Comprehensive Renewable Resources Strategy for Airports

Thursday, November 7, 2019
2:00-3:30 PM ET
Purpose

Learning Objectives
At the end of this webinar, you will be able to:

• Identify how to prioritize renewable resource projects

• Describe how to connect related projects into an overall strategy with appropriate goals and metrics
Guidebook for
Developing a Comprehensive
Renewable Resources Strategy

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Natural Power

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Barrett Energy Resources Group
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- Registered electrical engineer
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- Lead Author of ICAO’s Renewable Energy and Aviation
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Christine Gerencher, TRB Liaison
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ACRP Report 197: Guidebook for Developing a Comprehensive Renewable Resources Strategy

- Provides background information on renewable resources
- Describes steps for developing a strategy consistent with typical airport planning processes
- Includes guidance on how to establish milestones and metrics to measure progress
- Provides tools and templates that can be adapted by users to build an initial airport strategy
- Presents real-world examples of strategies developed with airports as part of the research

Report 197 was published April 2019
Research Problem

- Airports have increasingly been adopting renewable resources such as alternative energy and biodegradable materials in recent years.
- Drivers include decreasing carbon emissions, increasing efficiency, and sourcing products locally.
- However, typical airport planning processes do not specify where renewable resources ought to best be considered.
- This research provides guidance to airports on when renewable resources should be considered and includes tools for developing a comprehensive strategy.
Research Approach

- Summarize background information on renewable resources and typical planning processes
- Specify where planning can integrate consideration of renewable resources
- Prepare draft guidance for airports to follow
- Engage three pilot airports to prepare a comprehensive renewable resource strategy
- Integrate lessons learned from the pilot to improve the final guidance
## Results – Renewable Resources

<table>
<thead>
<tr>
<th>Utility Provided</th>
<th>Non-Renewable Resource Used</th>
<th>Renewable Resource Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating and cooling</td>
<td>Fuel oil, natural gas</td>
<td>Biomass</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Geothermal cooling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ground source heat exchange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anaerobic digestion</td>
</tr>
<tr>
<td>Electricity</td>
<td>Coal, natural gas</td>
<td>On-site solar photovoltaic (PV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Small wind</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power purchasing from off-site renewable energy systems</td>
</tr>
<tr>
<td>Plastic cutlery</td>
<td>Petroleum-based plastic</td>
<td>Bioplastic</td>
</tr>
<tr>
<td>Soil remediation</td>
<td>Chemical fertilizer</td>
<td>Compost</td>
</tr>
<tr>
<td>Waste disposal</td>
<td>Paid garbage handling</td>
<td></td>
</tr>
<tr>
<td>Vehicle washing</td>
<td>Pumped municipal water</td>
<td>Gray water reclamation</td>
</tr>
<tr>
<td>Irrigation</td>
<td></td>
<td>Condensation catchment from cooling units</td>
</tr>
<tr>
<td>Ingredients for on-site restaurants</td>
<td>Open-loop food providers</td>
<td>On-site or indoor gardens</td>
</tr>
<tr>
<td>Transportation</td>
<td>Gasoline/diesel fuel</td>
<td>Renewable fuels—biodiesel; renewable diesel</td>
</tr>
</tbody>
</table>
Results – Steps for Developing a Strategy

• Define your vision
• Assemble a team and engage stakeholders
• Assess current renewable resources and set goals as appropriate
• Identify administrative, financial and technical processes, and prioritize actions
• Choose how to evaluate
• Write and implement your renewable resources strategy
Spotlight: Vision Statement

A vision statement serves as an organization’s roadmap, guiding its internal decision-making and defining its goals for the future. An effective vision statement will be clear, concise, inspiring, and stable, yet challenging. It will be applicable in the short-term while offering long-term perspectives for an organization. Thus, an airport’s vision statement is an ideal place to begin when considering both short- and long-term sustainability initiatives.
Results – Make the case for renewable resources

- Mitigate potential impacts of climate change
- Contribute to domestic energy independence
- Diversify energy sources
- Invest in long-term savings associated with renewables
- Increase decentralized power generation
- Stimulate job growth

Renewable Energy Public Policy
Results – EONS

ECONOMIC
- Better utilization of assets
- Reduced development and/or operations and maintenance costs

OPERATIONAL
- Efficient use of resources and facilities
- Minimizes waste

NATURAL
- Conserves and protects resources
- Reduces impacts
- Facilitates environmental approvals and permitting

SOCIAL
- Improved passenger and employee experience
- Enhances quality of life and socioeconomic well-being of the local community
Results – Assess current renewable resource / set goals
Results – Engage stakeholders
Results – The Pillars of a Successful Strategy

