

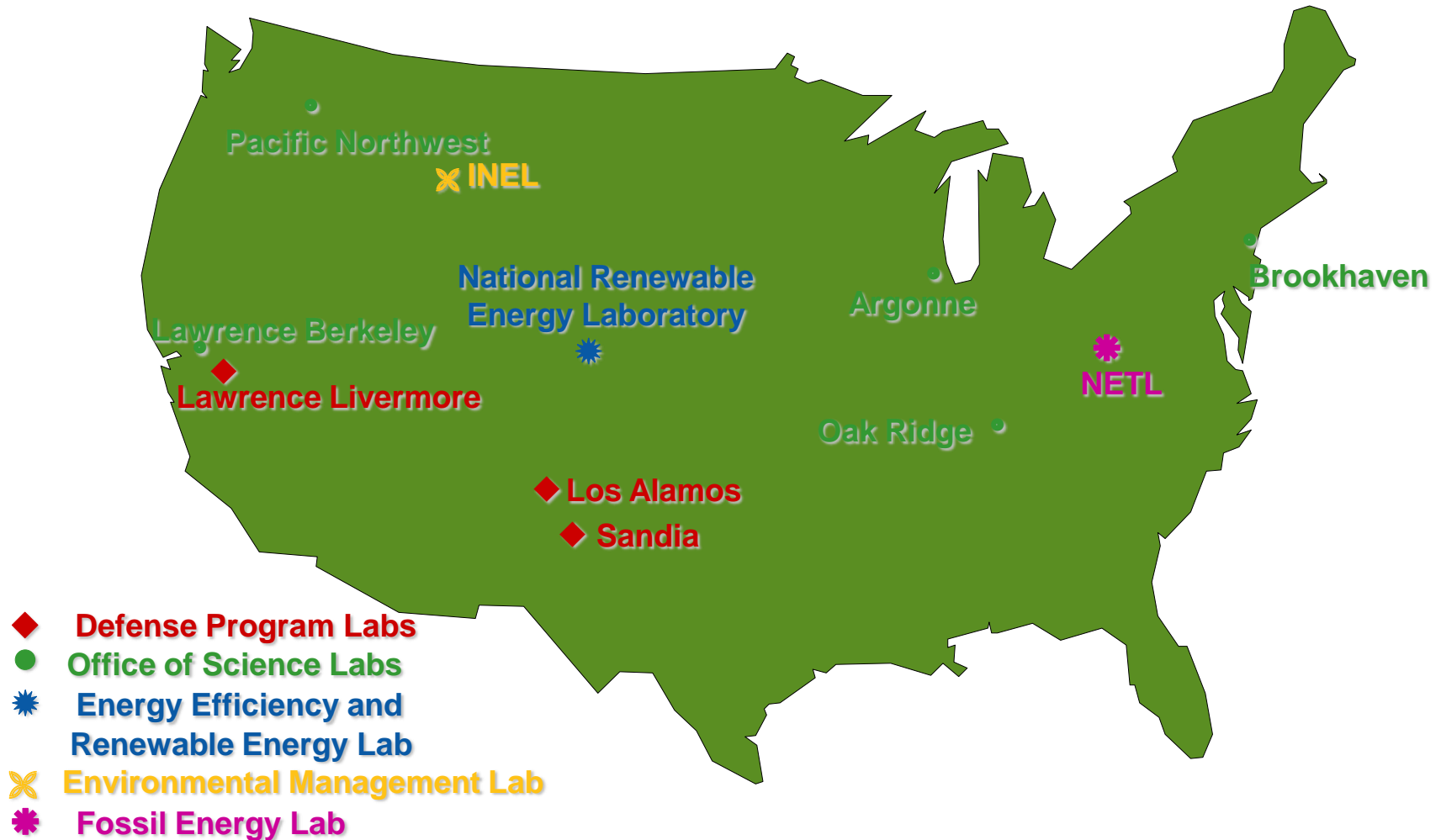


Tribal Energy Program 2010 Annual Review

Roger Taylor

October 25-29, 2011

Major DOE National Laboratories



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

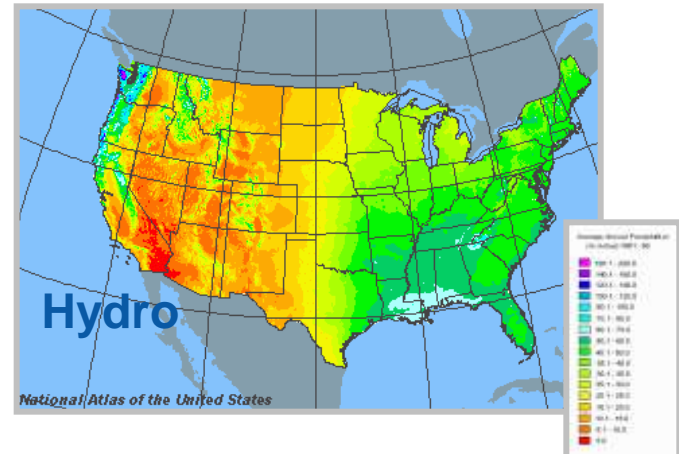
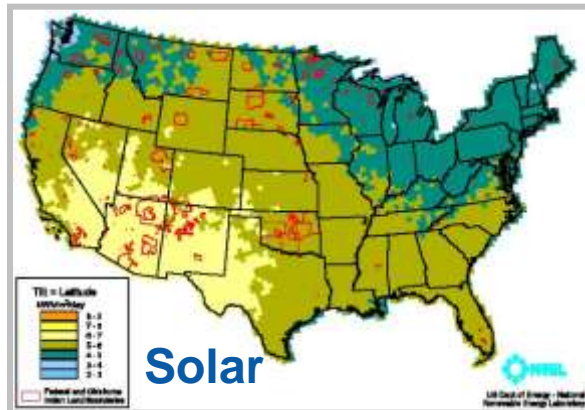
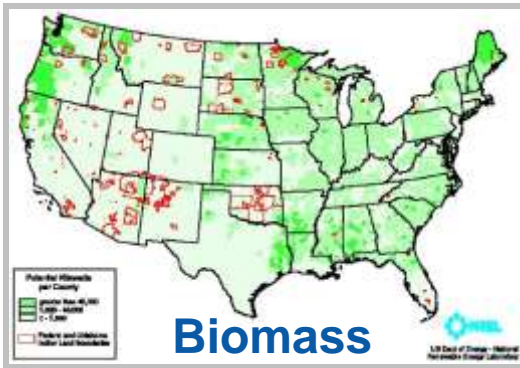
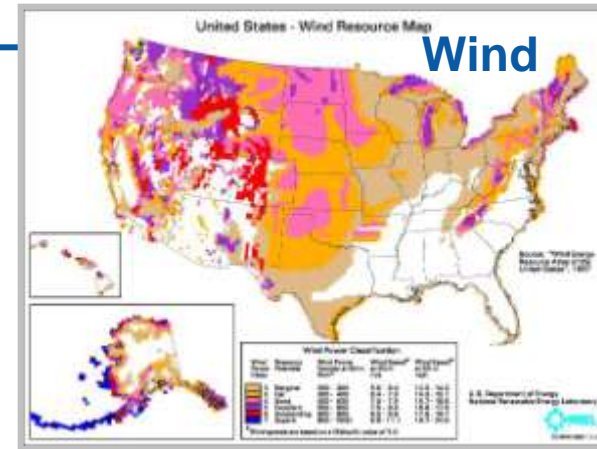
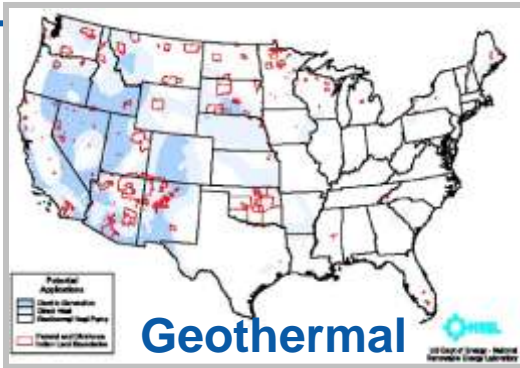
Integrated Deployment

