Major NREL Technology & Market Thrusts

Supply Side
- Wind Energy
- Solar
  - Photovoltaics
  - Concentrating Solar
  - Solar Buildings
- Bio-Energy
  - Power
  - Biofuels
- Geothermal Energy
- Hydrogen
- Superconductivity
- Grid Integration

Demand Side
- Transportation
- Fuels Utilization
- Buildings Energy Technology

Cross Cutting
- Basic Energy Science
- Strategic Energy Analysis
- International Programs
- Integrated Deployment
- FEMP
- State & Local Initiatives
- Tribal Energy Program

NATIONAL RENEWABLE ENERGY LABORATORY
Renewable Resource Options

- Geothermal
- Biomass
- Solar
- Wind
- Hydro
Energy Efficiency

Energy Star Appliances

- Refrigerators – Half as much energy
- Clothes Washers – Save up to $110 per year
- Oil & Gas Boilers – Save up to 10%
- Programmable Thermostats – Save up to $100 per year

Efficient Lighting

If every American changed out 5 lights, we’d save $6 billion/year and the equivalent of 21 power plants.
Building Design

“Whole Buildings” Strategy:
Existing R&D programs, building technologies, and components tied together by Systems Integration and Computerized Design Tools.

Passive Solar Strategies
- Siting and orientation, glazing size and location, and shading strategies contribute to a passive solar, or “climate-responsive,” building.

Advanced Technologies
- Energy-saving appliances, advanced energy controls and thermostats, efficient heating and cooling systems, photovoltaics, and solar water heating systems.

Energy-Efficient Materials
- Superior building materials, including high-efficiency windows, insulation, brick, concrete masonry, and interior finish products.
Wind Turbine Sizes and Applications

Small (≤10 kW)
- Homes
- Farms
- Remote Applications (e.g. water pumping, telecom sites, icemaking)

Intermediate (10-250 kW)
- Village Power
- Hybrid Systems
- Distributed Power

Large (250 kW – 2+ MW)
- Central Station Wind Farms
- Distributed Power
Wind Powering America – Anemometer Loans

- 20m WPA Monitoring Completed
- 20m WPA Anemometer
- 50m WPA Anemometer
- 50m TEP Anemometer
Geothermal Options
Bioenergy Opportunities

Heat

Power

Fuels
Bioenergy Project Requirements

Energy Markets

- Long term Agreements
- Competitive Prices
- Environment
- Economic
- Social

Success

- High Capacity Factor
- High Availability

Conversion Technology

- Competitive Investment Cost

Feedstock Supply

- Renewable
- Sustainable Resource

Renewable Resource

Competitive Prices

Technically Proven

High Availability

NATIONAL RENEWABLE ENERGY LABORATORY
Small & Micro Hydro Power Options

http://hydropower.inl.gov/prospector/
We Live in a Changing World

Crude Oil Prices
2008 Dollars

$100
$80
$60
$40
$20
$0

2008 $/BARREL

1970 - August, 2009

- U.S. 1st Purchase Price (Wellhead)
- "World Price"*
- Avg U.S. $32.36
- Avg World $35.59
- Median World $30.04

PDVSA Strike
Iraq War
Asian Growth
Weaker $

Iran / Iraq
Revolution

Oil Embargo

Asian Financial Crisis
OPEC 10% Quota Increase

Gulf War

Series of OPEC Cuts
4.2 Million Barrels

9/11

Recession

WTRG Economics ©1998-2009
www.wtrg.com
(479) 293-4081
We Live in a Changing World

U.S. / Euro Foreign Exchange Rate (DEXUSEU)
Source: Board of Governors of the Federal Reserve System

5 Year Copper Spot

STEEL

Source: MEPS (International) LTD.
http://www.meps.co.uk

www.kitco.com
We Live in a Changing World

CORN

DAILY Cash - Nearby Futures Contract

(September 2006 - Present time)

SD Ave. Cash Price   Nearby Futures

S-06 N-06 J-07 M-07 M-07 J-07 S-07 N-07 J-08 M-08 M-08 J-08 S-08 N-08
Coal costs fire up

Mining expenses and foreign demand will bring higher prices to electric bills

By Mark Jaffe, The Denver Post

When it comes to making electricity, nothing is cheaper than coal — but with growing foreign demand, rising mining costs and declining East Coast reserves, not even coal will be as cheap.

And with almost 60 percent of Colorado’s electricity generated from coal-fired power plants, those prices will find their way into electric bills across the state.

Colorado has mandated that 30 percent of electricity from regulated utilities come from renewable energy sources by 2030, and there is a plan to replace three aging Xcel Energy coal plants with natural gas.

Still, coal will be a major source of electricity in the state for decades to come.

“While coal will remain an important part of the energy picture in Colorado for years into the future, new energy sources are increasingly attractive from cost and environmental perspectives,” said Todd Hartman, a spokesman for the Governor’s Energy Office.

Since last October, the price for a one-month contract for Wyoming’s Powder River Basin coal, a main Colorado supplier, has risen 67 percent to $33.86 a ton, according to coal broker Evolution Markets.

“Tenders are more efficient, but at some point, that gets into the bill,” said Jason Friebl, power production manager for the Platte River Power Authority, which serves Fort Collins, Loveland, Longmont and Estes Park.

“For years Powder River Basin coal was $5 a ton,” Friebl said.

Then that coal began to be shipped east and the price ticked up. “The next wave came as more coal began moving overseas,” he said.

The Platte River Power Authority, Colorado Springs Utilities and Xcel Energy provide electricity to more than 1.6 million customers in Colorado and all depend on coal from the Powder River Basin.

“We are expecting the market price to climb,” said Michele Fujimoto, the Colorado Springs Utilities fuel manager.

“The price impact is dampened by long-term contracts and Hodges, Fujimoto said.

“Over the past five years, coal market prices have been peaks, valleys and a general escalation in delivered prices,” Francis Roberts, a consultant for Colorado coal, said.

Source Bloomberg

Prices continued to climb because of deep changes in the coal market, Kolyukhin said.

The biggest change is China’s shift in 2009 from a coal exporter to an importer and the growing demand from India.

By 2030 China’s coal consumption will quadruple and India’s will double, according to Peabody Energy Corp., the largest U.S. coal producer and a major operator in the Powder River Basin.

The rest of the world is starting to tap into the U.S. market, and it is going to have a rip-through, British Columbia, for shipment to China, South Korea and South America.

Peabody is looking to develop a West Coast terminal, Rick Navarre, the company’s president and chief commercial officer, told an investor forum in June.

“Discussions are underway with customers and counterparties in several Asian nations,” Navarre said.

Compounding the price pressure is rising costs in mining the Powder River Basin as coal seams run deeper underground.

The industry has been able to offset the
We Live in a Changing World
We Live in a Changing World

Tribal Energy Security ↔ Tribal Sovereignty

General Council

Tribal Council

Legal
- Sovereignty, Codes & Standards, Contracts, Legal Authority

Environment
- Earth, Air, Water, Parks, Open Space, Wildlife & Plants

Financing
- Local Resources, Federal Grants, “Green Tag” Sales, Partnerships

Community Energy Use & Growth
- Residential, Commercial, Industrial Loads

Technology
- Energy Resources, Technology Options

Power Markets
- On-Site Energy Displacement, Merchant Power Sales, “Green Tag” Sales

Strategic Plan

Projects