles, ridge summits, valleys, rivers, canyons, cliffs, fissures). Careful siting of new wind turbines which incorporate this knowledge could substantially reduce fatalities (Orloff and Flannery, 1992 and 1996; Smallwood and Thelander, 2004 and 2005; and

Smallwood and Neher, 2004). Locating wind turbines away from the these features may lower bat and bird fatality rates (Richardson, 2000, Williams et al., 2001, McCrary et al. 1983).

- Maximize use of flat land and gentle slopes.
- When ridges, canyons, cliffs, and fissures are within the project vicinity, offset the turbines away from the geologic features.
- Avoid placing strings or clusters of towers close to prairie dog colonies.
- Use cluster and/or string designs to reduce gaps. Towers in groups or strings cause fewer mortalities than lone towers. Perhaps due to the visual disturbance causing raptors and birds to fly around the wind farm as opposed to flying through it.
- Minimize or eliminate single towers or cluster designs less than 4 towers.
- Add non-bladed pylons at the ends of large cluster strings. Increased mortality occurs at string ends. By placing less lethal structures at the ends, birds are more likely to fly around the strings without incident.

#### ***Minimize Ground Disturbance near Turbines***

Areas around turbines and along roads disturbed by construction and operations activities may provide habitat for prey species such as insects and small mammals. Increases in prey availability may in turn attract bats, raptors, and insectivorous birds, putting them at increased risk of collision. Project proponents should be aware of these potential impacts when reviewing the site design and recommend construction and management practices to minimize ground-disturbance activities that may attract prey and predators.

- Avoid riprap around towers. Debris piles invite a variety of prey species into an area, which attract raptors.
- Coordinate with AGFD on any plans that involve the elimination or reduction of burrowing animals in the project area.

#### ***Avoid Lighting that Attracts Bats and Birds***

How bats and birds respond to lighting is poorly understood. Night migrating songbirds are apparently attracted to steady-burning lights at communications towers and other structures, increasing the potential for large scale fatality events (Kerlinger, 2004). Research by Evans et al. (2007) indicates that the color of light and whether it is steady or flashing makes a significant difference in whether night migrating birds aggregate around tall, lit structures.

While red lights have been blamed for bird fatalities at tall TV towers, the Evans et al. (2007) study indicates that for birds migrating within cloud cover, blue, green, or white light would be more likely to induce bird aggregation and associated fatality. Evans et al. concluded that while white flashing lights are relatively safe, red flashing lights with a long dark interval and short flash on-time would likely be the safest lighting configuration for night flying birds. Bats and nighthawks are known to feed on concentrations of insects at lights (Fenton, 1997). Thus, any source of lighting that attracts insects may also attract bats at a wind development. No studies have found differences in bat fatalities between turbines equipped with red, flashing Federal Aviation Administration (FAA) lights and those that were unlighted (Arnett, 2007). Under current FAA guidelines (FAA, 2007; <http://oeaaa.faa.gov>), anyone proposing construction of structures above a certain height must notify the FAA 30 days prior to construction and in that

notification should specify the type of lighting desired at the proposed structure. Plans for lighting should balance FAA requirements with protection of bats and birds.

- Use only red or dual red and white flashing lights with the minimum “on” period for turbines instead of steady burning lights.
- Keep lighting at both operation and maintenance facilities and substations to the minimum required to meet safety and security needs.
  - i. Use white lights with sensors and switches that keep the lights off when they are not required.
  - ii. These lights should be hooded and directed to minimize backscatter, reflection, skyward illumination, and illumination of areas outside of the facility or substation.

***Minimize Power Line Impacts***

To prevent avian collisions and electrocutions, place all connecting power lines associated with the wind energy development underground, unless burial of the lines would result in greater impacts to biological or archeological resources.

- Follow existing disturbed areas during installation to minimize habitat alterations. In low areas where the power line crosses drainages, the soil should be compacted to reduce the potential for erosion.
- Trenching and backfilling crews should be close together to minimize the amount of open trenches at any given time.
- Trenching should occur during the cooler months (October – March) when wildlife is less active. However, there may be exceptions (e.g. critical wintering areas) that need to be assessed on a site-specific basis.
- Avoid leaving trenches open overnight.
- Where trenches cannot be back-filled immediately, escape ramps should be constructed at least every 45 meters. Escape ramps can be short lateral trenches or wooden planks sloping to the surface. The slope should be less than 45 degrees (1:1). Trenches that have been left open overnight should be inspected and animals removed prior to backfilling.

All above-ground lines, transformers, or conductors should fully comply with the Avian Power Line Interaction Committee (APLIC) 2006 standards to prevent avian fatality, including use of various bird deterrents and avian protection devices.

***Avoid Guy Wires***

Guyed structures are known to pose a hazard to birds, especially if lighted for aviation safety or other reasons. Communication towers and permanent met towers should not be guyed at turbine sites. If guy wires are necessary, then use bird deterrents as previously addressed.

