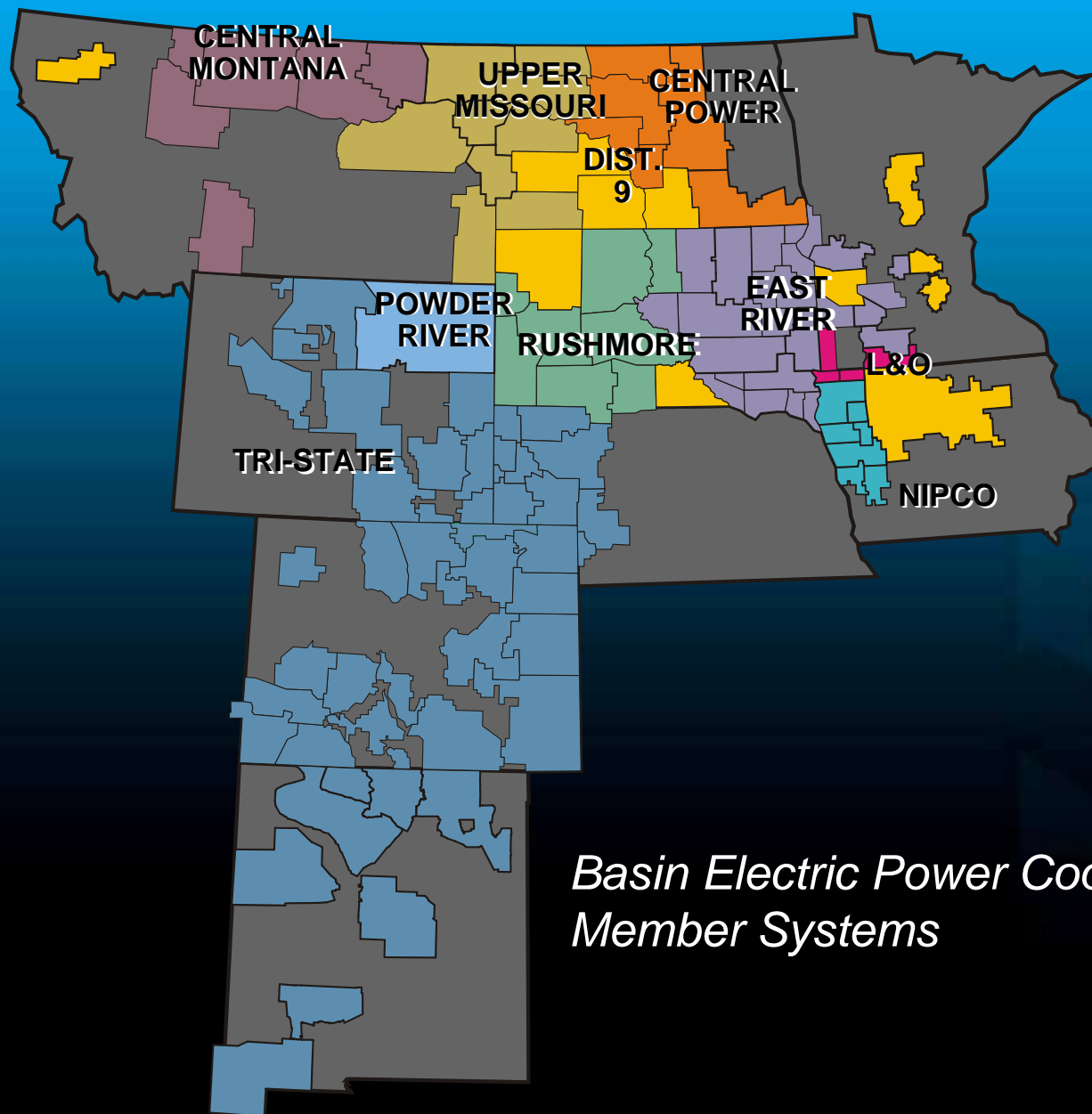




The Future of Coal

*Mike Eggl, Sr. Vice President
External Relations and Communications
Basin Electric Power Cooperative
May 12, 2009*



*Basin Electric Power Cooperative
Member Systems*

The Future of Coal

- Who Uses Coal and Why
- Climate Change – the Primary Concern Facing Coal
 - Current Political Activities
- Using Coal in the Future

Why Coal?

The Good

- Abundant and efficient
- Primary fuel source for electricity
- Years of experience
- Years of supply

The Bad

- Contribution to CO₂ emissions
 - Costs and reliability of carbon capture
 - Legislation