FEMP

State & Local Initiatives

Tribal Energy Program

Renewable Resource Options



Renewable Technology Options

Power



Biomass Heat, Power & Fuels



Small Wind



Diesel Hybrids



Big Wind



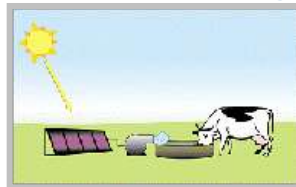
Direct Use



Remote Homes



Stock Watering



Small Hydro



CS Power & Heat



Buildings



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

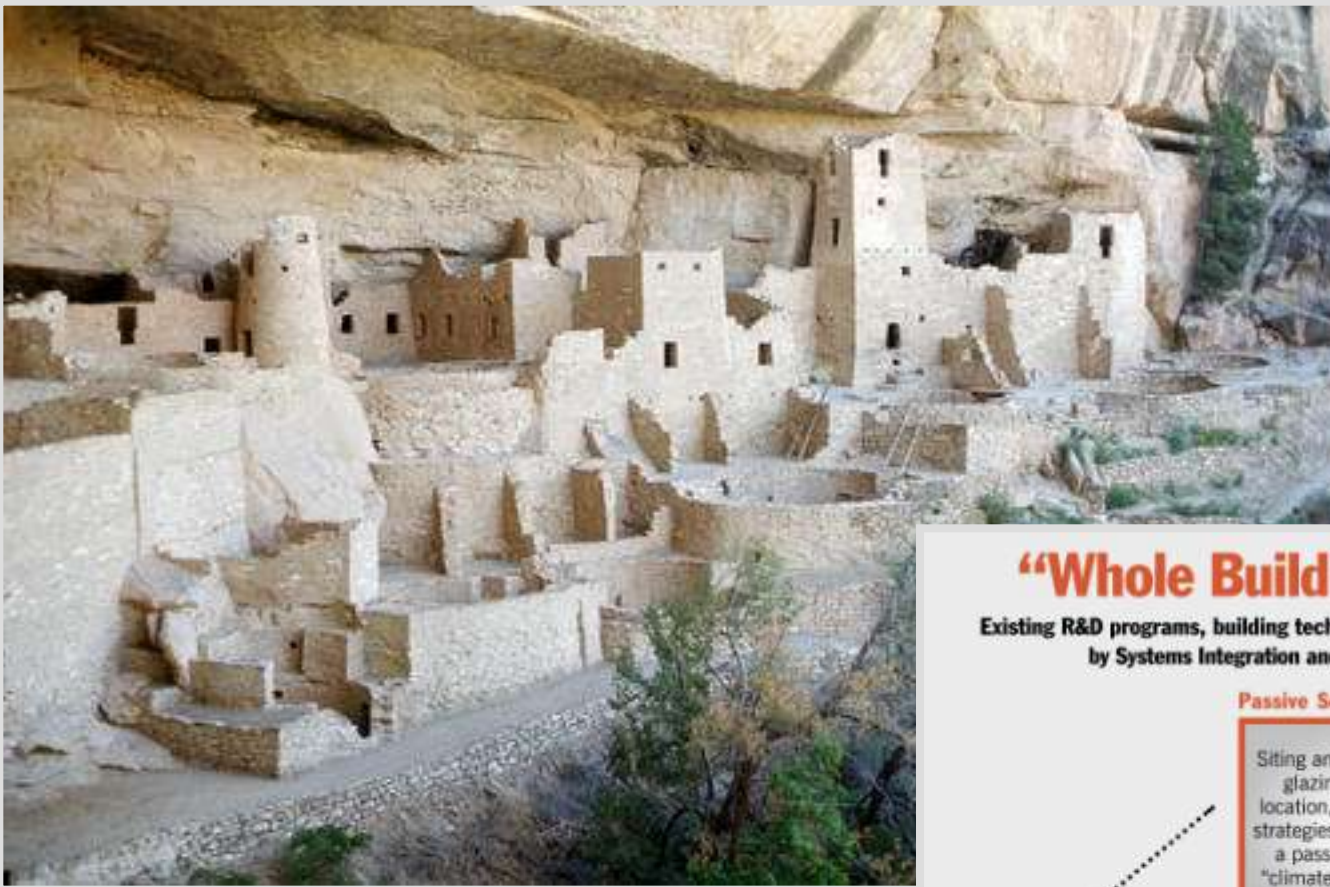