**Mitigation**

Project proponents and permitting agencies should ensure that appropriate measures are incorporated into the planning and construction of the project to avoid or minimize impacts as

much as possible. If these measures are insufficient to avoid estimated impacts to bats and birds, mitigation can be used to offset such impacts, including cumulative impacts. The following potential mitigation options are known to protect and enhance bat and bird populations at biologically appropriate locations when properly designed and implemented:

- Funding wildlife research
  - Studies of displacement
  - Population impacts
  - Wildlife movement and behavior
- Offsite conservation and protection of essential habitat
  - Nesting and breeding areas
  - Foraging habitat
  - Roosting or wintering areas
  - Migratory rest areas
  - Habitat corridors and linkages
- Offsite conservation and habitat restoration
  - Restored habitat function
  - Increased carrying capacity
- Offsite habitat enhancement
  - Predator control program(s)
  - Exotic/invasive species removal

Although impacts may occur, the ability to mitigate for them can determine whether a project is supported by AGFD. Feasible mitigation is recommended by AGFD if it will serve to minimize a project's effect on wildlife populations and their habitat. Mitigation is site- and species-specific, and must be formulated for each individual project. Mitigation should have a biological basis for ensuring protection or enhancement of the species affected by the project.

Mitigation can involve the purchase of land through fee title, or purchase of conservation easements, or other land conveyances for the permanent protection of the biological resources on these lands. The purchased land or easements should have biological value equal to or higher than the land lost for the target species affected by the wind energy project. Please refer to AGFD's Conservation Easements Fact Sheet for more information at <http://www.azgfd.gov/hgis/pdfs/LandsConservationEasement.pdf>.

Development of effective mitigation measures should involve the AGFD, permitting agencies, project proponents, USFWS, and the affected public stakeholders. Since a project's operational fatalities cannot be forecast with precision, AGFD and/or the lead permitting agency may be unable to make some mitigation decisions until fatality data have been collected. However, the general terms for future mitigation, the triggers or thresholds for implementing such mitigation, and the study designs to monitor for those triggers should be developed prior to issuing final permits. If operational impacts exceed the threshold specified in the permit, additional mitigation would be necessary. Any additional mitigation should be well defined and feasible to implement, so the permittee will have an understanding of any potential future mitigation requirements.

Regardless of the form of mitigation, the permitting agency should establish a nexus between the level of impact and the amount of mitigation. Unlike habitat impacts in which an acre of habitat loss can be compensated with an appropriate number of acres of habitat protected or restored, bat and bird collisions with wind turbines are cumulative impacts that do not suggest an obvious mitigation ratio. These impacts can extend well beyond the local environment because the affected bats and birds are often migratory and far ranging, sometimes coming from out of state or out of country. Finally, fatalities can vary greatly between project sites and from year to year. Under these circumstances, it is difficult to identify acreage of land that offers mitigation value for some quantity of bat or bird fatalities. Consult with AGFD and USFWS in development of the ratios and fees to be used in establishing these compensation formulas, because all of these methods require some forecasting of impacts over the life of the project based on pre-construction studies.

Funding wildlife research is one potential mitigation option with long-term benefits. The more knowledge about wildlife response to wind energy development in Arizona, the more effective recommendations can be made to avoid/minimize/mitigate impacts. When considering research as a mitigation option, consult with AGFD to help design and conduct investigations. AGFD has identified the following top wind-wildlife research needs in Arizona:

- Monitor the movement patterns of resident raptors (e.g. nesting golden eagles, red-tailed hawks) prior to the wind project's construction in order to aid in tower placement.
- Identify and map the major migratory pathways of raptors and bats in Arizona.
- Determine patterns of migration (e.g. time of year, time of day) by bats and birds in Arizona.
- Identify the temporal and spatial patterns of bat activity at proposed wind energy sites.
- Determine the effect of wind turbine size and configuration on bat and bird mortality.
- Evaluate the movement and behavior patterns of select wildlife species (e.g. ungulates, grassland passerines, raptors) pre- and post-construction.
- Evaluate the efficacy of bird strike diverters used on guyed wire towers.
- Develop standardized before-after/control-impact study protocols for bat and bird mortality studies in Arizona.
- Identify the impacts of wind development infrastructure (e.g. roadways, high voltage wires, electrical substations) on wildlife connectivity.
- Develop and evaluate predictive models that forecast wildlife fatalities prior to wind energy development at the project site.
- Determine the potential effects of a proposed wind project on the demographics of select wildlife species.
- Identify the causes of bat and bird mortalities at wind project sites; develop and evaluate potential mitigation procedures and/or devices.

### **Operations Impact Mitigation and Adaptive Management**

Operations impact mitigation and adaptive management generally occur only if the level of fatalities at a project site was unanticipated when the project was permitted, and therefore,

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measures included in the permit are inadequate to avoid, minimize, or compensate for bat or bird fatalities. Once a project is operating, it is difficult to modify turbine site layout. Developing contingency plans to mitigate high levels of unanticipated fatalities become important when choices for operational impact avoidance or minimization are so limited. To avoid open-ended conditions which are difficult for developers to include when planning for project costs and timing, establish minimization measures and mitigation that could be used for unexpected impacts as well as the thresholds which will trigger these actions.

Determine these measures and mitigation early in the process. In extreme cases, the compensation specified in the permit may not be adequate for high levels of unanticipated impacts, and project operators may need to consider operational and facility changes. For example, if a Category 3 site is developed without resolving uncertainties about potential risk to bats and birds through pre-construction and operations monitoring studies, adaptive management may be a necessary tool to reduce impacts to the level described in permit conditions. The adaptive management process recognizes the uncertainty in forecasting impacts to bats and birds and allows testing of options as experiments to achieve a goal and determine impact avoidance, minimization, and mitigation effectiveness. These options include maintenance activities or habitat modification to make the site less attractive to at-risk species and seasonal changes to cut-in speed. During the bat migratory period, limited and periodic feathering of wind turbines during low wind nights may help avoid impacts to bats. If multi-year monitoring documents high levels of fatalities, removal of problem turbines or seasonal shutdowns of turbines may be options if other minimization measures are ineffective in reducing fatalities.