Proven coal reserves at end 2006

USA = 27 %

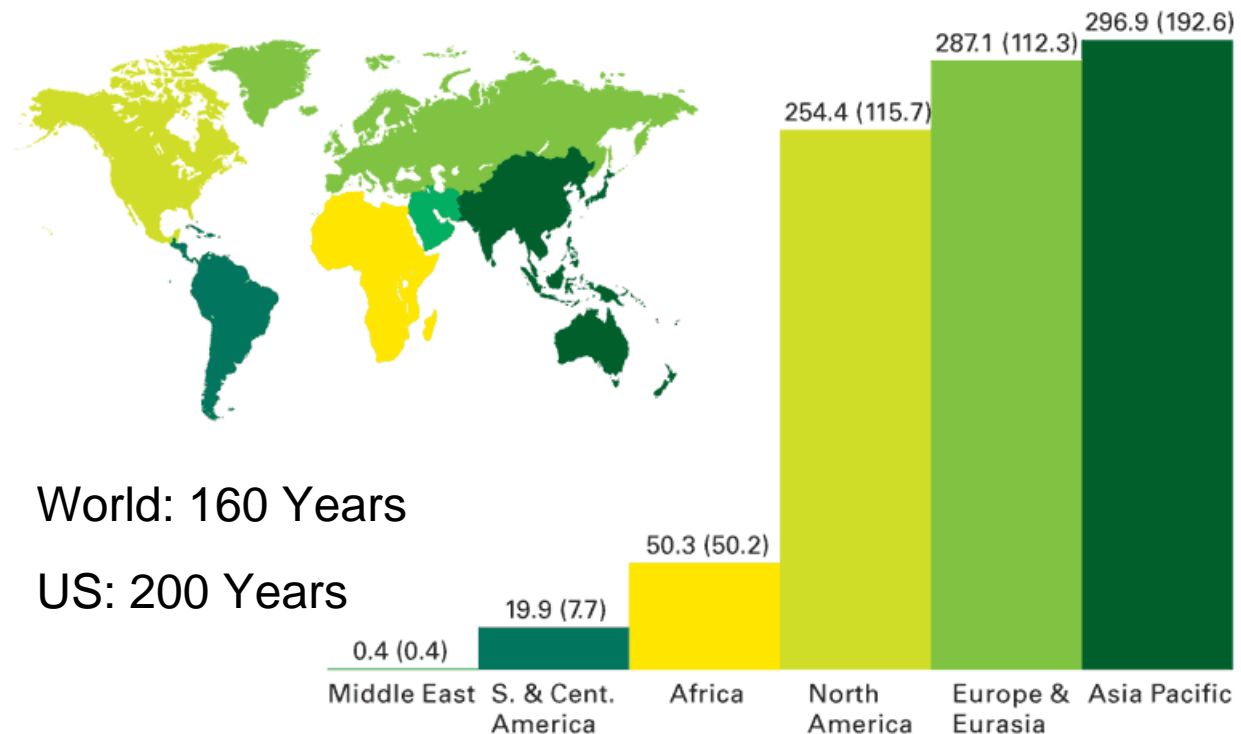
Russia = 17%

China = 13 %

India = 10%

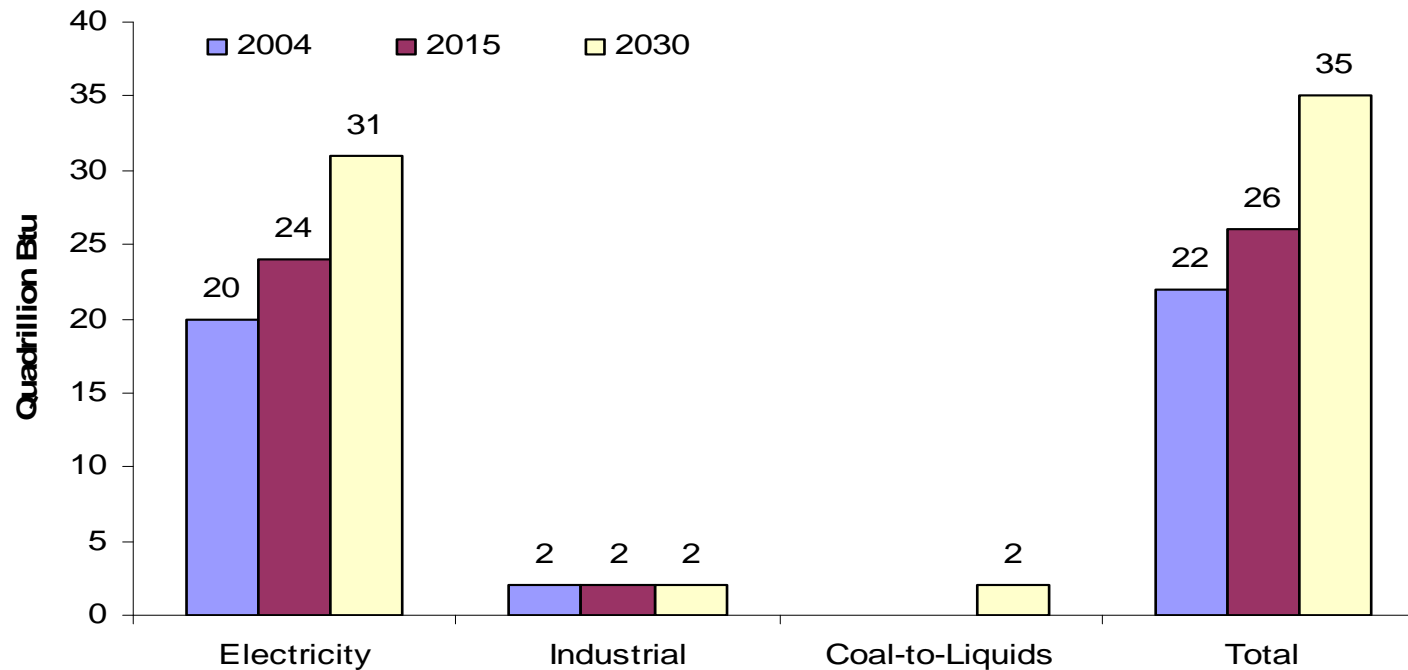
Proved reserves at end 2006

Thousand million tonnes (share of anthracite and bituminous coal is shown in brackets)



