

Federal Aviation Administration

AIRPORT TECHNOLOGY R&D SOLAR POWERED LIGHTING RESEARCH

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Airport Technology R&D Solar Powered Lighting Research September 7, 2021





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3

Evaluation of Solar Powered Lighting Systems on Airports

Research Request:

Conduct Research to Evaluate Solar Lighting Systems at Five GA Airports in Diverse Geographic Regions Based on Varied Solar Insolation, Ambient Temperature Range, and Snow Fall.

1. Geographic Regions Selected:

- Cape May, NJ (Initial Prototype Installation)
- Central Upstate New York
- Pacific Northwest (Washington State)
- Central/Southern Arizona
- Central Oklahoma

3. Site Selection:

Select one GA airport from each region for evaluation



2. Site Survey:

Conduct surveys at candidate GA airports in each region to identify most suitable locations

Timeframe:

Evaluations to be conducted over a sufficient period of time to allow for assessment of seasonal solar insolation and related battery charging capabilities.



Research Objectives

- **1. Determine Compliance:**
 - FAA photometric requirements
 - Reserve battery requirements
- 2. Assess functionality and durability:
 - under various environmental conditions, outside of controlled laboratory conditions
- 3. Cost comparison:
 - installation and operating costs of decentralized solar airfield devices compared to conventionally-powered versions of these devices.



Components

- Airfield Components (total of 46):
 - L-861 Runway Edge/Threshold Lights
 - L-861T Taxiway Edge Lights
 - L-810 Obstruction Lights
 - Elevated Runway Guard Lights
 - Wind Cones
 - Airfield Guidance Signs
- Each component is "decentralized" i.e. each component has its own solar panel and battery charging system
- Two manufacturers
 - Carmanah and AvLite





Proposed Test Site Locations





Candidate Airports

- Central Upstate New York:
 - Oswego County (FZY)
 - Dunkirk (DKK)
 - Penn Yan (PEO)
- **Pacific Northwest** (Washington State):
 - Felts Field (SFF),
 - Deer Park (DEW),
 - Ephrata Municipal (EPH)

Central Arizona:

- Phoenix Goodyear (GYR)
- Casa Grande (CGZ)
- Pinal Airpark (MZJ)

Central Oklahoma:

- U. of Oklahoma (OUN)
- Wiley Post (PWA)
- William Pogue (OWP)





Project Status

- Laboratory Testing at Intertek and RPI is complete
- Cape May "Prototype" Installation is complete
- Data Acquisition formally began on February 1, 2021
- Preliminary* Site Survey Report for candidate sites in Upstate NY delivered on December 31, 2020 complete
- Interim (~30% submittal) field test data report delivered
- Final NY Site Visits complete
- Installation at NY airport (Penn Yan) In Progress
- Selection of next test sites Commencing
 - Arizona
 - Washington State



Cape May Airport – Prototype Overview – Data Collection

Field testing at WWD primarily consists of visual observations utilizing cameras to monitor the environmental conditions at the test bed and data collected from field instrumentation.

The instrumentation and data acquisition (DAQ) systems are used to collect and record data on various accessible performance parameters for the solar devices:

- **Battery voltage** allows for tracking the charge level for the device. If the charge begins to degrade, it will limit how long the light can remain operational which provides an indication of the performance of the device.
- **Relative light intensity** (or LED drive current) of the device. signifies if the light output has degraded due to reduced driver power. In some cases, the LED drive current provides an indication if the device begins to reduce its power to the LED driver, thereby falling below its required performance level.



Cape May Installation



Solar Powered Devices Located on an Abandoned Section of Former Runway 14-32.





Solar Device Test Beds will Have a Combined Foot Print of Approximately 100 feet x 70 feet.





Portable Test Beds





Lights are baffled





PEO Test Bed Location





PEO Test Bed Construction



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Data Analysis

- Raw test data collected during the tests will be combined with the temperature sensor, pyranometer, and weather-related data.
- The performance of the units under test will be analyzed in view of the environmental factors in place.
- It is expected that the available watt hours of energy available will influence the performance of the devices.
- The analysis will use this information and to the extent possible identify these influences on the performance of the devices.









Final Reporting

Reports will include the following information:

- A description of each solar-powered lighting device
- Details for each site location
- Impacts to the airport
- Conclusions/recommendations derived from results.
- A cost comparison



Questions?

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