



Presentation
for the
Energy Development and
Transmission Committee
December 6, 2007

Great River Energy

- a Who we are
- a Where have we been
- a Where are we going
 - ε Environmental Sustainability
 - ε Renewable
 - ε Efficiency
 - ε Business Development



Great River Energy



- a A generation & transmission cooperative
- a Serves about 600,000 connected services for 28 distribution cooperatives in Minnesota & parts of northwest Wisconsin & northern Iowa
- a 8 power plants; 2 in permitting stage
- a 4500 miles of transmission line



More about Great River Energy

- a Nearly 800 employees (in MN and ND)
 - ↳ 331 ND employees
- a 2,500 MW of generation
- a 4,500 miles of transmission lines
- a Taxes paid in ND and MN: \$30 million
- a Revenue: \$691 million
- a Most significant expenses: Rising fuel, purchased power costs
- a Total assets: \$1.8 billion

Generating Plants

a Baseload Plants

- z Coal Creek 1,115 net MW
- z Stanton 188 net MW
- z Genoa #3 170 net MW



a Biomass

- z Elk River Station 39 MW



a Peaking Plants

- z 110 MW Oil Only (4 plants)
- z +1100 MW Gas-Fired (3 plants)



Coal Creek Station

- a Coal (lignite) plant
- a Two 550 MW units
- a Located near Underwood, ND
- a Largest plant in ND
- a Coal supply - Falkirk Mine
 - z 7.5 to 8.0 million tons per year