## CHAPTER 5: POST-CONSTRUCTION MONITORING AND REPORTING

This section of the *Guidelines* describes the standardized techniques recommended for collecting, interpreting, and reporting post construction monitoring data. After data from initial pre-construction surveys is collected, laws and permitting requirements are met, and impact and mitigation measures are in place, it becomes necessary to evaluate the potential long-term effects of met towers and wind turbines on wildlife, specifically to bat and avian species. It is necessary to collect this information in order to estimate the direct and indirect impacts and how these may change over time.

It is important to collect post-construction data at wind turbine and met tower sites in order to assess and compare:

- Wildlife use data and impact estimates from the pre-construction studies,
- Cumulative impacts from other wind energy projects,
- Avoidance, minimization, and mitigation measures implemented in the pre-construction phase, and
- Overall bat and bird fatality rates and how these rates relate to other projects.

In general, post-construction monitoring consists of ongoing bat and bird use surveys and counts of bat and bird carcasses in the vicinity of wind turbine bases. In order to best measure effects, post-construction monitoring should be directly comparable to pre-construction, therefore the same techniques should be used in both the pre and post-construction monitoring (see Tables 3 (birds) and 4 (bats) for exceptions). Post-construction monitoring should also include carcass searches and the associated searcher bias estimation.

### Post-construction Monitoring

#### *Where should monitoring occur?*

Wind development can occur within a variety of wildlife habitats, at varying scales of production; therefore, it is recommended post-construction monitoring occur at all wind projects. In addition, there may be areas requiring more intensive monitoring due to the absence of existing information or significant biodiversity. This would include those projects classified as Category 3 or 4 in [Chapter 2](#), or projects adjacent to significant areas such as Important Bird Areas (<http://www.aziba.org>), AGFD Wildlife Areas, ([http://www.azgfd.gov/outdoor\\_recreation/WildlifeViewingAreas.shtml](http://www.azgfd.gov/outdoor_recreation/WildlifeViewingAreas.shtml)), or National Wildlife Refuges (<http://www.fws.gov/southwest/refuges/arizona/azrefuges.html>). Refer to Tables 3 and 4 for information about type and duration of operations monitoring techniques relative to Project Category.

#### *When should monitoring begin?*

Post-construction monitoring should begin immediately after met towers (see Met tower guidance, [Appendix C](#)) and/or wind turbines are constructed in order to evaluate initial effects. While some local wildlife species may adjust to the presence of wind-related structures over

time, they may be initially affected by new structures within their home range. As a result, some fatalities or injuries may occur immediately after construction and should be captured by post-construction monitoring.

When rare species are not present and/or post-construction monitoring is not plausible (e.g., bad weather), AGFD recommends data collection begin the next season or period in which pre-construction data was collected. For example, if wind structures were constructed in winter, data collection would need to start the following spring breeding season.

For consistency, these monitoring periods should be the same as those in the pre-construction data collection period in order to make direct comparisons (See [Chapter 3: Pre-construction Survey Protocols](#)). Monitoring should be emphasized during wildlife breeding seasons and spring/fall migration periods. Winter sampling should also be included since wintering grounds in Arizona are important for some wildlife locally and nationwide. The duration of monitoring should be sufficient to determine if pre-construction estimates of impacts were accurate. See Table 3 & 4 for a summary of post-construction monitoring recommendations.

#### ***How should monitoring occur?***

It is recommended that post-construction monitoring consist of a combination of estimating presence and activity of bat and avian species at wind structures, assessment of fatalities, and quantifying displacement due to wind structures. Kunz et al. (2007) recommends post-construction monitoring for bats and birds address two objectives:

1. Search protocols be conducted in such a way that they can be compared across different landscapes and habitats, and
2. Protocols be implemented to measure and establish patterns of fatalities relative to several variables such as weather, turbine characteristics, and other environmental variables in the post-construction monitoring.

### **Determining Bat and Bird Abundance and Behavior During Operations**

#### ***Estimating Presence and Activity Post-construction (Bats and Nocturnal Birds)***

The purpose of post-construction monitoring is to obtain data that can be compared with pre-construction survey data, evaluate the effectiveness of mitigation measures, and assess fatalities at wind turbines (Kunz et al. 2007). The guidance document entitled *Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats* provides methods to assess impacts of wind energy on nocturnal bats and birds. Kunz's methods include:

1. Visual methods such as night vision imaging, thermal infrared imaging, and radar,
2. Acoustic monitoring of migrating and non-migrating bats and birds using sophisticated microphones and bat detectors, and
3. Radio telemetry techniques.

