Meeting our Energy Challenges
Through
On-Site Clean Energy Generation

Siemens Building Technologies
October 5, 2009
Facing Global Energy Challenges

Siemens Building Technologies; On-site Clean Energy Generation
Facing Global Energy Challenges

- Increased global competition for scarce resources
- The US produces ¼ of the world’s CO₂ emissions
- Cheap, plentiful energy supply is a thing of the past
- A reliable and secure energy supply is a national security issue

Impacts our World of Tomorrow....

What we Know Today....

- Increased demand for fossil fuels
- Global fossil fuel production will peak
- Our nations facilities are aging and inefficient
- Energy prices are rising and volatile
- Strained energy infrastructure and delivery system
Facing Global Energy Challenges

- 5% of world population
- 24% of world energy consumption
- 23% of world CO₂ emissions
- Import 56% of consumed oil
- 40% of cars run on 100% ethanol
Facing Global Energy Challenges

- **Oil**: +85%
- **Natural Gas**: +200%
- **Coal**: +120%
- **Renewable**: +132%
- **Nuclear**: +351%

Source: EIA
Meeting those Challenges

- **Manage** total energy expenditure and costs to achieve stability and predictability – and affordability
- Continually **Improve** facility energy performance to maximize efficiency & reduce operating costs
- **Ensure** a robust, flexible and diverse supply of energy to meet long term needs
- **Balance** goals for environmental initiatives with financial impact & budgetary constraints
- **Create** healthy environments for all communities
Renewable Energy – Still in it’s Infancy

World Electricity Generation by Source

1973

- Coal: 38%
- Oil: 25%
- Natural Gas: 3%
- Hydroelectric: 21%
- Nuclear: 12%

2003

- Coal: 40%
- Oil: 7%
- Natural Gas: 19%
- Hydroelectric: 16%
- Nuclear: 16%
- Renewables: 2%

Role of Renewables in the U.S. Energy Supply

Domestic U.S. Energy Consumption by Source – All Forms of Energy

- Petroleum: 40%
- Coal: 23%
- Natural Gas: 23%
- Nuclear: 8%
- Renewable: 6%
  - Biomass: 47%
  - Hydroelectric: 45%
  - Wind: 2%
  - Solar: 1%
  - Geothermal: 6%

Source: US Department of Energy, 2004 Figures
Role of Renewables in U.S. Electricity Generation

U.S. Electricity Generation by Source – (Power Only)

- Coal: 51%
- Nuclear: 21%
- Natural Gas: 16%
- Renewables: 9%
- Petroleum: 3%
- Solar: <1%
- Wind: 4%
- Geothermal: 4%
- Biomass: 17%
- Hydroelectric: 75%

Source: Energy Information Administration, 2004 Figures
Role of Renewables in the Florida Energy Supply

Florida Electric Generating By Fuel Source

Installed Generating Capacity - By Primary Fuel Source

- Natural Gas: 39%
- Coal: 23%
- Oil: 24%
- Nuclear: 8%
- Non-Utility Generators: 4%
- Renewable: 1%

Generating Capacity Additions 2005-2014
By Primary Fuel Source

- Natural Gas: 80%
- Oil: 1%
- Coal: 19%
Role of Renewables in the Florida Energy Supply

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\[\text{Gas} \text{ Petroleum} \text{ Coal}\]
Benefits Of Renewable Energy

Schools and Communities that turn to renewable energy are enjoying these benefits:

- **Economic:**
  - Fuel cost savings
  - Reduced operating expenses
  - Job creation related to project
  - Improved economic development near the landfill

- **Community:**
  - Enhanced image as an innovative community
  - Responsible community planning
  - A safer landfill and reduced odors

- **Environmental:**
  - Improved local air quality
  - Reduced greenhouse gas emissions

- **Energy:**
  - A reliable local fuel source
  - Less need for polluting fossil fuels
Facing Global Energy Challenges

Siemens Building Technologies;
On-site Clean Energy Generation
Alternative and Renewable Energy