Efficient Lighting



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

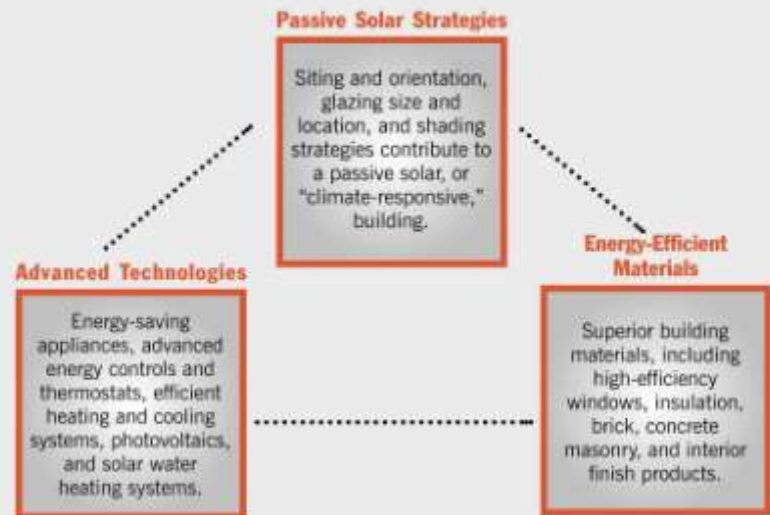




Building Design

“Whole Buildings” Strategy:

Existing R&D programs, building technologies, and components tied together by Systems Integration and Computerized Design Tools.



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

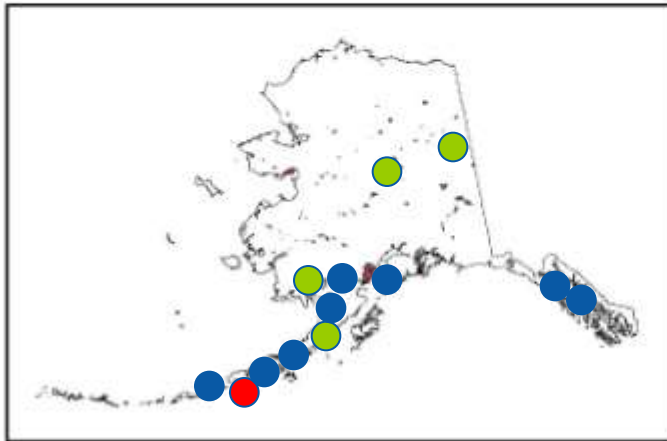
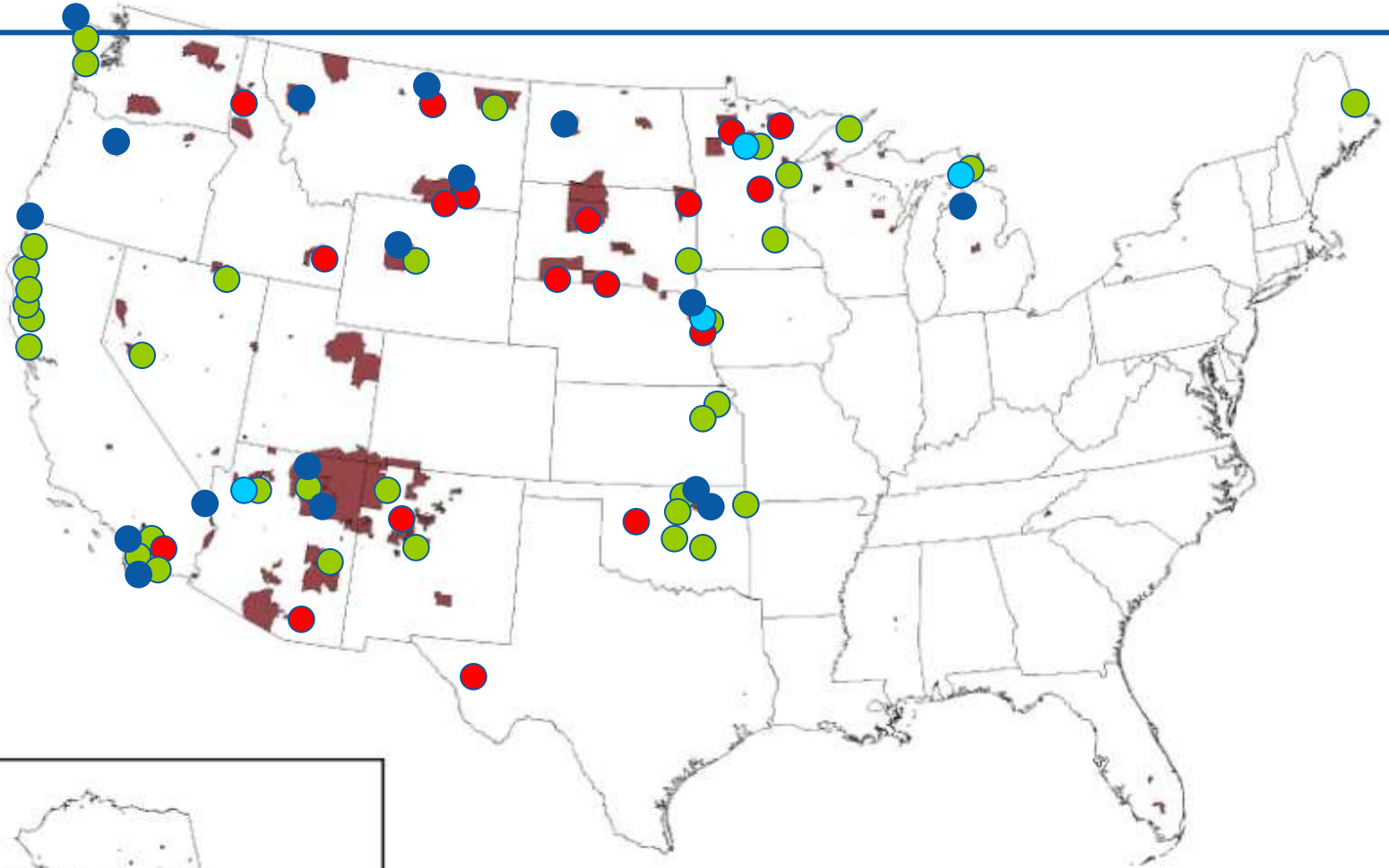