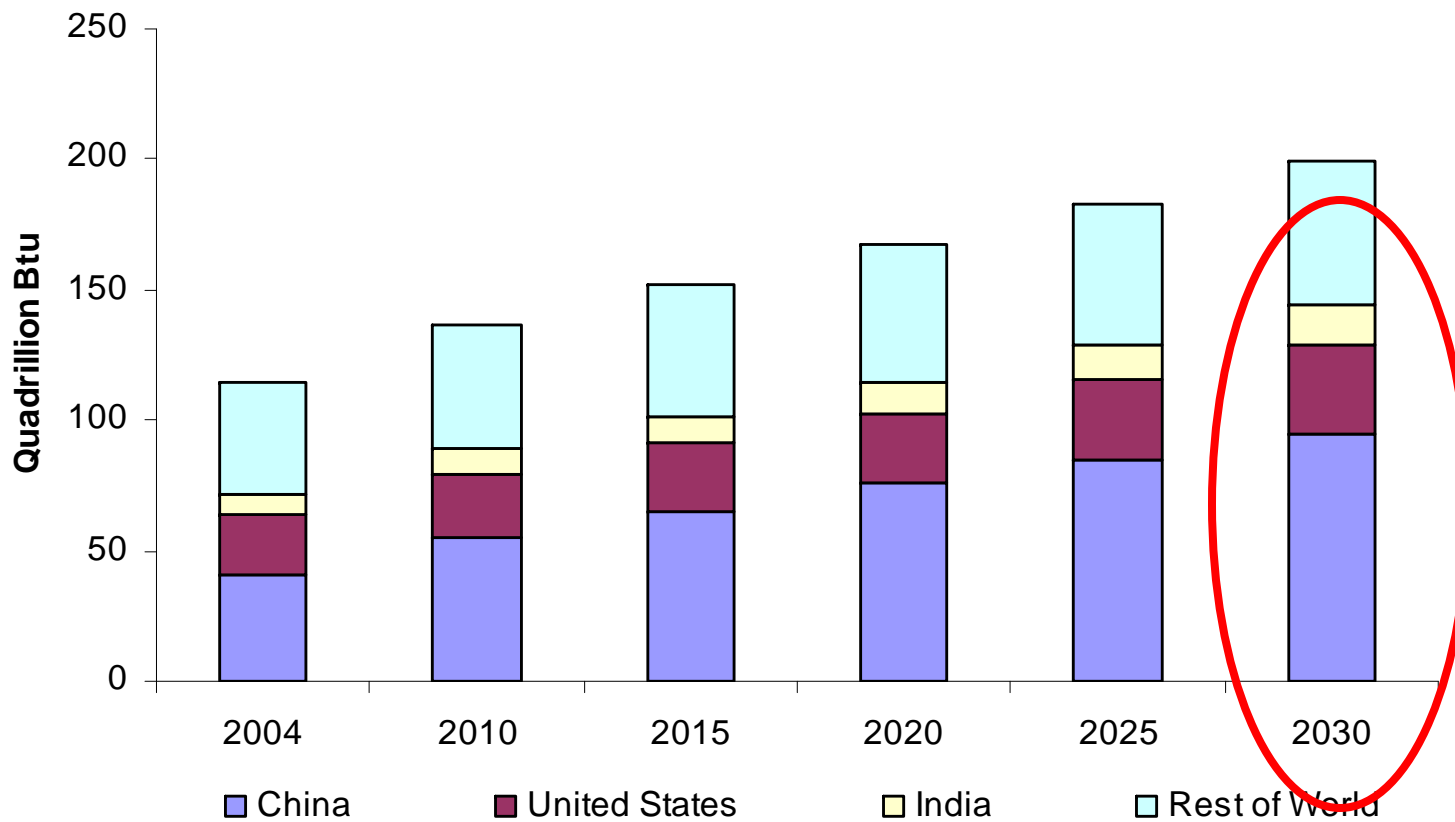
Survey of Energy Resources 2004, World Energy Council

U.S. Coal Consumption by Sector (2004, 2015, 2030)