- Net Metering
- Avoided Cost Rate
- Power Purchase Agreement (PPA)
- Renewable Energy Credits (RECs)
- Carbon Credits
- Renewable Portfolio Standard (RPS)
- Feed-In Tariff
- www.dsireusa.org
Siemens-Alternative and Renewable Energy

- Solar Photovoltaic (PV)
- Solar Thermal
- Wind
- Fuel Cell
- Geothermal Cooling
Alternative and Renewable Energy – Solar PV

- Service Territory
  - Net Metering
  - Avoided Cost Rate
- State Incentive capped ($100k)
- Fed Tax Incentive
- Impending RPS
- Currently ~ 40+ year pay back
Alternative and Renewable Energy – Solar PV

- Area Requirement
  - 75,000sqft – TRAD.
  - 100,000sqft - TF
- 5.5 Full Sun Hours
- Low Maintenance
- Cells Produce DC to be converted to AC
- 20 Year Warranty
Siemens provided a 1.1 megawatt solar photovoltaic generation PPA combining Carport mounted (700kw) and roof mounted (400kw) for Siemens Transportation Services in Sacramento California. The system is expected to generate almost 30 million KWh of electricity over the first 20 years and is equal to approximately 150 residential solar systems.
Siemens was the contractor for a 128 kw solar photovoltaic carport structure for the South Coast Community College in Costa Mesa, California.
Siemens-Solar Photovoltaic – Thin Film

Thin Film Solar PV is applied directly to the roof with an adhesive
Alternative and Renewable Energy - Solar Thermal

- Water Heaters
- Space Heating
- Swimming Pools
- Air Conditioning
- Science Labs
- Sterilization
Alternative and Renewable Energy - Wind Energy

- REC$\text{s}$
- Schools with land
- Demonstration Project
- Education Enhancements
Alternative and Renewable Energy - Wind Energy

United States - Wind Resource Map

This map shows the annual average wind power estimates at 50 meters above the surface of the United States. It is a combination of high resolution and low resolution datasets produced by NREL and other organizations. The data was screened to eliminate areas unlikely to be developed onshore due to land use or environmental issues. In many states, the wind resource on this map is visually enhanced to better show the distribution on ridge crests and other features.

Wind Power Classification

<table>
<thead>
<tr>
<th>Wind Power Potential</th>
<th>Wind Power Density at 50 m</th>
<th>Wind Speed at 50 m</th>
<th>Wind Speed at 90 m</th>
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<td>5 Excellent</td>
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*Wind speeds are based on a Weibull k value of 2.0

U.S. Department of Energy
National Renewable Energy Laboratory
Alternative and Renewable Energy – Fuel Cell

- Computer Labs
- District Computer Servers
- Remote Schools
- Education Programs
- NREL
Alternative and Renewable Energy – Geothermal

- HVAC Energy Reduction
- Buildings In Close Proximity
- Environmentally Friendly
- Safety
- Space Requirements
- Installed 105 units in Sylacauga, AL
Advanced Renewable Energy

- Biomass
  - Shaw
- Landfill Gas
  - Three Rivers
  - Manatee County
- Solar Thermal Power
  - Arizona
  - California
  - Nevada
Shaw Industries and Siemens have developed a 15 million dollar process for converting carpet and wood waste into steam energy and, as a result, will lower plant emissions, greatly reduce the amount of post-manufacturing carpet waste in landfills, and save Shaw’s plant up to 2.5 million dollars per year.
Siemens Building Technologies, Inc. (Siemens) has assisted the Hudson Valley Community College in upstate New York to become energy independent, partially by converting methane gas from a local landfill into electricity. The project is expected to save the community college more than $1.3 million in energy costs while paying for the construction, operation and maintenance of the plant over a 15-year period.
The sun over Nevada is supplying environmentally friendly electricity — thanks to a solar-thermal power plant that recently went online in the desert there. The facility with an area of one square kilometer focuses sunlight for heating water, with the resulting steam used to drive a 64-megawatt turbine built by Siemens.
Questions?