- **Administrative**: Integration with ongoing planning processes; review and approval
- **Fiscal**: Ownership, funding, and financing
- **Technical**: Physical compatibility with space, electrical, and other constraints
## Pillars - Administrative

<table>
<thead>
<tr>
<th>Renewable Resource Project</th>
<th>Airport Layout Plan</th>
<th>Airport Master Plan</th>
<th>Capital Improvement Plan</th>
<th>Strategic Energy Plan</th>
<th>Sustainability Plan</th>
<th>Airport O&amp;M Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rooftop Solar PV System on an Existing Building</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2. Program to Compost Food Waste with an External Vendor</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3. Large Ground-mounted PV Array on Existing Green Space</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4. Water Source Geothermal Project for Cooling and/or Irrigation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5. Alternative Transportation Fuels for Airport Fleet</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>6. Aeroponic Garden Inside Airport to Provide Food to Internal Restaurants</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>7. Green rooftops</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>8. Airport Wastewater Reclamation Facility for Treatment of City Water</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>9. On-Site Apiary Operated by an Outside Non-Profit Organization</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
## Pillars - Fiscal

<table>
<thead>
<tr>
<th>Technology</th>
<th>Ownership</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar PV (on-site use)</td>
<td>Airport</td>
<td>FAA AIP, bonds, annual budget</td>
</tr>
<tr>
<td>Solar PV (off-site grid supply)</td>
<td>Third party developer</td>
<td>Tax Credits, PPA</td>
</tr>
<tr>
<td>Solar Thermal</td>
<td>Airport</td>
<td>VALE, annual budget</td>
</tr>
<tr>
<td>Wind</td>
<td>Airport</td>
<td>FAA AIP, annual budget</td>
</tr>
<tr>
<td>Biomass</td>
<td>Airport, Third party</td>
<td>Various</td>
</tr>
<tr>
<td>Ground Source Heat Pump</td>
<td>Airport</td>
<td>VALE, annual budget</td>
</tr>
</tbody>
</table>

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*Energy used by airport from the grid*
## Results – Goals and Metrics

### Goal Setting

<table>
<thead>
<tr>
<th>Weak Goal</th>
<th>Strong Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use more renewable energy</td>
<td>Increase renewable energy consumption at airport facilities by 25% from the baseline by 2020.</td>
</tr>
<tr>
<td>Decrease carbon footprint/ emissions</td>
<td>Reduce landfill waste from airport facilities by 20% in the next 5 years.</td>
</tr>
<tr>
<td>Reduce energy usage</td>
<td>Transition all indoor fluorescent lighting to 100% energy-efficient lighting by 2050.</td>
</tr>
<tr>
<td>Use less water</td>
<td>Reduce water consumption per passenger by 15% within the next 10 years.</td>
</tr>
</tbody>
</table>

### Metrics

<table>
<thead>
<tr>
<th>Key Performance Indicator</th>
<th>Performance Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>kBtu* per square foot of building</td>
<td>Reduce GHG emissions and/or energy intensity</td>
</tr>
<tr>
<td>Annual gallons of water per passenger</td>
<td>Water conservation</td>
</tr>
<tr>
<td>Percentage of organic material composted</td>
<td>Reduce waste generation</td>
</tr>
<tr>
<td>Energy, petroleum, or emissions per mile of travel or per seat-mile</td>
<td>Reduce energy, petroleum, or emissions</td>
</tr>
</tbody>
</table>
Putting Research Into Action - Checklists

Prioritize Renewable Resources

- Solar Space Heating
- Solar Hot Water
- Roof-mounted Solar PV
- Ground-mounted Solar PV
- Canopy-mounted Solar PV
- Wind Turbine
- Waste Management

Evaluate Relative to Technology Checklist

<table>
<thead>
<tr>
<th>Canopy/Carport-Mounted PV Assessment Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line #</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
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<tr>
<td>4</td>
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<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
</tbody>
</table>