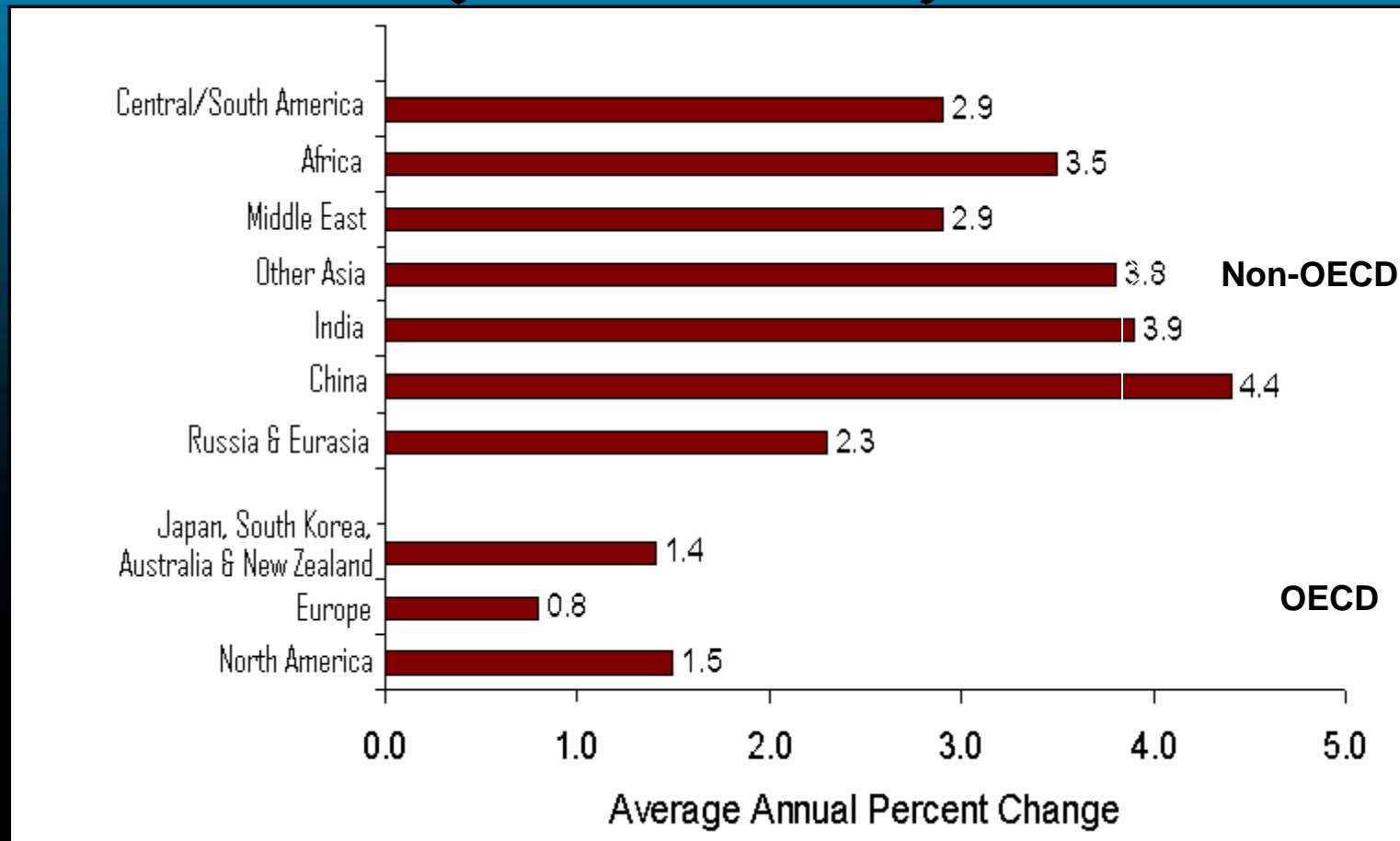
Source: EIA, Annual Energy Outlook 2007

World Coal Consumption by Region (2004 – 2030)



Source: EIA, International Energy Outlook 2007

Annual Growth in Electricity Generation by Region (2004-2030)



Source: EIA, International Energy Outlook 2007

Climate Change

The Primary Concern for Coal

- Types of Legislation
- Current Proposals
- Potential Regional Impacts



Climate Change is Everywhere

- Growing scientific and public opinion...
- Priority of 111th Congress
- U.S. responsible for 25% of global CO₂ emissions...
- Electricity sector responsible for 33% of U.S. CO₂ emissions...
- Technology solutions are needed...



Climate Change Legislation

- Cap and Trade
- Carbon Tax
- Research and Development



Administration Proposal



- 100% Auction
- Revenue Raiser

Administrative Hammer

White House



Carol Browner
White House “Climate Czar”

- “Re-establish the United States as a leader” on climate
- “[Waxman-Markey] is absolutely essential to our position . . . in Copenhagen” (next UN Climate meeting)

Administrative Hammer EPA

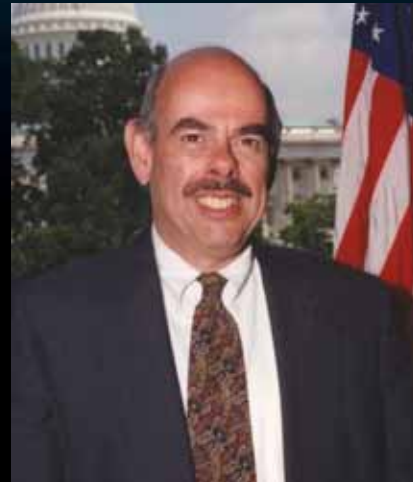


Lisa Jackson
Administrator, EPA

- Endangerment Finding
“triggers the beginnings of regulation of CO₂ for this country”
- Favors cap vs. tax legislation

House - Waxman-Markey Bill

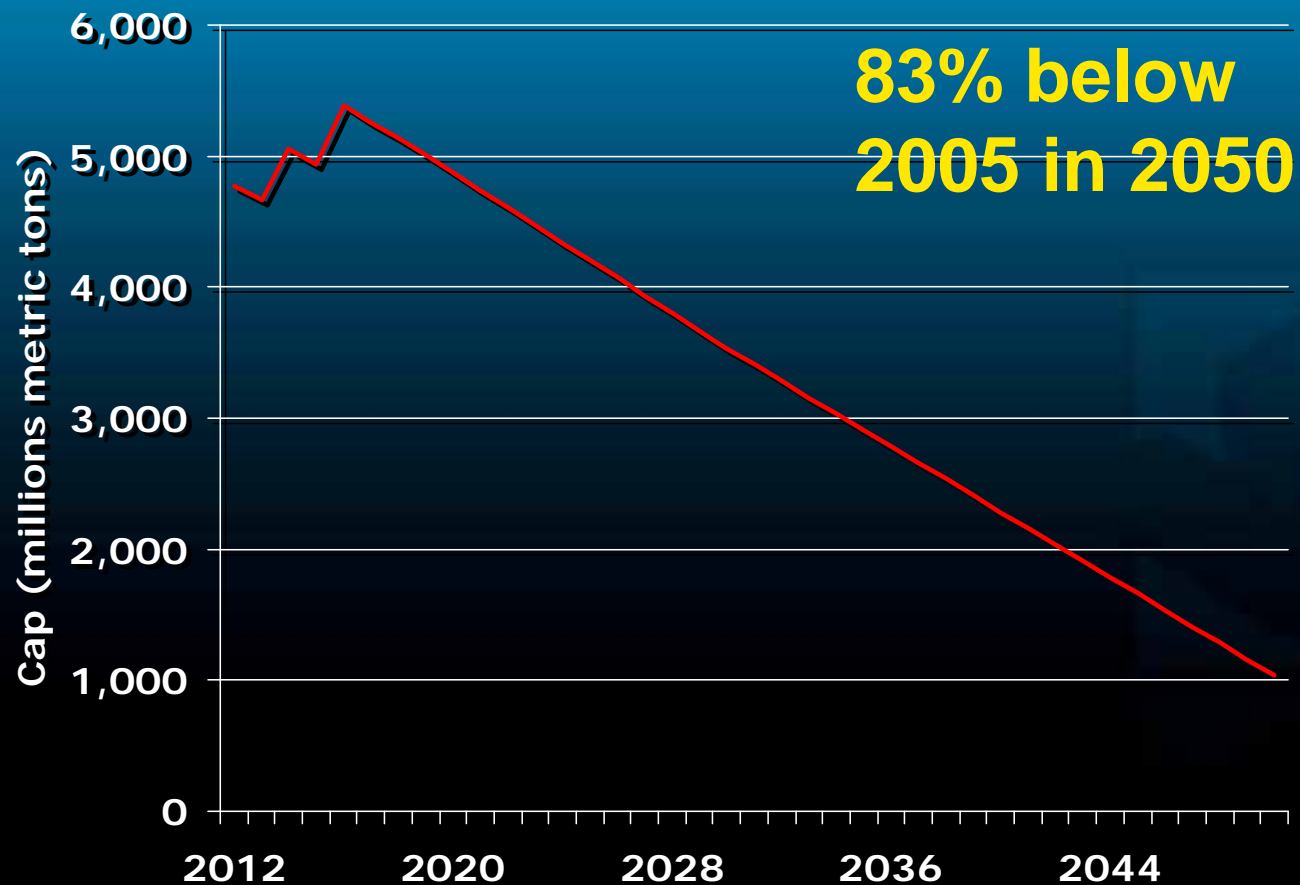
- Cap and Trade
- Subcommittee markup April 27
- Ongoing Negotiations in the House



