U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Request for Information: Wind Energy Bat and Eagle Impact Minimization Technologies and Field Testing Opportunities

DATE: June 25, 2014

SUBJECT: Request for Information (RFI)

DESCRIPTION: The Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) invites input from the public regarding a potential funding opportunity to advance the readiness of technologies intended to reduce mortality of bats, eagles, or other wildlife at operational wind turbines or wind facilities. EERE in particular seeks input on the current state of wildlife impact mitigation and minimization technologies, conditions under which technology vendors or developers would consider participating in a campaign to field test and validate their technologies, and the conditions under which wind farm owner/operators would consider hosting field testing and validation activities at their operational facilities. Finally, EERE seeks input on a proposed framework for conducting both technology field testing and validation activities and focused research and development (R&D) to advance wildlife impact minimization technologies towards commercialization, and on how to prioritize funding for research within this framework.

BACKGROUND: The mission of the Wind Program, located within the Wind and Water Power Technologies Office in EERE, is to accelerate widespread U.S. deployment of clean, affordable, and reliable wind power to promote energy security, economic growth, and environmental quality. For more information about the Wind and Water Power Program, please visit our website at http://wind.energy.gov.

The Wind Program is committed to supporting technological innovations that facilitate the growth of the domestic wind industry. In addition to wind technology R&D, the Program funds R&D to address market barriers that affect the deployment of wind energy, including the effects of wind on wildlife. In permitting wind facilities and complying with state and federal laws protecting wildlife, such as the Endangered Species Act, Migratory Bird Treaty Act, and Bald and Golden Eagle Protection Act, developers and operators of wind energy facilities often must take measures to mitigate (avoid, minimize, or compensate for) the potential impacts of their facilities on protected species.

While guidelines exist for siting wind facilities in the landscape and wind turbines within a facility to avoid impacts to wildlife, technologies to minimize impacts at operational facilities for most species are either in early stages of development or simply do not exist. Research in this area is on-going, but significant advancements are needed to address the siting and permitting challenges currently faced by the wind industry.

Significant work to perfect these technologies and methods remains. For example, research on bat interactions with wind turbines funded by EERE and numerous partners under the Bats and Wind Energy Cooperative (BWEC) has found that bat mortality at wind facilities due to turbine

strike can be reduced significantly by increasing the cut-in-speed of wind turbines during periods of high bat activity.[1] The U.S. Fish and Wildlife Service and state agencies now widely request such cut-in-speed adjustment at proposed and operational facilities in the habitat of sensitive bat species. However, cut-in-speed adjustment has a negative impact on energy production and revenue, and because wind turbines were not designed with this mitigation in mind, applying cut-in-speed adjustment can make operations and maintenance more expensive or even violate wind turbine warranties. The BWEC and other groups have also made progress developing deterrent devices to keep bats from approaching operating wind turbines, but studies on their effectiveness in the operational wind-farm environment have not yet been conclusive. More work is needed to determine both the biological effectiveness and cost-effectiveness of deployment of bat deterrents at operational wind facilities.

Wind energy facility developers and operators working in areas with other species of concern, such as California Condors, Golden Eagles, or other sensitive migratory birds, have applied a number of mostly experimental technologies to minimize their impacts. These include, for example, using radar in combination with onsite biologists to identify individuals of these species as they approach a wind energy facility and shutting down the facility or individual turbines to minimize the risk of collision, or radar integrated with the wind facility's Supervisory Control And Data Acquisition (SCADA) systems to shut down the facility or individual turbines given birds or other targets in the vicinity when certain weather conditions are present (e.g. fog) that may put these species at higher risk. Both automated and manual "Detect and Deter" systems have also been proposed for testing but have not been widely deployed in the U.S. at commercial facilities.

Wind energy developers and operators are likely to face increasing siting and environmental compliance challenges over the next several years as threats to bat populations (e.g. White Nose Syndrome) and other wildlife, such as prairie grouse species, drive the potential listing of those species under the Endangered Species Act and as a new permitting regime for Bald and Golden Eagles is implemented. As developers and operators navigate these challenges, their need for biologically effective and cost-effective impact minimization technologies that can be deployed at operational facilities will increase significantly. While a few such technologies have been deployed, researchers have conducted few controlled tests at operational facilities, or published results in the peer-reviewed literature.

More research, development, field testing, and validation of impact minimization technologies will therefore be needed in order for the industry to grow while managing the impacts that increased wind energy deployment may cause to sensitive wildlife. Particularly important will be field testing and demonstration of these technologies at operational wind facilities, with a goal to see statistically significant and cost-effective reduction of mortality of key species of concern, and the publication of such results in the peer-reviewed literature.