- High Priority: Line 5 (PV Generation) offsets 20% or more of airport energy usage and Lines 6-8 are all “Yes.”
- Medium Priority: Line 5 (PV Generation) offsets 6% to 19% of airport energy usage and some of Lines 6-8 are “Yes.”
- Low Priority: Line 5 (PV Generation) offsets less than 5% of airport energy consumption or significant siting restrictions exist.
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<th>Task</th>
<th>Timeline</th>
<th>Deliverables</th>
</tr>
</thead>
</table>
| Task 1 Project Administration | 0-16 Weeks | • Memo style project plan  
|                             |          | • Weekly conference calls with meeting notes     |
| Task 2 Data Review, Assessment and Analysis | 0-4 Weeks | • Summary memorandum                             |
| Task 3 Develop Renewable Resources Strategy Outline | 0-4 Weeks | • Brief outline of Renewable Resources Strategy |
| Task 4 Hold Stakeholder Workshop | 4-8 Weeks | • Workshop agenda  
|                             |          | • Workshop presentation materials  
|                             |          | • Post-workshop discussion notes                 |
| Task 5 Draft Renewable Resources Strategy | 8-12 Weeks | • Draft Renewable Resources Strategy            |
| Task 6 Final Renewable Resources Strategy | 12-16 Weeks | • Final Renewable Resources Strategy  
|                             |          | • Electronic folder containing relevant background materials |
| Task 7 Technical Assistance | 0-16 Weeks | • As determined on an assignment basis          |
**Vision Statement**

CHO is committed to the principles of environmental stewardship. CHO will strive to preserve our natural resources, operate efficiently, promote the airport as a steward of the environment, enhance our passenger experience and serve as a vital asset for Charlottesville, Albemarle County and Central Virginia.

**Goals**

Through the implementation of this strategy, CHO seeks to achieve the following goals:

1. Upgrade Facilities for Better Efficiency.
2. Reduce Weather-adjusted Utility Costs 20% below 2016 levels by Year 2025 and by 10% by 2020.
3. Serve as a Model of “Green” Success and Efficiency for the County and the Region.
## Planned Projects and Initiatives

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Project</th>
<th>Description</th>
<th>Task Lead</th>
</tr>
</thead>
</table>
| 1Q2018  | Recycling Program            | Official launch of public-facing recycling program and engagement with all tenants, including:  
• Public facing education materials  
• Training for tenants and airport staff  
• Placement of all necessary bins/containers | Director of Operations            |
| 1Q2018  | Terminal LED Retrofit Phase 1| Phase 1 nearing completion; 98% terminal lighting replaced with LED         | Maintenance Superintendent         |
| 2Q2018  | Gas Utility Engagement      | • Outreach to Natural Gas provider to extend service to airport terminal. BCA underway with Natural Gas Provider  
• Calculate GHG emissions reductions for switching to natural gas | Director of Ops & Maintenance Superintendent |
| 2Q2018  | Parking Lot LED Retrofit    | • Retrofit of parking lot lighting to LED included in parking lot expansion project design.  
• Feasibility of solar power arrays for parking lot canopy lighting. | Director of Operations            |
| 3Q2018  | Energy Consumption          | • Establish baseline of kilowatt consumption prior to terminal LED retrofit. Establish baseline for parking lot electricity consumption.  
• Develop and retain a “sustainability” intern to track energy consumption  
• Prepare outreach piece/website article on lighting retrofit and recycling program | Director of Ops & Airport Intern  |
| 4Q2018  | Boiler Replacement          | • Bids released for replacement of heat oil boiler system to natural gas  
• Calculate GHG emissions savings expected | Director of Ops & Maintenance Superintendent |
Pilot Study – Dayton Airport

Our Mission
Similar to our Sustainability Mission, we strive to conserve our natural resources, operate efficiently, promote Airport employees’ well-being, enhance our passenger experience and serve as a vital asset for Southwest Ohio and beyond.

Our Visions
Energy Optimization: We want to maximize energy efficiency and the use of renewable energy sources through system optimization, innovative design methodology and economic feasibility.

Resiliency: We will implement measures that prepare the Airport to mitigate the effects of climate change and support regional climate change mitigation plans and activities.

Environmental Steward: As a corporate and community leader minimize the Airport’s consumption of natural resources and its impact on the surrounding environment.

Sustainable Investment: We contribute to regional economic growth through sustainable investments of our land, capital, and human resources.
## Planned Projects and Initiatives

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Project</th>
<th>Description</th>
<th>Task Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>Restaurant Recycling with HMS Host</td>
<td>Set up a simple recycling station at the Fast Food Type Restaurants and include a Liquid Collection Station.</td>
<td>Airport Environmental</td>
</tr>
<tr>
<td>2019</td>
<td>Explore Feasibility of Bio-Jet fuel</td>
<td>Coordinate with FBO fuel supplier and PSA Airlines to investigate the feasibility of using bio Jet Fuel in a dedicated aircraft.</td>
<td>Airport Environmental</td>
</tr>
<tr>
<td>2019</td>
<td>Explore the feasibility of stocking a bio diesel blend</td>
<td>Coordinate with local fuel supplier on the feasibility of stocking Bio-Diesel Blend for Field Maintenance Vehicles.</td>
<td>Airport Operations</td>
</tr>
<tr>
<td>2019</td>
<td>Re-evaluate solar/storage microgrid</td>
<td>Continue to re-evaluate the opportunities to develop battery storage and a solar array on the airport.</td>
<td>Airport Engineering</td>
</tr>
<tr>
<td>2018</td>
<td>Verify Existing Conditions</td>
<td>Continue to develop and monitor opportunities to include renewable resources as a strategy to manage our energy, waste streams and building materials.</td>
<td>Airport Environmental</td>
</tr>
</tbody>
</table>
Pilot Study – Portland International Airport