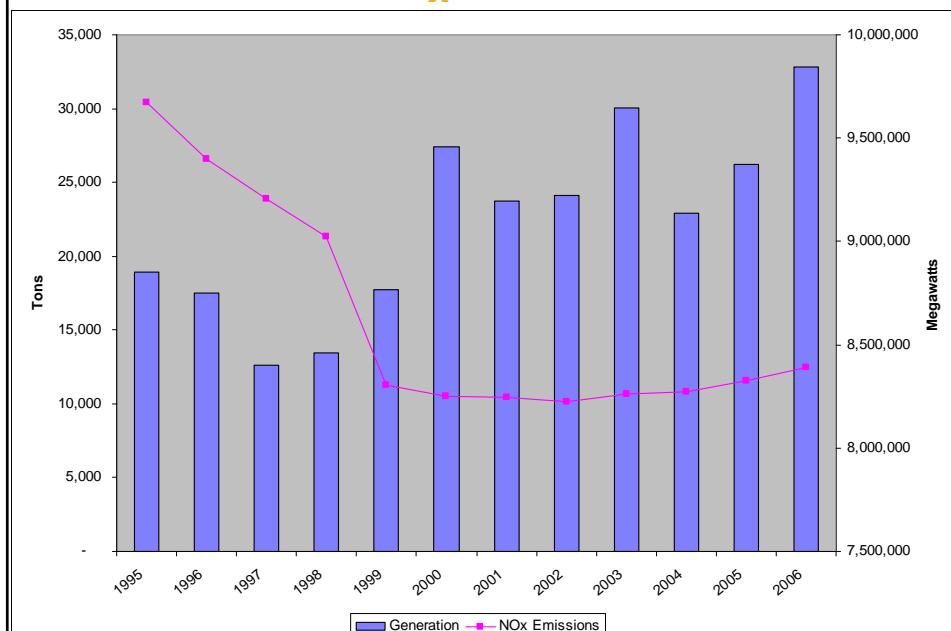
Coal Creek Station

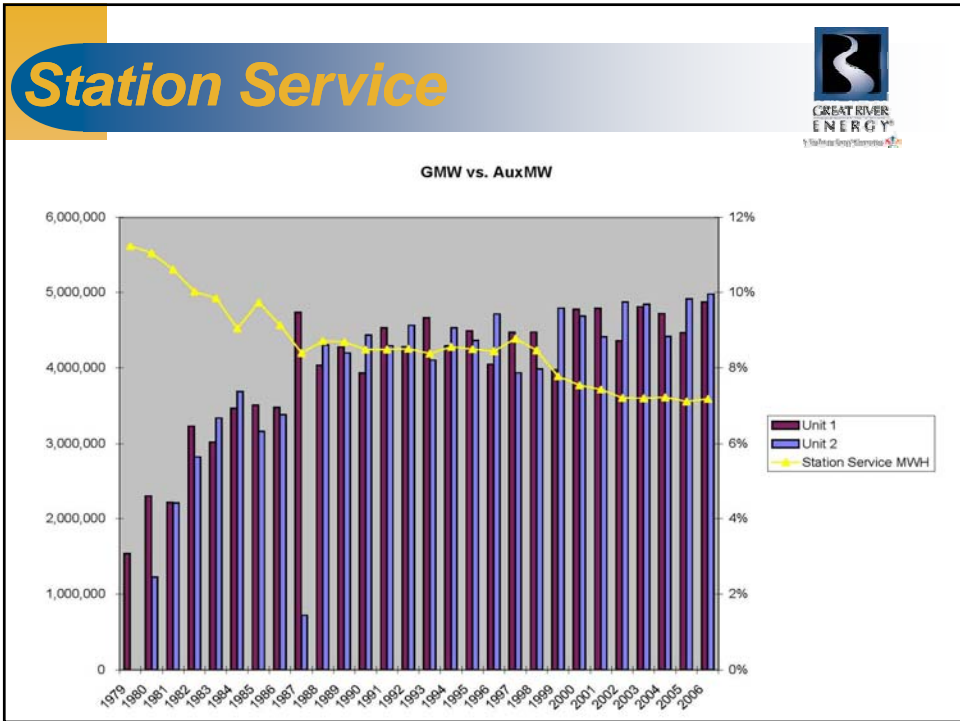
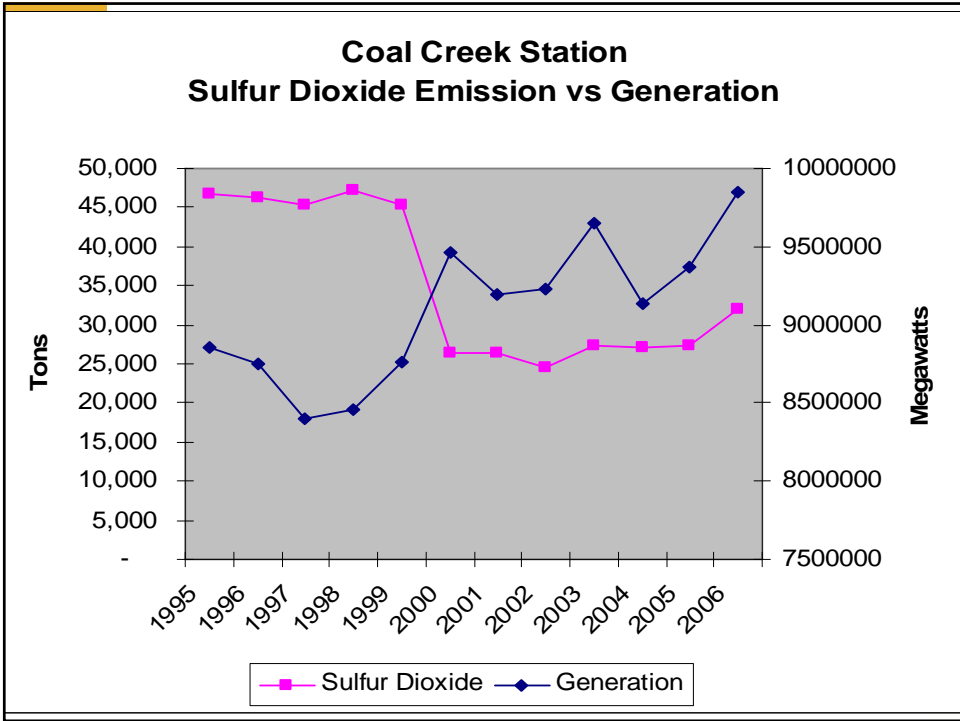