## Carcass Searches

### *Estimating Fatalities of Bats and Birds:*

Carcass surveys are an important tool for assessing mortality in the turbine area. It is recommended that carcass searches be done at no less than 30% of turbines and met towers at large sites, and at smaller sites, every tower-base should be searched. Turbines sampled should represent a variety of the habitat features and be located throughout the project footprint. The search area should have a width equal to the maximum rotor tip height (e.g. a turbine that is 400 feet tall, the search radius should be 200 feet from the base of the turbine). Kerns et al. (2005) found bats were located >80% of the time within half the maximum distance from the top of the rotor to the ground. In addition, searches should begin at sunrise to minimize carcass loss by early morning scavengers. Although there are multiple approaches to doing carcass searches (e.g. line transects, circular plots), they can all be scientifically reliable as long as the sampling bias is quantified (Kunz et al. 2007). It is recommended that developers and consultants work directly with AGFD and USFWS to develop a monitoring design appropriate for a given site.

### *Collecting Carcass Data*

Collecting bats and birds during carcass counts can provide data about the geographical source and abundance of resident and migratory populations (Note: Scientific Collecting License is required by AGFD to handle native animals). Record the species information, which turbine they were collected beneath (e.g. mid-row or end row), and if possible, photograph the specimen. Since AZ and CA have some overlap in raptor species, it may be helpful for searchers to use the Energy Commission's 2005 *Guide to Raptor Remains: A photographic guide for identifying the remains of selected species of California raptors* available at [www.energy.ca.gov/2005publications/CAC-500-2005-001/CEC-500-2005-001.PDF](http://www.energy.ca.gov/2005publications/CAC-500-2005-001/CEC-500-2005-001.PDF).

### *Frequency of Carcass Searches*

Since bat and bird carcasses are readily scavenged and easily overlooked, at least 30% of turbines at a given site should be searched daily during seasons when bats are most active (April to October) to identify potential problem areas. If it is not possible to survey all turbines each day, then a staggered pattern search should be conducted to ensure some turbines are searched each day over a longer period (Arnett 2005). If it is not possible to search on a daily basis, then searches should be conducted on a systematic schedule of days (e.g. every 3<sup>rd</sup>, 7<sup>th</sup>, or 14<sup>th</sup> day), with an effort to conduct more intensive daily searches during spring and autumn migratory periods (Kunz et al. 2007).

With respect to fatality estimates, it should be noted that important sources of field sampling bias must be taken into account (Wobeser and Wobeser 1992, Philibert et al. 1993, Anderson et al 1999, Morrison 2002, Kunz et al. 2007). The following section defines these biases and offers methods in which to minimize them.

**Bias #1:** Fatalities occur on a periodic, clustered basis instead of more evenly distributed. This may happen due to weather events, flushes of migratory movement, and/or habitat use patterns.

**Correction:** In order to account for fatalities occurring on a periodic (clustered) basis, or to determine a specific goal, such as the effect of weather on fatalities during the bat

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migratory period (July to August-October), search plots should be done on a nightly basis during a portion of the survey period and well-distributed throughout the site. If nightly surveys are not reasonable throughout the entire survey period due to site location, bad weather, etc, clustering a sub-period of nightly surveys will help address this problem.

**Bias #2:** Carcasses are removed by scavengers prior to search effort. All wind energy sites will be inhabited by a variety of species of scavengers; therefore, it is important to determine site-specific scavenging rates.

**Correction:** Conducting carcass removal trials will determine scavenging rates and assist in estimating more accurate fatality estimates in a given area (Smallwood 2007, CA guidelines, others). It should be noted scavenging will vary temporally and spatially from site to site, therefore estimating scavenging rates between sites is discouraged. Several wind sites have conducted scavenging trials and found using small birds as surrogates for bats may not be recommended (Erickson et al. 2003, Johnson et al. 2003). However, if bat carcasses are not available, small birds may be used. It is important to conduct multiple scavenger trials, as one is not typically representative. Lastly, if scavenging trials indicate high levels of carcass removal, it may become necessary to conduct more frequent carcass searches.

**Bias #3:** Differences in searcher detection. Depending on individual searcher variation and site conditions (e.g., vegetation characteristics), detection of carcasses will vary.

**Correction:** Incorporate estimates of searcher detection from previous studies (Smallwood 2007) in order to more accurately estimate fatality. In addition, the use of trained dogs for increased detection is recommended (Arnett 2006).

**Bias #4:** Fatalities or injured bats or birds may move outside of search plots.

1. **Correction:** Although there is little relevant data per unit time to measure crippling bias (CA guidelines), AGFD recommends searchers conduct stratified random searches outside of the “regular” search zone in order to determine if there are towers that may be higher risk.

