



Challenges and Opportunities at the Interface of Wind Energy and Radar Technology

DATE: November 7, 2023
SUBJECT: Request for Information (RFI)
RFI NUMBER: DE-FOA-0003166

Description

This is a Request for Information (RFI) issued by the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) on behalf of the Wind Energy Technologies Office (WETO) and in collaboration with the Wind Turbine-Radar Interference Mitigation (WTRIM) Working Group. This RFI seeks public input to help inform DOE's implementation of the Infrastructure Investment and Jobs Act, also commonly known as the Bipartisan Infrastructure Law (BIL).¹

The BIL is a once-in-a-generation investment in infrastructure, which will grow a more sustainable, resilient, and equitable economy through enhancing U.S. competitiveness in the world, creating good jobs, and ensuring stronger access to these economic and other benefits for disadvantaged communities. As relevant to this RFI, BIL Provision 41007(b)(1) authorized appropriations of \$60 million to optimize the performance of wind energy systems through development of new materials, hardware, and software. A portion of these funds will be used to conduct research, development, deployment, and demonstration activities related to mitigating radar interference and associated radar mission impacts caused by wind turbines.²

To help inform DOE's implementation of BIL funds under the provision referenced above, this RFI seeks input on:

- Siting challenges of wind energy developers related to radar interference – Category 1
- Potential mitigation technologies at the radar and/or turbine level that currently exist or are in development to address wind turbine-radar interference – Categories 2 & 3
- Commercialization and market adoption of wind-radar interference mitigation measures, and what obstacles need to be overcome to accelerate commercialization and maximize adoption – Category 4
- BIL Provisions and Requirements and Buy America Requirements – Categories 5 and 7

¹ Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (2021).

² 42 U.S.C 16237(b)(2)

This is a Request for Information (RFI) only. DOE 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. DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

-
- Effective solicitation process, Funding Opportunity Announcement (FOA) structure, and implementation strategies to enable the commercialization and market adoption of wind-radar interference mitigation measures – Category 6

Information collected from this RFI may be used by DOE for planning purposes, which could include developing future FOAs or other funding mechanisms related to BIL Provision 41007(b)(1). The information collected will not be published but may be shared with federal agencies that form the WTRIM Working Group.³

RFI Technology Background and Goals

The WTRIM Working Group⁴, which includes DOE, the Department of Defense (DOD), the Department of Transportation's (DOT) Federal Aviation Administration (FAA), the Department of Commerce's (DOC) National Oceanographic and Atmospheric Administration (NOAA), and the Department of the Interior's (DOI) Bureau of Ocean Energy Management (BOEM), is working to identify and develop the means to mitigate the technical and operational effects of wind turbines on critical radar missions.

With over 140 GW of installed capacity on land and over 50 GW of capacity in the project pipeline offshore, wind farms are a staple of the energy economy of the United States.⁵ As wind turbines continue to expand in both size and number, they can cause an increased level of interference with radar systems. Wind development within the line-of-sight of radar systems (and beyond the line-of-sight for coastal surface radar and over the horizon systems) can cause clutter and interference, which has resulted in significant performance degradation at some radar sites. This represents a significant challenge as over 40 percent of land-based and over 25 percent of offshore wind resource technical potential is in the field of view of critical radar systems. Since 2011, WETO has worked with federal agencies, the wind industry, radar providers, and other stakeholders to: (1) better evaluate the impacts of wind energy on sensitive radars, (2) develop and deploy mitigation measures to increase the resilience of existing radars to wind turbines, and (3) encourage the development of next-generation radars resistant to wind turbine interference.

This RFI represents the latest effort by the WTRIM Working Group to better understand the challenges wind developers are facing regarding radar interference and to determine the

³ [Memorandum of Agreement: Establishment of the Wind Turbine Radar Interference Mitigation Working Group \(energy.gov\)](#)

⁴ [Mitigating Wind Turbine Radar Interference | Department of Energy](#)

⁵ [Wind Market Reports: 2023 Edition | Department of Energy](#)

This is a Request for Information (RFI) only. DOE 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. DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

capability of the marketplace to find solutions that mitigate the impact of wind turbine interference on existing and future radar systems.

Bipartisan Infrastructure Law Background

On November 15, 2021, President Joseph R. Biden, Jr. signed the Bipartisan Infrastructure Law. The BIL is a once-in-a-generation investment in infrastructure, which provides the backbone for a more sustainable, resilient, and equitable economy through enhancing U.S. competitiveness in the world, diversifying regional economies to include supply chain and manufacturing industries, creating good union jobs, and ensuring stronger access to these economic and other benefits for underserved communities. The BIL appropriates more than \$62 billion to DOE to ensure the clean energy future delivers true economic prosperity to the American people by:

- Investing in American manufacturing and workers, including good-paying jobs with the right to join a union, and effective workforce development to upskill incumbent and dislocated workers.
- Expanding access to energy efficiency and clean energy for families, communities, and businesses.
- Delivering reliable, clean, and affordable power to more Americans.
- Building the technologies of tomorrow through clean energy demonstrations.