Ed Markey (MA)

Henry Waxman (CA)

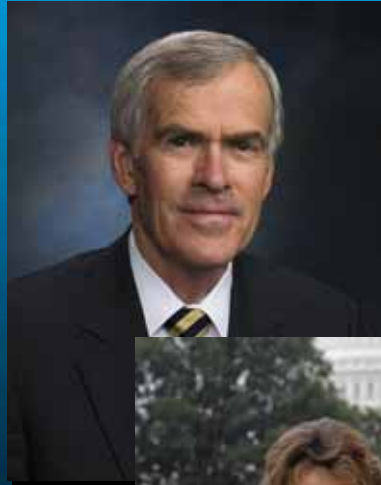
Waxman-Markey Cap



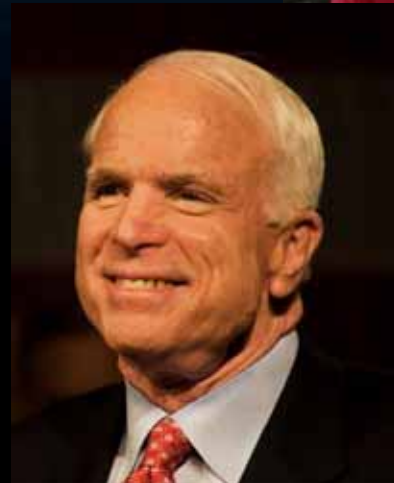
Senate



Leaders



Maverick



Energy



EPW



What Does CO2 Cost?

Dollars Per Ton of CO2

- **Lieberman-Warner**
 - \$20 to \$120 / ton of CO2
- **Bingaman-Specter**
 - \$12 / ton safety valve
- **Larson Tax**
 - \$15 / ton + \$10/year
- **Waxman-Markey**
 - ?
- **Obama Budget**
 - ~\$20 / ton



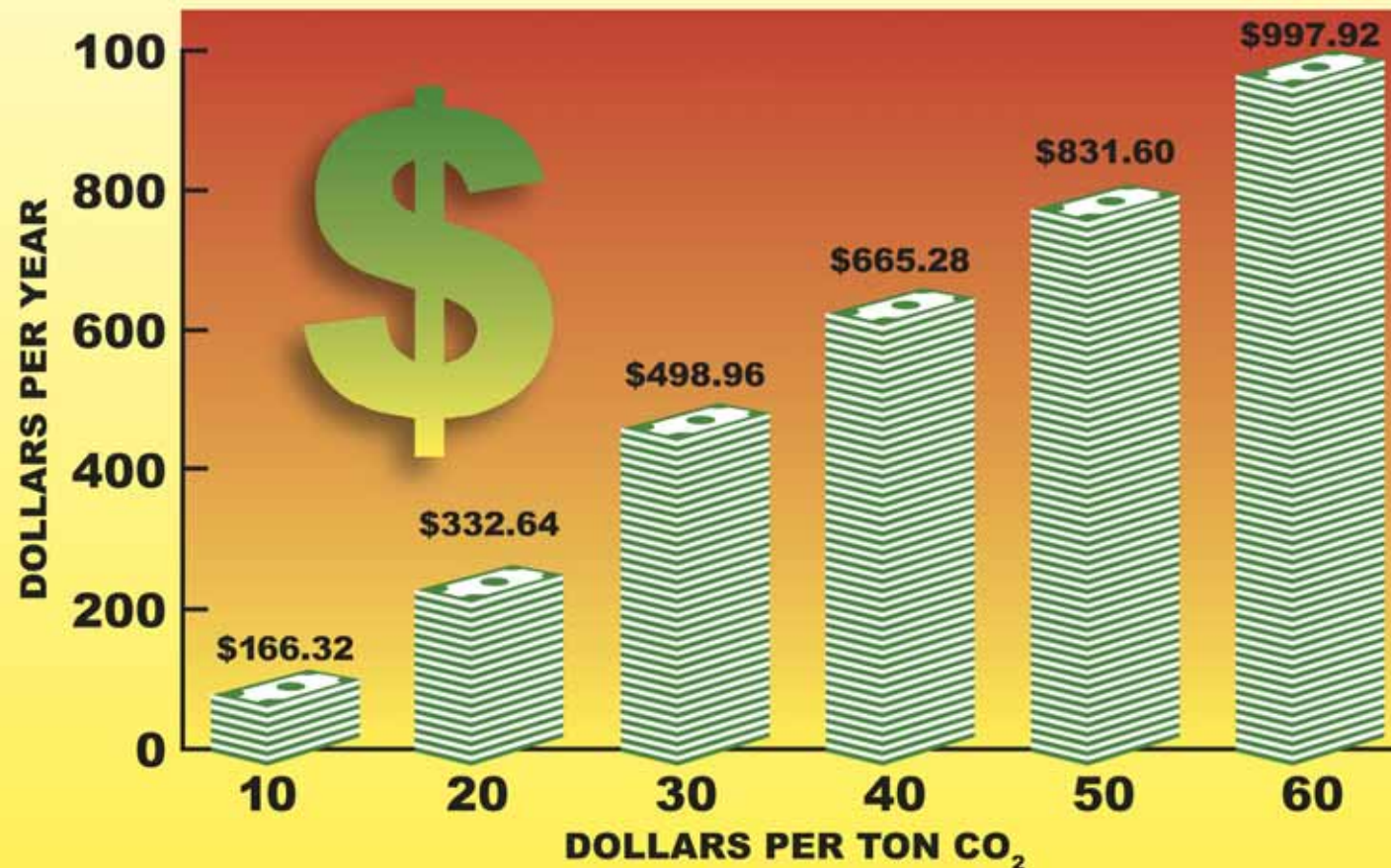
**What does this mean to an
average household?**