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[1] Arnett, E. B., G. D. Johnson, W. P. Erickson, and C. D. Hein. 2013. A synthesis of operational mitigation studies to reduce bat fatalities at wind energy facilities in North America. A report submitted to the National Renewable Energy Laboratory. Bat Conservation International. Austin, Texas, USA. http://www.batsandwind.org/pdf/Operational%20Mitigation%20Synthesis%20FINAL%20REPORT%20UPDATED.pdf

PURPOSE: The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders aimed at accelerating the progress of wildlife impact minimization technologies to commercial readiness.

In this RFI, "impact minimization technology" or "technologies" means any device (such as a bat deterrent), alteration of operation (such as cut-in-speed adjustment), or any other method (such as painting of turbine blades to increase visibility to eagles) that can be employed at an operational wind energy facility that has the intended effect of reducing impacts (particularly mortality) to wildlife species of concern. This definition specifically excludes methods situated in other parts of the mitigation hierarchy, such as pre-construction siting or micrositing impact avoidance measures, or compensatory mitigation.

Further described below, EERE is seeking particular input on:

1) The state of development of impact minimization technologies, and the conditions under which technology developers would consider participating in a demonstration and validation campaign.

2) The conditions under which wind-farm owner/operators would consider participating in a campaign to demonstrate, field-test, and validate such technologies; and

3) A proposed framework for funding the advancement of wildlife impact minimization technologies aimed at reducing impacts to bats, eagles and other wildlife of concern (in that order of priority) at operational wind energy facilities;

While EERE is primarily interested in technologies that can reduce impacts to bats or eagles (in that order of priority), EERE will take into consideration input regarding technologies that have the potential to reduce impacts to any species of concern for wildlife agencies and wind energy facility developers and operators.

This is solely a request for information and not a Funding Opportunity Announcement (FOA). EERE is not accepting applications.

DISCLAIMER AND IMPORTANT NOTES: This RFI is not a Funding Opportunity Announcement (FOA); therefore, EERE is not accepting applications at this time. EERE may issue a FOA in the future based on or related to the content and responses to this RFI; however, EERE may also elect not to issue a FOA. There is no guarantee that a FOA will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if EERE chooses to issue a FOA regarding the subject matter. Final details, including the anticipated award size, quantity, and timing of EERE funded awards, will be subject to Congressional appropriations and direction.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. EERE will review and consider all responses in its formulation of program strategies for the identified materials of interest that are the subject of this request. EERE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that EERE is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind EERE to any further actions related to this topic.

PROPRIETARY INFORMATION: Because information received in response to this RFI may be used to structure future programs and FOAs and/or otherwise be made available to the public, **respondents are strongly advised to NOT include any information in their responses that might be considered business sensitive, proprietary, or otherwise confidential.** If, however, a respondent chooses to submit business sensitive, proprietary, or otherwise confidential information, it must be clearly and conspicuously marked as such in the response.

Responses containing confidential, proprietary, or privileged information must be conspicuously marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The U.S. Federal Government is not liable for the disclosure or use of unmarked information, and may use or disclose such information for any purpose.

If your response contains confidential, proprietary, or privileged information, you must include a cover sheet marked as follows identifying the specific pages containing confidential, proprietary, or privileged information:

> **Notice of Restriction on Disclosure and Use of Data:**
> Pages [list applicable pages] of this response may contain confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this RFI DE-FOA-0001157. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.

In addition, (1) the header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: “Contains Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure” and (2) every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

EVALUATION AND ADMINISTRATION BY FEDERAL AND NON-FEDERAL PERSONNEL: Federal employees are subject to the non-disclosure requirements of a criminal statute, the Trade Secrets Act, 18 USC 1905. The Government may seek the advice of qualified non-Federal personnel. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The respondents, by submitting their response,

consent to EERE providing their response to non-Federal parties. Non-Federal parties given access to responses must be subject to an appropriate obligation of confidentiality prior to being given the access. Submissions may be reviewed by support contractors and private consultants.

REQUEST FOR INFORMATION CATEGORIES AND QUESTIONS:

CATEGORY 1: Survey of Wildlife Impact Minimization Technologies

To facilitate advancements and commercialization of impact minimization technologies, EERE needs to understand the status of development of these technologies, and requests input from technologists and vendors on the status of their particular technologies.

To ensure consistency in characterization of where a technology is on the pathway to commercialization, EERE utilizes a Technology Readiness Level (TRL) framework to provide a common yardstick for measuring technological progress from basic scientific research (TRL 1) to full commercial readiness (TRL 9), per Table 1 below.

