Transforming the Energy Future: NREL’s Role

Janice Rooney
Manager, Corporate Relations
April 9, 2010
Energy Challenges

Security
- Secure supply
- Reliable Infrastructure

Economy
- Economic Development
- Energy price volatility
- Affordability

Environment
- Carbon mitigation
- Land and water use

All three imperatives must be simultaneously addressed.
Our Energy System

Supply & Conversion
- Oil 40%
- Coal 23%
- Natural Gas 23%
- Nuclear 8%
- Hydro 6%
- Wind
- Solar
- Biomass
- Geothermal

Transmission & Distribution
- 61%

Utilization
- 27%
- 40%
- 33%

Lost energy as inefficiencies – 62%
Renewable Energy Resources

- Solar
- Wind
- Geothermal
- Biomass
- Water
An Integrated Approach is Required
State Policy Framework
Renewable Portfolio Standards

Source: DSIRE database, January 2010
The Database for State Incentives for Renewable Energy

www.dsireusa.org
NREL Status Report
What Makes NREL Unique?

• Only national laboratory dedicated to renewable energy and energy efficiency R&D
• Collaboration with industry and university partners is a hallmark
• Ability to link scientific discovery and product development to accelerate commercialization
Technology Development Programs

Efficient Energy Use
- Vehicle Technologies
- Building Technologies
- Industrial Technologies

Renewable Resources
- Wind and water
- Solar
- Biomass
- Geothermal

Energy Delivery and Storage
- Electricity Transmission and Distribution
- Alternative Fuels
- Hydrogen Delivery and Storage

Foundational Science and Advanced Analytics
Technology for Cost Effective Zero Energy Buildings

NREL Zero Energy Habitat House

BIPV Products & PV-T Array

Compressorless Cooling

Electrochromic Windows

Polymer Solar Water Heaters

Computerized optimization & simulation Tools
Renewable Electricity Supply
Wind Energy Technology

US Wind Resource Exceeds Total Electrical Demand

Offshore Wind

Advanced Blades

Innovative Tall Towers

Giant Multi-megawatt Turbines

Wind Forecasting

Courtesy: WindLogics, Inc. St. Paul, MN
NREL Research Thrusts

- Improved performance and reliability
- Advanced rotor development
- Utility grid integration
Solar Research Thrusts

Photovoltaics
- Higher performance cells/modules
- New nanomaterials enabled technologies
- Advanced manufacturing techniques
- Improved reliability

Concentrating Solar Power
- Low cost high performance storage for baseload markets
- Advanced absorbers, reflectors, and heat transfer fluids
- Next generation solar concentrators

8.22-megawatt Alamosa, Colo., Solar Power Plant
Sustainable Transportation
Biomass Scenario Model

Organizational Framework of the Model: The Biofuels Supply Chain
2nd generation—from lignocellulosic biomass materials, primarily producing ethanol via biochemical or thermochemical conversion.
Test Vehicles

NREL Plug-in Electric Vehicle – Solar Tree

CoolCab task, studying ways to improve thermal efficiency in truck sleeper cabins to save fuel and $

NREL Hydrogen Fueling station
Transportation Tools

- **130 Truck Stop Electrification Systems** - truckers “plug in” vehicles to operate systems without idling the engine

- **Mobile Truck Stop Electrification Locator** - provides drivers remote access to site via cell phones and PDAs

- **Alternative Fuels and Advanced Vehicles Data Center (AFDC) web portal** - quick navigation to tools, maps and vehicle information

www.afdc.energy.gov
Market Applications
Working with Partners

NREL’s Renewable Energy Optimization team supports Frito-Lay’s plan to save energy by integrating renewable energy and efficiency technologies.

DuPont and NREL researchers worked side-by-side in the facility to move biomass conversion technology from the laboratory to pilot scale.

Wal-Mart recognized that using LED (light-emitting diode) lights in their refrigerated and frozen food cases achieved as much as a 70% energy savings compared to standard fluorescent lights.
Energy Analysis and Tools

- Jobs and Economic Development Impacts (JEDI)
- IP Portal
- PVWatt
- Energy 10
  www.nrel.gov/analysis

- Virtual Information Bridge to Renewable Energy and Energy Efficiency (VIBE)
  http://vibe.nrel.gov/
Educating the Future Workforce

• Student education programs

• In-service teacher training

• Mobile education program

• Internship programs
Working With NREL

Use our state-of-the-art research facilities
http://www.nrel.gov/research_facilities/working_with.html

Partner with a research program
http://www.nrel.gov/science_technology/working_with.html

Deploy your technology
http://www.nrel.gov/applying_technologies/working_with.html

Commercialization and technology transfer
http://www.nrel.gov/technologytransfer/

Use a renewable energy analysis tool
http://www.nrel.gov/analysis/