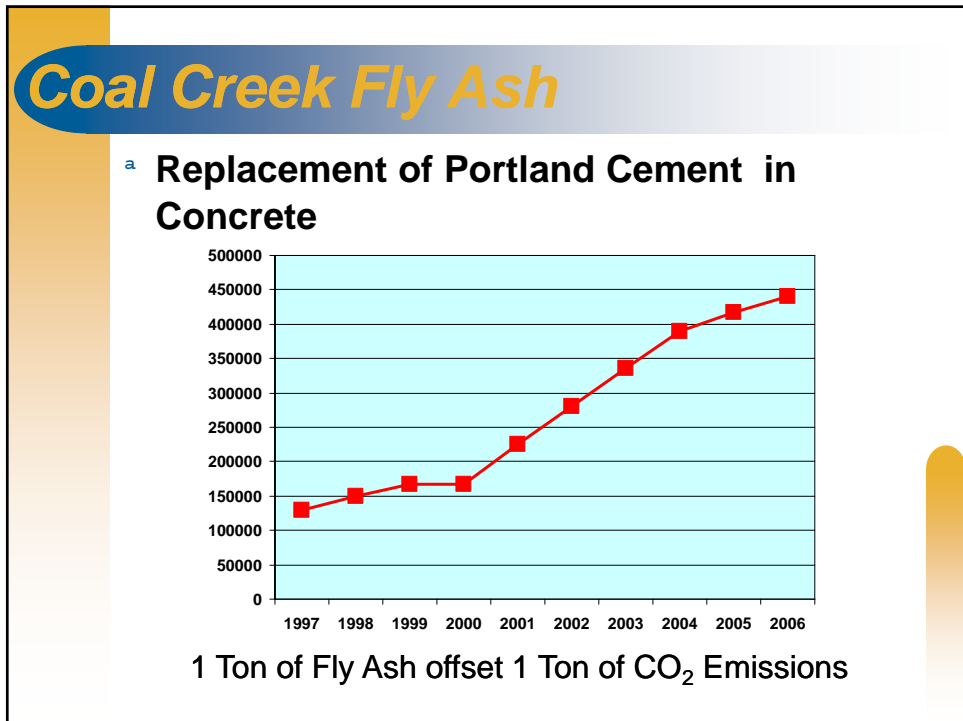
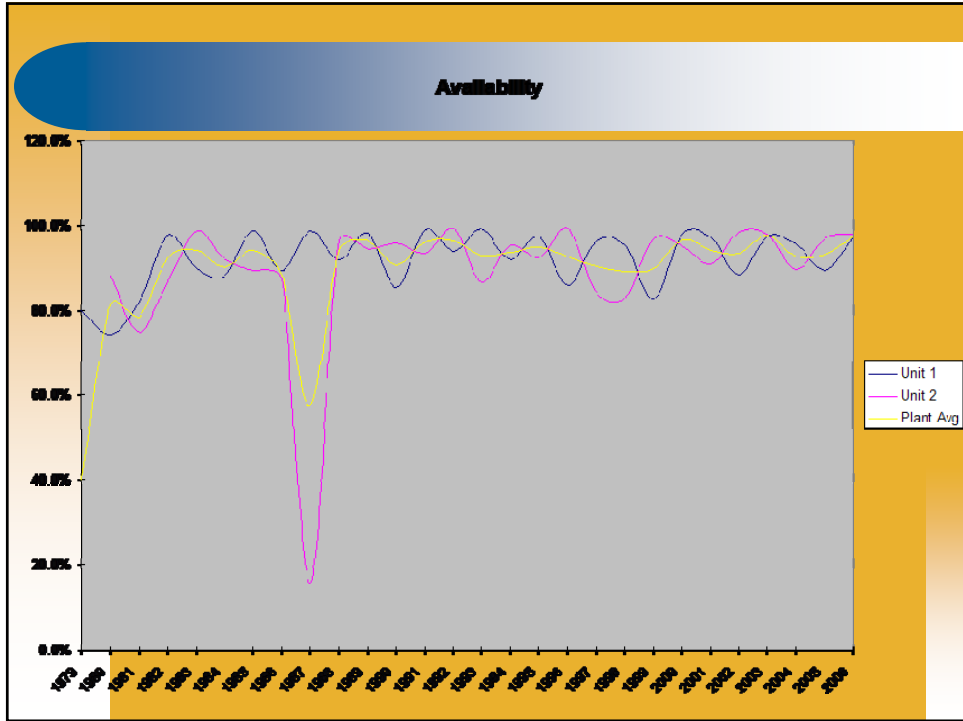
a Environmental commitment

- z Only plant in North Dakota that is ISO 14001 certified
 - a A commitment to continuous environmental improvement
- z Only plant in North Dakota that is ISO 18001 safety certified
 - a A commitment to continuously improve employee safety performance and awareness
- z \$316 million in environmental upgrades to date
- z Commitment to resource conservation

CCS NO_x Emissions







Stanton Station



GREAT RIVER
ENERGY
A Hudson Energy Group Company

2 boilers/1 turbine generator 188 MW

- ⌘ Record run of 731 days for Unit 1 boiler in 2006
- ⌘ Record turbine-generator run of 833 days (ended in 2006)

Low sulfur PRB

- ⌘ 800,000 tons annually



Stanton Station

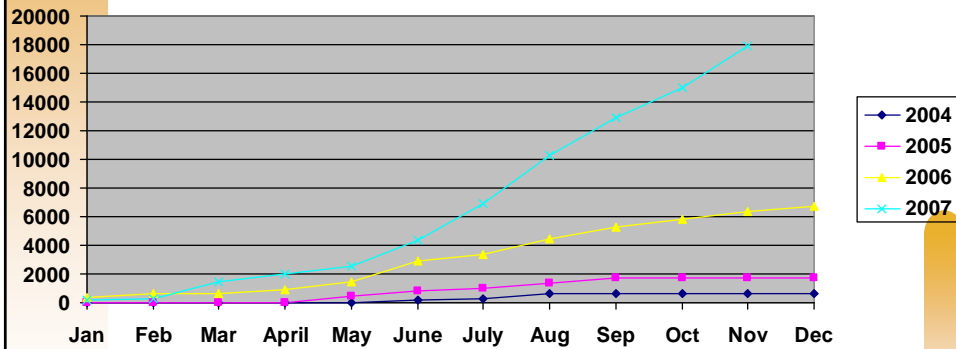


a Environmental commitment

- ⌘ Announced environmental upgrades of \$100 million
 - One unit scrubbed / other unit will be scrubbed by 2013
 - New NOx emissions control technology
- ⌘ Flyash marketing program started 3 years ago, this year will sell approximately 80% of production