The information gathered through this effort will support BIL Provision 41007(b)(1) and the broader government-wide approach to enable the innovations needed to advance U.S. wind systems, reduce the cost of electricity, and accelerate the deployment of wind power, maximize the benefits of the clean energy transition as the nation works to curb the climate crisis, empower workers, and advance environmental justice. This will support the Biden Administration's goal to achieve a carbon-free electric grid by 2035 and a net zero emissions economy by 2050.⁶

⁶ FACT SHEET: President Biden sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/>

This is a Request for Information (RFI) only. DOE 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. DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

Purpose

The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders on issues related to radar interference caused by wind turbines. DOE is specifically interested in information on siting challenges faced by wind energy developers due to wind turbine interference with radar and technologies needed to mitigate those issues. This is solely a request for information and not a funding opportunity. DOE is not accepting applications for funding.

You may answer as few or as many of the questions below as you would like. Please use the bolded Category numbers and sub-numbers as headings in your response to the greatest extent possible and refer to the questions (C1.1a, C2.12 etc.) in the body of your responses. This helps save time both for the responder and the reviewers.

DOE will keep any business-sensitive or proprietary information confidential to the greatest extent possible within the parameters of the Freedom of Information Act (FOIA). See instructions for labeling confidential information at the end of this RFI.

Specifically, DOE is requesting input on the following categories and questions:

Category 1: Wind Developers' Perspective on Wind Turbine Interference with Radar Systems

This category is intended to solicit feedback from **wind developers, owner/operators, and third-party consultants** on the impact of wind turbine radar interference on wind energy development and operation.

1. Describe and quantify any current or past wind energy projects that have or may encounter radar interference issues.
2. Have any past projects been delayed, replanned, resized, or cancelled because of radar interference? Are any current projects at risk of being delayed, replanned, resized, or cancelled because of radar interference issues? What were the impacts of these changes?
3. What resources are available to developers to mitigate radar interference challenges? How have mitigation strategies impacted wind farm operations or curtailment of operations?
4. Has any research and development been conducted by the respondent's organization to overcome radar interference issues?

This is a Request for Information (RFI) only. DOE 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. DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

-
5. Does your organization have any feedback on potential industry funding mechanisms (e.g., industry consortia) to support the deployment of radar interference mitigation technologies?
 6. Describe your process for changing or adding wind turbines to existing wind farms. What is the process to communicate these changes to review and approval bodies specifically related to radar interference?
 7. How will the future trends for wind turbines such as size (height and blade diameter) and increased installations (such as additions to existing farms, development of new wind farms) impact the need for developers to seek out solutions for radar interference?
 8. How do you expect new wind turbines installed in the United States to grow, both onshore and offshore, in the next 5 years? 10 years?
 9. How will the geographic distribution of new project development shift in the next 5 years? 10 years?
 10. Are there key areas of the United States that are avoided by your organization due to potential radar interference? What impacts does this have?
 11. Is there anything else that we did not ask about this topic you would like to tell us?

Category 2: Mitigation Solutions to Reduce or Eliminate the Effect of Wind Turbine Interference on Radar Systems – Radar Perspective

This category is intended to solicit feedback from **radar manufacturers, radar-related software producers, radar operators, and any other relevant party** that has information on wind turbine interference mitigation solutions from the radar technology perspective. As previously mentioned, DOE will keep any business-sensitive or proprietary information confidential to the greatest extent possible within the parameters of the Freedom of Information Act (FOIA). See instructions for labeling confidential information at the end of this RFI.

12. What radar technologies are available or in development at the respondent's organization to mitigate wind turbine interference on radar systems?
13. What type of radar system and what frequency does the respondent's technology target, e.g., terminal, long-range, high-frequency, weather, etc.?
14. What is the Technology Readiness Level⁷ of the respondent's solution? Describe any testing that has been conducted with the technology and its performance in and around wind turbines. Include, as applicable, any test reports.