Table 1: Technology Readiness Levels

TRL 1	**Basic Research:** Initial scientific research has been conducted. Principles are qualitatively postulated and observed. Focus is on new discovery rather than applications.
TRL 2	**Applied Research:** Initial practical applications are identified. Potential of material or process to solve a problem, satisfy a need, or find application is confirmed.
TRL 3	**Critical Function or Proof of Concept Established:** Applied research advances and early stage development begins. Studies and laboratory measurements validate analytical predictions of separate elements of the technology.
TRL 4	**Lab Testing/Validation of Alpha Prototype Component/Process:** Design, development and lab testing of components/processes. Results provide evidence that performance targets may be attainable based on projected or modeled systems.
TRL 5	**Laboratory Testing of Integrated/Semi-Integrated System:** System Component and/or process validation is achieved in a relevant environment.
TRL 6	**Prototype System Verified:** System/process prototype demonstration in an operational environment (beta prototype system level).
TRL 7	**Integrated Pilot System Demonstrated:** System/process prototype demonstration in an operational environment (integrated pilot system level).
TRL 8	**System Incorporated in Commercial Design:** Actual system/process completed and qualified through test and demonstration (pre-commercial demonstration).
TRL 9	**System Proven and Ready for Full Commercial Deployment:** Actual system proven through successful operations in operating environment, and ready for full commercial deployment.

1) Please describe your proposed minimization technology or technique in detail. What is its intended function? What species or groups of species does it address, and what is the mechanism through which it accomplishes reduction of impacts?

2) What is the technology readiness level of your technology (see Table 1 above)?

3) What are your next steps towards commercialization and what resources do you require in order to complete these steps?

    a. If your technology is TRL 6+, how much would it cost to deploy your system at an operational wind facility at a scale sufficient to statistically demonstrate its effectiveness in reducing impacts? What other resources (site access, permits, technical or other assistance) do you require?

    b. If your technology is TRL 4-6, what R&D do you need to perform in order to achieve readiness for demonstration at a wind facility, and what resources do you require?

    c. If your technology is TRL 2-4, what R&D do you need to perform in order to achieve proof of concept or develop a prototype, and what resources do you require?

4) Can you provide published work or internal analysis indicating actual or theoretical effectiveness (preliminary test results, proof of concept, etc.?)

5) Can you estimate the costs associated with a full commercial deployment of your system, assuming a project size of 100MW (50 2MW turbines)?

6) Under what conditions would you consider participating in a campaign to demonstrate your technology and have its performance objectively validated by a third party? For example, would you feel comfortable participating in such a campaign if EERE made test results fully public?

7) What other factors or sensitivities should EERE consider in developing this technology testing and validation program?

CATEGORY 2: Wind Facility Owner/Operators - Needs and Interest

1) What are the factors you would need to consider (legal, permitting/regulatory, operational, financial, etc.) in evaluating whether to participate in a field test of a minimization technology, and under what conditions would you be prepared to host a field test at one of your facilities?

2) What can EERE do to help you overcome any obstacles you might face in hosting a field test?

3) How can EERE structure a field testing campaign to maximize the chance that owners or operators of wind facilities will agree to host field testing activities? For example, would

the model of evaluation described in Topic Area 3 below affect your willingness to participate (applicants selecting teams including biologists to evaluate technologies at their sites versus EERE selecting a third party to conduct evaluations across all sites or some other model)?

4) What permits or authorizations might be required in order to allow for field testing at an operating facility? How much time would be needed in order to get those permits or authorizations?

5) What other factors or sensitivities should EERE consider in developing this technology testing and validation program?

CATEGORY 3: Potential Funding Opportunity Structure

To accelerate the commercialization and deployment of impact minimization technologies, EERE seeks input on the development of a potential research, development, and demonstration Funding Opportunity Announcement (FOA) based around the Technology Readiness Level (TRL) framework explained above (see Table 1).

Based on initial consideration of the status of wildlife impact minimization technologies, EERE is considering the following breakout of activities by TRL level. If EERE ultimately pursues a FOA along these lines, the balance of funding allocated for each topic would be informed by EERE's understanding, in large part from responses to this RFI, of the relative need for investment at the low, middle, and high TRL levels, respectively.

EERE is considering the following three Topic Areas for a possible future FOA:

Topic Area 1: TRL 1-4 – Applied research to proof of concept (Required non-federal cost share: 20%)
This Topic Area would support work including the development of technology design, initial prototype/system development, and testing in a controlled setting to demonstrate the potential effectiveness of a minimization technology concept. For example, this Topic Area might support the testing of different auditory or visual stimuli on bats in a controlled setting to determine relative effectiveness in deterring particular species or group of species and development of an initial prototype deterrent device based on the results.