Stanton Station Fly Ash

Beneficial Use



1 Ton of Fly Ash offset 1 Ton of CO₂ Emissions

Peaking Plants Combustion Turbines

- a Lakefield Junction Station - 515 MW
- a Pleasant Valley Station - 427 MW
- a Cambridge Station – 170 MW
- a North Combustion Turbines
 - z St. Boni - 50 MW
 - z Cambridge - 19 MW
 - z Maple Lake - 20 MW
 - z Rock Lake - 19 MW



Renewables

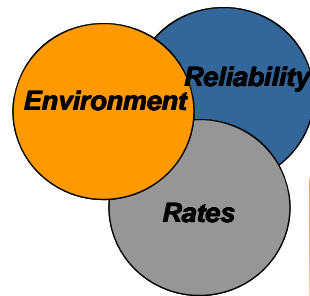


- a Existing Projects
 - ε 100 MW Trimont Wind Farm
 - ε Chandler Wind Farm– 6 MW
 - ε Jackson County Wind - 6 MW
 - ε Dodge Center Wind – 6 MW
 - ε 33 MW Refuse Derived Fuel
 - ε 3.2 MW Landfill Gas
 - ε .4 MW Anaerobic Digesters
- a Committed
 - ε Prairie Star Wind Farm – 100MW
- a Proposed
 - ε Trimont 2 Wind Farm – 100MW
 - ε RFP Evaluations



The GRE "Triple Bottom Line"

- a **Great River Energy has a commitment to provide customers with:**
 - ε Stable rates
 - ε Reliable electricity
 - ε Environmental stewardship
- a **Members annually approve:**
 - ε Rates
 - ε New projects
 - ε Environmental investments



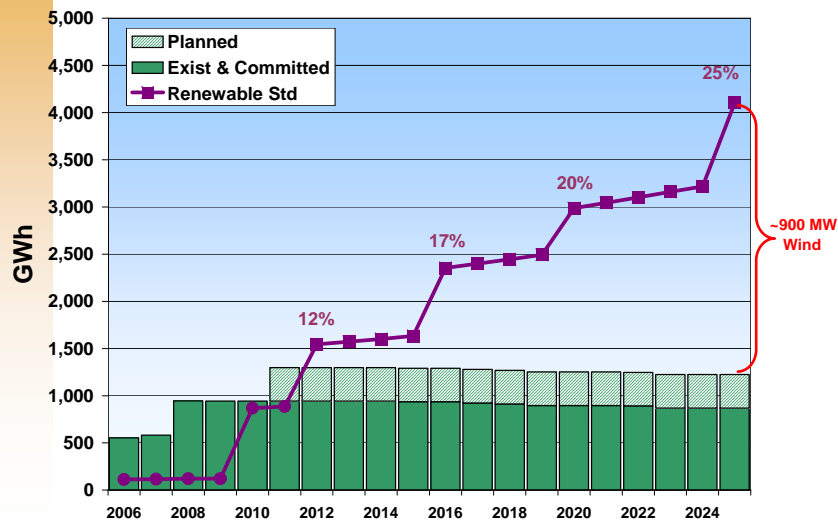
Five-point Sustainable Energy Commitment

- ε Commitment to 25 percent renewable energy portfolio by 2025
- ε Commitment to reduce CO₂ emissions below 2000 levels by 2020
- ε Commitment to conservation & energy efficiency as generation resources
- ε Commitment to employ research to find sustainable energy resource solutions
- ε Commitment to creative coalitions to solve energy & environmental challenges

Renewable Energy



GRE Renewable Energy Standard Compliance



CO₂ Reduction Strategy



- a Efficiency improvements at existing plants
 - a Coal Drying
 - a Conservation and demand-side efficiency programs
 - ε Energy Conservation Campaign
 - ε Energy Education Funding Research
 - ε Promotion and demonstration of LEED
 - a Funding Research
 - ε PCOR
 - ε EPRI chilled ammonia
 - ε Carbozyme
 - a Investigating new generation technology

