Understanding Green Energy Technologies’ Effects on the Air Transportation System

ACRP Staff Comments: The proposed research could build on Synthesis Project S10-10-06, Investigating Safety Impacts of Energy Technologies on Airports and Aviation. A higher funding amount might be needed to deal with the project's technical issues.

TRB Aviation Group Committees Comments: AIRCRAFT/AIRPORT COMPATIBILITY CMTE - This research promises to add value to previous ACRP synthesis studies identifying the hazards posed by certain "green" technologies on airport and aviation operations. It will produce a handbook that identifies measures airports can adopt to minimize the impacts of certain green technologies such as wind farms and solar panel arrays. Coordination with industry is necessary so the researchers know what modifications are being made to solar and wind facilities to mitigate their impacts on aircraft operations.
ENVIRONMENTAL IMPACTS OF AVIATION CMTE - Support. Renewable energy projects are a growing sector for electricity generation and will continue to be for the foreseeable future based on the administration’s commitment to renewable energy as a way to reduce our dependence on foreign oil and mitigate climate change. With these new technologies comes concern over potential impact to airports, specifically with respect to radar and solar glare among others. A guidebook, similar to the solar guide which was recently prepared for the FAA, would help all parties (e.g. airports, FAA, and developers) when siting new projects and reduce the potential negative impact to aviation.

Review Panel Comments: Recommended — This topic is increasingly relevant. Also, the safety aspect has not been looked at previously. It should include a broader approach to green projects, including green roofs, and evaluate effects on safety of aircraft operations. The research might expand to include on-airport projects as well, combining environmental issues with operational concerns. It needs careful rethinking in terms of balance when being rewritten. Need to broaden consideration by the community both within and outside the airport property. Gathering data through surveys, but not collecting data that requires laboratory analysis. It builds on ACRP Synthesis 10: Airport Sustainability Practices. The topic panel should include airport operations personnel.

AOC Disposition: Approved and funded at $450,000. The impetus for this project came from ACRP Synthesis Report 28, Investigating Safety Impacts of Energy Technologies on Airports and Aviation. The research could help determine whether they are different from other objects affecting airspace and navigation. FAA has done a lot of work in this area, so the research panel will need to make sure there is no duplication of effort.
I. PROBLEM TITLE

Understanding green energy technologies’ effects on the air transportation system.

II. RESEARCH PROBLEM STATEMENT

New energy technologies threaten the safety of the entire air transportation system. Airport Cooperative Research Program (ACRP) Synthesis S10-10-06, Investigating Safety Impacts of Energy Technologies on Airports and Aviation, now in progress, is taking the important first step in focusing on the effects energy technologies have directly on airports. Initial findings and discussions with experts suggest, though, that the scope of the safety hazards is much greater, extending far beyond airports. This proposal expands upon that initial research and would evaluate the effects energy technologies have on the entire air transportation system, including airplanes in flight, away from the airport environment. For example:

a. Wind turbine blade rotation may interfere with both aviation related and weather radar systems.

b. Solar panels create glare, and pose a vision hazard to pilots at anytime during the flight.

c. Wind farms and solar panel fields developed in remote areas need significant support infrastructure to transmit the power generated on site to the grid. This infrastructure includes tall transmission towers which potentially affect low level aviation safety.

d. Meteorological evaluation towers (MET) often are erected on short notice, but are not marked or lit and have nearly invisible guy wires. MET towers pose a hazard to low level aviation.

e. Aerial applicator pilots (agricultural sprayers) have expressed concerns about wind farms located in fields and many have stopped flying into these areas. The resulting potential loss to crop production is staggering.

There are likely other examples as well that a formal synthesis would identify.

III. OBJECTIVE

The objective of this research is to produce a guidebook that may be utilized by the aviation industry, government agencies, private energy companies, land owners, etc. Using the products of ACRP Synthesis S10-10-06 as a springboard, ACRP would conduct additional research in order to:

1. Identify which emerging energy technologies impact on the overall air transportation system, including all locations away from airports.

2. Assess existing hardware and how it is used to determine which represent safety hazards to the air transportation system.

3. Develop approaches for users of the guidebook to assess and mitigate these impacts where appropriate.

IV. RESEARCH PROPOSED

The research will evaluate the off-airport impacts of emerging energy technologies including wind turbines, solar panels and peaker plants, as well as the associated infrastructure system. The research will provide an overview of the technologies, including benefits, costs, and production data; benefits to airports and aviation (if there are any) as well as any case studies that have been
conducted. Based on initial findings and assessment of potential risks, steps may also include a review of existing relevant FAA regulations, relevant DOE regulations, a survey of pilots and airport personnel to locate potential hazards, contact with energy companies to understand their process and goals, site assessments and technical studies to capture objective data on energy technology by-products (turbulence, glare, EMI, obstruction, etc.) Where appropriate, the research will present mitigation steps. This could include impact assessment techniques that allow users to determine when they have a safety problem, modification of existing energy hardware, guidelines for new energy hardware deployments, or suggested changes in aviation procedures.

For example, expanding on one of the concerns discussed in this proposal, wind turbines generate turbulence, which is a serious safety concern among aerial applicator and EMS pilots. However, this turbulence has not been measured and its impacts have not been determined. One product of this research would be quantification of turbulence from wind turbines and assessment of the threat to aviation safety. Based on the assessment, the research would develop mitigation strategies, such and planning and operational suggestions for airlines, turbine owners, and government entities. Products would similarly be developed based on assessment of how wind turbines affect weather radar systems, how solar panel glare affects pilot vision, what critical solar panel angles are most hazardous relative to aircraft positions, etc.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

**Recommended Funding:** $450,000
**Research Period:** 18 months

VI. URGENCY AND PAYOFF POTENTIAL

Urgency and Payoff Potential: Emerging energy technologies are rapidly becoming a national priority. However, left unchecked, this national movement will yield unintended and potentially disastrous consequences. Quantifying the effects of these new technologies will enable all sides to make rational, fact base decisions which will give our national air transportation system the best chance of co-existing harmoniously with new, environmentally friendly technologies.

VII. RELATED RESEARCH

ACRP Synthesis S10-10-06
October 2010 literature search conducted by the Wisconsin Department of Transportation

VIII. PERSON(S) DEVELOPING THE PROBLEM

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IX. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement is the product of the individual, based on his participation in the synthesis panel.

X. DATE AND SUBMITTED BY

Submitted 10/12/10 by SRB