**Table 3. Bat Survey Techniques for Post-Construction Monitoring**

Technique	Purpose	When to Use	Seasons	No. Years Recommended
<b>Carcass Searches</b>	To assess mortality in the turbine area.	Daily during high activity seasons or systematically (every 3 <sup>rd</sup> , 7 <sup>th</sup> , 14 <sup>th</sup> day, etc.) during migratory periods.	In general, April – October (higher elevations); lower elevations may warrant year round surveys	Cat. 1: 1 year min Cat. 2: 1-2 years Cat. 3: 2 year min Cat. 4: 3 years
<b>Acoustic Detection</b>	Acoustic monitoring provides information about bat presence and activity, as well as seasonal changes in species composition, but does not measure the number of individual bats or population density.	Conduct acoustic monitoring for bats at all proposed wind energy sites.	Samples should be robust during migration (August 16 – October 31); Year-round surveys will yield additional information.	Cat. 1: 1 year min Cat. 2: 1-2 years Cat. 3: 2 year min Cat. 4: 3 years
<b>Mist-Netting</b>	This capture technique can help to distinguish species that are difficult to identify or detect acoustically and to gather additional information such as species, age, sex, and reproductive status of local bat populations in which no other source, short of collecting the bat, can provide. Such information may be relevant in pre-construction studies if the goal is to evaluate potential project impacts to a local bat population.	Use with acoustic monitoring to provide an inventory of the species of bats present at a site (O'Farrell et al., 1999).	In general, April – October (higher elevations); lower elevations may warrant year round surveys	Cat. 1: 3 survey min Cat. 2: 5 surveys min Cat. 3: 7 surveys annual Cat. 4: 9 surveys annual
<b>Roost Surveys</b>	Include an assessment to determine whether known or likely bat roosts in mines, caves, bridges, buildings, or other potential roost sites could occur near proposed wind turbine sites. If active roosts are detected during this assessment, exit counts and roost searches can provide additional information about the size, species composition, and activity patterns for any bat-occupied features near project areas.	Use where potential roost sites occur near proposed wind turbine sites.	<b>Internal Roost Survey:</b> anytime, use caution in winter if the roost could be a hibernaculum; <b>External Roost Survey:</b> Conduct a minimum of 1 survey each season – recognize that absence of activity does not indicate absence of bats	For each category: surveys should be conducted until such time the roost use can be described
<b>Visual Monitoring</b>	<b>Night-vision, thermal infrared imaging, and radar</b> can be used to augment the information from above survey methods.	Use when the information from acoustic monitoring needs to be augmented.	Should be conducted in conjunction with other surveys with a similar time frame	Should be conducted in conjunction with other surveys with a similar time frame

**Table 4. Diurnal Bird Survey Techniques for Post-Construction Monitoring**

Technique	Purpose	When to Use	Seasons	No. Years Recommended
<b>Carcass Searches</b>	To assess direct impacts to birds from wind turbines and met towers, to determine patterns and rates of fatality within resident migratory populations; and to assess the effectiveness of micro-siting design for turbine locations and other mitigation measures designed for birds.	Use on all constructed wind energy projects. Daily during high activity seasons or systematically (every 3 <sup>rd</sup> , 7 <sup>th</sup> , 14 <sup>th</sup> day, etc.) during migratory periods.	Immediately after turbine construction for site with rare species, April – July otherwise	
<b>Bird Use Counts</b>	To assess small and large bird species composition, displacement, occurrence, frequency, and behavior in relation to wind development operations. Also used to assess the effectiveness of mitigation measures designed for birds.	Use on all constructed wind energy projects. Design surveys with points of unlimited radius and at the small bird use count density (see pre-permitting section).	April – July	For the first 2 years, then throughout the life of the project at 3-year intervals.
<b>Raptor Nest Searches</b>	To provide data on location and activity level of nesting raptors in relation to wind turbine sites, and to assess the effectiveness of mitigation measures designed for raptors.	Use on all constructed wind energy projects because ground disturbance associated with construction can increase prey populations for raptors.	January – May below 4000 ft. elev. and April – July above 4000 ft. elev.	After 5 years then throughout the life of the project at 5-year intervals

**Minimum Post-construction Monitoring for Birds by Project Category**

**Category 1:**

Carcass Searches *Immediately after operations begin for 2 consecutive years; long-term monitoring TBD*  
 Bird Use Counts *2 consecutive years; then once every 3 years*  
 Raptor Nest Searches *Once every 5 years*

**Category 2:**

Carcass Searches *Immediately after operations begin for 2 consecutive years; long-term monitoring TBD*  
 Bird Use Counts *2 consecutive years; then once every 3 years*  
 Raptor Nest Searches *Once every 5 years*

**Category 3:**

Carcass Searches *Immediately after operations begin for 2 consecutive years; long-term monitoring TBD*  
 Bird Use Counts *2 consecutive years; then once every 3 years*  
 Raptor Nest Searches *2 consecutive years; then once every 5 years*

**Category 4:**

Carcass Searches *Immediately after operations begin for 3 consecutive years; long-term monitoring TBD*  
 Bird Use Counts *3 consecutive years; then once every 2 years*  
 Raptor Nest Searches *3 consecutive years; then once every 5 years*

## Reporting

### ***Report #4- Post Construction Monitoring plan:***

Once permits are acquired for a wind project and sufficient information has been collected in the pre-construction phase, AGFD recommends project proponents develop a post-construction monitoring study plan. This monitoring plan should be developed in coordination with appropriate state and federal agencies. Table's 3 and 4 provide guidance on bird and bat survey techniques depending on project site category. Post-construction data should be directly comparable to pre-construction. Types of information needed in this monitoring plan may include:

- Methods to assess the effects of wind turbines on bat and bird populations and how those coincide with monitoring for the established triggers.
- *Bats:* carcass searches (with searcher efficiency trials), acoustic detections, mist-netting, roost surveys, visual monitoring (Table 3).
- *Birds:* carcass searches (with searcher efficiency trials), bird use counts, migration counts, raptor nest searches, small bird counts, area searches, winter bird counts (Table 4).