Topic Area 2: TRL 5-6 – Prototype advancement through laboratory and small-scale field testing (Required non-federal cost share: 20%)
This Topic Area would support advancements in impact minimization technologies to ready them for full system testing in an operational environment. This work could include establishing the effectiveness of a prototype technology in a controlled or small-scale setting and iterative design improvements based on initial performance. For example, this Topic Area might support the field testing of a prototype bat deterrent in a setting outside of a wind facility, such as at a field or pond, to establish its ability to reduce bat activity without habituation. Work could also

include system cost analysis to establish the potential cost-effectiveness of the proposed minimization technology in operation at a wind facility.

Topic Area 3: TRL 7-8 – Operational demonstration and validation (Required non-federal cost share: 50%)

This Topic Area would support the demonstration of a proposed minimization technology at an operational wind facility at a scale sufficient to provide a statistically significant reduction of impact at a demonstrated reasonable cost. For rare events, such as eagle collision fatalities at a facility, collecting behavior data that can demonstrate significant reductions in modeled risk of impact would be considered in lieu of demonstrating statistically significant reductions in the number of fatalities.

For this effort, EERE would work with a group of independent experts to develop and provide a set of broad, consistent study protocols for a targeted species or group. This approach would provide a framework for rigorous and consistent evaluation of efficacy across multiple technologies and sites, and allow for rigorous evaluation and peer review of specific study designs and study results. Under this model, applicants would propose their own project teams to conduct the field campaign and carry out the study protocols at their proposed sites.

Under this topic, it would be essential that applicant teams conduct their technology demonstration at an operational wind facility and have the active participation and support of the facility operator to ensure safe and effective integration of the impact minimization technology being evaluated, as well as to allow for a full evaluation of the costs associated with implementing the technology. Teams must also obtain or show the ability to obtain any necessary research permits or permit alterations in a timely manner. EERE would encourage applicant teams to include wind farm owner/operators, impact minimization technology developers, and entities with biological expertise that could serve as evaluators of the effectiveness of the impact minimization technology.

EERE welcomes input on the approach outlined above. Specifically, we welcome feedback on the following questions:

1) Is the TRL advancement model outlined above the optimal approach to supporting the development of impact minimization technologies? If not, what improvements would you suggest?

2) Given your understanding of the current state of impact minimization technologies, how should EERE prioritize research investments across the three topic areas listed above? Please explain.

3) EERE has proposed to prioritize support for technologies that reduce impacts to bats, followed by eagles, and then by other wildlife species. Do you agree with this relative prioritization? If not, what species do you see as highest priority for impact minimization technology development?

4) What are the best ways to measure the effectiveness of impact minimization technologies prior to costly full system deployment at operational wind facilities? What technical, biological, and cost-effectiveness milestones should a technology meet in order to justify demonstration and validation at a facility?

5) How can EERE structure a field testing campaign to maximize the chance that owners or operators of wind facilities will agree to host field testing activities?

6) In regards to Topic Area 3, is the structure that EERE has laid out above the most appropriate or are there other models we should consider? For example:

    a. Should EERE consider selecting a single independent organization to conduct evaluations of minimization technologies at all sites selected through this opportunity rather than allowing applicant teams to select the entities?
    If under this Topic Area EERE provided assistance only for field testing and evaluation activities, and required that applicants fund the manufacturing and deployment of the technology to be tested, would that make participation cost-prohibitive?

7) For systems designed to minimize already rare events (collisions of Golden Eagles with turbines, for example), where statistically significant reductions in mortality are unlikely to be detectable without multi-year, multi-site demonstration, what performance metrics should EERE be measuring that may be more likely to show statistically-significant evidence of a minimization technology's performance in reducing impacts?

CATEGORY 4: Environmental Impact Mitigation – Alternative Approaches

1) In developing a program to advance the mitigation of wildlife impacts from wind energy, should EERE consider prioritizing funding for the development of methods for wildlife impact mitigation other than the minimization technologies addressed above, such as compensatory mitigation? Explain.

2) What else not considered here should EERE address as it develops a program to advance the mitigation of wildlife impacts from wind energy development?

REQUEST FOR INFORMATION RESPONSE GUIDELINES: Responses to this RFI must be submitted electronically to WindMitigationRFI@ee.doe.gov no later than 5:00pm (EDT) on July 25, 2014. Responses must be provided as attachments to an email. ***Responses must be provided as a Microsoft Word (.docx or .doc) attachment to the email, of no more than 10 pages in length, 12 point font, 1 inch margins.*** Only electronic responses will be accepted.

Please identify your answers by responding to a specific question or topic if possible. Respondents may answer as many or as few questions as they wish.

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives. EERE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

EERE will not respond to individual submissions or publish publicly a compendium of responses. A response to this RFI will not be viewed as a binding commitment to develop or pursue the project or ideas discussed.

Respondents are requested to provide the following information at the start of their response to this RFI:

- Company / institution name;
- Company / institution contact;
- Contact's address, phone number, and e-mail address.