Efficiency Improvements



- | | |
|---|--|
| <ul style="list-style-type: none">a <u>Completed Projects</u><ul style="list-style-type: none">ε Turbine bladesε Cooling Towersε Simulatorε Ventilationε Variable packingε Fans/VFD'sε Controlsε Leak detectionε Compressed aira 605,771 CO₂ tons/year saved | <ul style="list-style-type: none">a <u>Future Efficiency Projects</u><ul style="list-style-type: none">ε Coal Dryingε Turbine Upgradea 1,200,000 CO₂ tons/year saved |
|---|--|

Turbine Rotor Upgrade

a Add 9 Mw of Capacity and a minimum of 40 Mw of Energy Output from CCS

- z End of 2010
 - a 1 Mw in 2007
 - a 20 Mw in 2008
 - a 19 Mw in 2010



a Installation

- z 4 new LP turbines
- z 2 new HP/IP turbines
- z 4 new Feed Pump turbines
- z Mark VI control system to be done in 2007, 2008, 2010 major outages



a Cost: \$62 million

- z Fuel-free megawatts



Drying Goals and Schedule

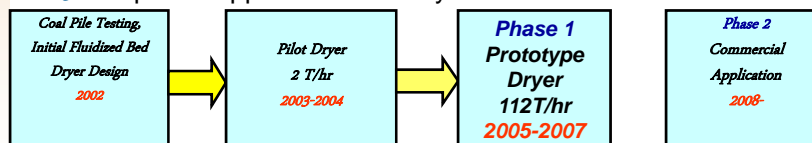


a Goals and Objectives:

- z Reduce moisture content of lignite, PRB, and other high-moisture fuels.
- z Use waste heat from the power plant.
- z Increase competitive position of lignite, PRB, and other high moisture coal-fired power plants.
- z Reduce environmental impact of lignite, PRB, and other high-moisture coal-fired power plants

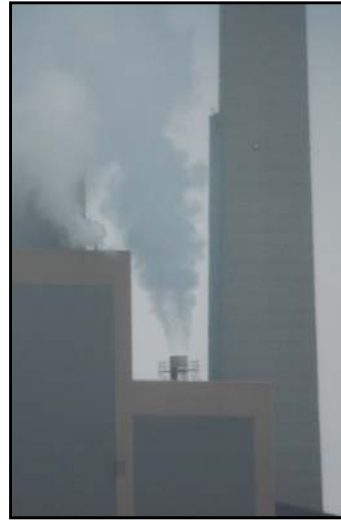
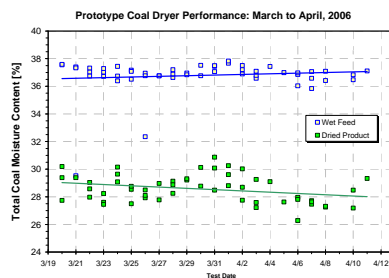
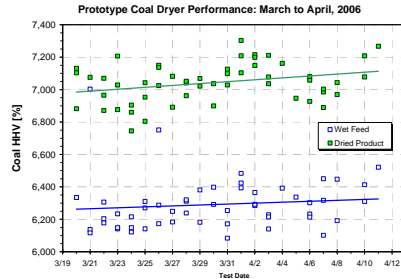
a Project Phases and Schedule:

- z Six patent applications filed by GRE



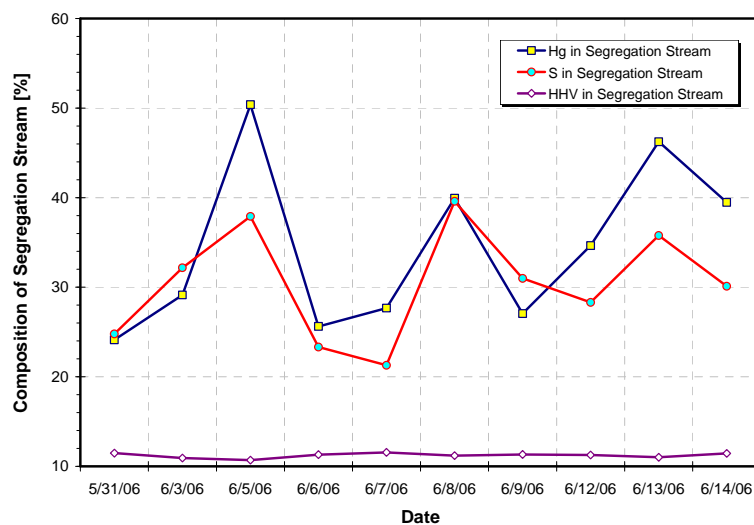
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Coal Drying Testing



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Segregation Stream



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Emissions Reduction Summary

| | | |
|----------------------------------|------------------------|-----------|
| NO_x reduction | | |
| | Prototype CDS | 7.5% |
| | Full-size CDS | > 10% |
| SO_x reduction: | | |
| | Prototype CDS | 1.9% |
| | Full-size CDS (4 FBDs) | 20 to 25% |
| Hg reduction | | |
| | Prototype CDS | 0.4% |
| | Full-size CDS (4 FBDs) | 40 to 45% |
| CO₂ reduction | | |
| | Prototype CDS | 0.4% |
| | Full-size CDS (4 FBDs) | 4.00% |