### ***Report #5- Annual and Long Term Monitoring reports:***

Once a post construction monitoring study plan has been developed, AGFD recommends project proponents draft an annual report for ongoing post-construction data collection. Annual reports should be yearly at first, then at intervals determined by the category to which the project belongs (see Tables 3 and 4). AGFD requests annual reports be submitted within six months from the last season's data collection. AGFD recommends project proponents submit an annual report of ongoing post-construction data. Annual reports should cover the full calendar year and include the following:

- Synthesis of bat and bird fatality and carcass search data.
- Comparison of these results to other areas.
- A discussion of the effectiveness of the techniques and whether aspects of monitoring need to be modified.
- A discussion on mitigation measures and whether they are sufficient to mitigate effects.

### ***Where to Submit Bat and Bird Data and Reports***

AGFD encourage data owners to share raw data and reports by submitting results to the PEP. Please e-mail a complete dataset with metadata and reports to [pep@azgfd.gov](mailto:pep@azgfd.gov) or mail on a CD to the following address:

Arizona Game and Fish Department -WMHB  
Project Evaluation Program  
5000 W. Carefree Highway  
Phoenix, AZ 85086

Please specify any viewing restrictions or applications required and any information that may be considered proprietary or confidential. AGFD requests the following necessary elements of data

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submittals: 1) electronic format, 2) geographic locations of biological observations including projected or geographic coordinate system and datum, 3) attributes defining observational data, 4) metadata and 5) monitoring reports (preferably in PDF format).

***Self-Reporting of Incidental Findings***

Field personnel at wind energy can augment information from operations monitoring programs by reporting incidental findings of dead or injured bats and birds. Orloff and Flannery (1992) provide guidance and template data sheets for self-reporting monitoring programs, which are typically implemented in collaboration with USFWS. The Avian Powerline Interaction Committee (APLIC, 2006) also offers suggestions on developing avian fatality reporting programs by trained field personnel. While not part of a systematic data collection effort, incidental observation data from trained workers who record and report bat and bird carcasses discovered in the project area can supplement fatality data from the standard operations monitoring studies. If such incidental observations are to be included in the data analysis and monitoring reports, researchers should coordinate closely with field personnel collecting the data, establish criteria for which self-reported data are appropriate for inclusion, and fully describe the criteria and protocol for incidental observation data collection in the monitoring reports.

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## APPENDIX A: Contact Information for the Arizona Game and Fish Department Headquarters and Regions

**Arizona Game and Fish Department**

**Headquarters**  
 5000 W. Carefree Hwy  
 Phoenix, AZ 85086  
 (602) 942-3000

**Project Evaluation Program**

5000 W. Carefree Hwy  
 Phoenix, AZ 85086  
 (623) 236-7600  
 pep@azgfd.gov

**Arizona Game and Fish Department Regions**



**Region 1**  
 2878 E. White Mountain Blvd.  
 Pinetop, AZ 85935  
 (928) 367-4281

**Region 3**  
 5325 N. Stockton Hill Rd.  
 Kingman, AZ 86409  
 (928) 692-7700

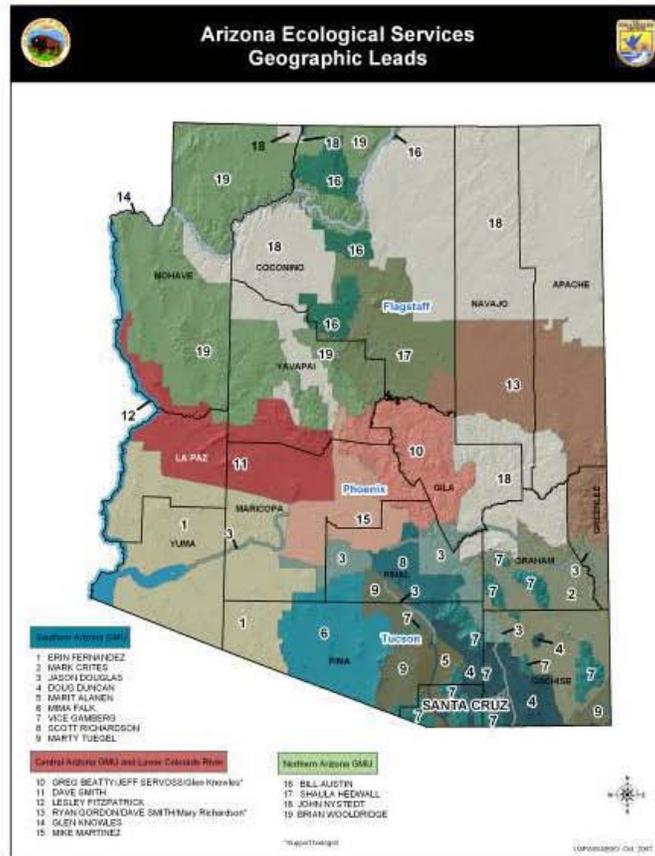
**Region 5**  
 555 N. Greasewood Rd.  
 Tucson, AZ 85745  
 (520) 628-5376

**Region 2**  
 3500 S. Lake Mary Rd.  
 Flagstaff, AZ 86001  
 (928) 774-5045

**Region 4**  
 9140 E. 28<sup>th</sup> St.  
 Yuma, AZ 85635  
 (928) 342-0091

**Region 6**  
 7200 E. University Dr.  
 Mesa, AZ 85207  
 (480) 981-9400

## APPENDIX B: Contact Information for United States Fish and Wildlife Service Ecological Services Offices with Jurisdiction in Arizona