Large (250 kW – 2+ MW)

Central Station Wind Farms

Distributed Power

Wind Powering America – Anemometer Loans

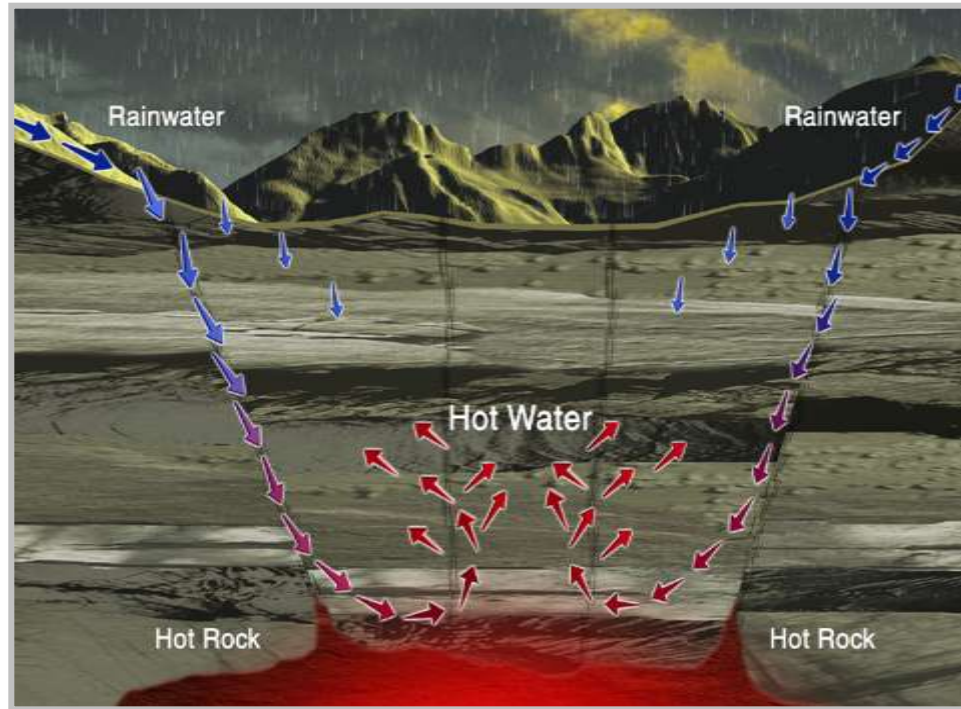


-  20m WPA Monitoring Completed
-  20m WPA Anemometer
-  50m WPA Anemometer
-  50m TEP Anemometer