**= 1 metric ton
carbon/month**

Costs of Controlling Carbon

While a number of different legislative proposals are under consideration to curb greenhouse gases like carbon dioxide (CO₂), most would assign a penalty for each ton of CO₂ emitted by power plants. This chart shows the average increase Basin Electric's customers would see depending on the cost Congress imposes for each ton of CO₂ emissions.*



* Wholesale rate increase – rate does not include potential retail or overall economic impact adjustment.

\$1 BILLION +



**BASIN ELECTRIC
POWER COOPERATIVE**

A Touchstone Energy® Cooperative



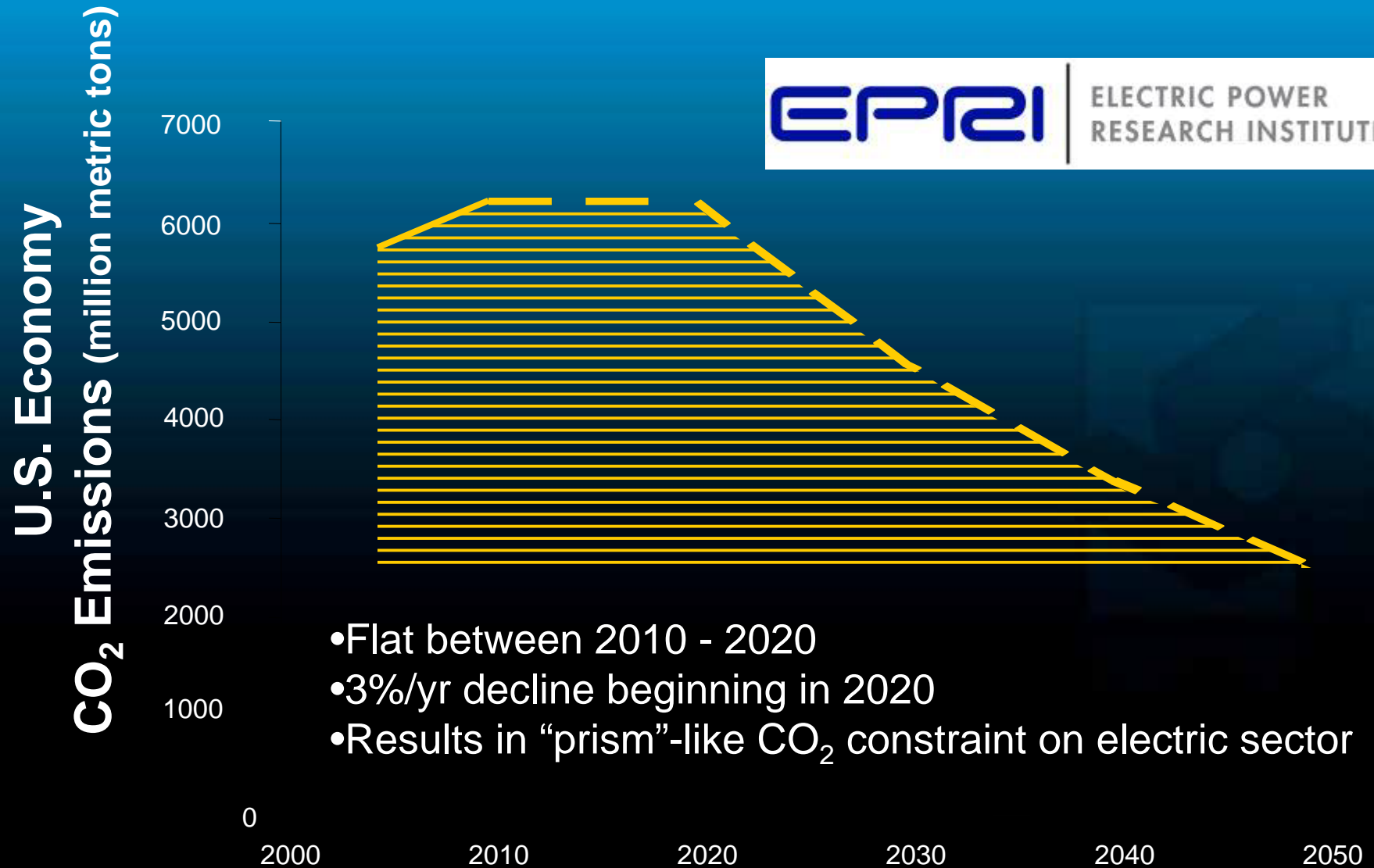
OPERATION COSTS

“Electricity demand will
increase by 50% by 2030.”