**Phoenix Main Office**  
 2321 W. Royal Palm R.d.  
 Suite 103  
 Phoenix, AZ 85021  
 Phone: (602) 242-0210  
 Fax: (602) 242-2513

**Tucson Sub-Office**  
 201 N. Bonita  
 Suite 141  
 Tucson, AZ 85745  
 Phone: (520) 670-6144  
 Fax: (520) 670-6155

**Flagstaff Sub-Office**  
 323 N. Leroux St.  
 Suite 201  
 Flagstaff, AZ 86001  
 Phone: (928) 226-0614  
 Fax: (928) 226-1099

## APPENDIX C: Guidelines for Installation and Monitoring of Meteorological Towers and their Associated Infrastructure

Met towers (whether temporary or permanent) and their associated infrastructure have the potential to cause avian and bat mortalities resulting from mid-flight strikes with the tower guy wires. Studies have shown guy-wired towers can cause four times more bird mortality than towers without guy wires (Young et al., 2003) ([http://www.west-inc.com/reports/fer\\_final\\_mortality.pdf](http://www.west-inc.com/reports/fer_final_mortality.pdf)). While bats can also strike guy wires, the occurrence is much less frequent. In addition, the visibility of met towers is important for the safety of aircraft pilots at low flight elevations. To reduce the potential for bat and bird collisions, and to provide guidance for keeping pilots and personnel safe, AGFD has developed these recommendations:

- AGFD requests all *permanent* met towers be unguyed, free standing structures. If possible, AGFD also requests temporary met towers be unguyed, free standing structures.
- If guy wires are present, AGFD recommends the applicant attach Bird Flight Diverters (BFDs) **at 10-meter intervals along the length of each guy wire** (Note: There are several manufacturers of BFDs: TYCO, Preformed Line Products, Dulmison, etc.). Research shows the attachment of BFDs can reduce bird collisions by as much as 86-89% (Pope et al., 2006) ([http://www.chelanpud.org/documents/Burch\\_Final\\_Report\\_V1.pdf](http://www.chelanpud.org/documents/Burch_Final_Report_V1.pdf)).
- AGFD recommends all temporary towers are only on site for the minimum amount of time needed to monitor the wind resource. If towers are on site for more than 1 year, AGFD recommends carcass searches be implemented, especially during the bird migration period (see [Chapter 5, Post-construction Monitoring and Reporting](#)).
- If a temporary tower is going to become a permanent structure for the life of the project, AGFD recommends the tower(s) be included as part of the longer term (pre-construction and post-construction) monitoring program.
- AGFD recommends the applicant place acoustic monitoring stations on met towers in the proposed project area (**Note:** This will help collect bat activity information needed for pre-construction analysis). An acoustic monitoring station is defined as two AnaBat detectors, one at “ground level” (approximately 1.5 meters above ground) and the other with an elevated microphone, ideally within the future rotor swept zone, but not less than 30 meters high. Reynolds (2006) and Lausen (2006) provide detailed guidelines for detector deployment and operation. Rainey et al. (2006) provides an in depth discussion of acoustic monitoring systems. Acoustic monitoring should be intensified during bat migration periods (August 16 – October 31). Acoustic data collection objectives should strive to collect as much acoustic information as is feasible across seasons with an emphasis on migration periods.
- Work with AGFD to determine the number of acoustic monitoring stations needed to adequately cover the project area. The number of acoustic stations will depend on project footprint and habitat complexity.
- When siting met towers, avoid habitat features that congregate wildlife such as water resources, habitat edges, etc.

***AGFD Personnel Safety***

- Low-level aerial flights can occur outside routine wildlife survey routes. GPS locations of all towers need to be provided to AGFD prior to construction to allow survey aircraft to avoid the towers. In addition, AGFD requests project proponents notify the Department when met towers are removed.
- For all monopole towers  $\geq 50$  feet tall, paint the top 30 feet of the tower in alternate orange and white paint. This does not apply to lattice towers or lit towers, both of which are more visible than monopoles.

## APPENDIX D: Reporting Monitoring Data

Reporting is crucial in determining if wind projects have undergone accurate methods of understanding possible effects on biological resources in the area, whether impacts can be avoided and/or minimized, and whether mitigation measures were appropriate. Reports are most informative and comparable when they follow standard scientific reporting format and provide sufficient detail to allow agency and peer reviewers to evaluate the methods used, understand the basis for conclusions, and independently check conclusions. To that end, AGFD recommends that permitting agencies or project proponents report on the following, and in this order:

### ***Report #1: Preliminary Site Screening***

This report should include data from the initial reconnaissance visit as described in Chapter 2. Include information on the assessment of the potential for bats and birds to occur at the site and a preliminary evaluation of collision risk. This report should contain sufficient data to conclude with a data-driven framework the Category to which the potential project may be designated. Submit the report to AGFD for concurrence. This should be completed prior to the development and submittal of the pre-permitting study plan.

Information in this report should include but not be limited to:

- A description of the vegetation community and major topographical features.
- Information gathered from state and federal agencies on wildlife populations in the area including any Threatened and Endangered species, raptors, and significant bat populations (especially known migration and/or colonies).
- Any information on known or suspected migratory corridors for bats and birds.
- Analysis of potential impact and mitigation to avoid impacts to wildlife (possible direct, indirect, and cumulative effects).