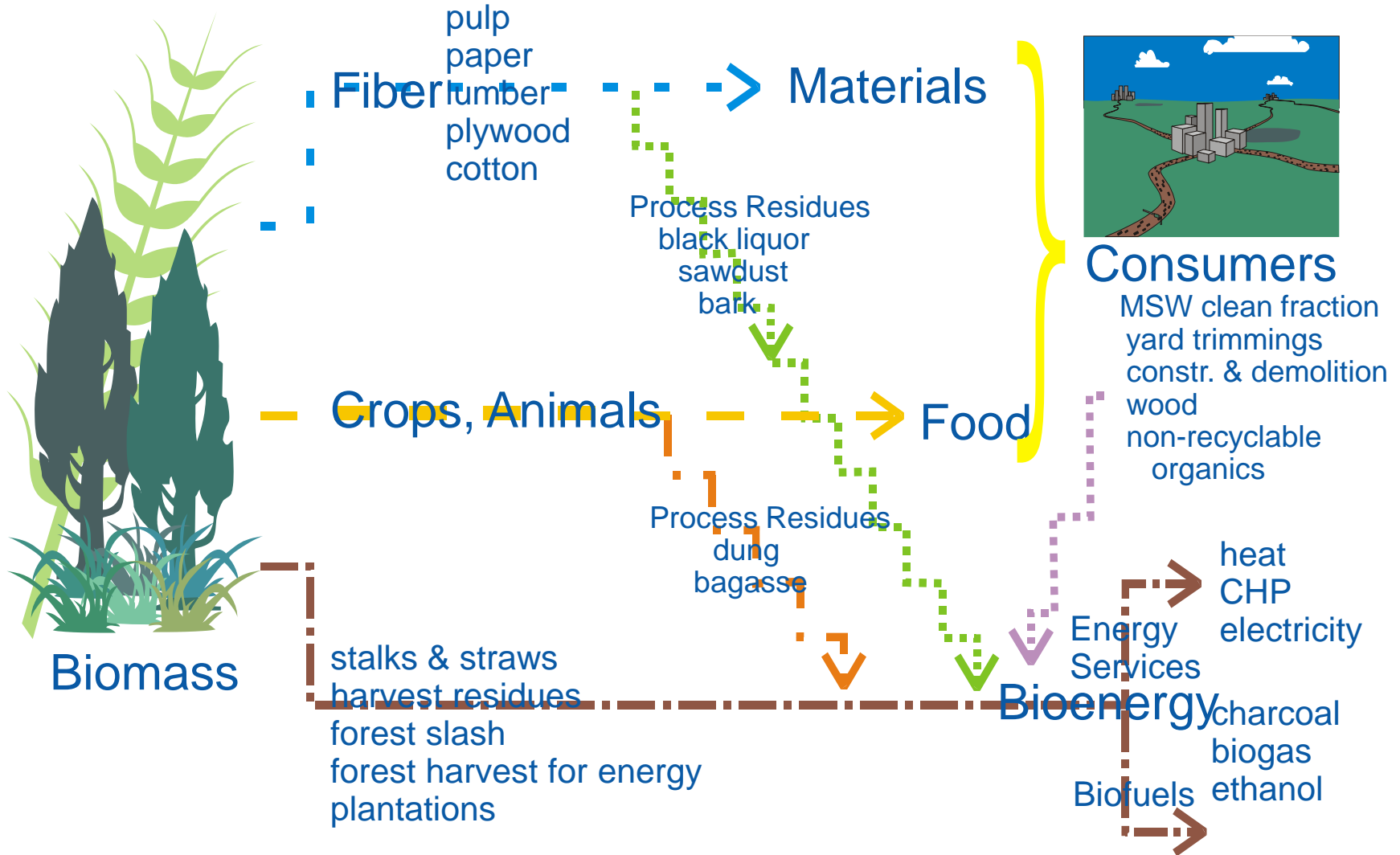
Solar



Geothermal Options

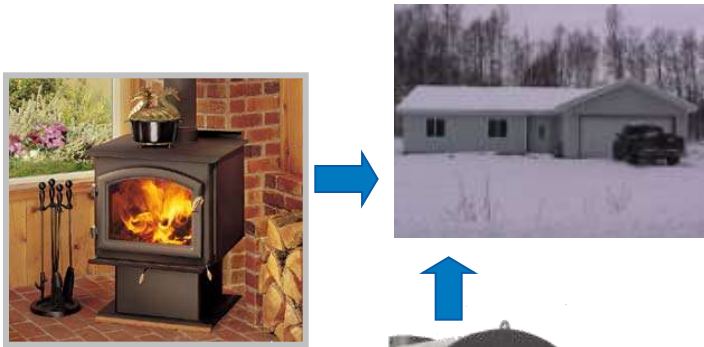


Biomass & Bioenergy Flows



Bioenergy Opportunities

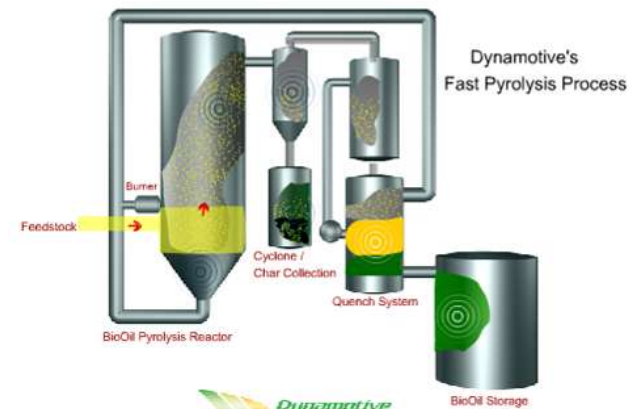