— U.S. Energy Information Agency



A Better Path



Climate Response

Power Supply Options Limited



- Natural gas price is highly volatile



- Nuclear option available but in the future



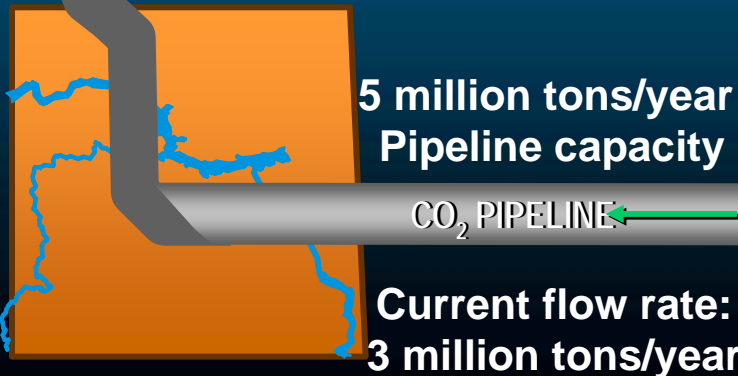
- Renewable, conservation and efficiency can not yet meet full base-load need

Dakota Gasification Company (DGC)

World's Largest Carbon Capture and Sequestration Project

Weyburn, Saskatchewan

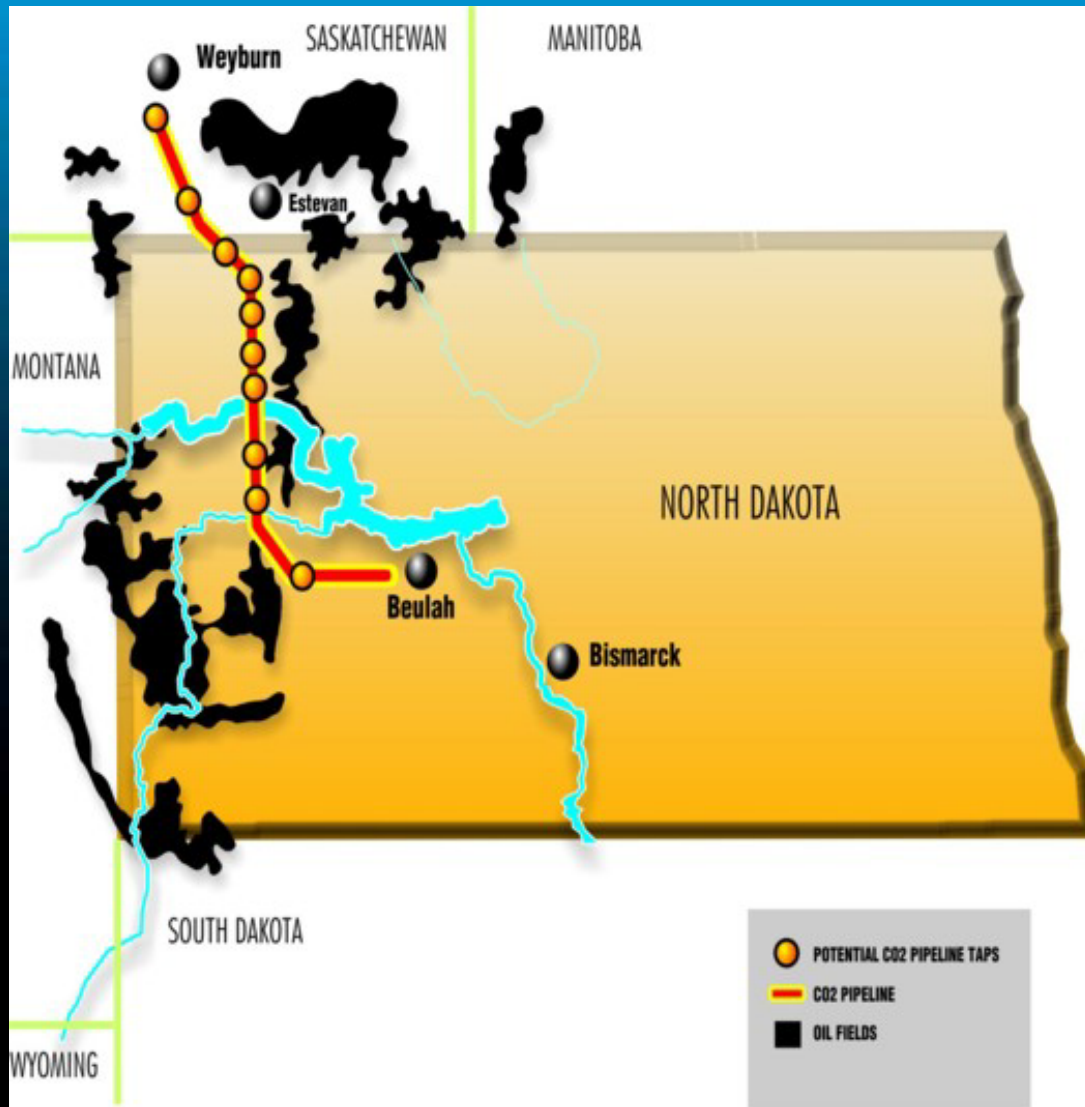
15 Million Tons Sequestered To Date



Compressors



Carbon Dioxide Pipeline



- 205 miles
- 14" and 12" carbon steel pipe
- Strategically routed through Williston Basin oil fields

DGC is unique

- Only commercial coal gasification facility producing synthetic natural gas
- Liquids production
- Fertilizer production
- CO₂ capture and sequestering

