# Generating Renewable Energy at Airports

Airports Going Green Conference
Chicago, IL
August 6, 2009

# *Presentation Overview*

- Geothermal
- Solar power (sunlight to electricity)
- Innovative financing
- Keys to success

# *Renewable Energy Market Drivers*

- Climate change
- Public sector and utility incentives and rebates
- Environmental leadership:  Walk the talk

# *Geothermal Airport Systems*

- Means “earth heat”
- Used since Roman times
- Same principle

# *Airport Examples*

- JFK Police Annex
- Juneau Airport
- Paris' Orly Airport (under construction)

# *How the Systems Work*

- Supplement heating and cooling
- Closed loop systems
- Circulate propylene glycol
- In winter transfers heat from earth to building
- In summer transfers heat from building to ground

# *Orly System Unique*

- Sits on hot water table
- Heating only
- Water flows directly into building system
- Due for completion in 2010

# *Solar: Free-Standing Projects*

- DIA
- Fresno-Yosemite
- Nellis AFB
- Charlotte-Douglas (planned)
- Metropolitan Washington Airport Authority (planned)

# *What They Have in Common*

- Land (5-10 acres)
- Lots of sun
- Outside funding
- Innovative 3rd party financing
- Environmental leadership

# Financial Incentives for Renewable Energy

Federal = ☐ State = ☐ Utility = ☐ Local = ☐ Non-Profit = ☐

| State | Personal Tax | Corporate Tax | Sales Tax | Property Tax | Rebates | Grants | Loans | Industry Support | Bonds | Production Incentives |
|---|---|---|---|---|---|---|---|---|---|---|
| Federal | 3 | 4 | 0 | 0 | 0 | 3 | 5 | 1 | 0 | 1 |
| Alabama | 1 | | | | 2 | 1 | 1 1 | | | 1 |
| Alaska | | | | | | 1 | 2 | | | 1 |
| Arizona | 3 | 1 | 1 | 2 | 6 | | 2 | 1 | | |
| Arkansas | | | | | | | | | | |
| California | | | | 2 | 6 36 3 | 1 | 2 1 4 | | | 1 1 |
| Colorado | | | 2 1 | 2 | 7 1 | 1 1 2 | 1 3 2 | | | |
| Connecticut | | | 2 | 1 | 1 2 | 3 | 2 | 2 | | |
| Delaware | | | | | 1 | 2 | | | | |
| Florida | | 2 | 2 | 1 | 1 8 1 | 1 | 5 | 1 | | 2 |
| Georgia | 1 | 1 | 1 | | 8 | | 1 | | | 2 |
| Hawaii | 1 | 1 | | | 2 | | 1 2 1 | 1 | | |
| Idaho | 1 | | 1 | 1 | | 1 | 1 | | 1 | 1 |
| Illinois | | | 1 | 2 | 1 | 2 1 | | | 1 | 1 |
| Indiana | | | | 1 | 4 | 1 | 1 | | | |
| Iowa | 1 | 1 | 1 | 3 | 11 | 1 | 2 1 | | | |
| Kansas | | | | 1 | 2 | | | 1 | | |
| Kentucky | 1 | 2 | 1 | | 7 | | 1 1 1 | | | 1 |
| Louisiana | 1 | 1 | | 2 | | | 2 | | | |
| Maine | | | 1 | | 1 | 1 | 1 | | | 1 |
| Maryland | 3 | 3 | 2 | 5 7 | 3 1 | | 3 | | | |
| Massachusetts | 2 | 3 | 1 | 1 | 2 4 | 2 | 1 | 1 | | 1 |
| Michigan | | | | 2 | 1 | 2 | | 3 | | 1 |
| Minnesota | | | 2 | 1 | 2 22 | 1 2 | 5 3 | | | 1 1 |
| Mississippi | | | | | 4 | | 1 2 | | | 1 |
| Missouri | | 1 | | | 6 | | 1 1 | | | |
| Montana | 3 | 1 | | 3 | 4 | 1 | 1 | 2 | | 1 |
| Nebraska | | | 1 | | 2 | | 1 | | | |
| Nevada | | | 1 | 4 | 1 | | 1 | | | |
| New Hampshire | | | | 1 | 1 4 | | 1 | | | |
| New Jersey | | | 1 | 1 | 4 | | 2 1 | 1 | | 1 |
| New Mexico | 4 | 3 | 2 | 1 | | | 1 | 1 | 1 | 3 |
| New York | 3 | 1 | 1 | 2 1 | 5 4 1 | 2 | 2 | 2 | | 1 |
| North Carolina | 1 | 1 | 1 | 2 | 4 | 1 | 1 1 | | | 3 1 |
| North Dakota | 1 | 1 | | 2 | | | 2 | | | |
| Ohio | | 1 | 1 | 2 1 | 5 1 | 6 | 1 1 1 | 1 | | |
| Oklahoma | | 1 | | 1 | 1 | | 4 1 | 1 | | |

# *Power Purchase Agreements*

- Contract between financing company and host-site
- Obtains state, federal grants, rebates, renewable energy credits
- Company owns, operates, and finances system—sells electricity to customer

# *Power Purchase Agreements*

- Company finances process (permits, design, procurement, installation)
- Company owns and operates system
- Issues PPA with term lengths and option to buy (site host)

# *Power Purchase Agreements*

- Customer provides site
- Access for operations and maintenance
- No capital outlay
- Customer pays only for energy used
- Fixed energy price
- Option to purchase

# *Roof-top Applications*

- San Francisco
- Long Beach
- Burbank
- Austin-Bergstrom
- Many others

# *Integrated Solar Roof-top Systems*

- More cost-effective
- 20-30% more efficient than crystalline panels
- Must be integrated into roof design/ replacement
- Requires advanced planning

# *Keys to Success*

- Sun
- Outside funding
- Innovative 3rd party financing
- Willingness to accept longer payback periods
- Environmental leadership