⁷ [EERE Technology Readiness Level Definitions](#)

This is a Request for Information (RFI) only. DOE 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. DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

-
15. What is the cost of the respondent's technology solution (including cost of production, total ownership, and transition). How cost effective is the solution when compared to existing state-of-the-art technologies?
 16. Describe the integration approach for the technology with existing infrastructure, command and control systems, and FAA automation systems. Include any testing and demonstrations as applicable.
 17. What is the overall processing approach of the respondent's radar technology to mitigate wind turbine clutter?
 18. How does the solution address a range of desired performance parameters such as: Probability of Detection (Pd), Demonstrated Target Performance, Doppler Performance, Coverage Volume (including minimum and maximum range, azimuth extent, and altitude), Range Accuracy, Azimuth Accuracy, Azimuth Resolution, Range Resolution, Clutter Rejection, Data Latency, Update Rate, Reliability, Availability, Data Transmission, etc.?
 19. When will the technology be ready to be fielded for demonstration and/or operational deployment? What are the availability, cost and infrastructure needs associated with an on-site demonstration or operational deployment of the respondent's technology?
 20. Describe market barriers or other challenges in developing radar technologies that reduce or eliminate the effect of wind turbine interference on radar systems.
 21. Is there anything else that we did not ask about this topic you would like to tell us?

Category 3: Mitigation Solutions to Reduce or Eliminate the Effect of Wind Turbine Interference on Radar Systems – Wind Turbine Perspective

This category is intended to solicit feedback from **wind turbine manufacturers, wind turbine blade manufacturers, wind turbine component manufacturers, wind turbine service providers, and any other relevant party** that has information on wind turbine interference mitigation solutions from the turbine technology perspective.

22. What wind turbine technologies are available or in development at the respondent's organization to mitigate wind turbine interference on radar systems?
23. What type of radar system and what frequency does the respondent's technology target, e.g., terminal, long-range, high-frequency, weather, etc.?
24. What is the Technology Readiness Level of the respondent's solution? Describe any testing that has been conducted with the technology and its performance in and around radar systems. Include, as applicable, any test reports.

This is a Request for Information (RFI) only. DOE 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. DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

-
25. What is the cost of the respondent's technology solution (including cost of production, total ownership, and transition). How cost effective is the solution when compared to existing state-of-the-art technologies and compared to wind turbines without mitigation?
 26. How does the solution address a range of desired performance parameters such as: Probability of Detection (Pd), Demonstrated Target Performance, Doppler Performance, Coverage Volume (including minimum and maximum range, azimuth extent, and altitude), Range Accuracy, Azimuth Accuracy, Azimuth Resolution, Range Resolution, Clutter Rejection, Data Latency, Update Rate, Reliability, Availability, Data Transmission, etc.?
 27. Are there plans to further minimize radar interference caused by wind turbines at the respondent's organization? If yes, please describe them and include, as appropriate, details for cost, time to implement, and expected customer acceptance.
 28. How do you expect new wind turbines installed in the United States to grow, both onshore and offshore, in the next 5 years? 10 years?
 29. How will the geographic distribution of new project development shift in the next 5 years? 10 years?
 30. How will the anticipated turbine growth affect wind turbine interference issues and mitigation strategies?
 31. Describe market barriers or other challenges in developing wind turbine technologies that reduce or eliminate the effect on radar systems.
 32. Is there anything else that we did not ask about this topic you would like to tell us?

Category 4: Market Adoption and Industry Sustainability

33. What mechanisms (e.g., tax/other incentives, offtake structures, prizes, competitions, alternative ownership structures, contracts for difference, etc.) would be valuable to incentivize market-based supply and demand relevant to this technology space?
34. What role/actions can DOE take to support reliable supply and demand for potential producers and customers relevant to wind turbine radar interference mitigation technologies?
35. If DOE asks for a market analysis as part of the fact-finding mission to support future investment in the space, what should the analysis include so that DOE can be confident that a proposed project will be successful?
36. What can DOE provide or do that would be helpful to a project to facilitate its collaborations with potential partners?
37. How can DOE support the industry in working together to increase competitiveness and scale?

This is a Request for Information (RFI) only. DOE 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. DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

-
38. To what extent will the wind turbine radar interference mitigation technologies be capable of demonstrating a path to economic viability after the BIL funding phases out and how could a project be structured to ensure this outcome?
 39. Are there any additional barriers to the adoption of wind turbine radar interference mitigation that you would like to tell us about, and if so, how can DOE assist?

Category 5: BIL Provisions and Requirements

40. What supportive activities would make the provision successful and sustainable (e.g., workforce development, community-based organization engagement, engagement with labor unions, domestic manufacturing, labor standards, etc.)?
41. What policies, infrastructure, or other considerations could be put in place to enable the provision implementation to be more successful?
42. What regional factors should be considered when identifying and selecting applicants for a potential future funding opportunity (e.g., economic considerations, policy considerations, labor-management partnerships, environmental and energy justice considerations, geology, workforce availability and skills, current industrial and other relevant infrastructure and storage available/repurposed/reused, industry partners, minority-serving institutions (MSIs), minority-owned businesses, regional specific resources, security of supply, climate risk, etc.)?