### ***Report #2: Preliminary Site Screening***

Once the project category has been designated and the *Preliminary Site Screening Report* has been completed and AGFD and other appropriate agencies have agreed to its conclusions, project proponents should draft a study plan for measuring pre-construction data on bats and birds. The study plan should be drafted in coordination with, and submitted to, AGFD and appropriate federal agencies. Tables 1 and 2 in Chapter 3 should guide project proponents on types of data to collect and the duration the data needs to be collected, depending on which Category a project is deemed. Proponents should use the most current scientific data to determine methodologies for data collection as previously outlined in this chapter. Some of the data collected may include:

- *Bats*: acoustic detections, mist netting, roost surveys, and visual monitoring.
- *Birds*: bird use counts, migration counts, raptor nest searches, small bird counts, area searches, and/or winter bird counts.

### ***Report #3- Annual reports of pre-construction data***

Once a pre-construction study plan has been evaluated, AGFD recommends project proponents draft annual reports for ongoing pre-construction data collection and submit those within six

months from the last season data collection occurred. Information in the annual reports should include but not be limited to:

- A yearly/seasonal synthesis of bat and bird data separated out by technique used to measure these variables.
- A discussion of the effectiveness of the techniques and whether the study plan needs to be modified.
- A re-evaluation of the impact analysis.
- A discussion on mitigation measures should there be potential effects to wildlife.
- A discussion and/or justification of the Category chosen.

***Report #4- Post Construction Monitoring plan:***

Once permits are acquired for a wind project and sufficient information has been collected in the pre-construction phase, AGFD recommends project proponents develop a post-construction monitoring study plan. This monitoring plan should be developed in coordination with appropriate state and federal agencies. Table's 3 and 4 provide guidance on bat and survey techniques depending on project site category. Post-construction data should be directly comparable to pre-construction. Types of information needed in this monitoring plan may include:

- Methods to assess the effects of wind turbines on bat and bird populations and how those coincide with monitoring for the established triggers.
- *Bats:* carcass searches (with searcher efficiency trials), acoustic detections, mist-netting, roost surveys, visual monitoring (Table 3).
- *Birds:* carcass searches (with searcher efficiency trials), bird use counts, migration counts, raptor nest searches, small bird counts, area searches, winter bird counts (Table 4).

***Report #5- Annual and Long Term Monitoring reports:***

Once a post construction monitoring study plan has been developed, AGFD recommends project proponents draft an annual report for ongoing post-construction data collection. Annual reports should be yearly at first, then at intervals determined by the category to which the project belongs (see Tables 3 and 4). AGFD requests annual reports be submitted within six months from the last season's data collection. AGFD recommends project proponents submit an annual report of ongoing post-construction data. Annual reports should cover the full calendar year and include the following:

- Synthesis of bat and bird fatality and carcass search data.
- Comparison of these results to other areas.
- A discussion of the effectiveness of the techniques and whether aspects of monitoring need to be modified.
- A discussion on mitigation measures and whether they are sufficient to mitigate effects.

AGFD encourages project proponents make wildlife data publicly available. Making pre-permitting and operations bat and bird data publicly available serves several important functions and would be a useful permit condition of all wind energy projects. Aside from facilitating maximum utility of results from bat and bird surveys, sharing the data may foster collaboration

among individuals working on similar projects in various parts of the state. Operations monitoring reports and raw data have value as public documents because they facilitate the learning process for application on subsequent projects and can supplement baseline data for nearby new projects. Making raw data available to the public is useful in cumulative impact analyses and potentially provides an overview of trends. Additional study results from impact avoidance, minimization, and mitigation monitoring and adaptive management programs would similarly be useful to the public.

#### ***Where to Submit Bat and Bird Data and Reports***

AGFD encourage data owners to share raw data and reports by submitting results to the Project Evaluation Program. Please e-mail a complete dataset with metadata and reports to [pep@azgfd.gov](mailto:pep@azgfd.gov) or mail on a CD to the following address:

Arizona Game and Fish Department -WMHB  
Project Evaluation Program  
5000 W. Carefree Highway  
Phoenix, AZ 85086

Please specify any viewing restrictions or applications required and any information that may be considered proprietary or confidential. AGFD requests the following necessary elements of data submittals: 1) electronic format, 2) geographic locations of biological observations including projected or geographic coordinate system and datum, 3) attributes defining observational data, 4) metadata and 5) monitoring reports (preferably in PDF format).

#### ***Self-Reporting of Incidental Findings***

Field personnel at wind energy developments can augment information from operations monitoring programs by reporting incidental findings of dead or injured bats and birds. Orloff and Flannery (1992) provide guidance and template data sheets for self-reporting monitoring programs, which are typically implemented in collaboration with USFWS. The Avian Powerline Interaction Committee (APLIC, 2006) also offers suggestions on developing avian fatality reporting programs by trained field personnel. While not part of a systematic data collection effort, incidental observation data from trained workers who record and report bat and bird carcasses discovered in the project area can supplement fatality data from the standard operations monitoring studies. If such incidental observations are to be included in the data analysis and monitoring reports, researchers should coordinate closely with field personnel collecting the data, establish criteria for which self-reported data are appropriate for inclusion, and fully describe the criteria and protocol for incidental observation data collection in the monitoring reports.