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Coal Creek Station - Coal Drying

^a U.S. Department of Energy project - Clean Coal Power Initiative (2003)

- ⌘ \$31.5 million project
- ⌘ \$13.5 million cooperative agreement (DOE)
- ⌘ Using waste heat to dry incoming lignite to under 30 percent moisture

^a Results from prototype dryer were successful

- ⌘ Thus, began commercialization to build four dryers each for Units 1 & 2
- ⌘ All dryers to be operational by summer 2009
- ⌘ \$170 million capital investment

^a Technology will be marketed worldwide for use in additional power plants

- ⌘ Significant impact (increase in power plant efficiencies & reduction in emissions)



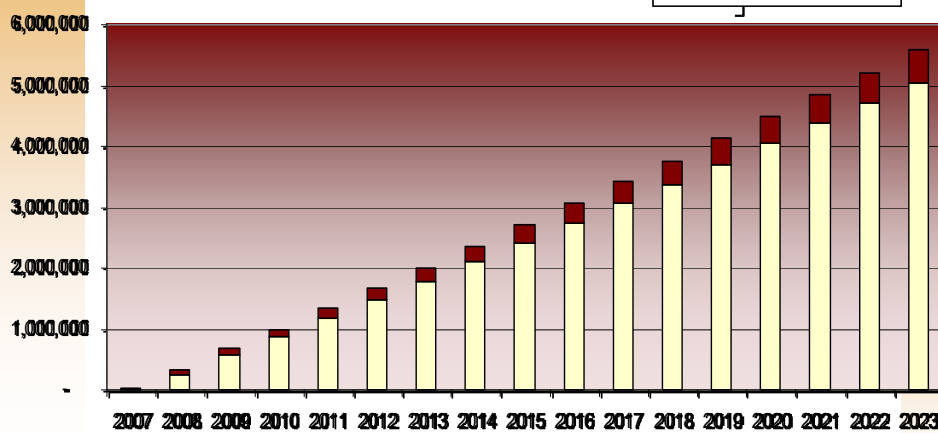
Conservation Programs



- a Develop an Energy Conservation Campaign that is second-to-none!
 - ε Begins with energy efficient lighting campaign
 - ε Use the lighting campaign as a platform to launch other conservation efforts
- a Commit to Energy Education
 - ε Possibly leverage our cooperatives' relationship with the Environmental learning centers
- a Seek support & partnership opportunities to help deliver conservation programs

Conservation Can Reduce Growth

In 2023,
6% of GRE's growth
will be served through
conservation



Demonstrate Our Commitment

- ε Implement corporate initiatives that demonstrate our environmental commitment
 - GRE vehicle fleet
 - ε 25% of light duty vehicle fleet is hybrid or FFVs
 - ε Goal is 100%
 - GRE LEED Buildings
 - ε New Headquarters building
 - Designed to be 63% more efficient than ASHRAE Energy Code
 - ε New Bismarck office

GRE Bismarck Office

Sustainable building practices



- Reducing energy consumption
- Diverting construction waste from landfills
- Using recycled and locally manufactured materials
- Capturing storm water runoff in rain gardens
- Using fly ash products
 - ε Carpet
 - ε Concrete
 - ε Ceiling tiles



New headquarters facility

Sustainable building practices



- Reducing energy consumption by 50%
- Reducing water usage by 40%
- Diverting 75% of construction waste from landfills
- Using recycled and locally manufactured materials
- Capturing storm water runoff in rain gardens
- Delivering 10 to 15 percent of the building's energy through on-site renewables



Business Development Strategy

- **Create core-related ventures that benefit rates through profits or cost savings**
 - Invest in energy independence initiatives
 - Ethanol
 - Coal-to-liquids (ALE)
 - Invest in combined heat & power partnerships
 - Spiritwood Station
 - Dickey-LaMoure
 - Utilize technology to benefit our core business
 - Coal drying
 - Great American Energy
 - Unlock the value of under-utilized assets
 - Fly ash
 - Infrastructure investments of more than \$27 million since 1997
 - Increase in marketing to reach greater sales

Blue Flint Ethanol

a Partnership with Headwaters Incorporated

- z Headwaters is majority owner & operator
- z Great River Energy is minority owner & service provider

a Located adjacent to Coal Creek Station - uses steam from power plant

- z Eliminates need for boiler (\$20-25 million) / plant is a low-cost producer of ethanol
- z Advantages: less emissions & water use than a greenfield site

a Other services

- z Water supplied by Coal Creek Station
- z Electricity (4.3 megawatts) supplied by McLean Electric