Vision Statement

Keywords: net zero, demand, resiliency, investments, airlines, tenants, share, leadership

We will:

1. become a net-zero energy airport by generating more energy than we use, and the energy we generate will be renewable energy;

2. source all new future PDX power demand from energy efficiency and renewable energy sources;

3. use on-site renewable energy generation and energy storage to support PDX resiliency goals;

4. design, time and locate our investments in renewable energy to be as cost-effective as possible given other Port goals;

5. actively encourage airlines and the military that use PDX to use sustainable (renewable) aviation fuels in aircraft that operate at PDX;

6. require the use of renewable energy in tenant and partner facilities at PDX;

7. seek to share our generation / resiliency capacity with our community and neighbors; and we will

8. be recognized by our region and industry as a leader in the application of renewable energy.
Net Zero
PDX-controlled airport operations will achieve carbon neutrality by 2035

Electrification (TCORE or PDX-Controlled?)
- eGSE
- Domestic Hot Water (75% by 2023), (100% by 2028)
- Heating (25-50% by 2023), (100% by 2028)
- Cooking by Concessions (10% by 2023), (100% by 2028)

Energy Efficiency
- Reduce Port-wide energy consumption (kWh) by 20% from 2011 baseline by 2020
- Achieve energy efficiency target of 45 w/m2 by 2035

Renewable Energy
- 100% power sources for PDX-controlled facilities from renewables by 2035
## Renewable Resource Assessment for PDX

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Location</th>
<th>Availability</th>
<th>Compatibility</th>
<th>Accessible</th>
<th>Environmental</th>
<th>Cost Effective</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass</td>
<td>On-site/Off-site</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Geothermal</td>
<td>Off-Site</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Ground Source Heating</td>
<td>On-Site</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Hydro (utility)</td>
<td>Off-Site</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Hydro (low impact)</td>
<td>On-Site</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Ocean</td>
<td>Off-Site</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Solar PV</td>
<td>Off-Site</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Wind (utility)</td>
<td>Off-Site</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Wind (building)</td>
<td>On-Site</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Sustainable Fuels</td>
<td>On-Site</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

**Availability:** Is there resource available at PDX or region?
**Compatibility:** Is technology for generation compatible with PDX?
**Accessible:** Can the energy from the resource be accessed by PDX?
**Environmental:** Are the environmental risks associated with generating the energy low?
**Cost Effective:** Is generating energy from the resource cost-effective?
**Overall:** Cumulative assessment of the potential for developing the resource.

High: Resource scores highest in this category
Medium: Resource scores in the middle for this category
Low: Resource scores lowest in this category
Framework for Resource Allocation

- Years 1-5, continued focus on energy efficiency, ramp up on renewables
- Years 6-10, relative parity between energy efficiency and renewables
- Years 11-20, changing focus on renewables as cost effectiveness of energy efficiency diminishes
- Selection of energy investments to be determined based on cost-effectiveness (~80%), and resiliency/innovation (~20%)
Today’s Speakers

• Kris Russell, *Dallas Fort-Worth Airport*, KRussell@dfwairport.com

• Shawn Shaw, *Natural Power*, shawns@NaturalPower.com

• Stephen Barrett, *Barrett Energy Resources Group, LLC*, Steve@barrettenergygroup.com
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- Conducts research to find solutions.
- Publishes and disseminates research results through free publications and webinars.
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Report 119: Prototype Airport Sustainability Rating System—Characteristics, Viability, and Implementation Options

Report 124: Airport Parking Garage Lighting Solutions


Report 141: Renewable Energy as an Airport Revenue Source


Synthesis 21: Airport Energy Efficiency and Cost Reduction

Synthesis 24: Strategies and Financing Opportunities for Airport Environmental Programs

Synthesis 66: Lessons Learned from Airport Sustainability Plans

Synthesis 69: Airport Sustainability Practices—Drivers and Outcomes for Small Commercial and General Aviation Airports

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**November 7**
Comprehensive Renewable Resources Strategy for Airports

**November 20**
Using GIS for Land Use Compatibility Planning Near Airports

**December 10**
Give the ‘All Clear’—Hazard Zoning at GA Airports
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2020

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