Heat



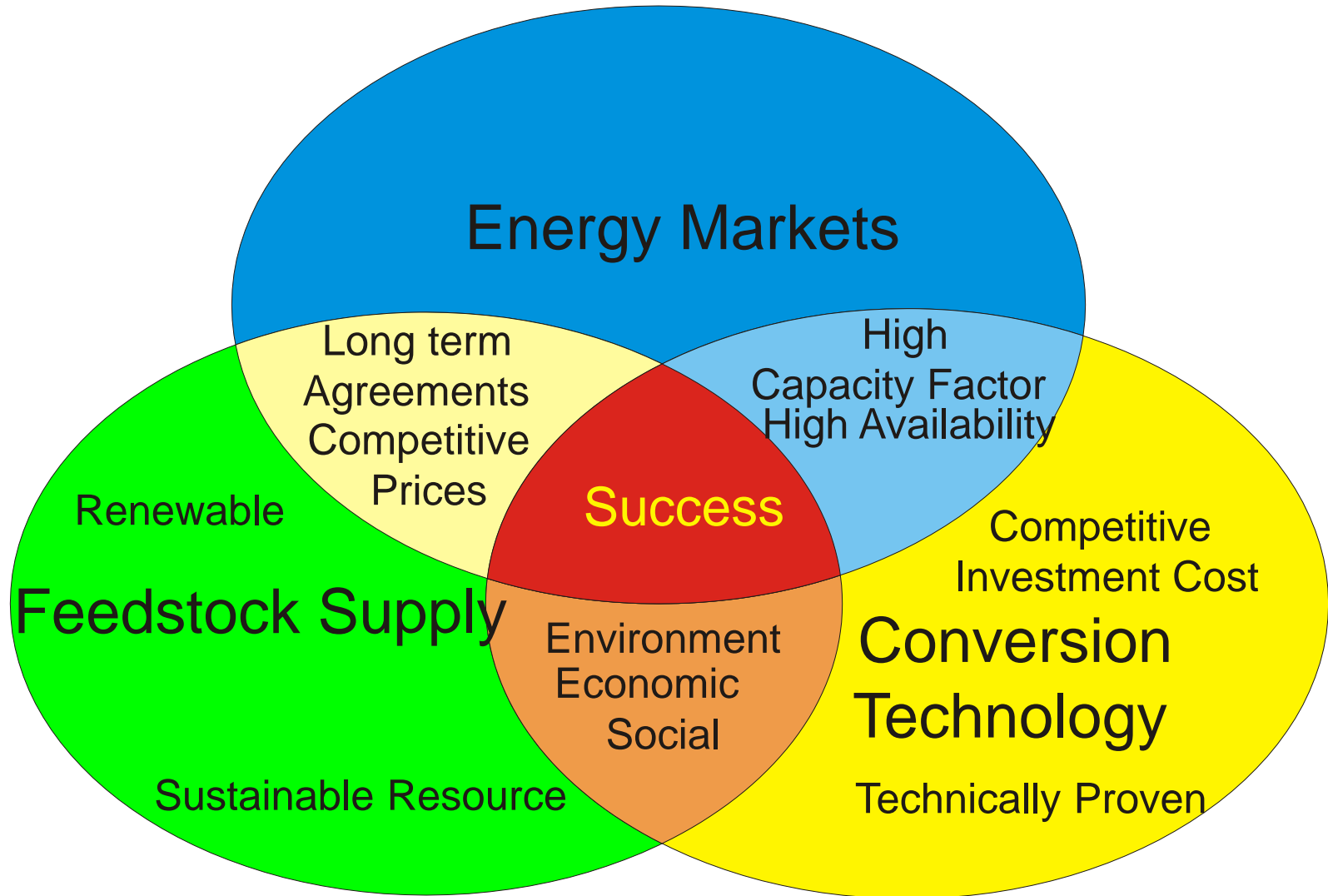
Power



Fuels



Bioenergy Project Requirements

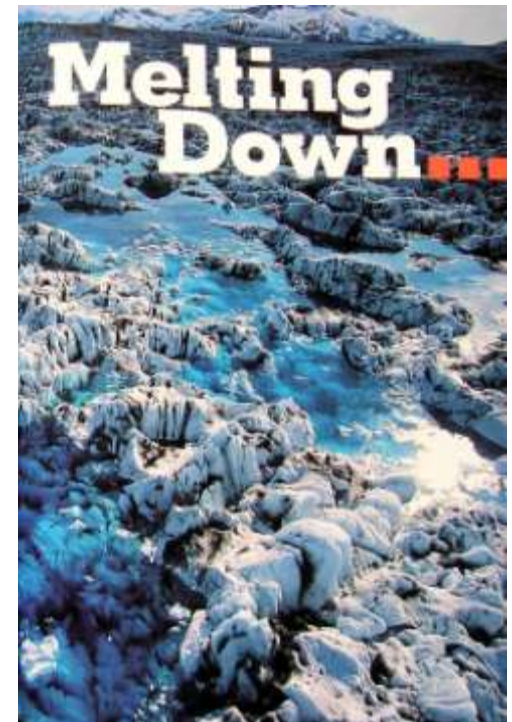
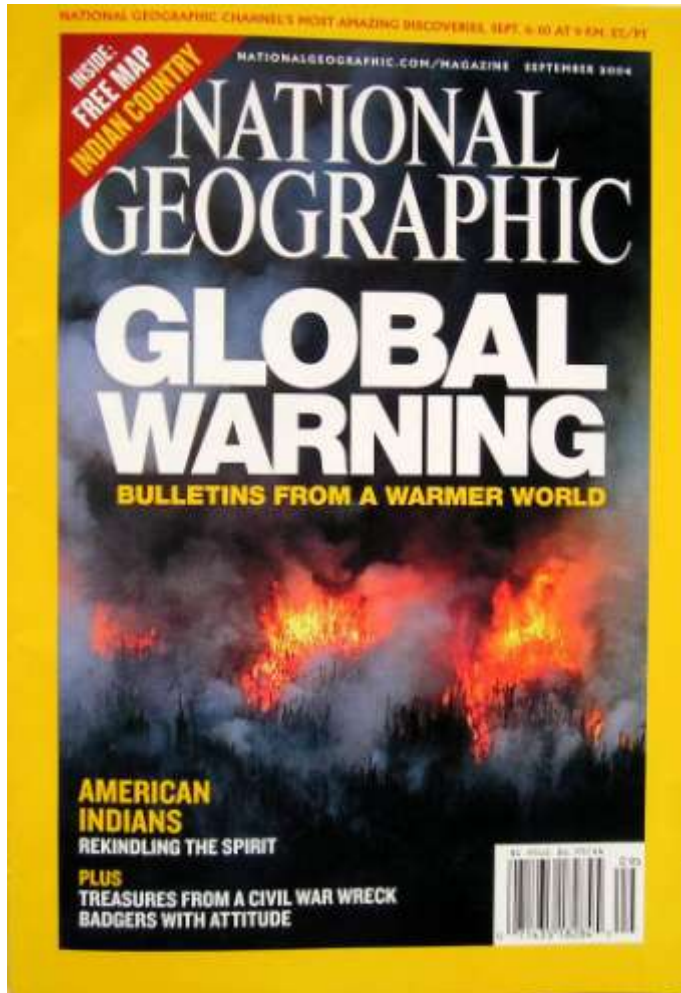