Category 6: DOE's Proposed Implementation Strategy for Challenges and Opportunities at the Interface of Wind Energy and Radar Technology

43. DOE is evaluating funding mechanisms for implementation of this BIL provision. What applicable funding mechanisms are best suited to achieve the purposes of the program (e.g., Cooperative Agreements⁸, Grants, Other Transactions Authority⁹, Partnership Intermediary Agreements¹⁰, prize competitions¹¹, technical assistance)?
44. What are the key review criteria (e.g., technical merit, workplan, market transformation plan, team and resources, financial, regional economic benefits, quality jobs, environmental justice, diversity, equity, inclusion, and accessibility) that DOE should use to evaluate and select projects as well as evaluate readiness to move from one phase to the next?
45. What incentives/programs exist or can be put in place to encourage and foster U.S. manufacturing of wind turbine radar interference mitigation technologies? What

⁸ For more information about Cooperative Agreements, see the DOE Guide to Financial Assistance:

<https://www.energy.gov/management/articles/department-energy-guide-financial-assistance>

⁹ Agreements under the Other Transactions Authority (OTA), Section 1007 of EAct 2005

¹⁰ [DOE Partnership Intermediary Agreement | Department of Energy](#)

¹¹ [EERE Prizes and Competitions | Department of Energy](#)

This is a Request for Information (RFI) only. DOE 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. DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

potential challenges or opportunities might exist to meet the new Buy America requirements in the BIL?¹²

46. What types of cross-cutting support (e.g., technical assistance) would be valuable from the DOE/national laboratories, and/or from other federal agencies, to provide in proposal development or project execution? Are there other entities that DOE could fund to provide technical assistance for individual projects or the program as a whole?
47. What data should DOE collect from recipients to evaluate the impact of the program? How should this data and the program outcomes be disseminated to the public?

Category 7: Questions related to the new Build America, Buy America requirements

48. Does any of the work for which you would seek funding through an opportunity related to this BIL provision involve the construction, alteration, maintenance, or repair of any of the following:
 - a. Roads, highways, and bridges;
 - b. Public transportation;
 - c. Dams, ports, harbors, and other maritime facilities;
 - d. Intercity passenger and freight railroads;
 - e. Airports;
 - f. Water systems, including drinking water and wastewater systems;
 - g. Electrical transmission facilities and systems;
 - h. Utilities;
 - i. Broadband infrastructure; and
 - j. Buildings and real property.
49. If your answer to question 46 is yes, please identify any iron, steel, manufactured goods/products or construction materials which are crucial to this work, and whether you would normally procure those items domestically or from a foreign source.
50. For any item you indicate that you would normally procure from a foreign source, please specify to the best of your ability whether you would avoid seeking to procure these items domestically due to lack of availability or cost.
51. Are there actions that manufacturers are taking or could take to increase the availability and affordability of products in this space that meet BABA requirements?

Disclaimer and Important Notes

¹² New Buy American requirements are located in Division G – Other Authorizations; Title IX – Build America, Buy America of the Infrastructure Investment and Jobs Act (IIJA), Public Law 117-58, which was enacted into law on November 15, 2021. <https://www.congress.gov/bill/117th-congress/house-bill/3684>

This is a Request for Information (RFI) only. DOE 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. DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

This RFI is not a Funding Opportunity Announcement; therefore, DOE is not accepting funding applications at this time. DOE may issue a FOA in the future based on or related to the content and responses to this RFI; however, DOE 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 DOE chooses to issue a FOA regarding the subject matter. Final details, including the anticipated award size, quantity, and timing of DOE-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. DOE 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. DOE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that DOE 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 DOE to any further actions related to this topic.

Confidential Business Information

Pursuant to 10 CFR 1004.11, any person submitting information believed to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery two well-marked copies: one copy of the document marked “confidential” including all the information believed to be confidential, and one copy of the document marked “non-confidential” with the information believed to be confidential deleted. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

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 DOE 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.

This is a Request for Information (RFI) only. DOE 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. DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.

Request for Information Response Guidelines

Responses to this RFI must be submitted electronically to windenergyrfi@ee.doe.gov no later than 5:00pm (ET) on January 12, 2024. Responses must be provided as attachments to an email. It is recommended that attachments with file sizes exceeding 25MB be compressed (i.e., zipped) to ensure message delivery. Responses must be provided as a Microsoft Word (.docx) or PDF attachment to the email, and no more than 10 pages in length, 12-point font, 1-inch margins. Only electronic responses will be accepted.

For ease of replying and to aid categorization of your responses, **please copy and paste the RFI questions, including the question numbering, and use them as a template for your response.** Respondents may answer as many or as few questions as they wish.

DOE 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 mission space
- Company / institution size & scale
- Company / institution relationship to wind energy and/or radar
- Company / institution contact
- Contact's address, phone number, and e-mail address.

This is a Request for Information (RFI) only. DOE 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. DOE may or may not issue a Funding Opportunity Announcement (FOA) based on consideration of the input received from this RFI.