Blue Flint Ethanol



a 50 million gallons - domestic fuel

- z 18 million bushels of corn (equal to 13 percent of North Dakota's production)
 - a The process from corn entering the plant, to leaving in the form of ethanol, takes about 3-to-4 days
- z Distillers grain – 225,000 feeder cattle



a Plant operating as of February 2007

- z \$95+ million project
- z 36 full-time employees
- z Operating at 115% rated capacity

Great American Energy

- a Provide refined lignite to regional customers seeking a North Dakota supplier
- a Customer value proposition
 - z Dryer coal with higher heating value
 - z Refined with the removal of heavier elements
 - z Competitive stable price
 - z Opportunity to ship by truck and short line rail
 - z Benefit North Dakota commerce
 - z Reliability of supply
- a Joint venture of North American Coal and GRE



GREAT AMERICAN ENERGY
Beneficiated Lignite Powering America's Independence

Raw Lignite vs. Beneficiated Lignite?

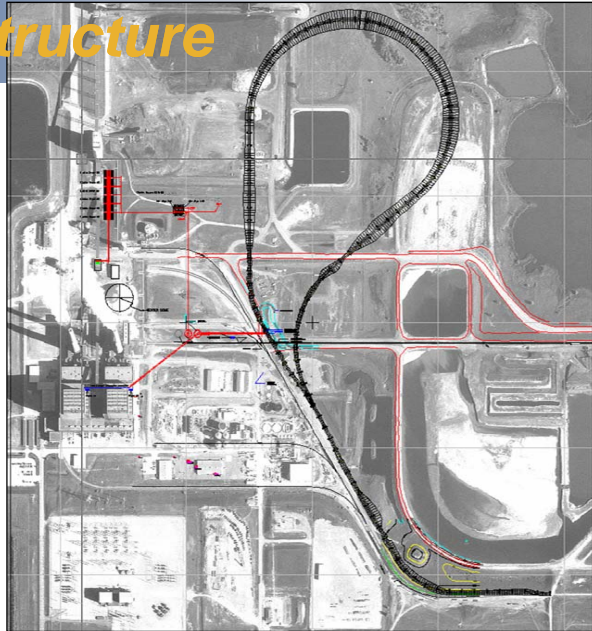
| Raw Lignite (example) | Beneficiated Lignite |
|-----------------------------|-----------------------------|
| 6262 BTU/# Heat value | 7500 BTU/# Heat value |
| 37.1 % Moisture | 26.2 % Moisture |
| 17.7 # Ash/MBTU | 16.2 # Ash/MBTU |
| 2.1 # SO ₂ /MBTU | 1.7 # SO ₂ /MBTU |
| 10.7 #Mercury/TBTU | 8.5 #Mercury/TBTU |
| | Higher energy density |
| | Less emissions |
| | Lower transportation cost |



GREAT RIVER ENERGY
A Duquesne Group Company

GAE Infrastructure

- a Load out
 - ε Rail loop
 - ε Trucks
 - ε Coal silo storage
 - ε >3,500,000 tons per year available



What's Coming Next?



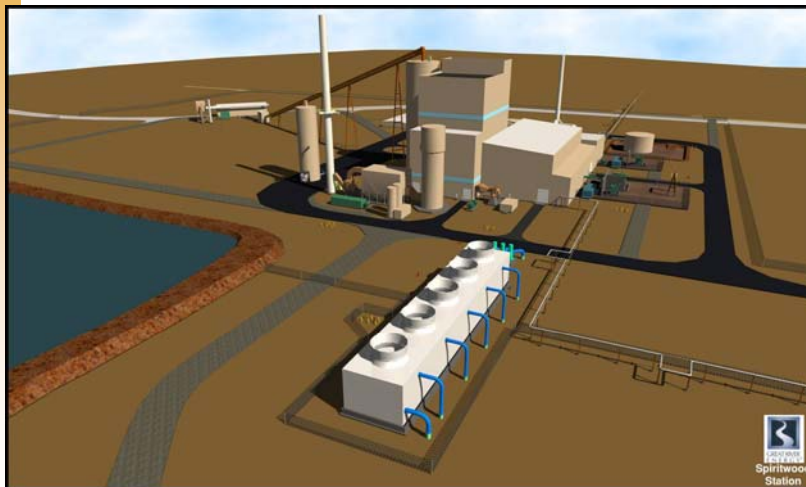
- a Temporary load out
 - ε Enable ND customers to test burn refined ND coal by 1st quarter 2008
 - While GAE is building its permanent facilities
- a Permanent facility construction target completion by early 2009
- a GAE commercial plans
 - ε Refined coal for Spiritwood Station
 - ε GAE is in discussions with potential customers