Small & Micro Hydro Power Options

<http://hydropower.inl.gov/prospector/>

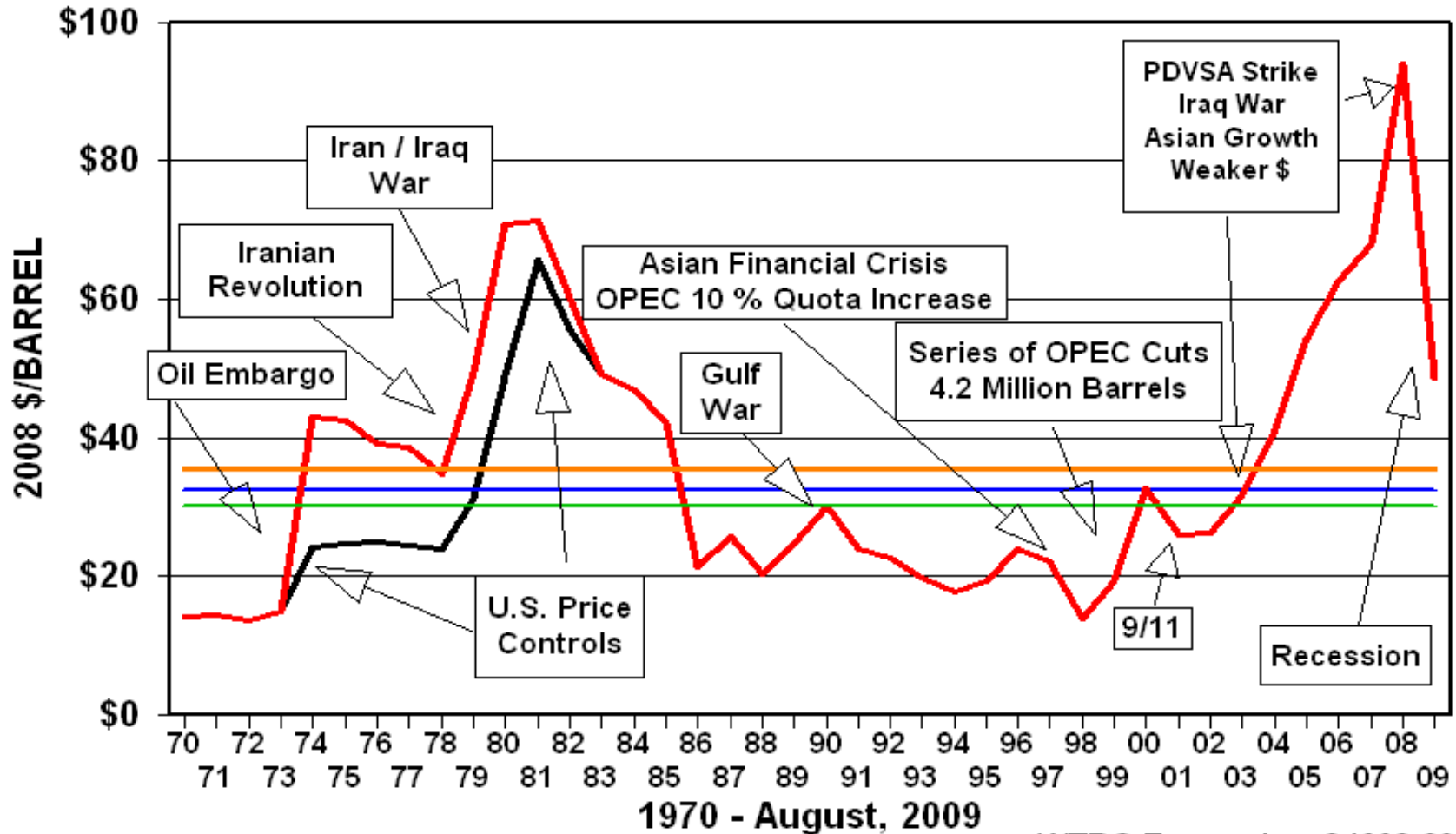


We Live in a Changing World



We Live in a Changing World

Crude Oil Prices
2008 Dollars

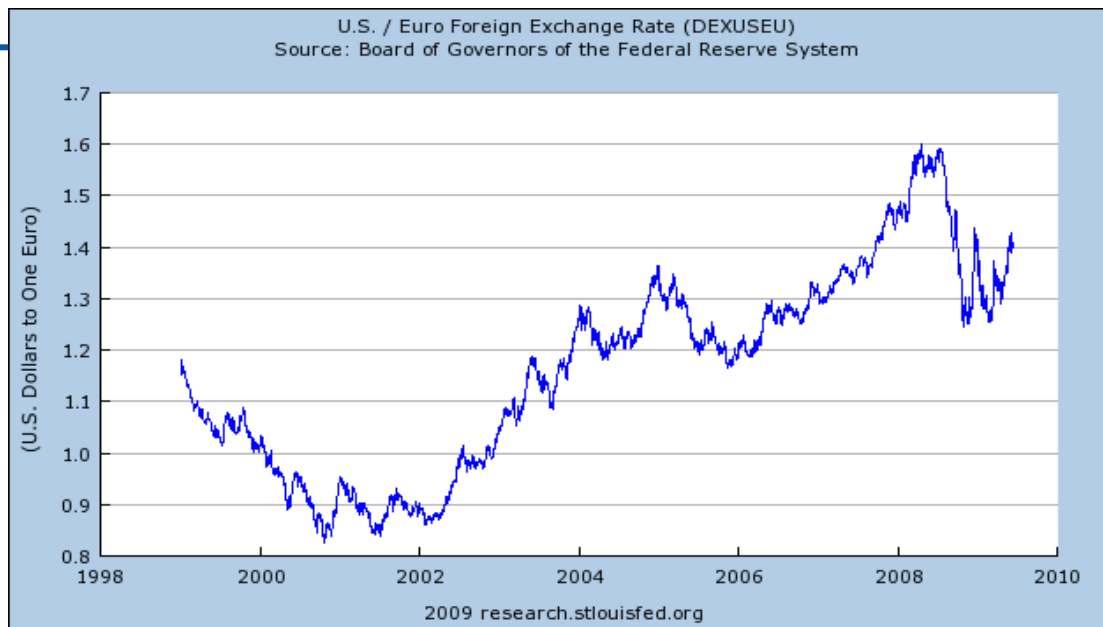


WTRG Economics ©1998-2009

www.wtrg.com
(479) 293-4081

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

We Live in a Changing World



5 Year Copper Spot

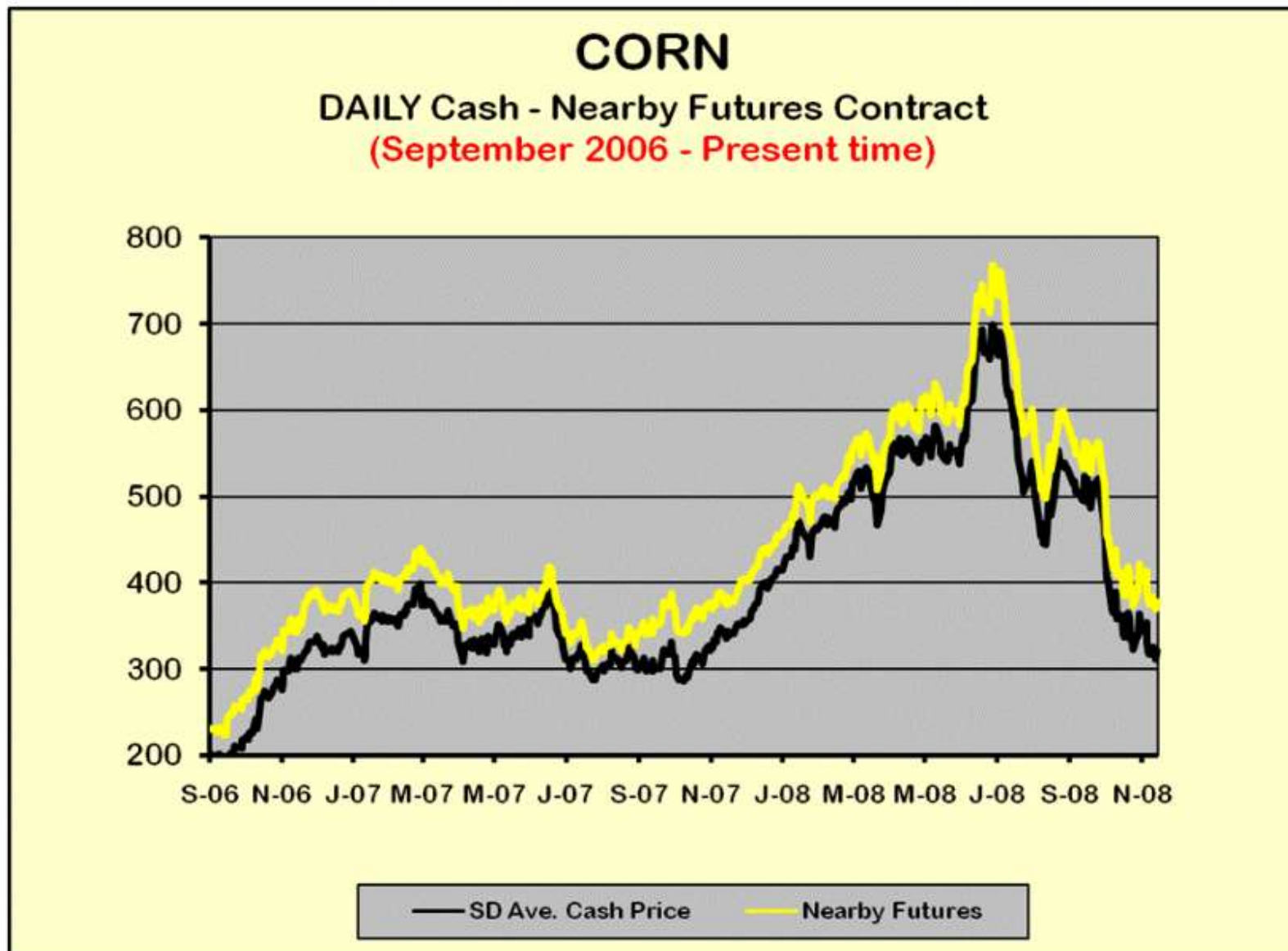


STEEL



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

We Live in a Changing World



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 is going to 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 2020, 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 \$13.80 a ton, according to coal broker Evolution Markets.

"You try to be more efficient, but at some point, that gets into the bill," said Jason Frisbie, 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," Frisbie 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.

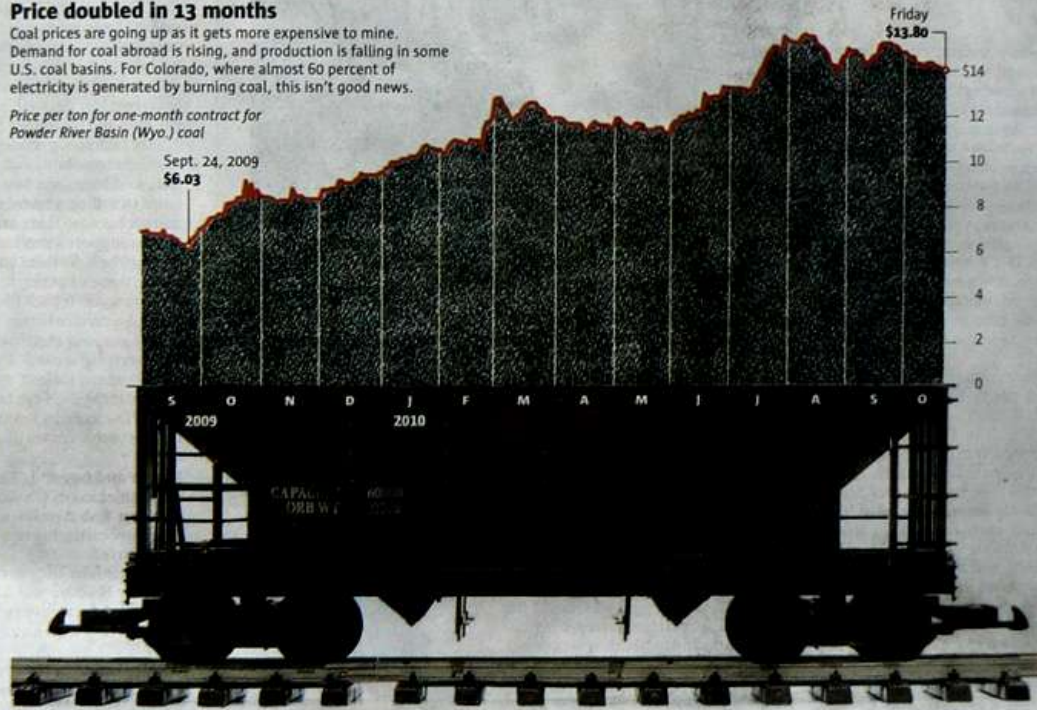
The price impact is dampened by long-term contracts and hedging, Fujimoto said.

"Over the past five years, coal market prices have seen peaks, valleys and a general escalation in delivered prices," Francis Roberts, a coal analyst for Wood Mackenzie,

Price doubled in 13 months

Coal prices are going up as it gets more expensive to mine. Demand for coal abroad is rising, and production is falling in some U.S. coal basins. For Colorado, where almost 60 percent of electricity is generated by burning coal, this isn't good news.

Price per ton for one-month contract for Powder River Basin (Wyo.) coal



Source: Bloomberg

Jeff Goertzen, *The Denver Post*

To be sure, the U.S. isn't running out of coal and it will remain a low-cost fuel, analysts and industry executives say.

The U.S. has the largest reserves of any country — 260 billion short tons, or 29 percent of world reserves, according to the 2010 BP Statistical Energy Review.

At current production levels, there is a 150-year supply for the nation in the Powder River Basin, said James Luppens, chief of the U.S. Geological Survey's U.S. Coal Assessment.

China, the No. 1 coal producer, has an estimated 40 years of reserves left.

\$4.45 this year.

Prices will continue to climb because of deep changes in the coal market, Rollyson 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-

cover, 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 pressures are 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



Electricity

C
o
m
m
e
r
c
i
a
l



Fuels



C
o
m
m
u
n
i
t
y



We Live in a Changing World

Tribal Energy Security ↔ Tribal Sovereignty