Two Future Technologies

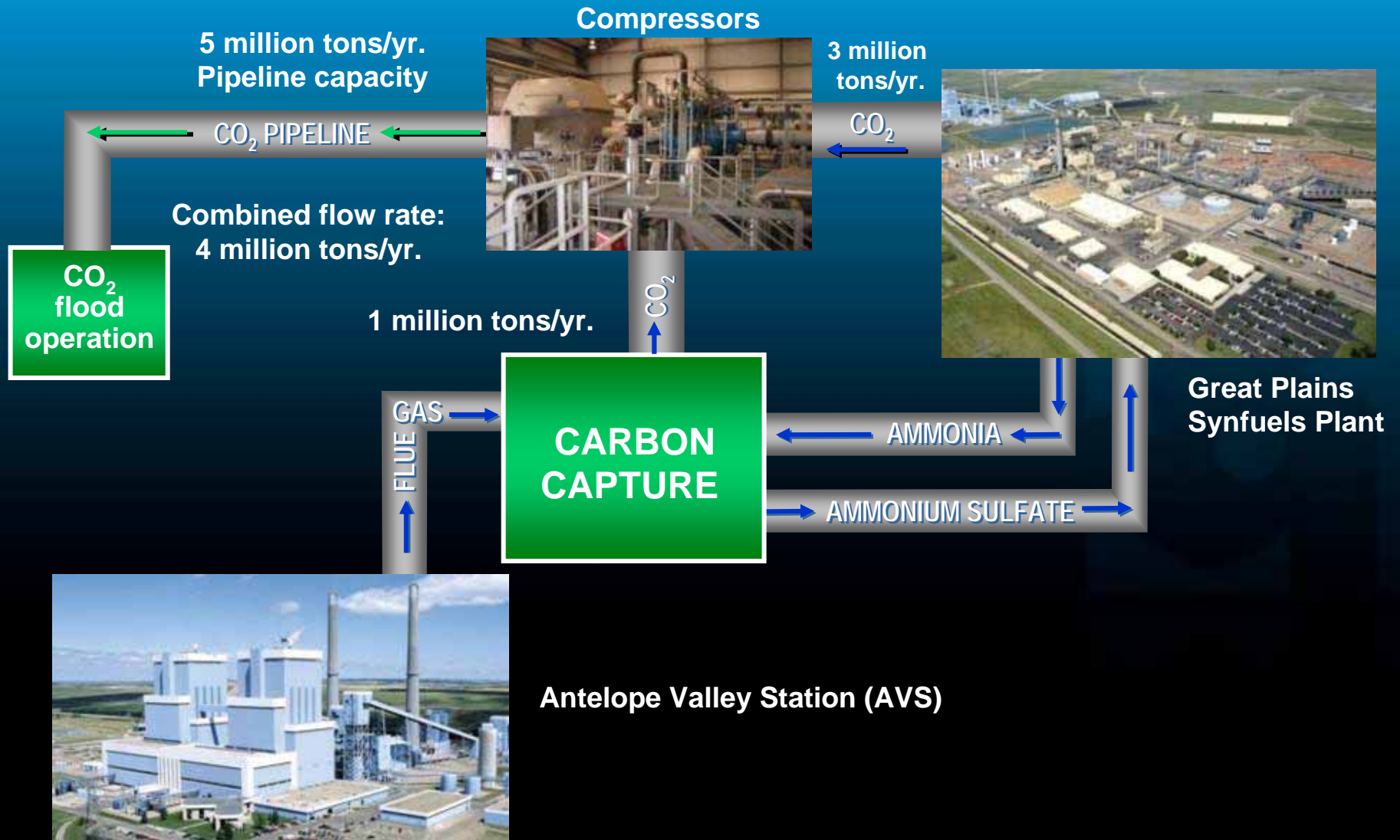
Developing New Technologies

The Antelope Valley Station Story

- Commercial-scale carbon capture pilot
- Working with technology provider
- Anticipated start = 2012
- Goal = 90% CO₂ removal
- Pathway for coal



Carbon Capture Pilot Project

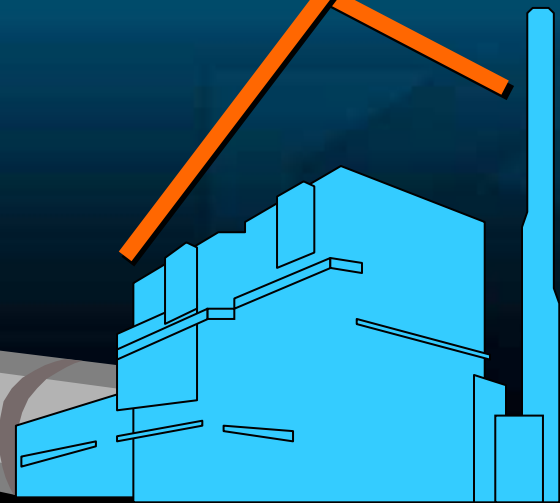


Estimated Costs

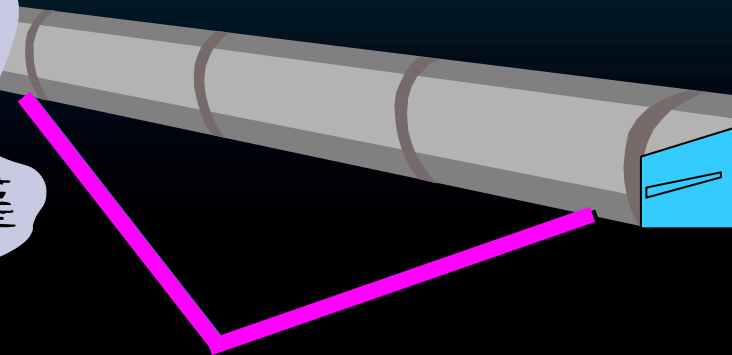
\$20 ~ 35/ton



\$35 ~ 60/ton



\$15 ~ 30/ton



Coal Market Challenges

- Enable economic development
- Maintain living standards
- Enhance energy security
- Produce clean energy
- Provide affordable energy



Questions?

Feasibility Study

- 3 month study – March-May 2008
- 28 MWs – station power requirements
– electrical power, steam and compression
- No fatal flaws identified
- Cost - \$300 million (+/- 30 percent)
- Cost to capture and compress \$45-50/ton
- Project Schedule – FEED, 6 months;
detailed engineering, procurement and
construction - 36 months

- On the generation side, SD in 2007 Hydro was 47.5% of net generation in SD and coal was 43%.

Carbon Capture Demonstration Project

- Challenges
 - Great Risk - first to commercialize the newest technology
 - Station Power for CCS
 - <10 ppm SO_2 inlet required
 - Cooling water for CO_2 absorption
 - Integration with existing infrastructure
 - Steam for CO_2 stripping
 - Permit Modification
 - Cost - \$300 million +

Carbon Capture Demonstration Project

- Opportunities
 - EOR is a driver for our AVS CCS project
 - EOR is a bridge for understanding future sequestration in saline aquifers & unrecoverable coal seams
 - Our industry needs Carbon Capture Technology demonstrated
 - PCOR phase III will advance CCS knowledge (MMV)