Blue Wing Solar Energy Project

April 9, 2011

Presented to:
North Texas Renewable Energy Group

Presented by:
John Kosub, P.E.
CPS Energy
Overview

- CPS Energy Company Overview
- Strategic Energy Plan
- Blue Wing Project
Company Overview

- Nation’s largest municipally-owned electric & gas utility.
- Serves over 1 million customers in Bexar County and seven adjoining counties.
  - 1,514-square-mile service area
  - 707,000 electric customers
  - 322,000 gas customers
- Generates all of its electricity from its 4 plant locations in Bexar County, plus 40% ownership of the South Texas Project, Units 1&2 in Bay City.
Company Overview

• Texas’ oldest utility company
  – Gas light system originated in 1860s
• 3,600 employees
• $9 billion in total assets
  – AA+/AA/Aa1 revenue bond ratings
• $250 million annual return paid to owner, the City of San Antonio
Guiding Principles

Pursue Conservation & Energy Efficiency

Increase Renewable Energy Supply

Supply Low-Cost, Diverse, Competitive Electric Power

Maintain Environmental Commitment

Strategic Energy Plan
Diversification is the key to supplying competitively priced electricity.

**Installed Capacity**

**1970**
- Gas: 100.0%
- 1,648 MW

**1980**
- Gas: 75.1%
- Coal: 24.9%
- 3,338 MW

**1990**
- Gas: 61.1%
- Nuclear: 17.8%
- Coal: 21.1%
- 3,930 MW

**2010**
- Gas: 39.4%
- Nuclear: 11.1%
- Coal: 33.2%
- 6,910 MW
2010 Native Load Generation (MWh)

- **Wind**: 96%
- **Nuclear**: 39%
- **Coal**: 41%
- **Solar**: 1%
- **Landfill Gas**: 3%

**Renewable Generation**:
- **Renewable**: 10%
- **Gas**: 6%
- **Purchased Pwr**: 4%

"STEP" energy efficiency & conservation is included.
Peak Demand vs. Capacity

Note: Peak includes 13.75% reserve margin

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Why Renewables are Important

- Provide a long term, energy solution to our community
- Diversify our generation portfolio beyond fossil fuels and nuclear
- Significantly less environmental impacts than fossil fuel and nuclear
- Provide a hedge against the uncertainties around carbon and other environmental regulation

CPS Energy goal is to have 1,500 MW of renewable generation by 2020 or ~20% of our generation capacity
Strategic Energy Plan
Renewable Goal

- Renewable Goal: 1,500 MW by 2020
  - Goal includes 100 MW of non-wind

- 883 MW in operation (59% of goal):
  - 859 MW wind
  - 9.6 MW landfill gas
  - 14.4 MW solar

- Additional 30 MW of solar under contract
WIND, SOLAR, & LANDFILL GAS INSTALLATIONS

Cottonwood Creek – 341.3 MW
Blue Wing Solar Project – 14 MW
SunEdison Solar Project – 30 MW
Desert Sky – 160.5 MW
Covel Gardens Landfill – 9.6 MW
Cedro Hill – 150 MW
Papalote Creek – 130.4 MW
Peñascal – 76.8 MW
Renewable Purchases

CPS Energy Annual Renewable Purchase

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<tr>
<th>Year</th>
<th>Expenditures (Energy Only)</th>
<th>MWh</th>
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Projected: 2013 - 2016

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2011 Projected Monthly Bill Impact

Net Monthly Bill Impact = $5.60

- Net Bill Impact
- Avoided Energy Cost

Solar includes all currently contracted solar capacity
Wind does not include costs related to “congestion”
Benefits related to off-system market sales are not included

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### Advantages
- No emissions
- No fuel cost
- About half the output is available at peak demand
- Very little water usage
- Works in clear or cloudy conditions (CPV only in clear)

### Key Challenges
- High cost
- Variable output
  - Nighttime & clouding
- Can run only about 15 – 25% of the time
- Best solar is remote from load which requires transmission
- Large areas of land needed
  - 5 to 10 acres per MW
- Output degrades 0.5% per year
- Storage technologies are needed
Renewable Contribution to System Peak

CPS Energy Renewables at System Peak

Project MW

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<thead>
<tr>
<th>Year</th>
<th>W TX Wind</th>
<th>Landfill</th>
<th>Coastal Wind</th>
<th>Solar</th>
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Peak MW

- W TX Wind
- Landfill
- Coastal Wind
- Solar
- System Peak

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2020 Renewable Plan – Annual Average Hourly Profiles

- Solar: 1,359 MW
- West Texas Wind: 129 MW
- South Texas Wind: 129 MW
- Coastal Wind: 20 MW
- Landfill Gas: 20 MW

Total = 1,508 MW

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Other Solar PV in San Antonio

200.6 kW Pearl Brewery Solar Array

130 kW Solar Landfill Cover at Republic Services

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Texas’ First Solar-Tile Home
Located in Northwest San Antonio
Future CPS Energy Solar Projects

- Sun Edison PV Project in development
  - 30 MW (3 x 10 MW) single axis tracking
  - Local economic development
- 2011 Solar RFP
  - Up to 50 MW of solar PV in San Antonio area
  - Local manufacturing, education, & R&D
  - Responses due 5/16/11
2008 Request for Proposals

• RFP Results
• August 2008 Solar Energy Request for Proposals
• 24 Respondents
• 36 proposals
• Technologies – Photovoltaic, Concentrating Solar, Thermal Trough – Up to 100 MW
• Bid Price Range - $150 to $315 per MWh
• Blue Wing (juwisolar) one of six shortlisted proposals

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14.4 MWac utility-scale solar PV plant
Thin film, fixed tilt
5th 6th largest PV plant in U.S.
Location – southeast of San Antonio, Texas
Equity Owner – Duke Energy
juwi solar - engineer and constructor
CPS Energy is power off-taker
Contract Term – 30 years
On-line: November 5, 2010
Blue Wing Solar Project

- 115 acre site
- 214,500 solar PV modules – 75 watts each
  - First Solar CdTe thin film
- 4,290 flex racks from Northern States Metals
- 1,000 volts dc on array side
- Twenty-two 630 kW SMA inverters
- Two 13.2 kV feeders to two substations – 7.5 MW ea.
- Oriented 25 degrees west of south
  - Frequently cloudy mornings
- Average annual generation - ~ 26,500 MWh

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Blue Wing Solar Project

Demonstration Project – 500 kW

• Provides opportunity to study and compare application of new and existing PV and concentrated PV technologies

• 8 Solar Technologies

• Generated energy will be part of the overall Blue Wing project
Blue Wing Solar Project

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Source: ju wisolar
Blue Wing Solar Project
Blue Wing Hourly Performance

March 2, 2011

March 4, 2011

Output (MW) vs. Hour Ending

Output (MW) vs. Hour Ending
Discussion