Spiritwood Industrial Park

Three major businesses with commitment to North Dakota operations

- ⌘ Great River Energy
 - Is building a combined heat & power plant
 - Will provide 62 megawatts baseload
 - 37 megawatts peaking electricity to customers
 - Will provide steam to
 - ⌘ Cargill Malt
 - ⌘ Spirit Ethanol
- ⌘ Cargill Malt
 - Expanded plant by 30 percent (world's largest)
 - ⌘ Because of future availability of low-cost energy
- ⌘ Newman Group
 - Will build 110 gallon ethanol plant

Spiritwood Station



Spiritwood Energy



- a Low emissions**
 - ¿ Beneficiated (upgraded) lignite
 - ¿ Best Available Emissions Control Technologies (BACT)
 - Limestone Injection
 - SO₂ polishing scrubber
 - SNCR (NO_x control)
 - Activated Carbon Injection
- a Wastewater from Cargill Malt**
- a Base load power plant economics at small size**
 - ¿ High efficiency - 66 percent energy efficient
 - ¿ Lower carbon footprint

Spiritwood Station continued

- a Operational - first quarter 2010**
 - ¿ Cost of plant \$276 million
 - ¿ Will provide 480 construction jobs
 - ¿ 42 long term operations jobs
- a Studying Co-fire of Bio-mass Feasibility with interested partners**
 - ¿ North Dakota Natural Resources Trust
 - ¿ Great Plains Institute
 - ¿ Ducks Unlimited
 - ¿ US Fish & Wildlife.

Coal-to-liquids



a American Lignite Energy

- z Announced in 2005 by Headwaters / Great River Energy / North American Coal Corp./Falkirk Mining Co.

a Studying feasibility of plant (\$3-4 billion) that:

- z Would be using GRE coal drying technology
- z Would gasify lignite coal
- z Would then convert the coal derived syngas into gasoline, other fuels & petrochemicals
 - 32,000 barrels per day / requiring 10 million tons of coal annually
- z Would use part of gas stream to produce electricity and lower carbon footprint than combined cycle
- z Would include CO₂ 70% sequestration



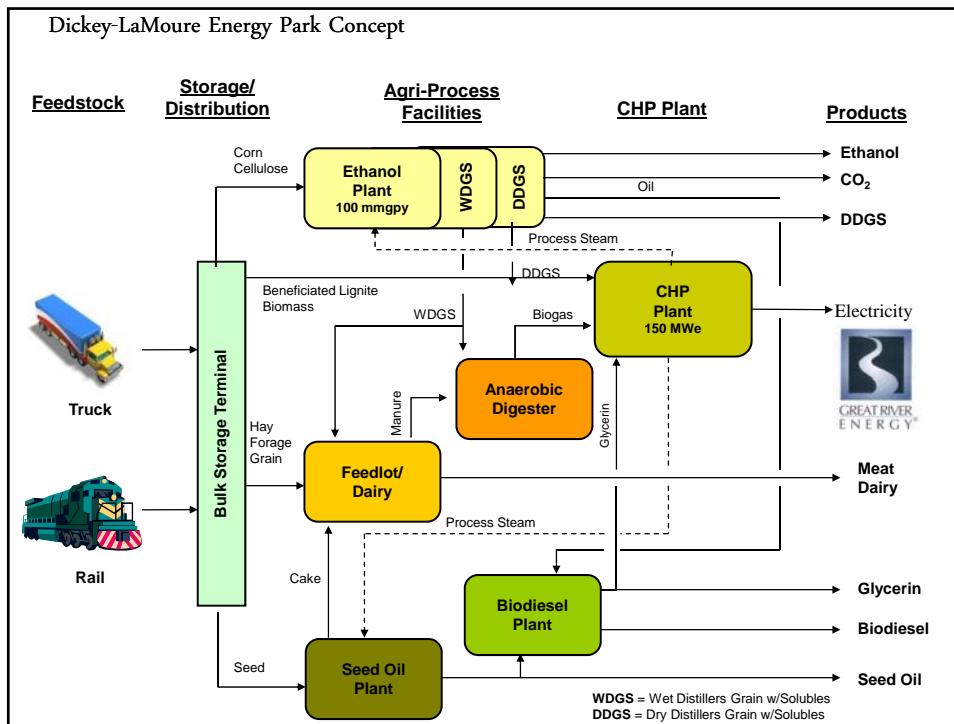
Coal-to-liquids



a Why Coal-to-Liquids?

- z Coal is the most abundant fossil fuel in the world. The United States has more coal reserves than any other country. Any product made from oil can be made from coal.
- z Coal-to-liquids will provide environmentally superior fuels that work in today's vehicles.
- z Coal-to-liquids has the power to enhance our nations' energy independence.
- z Coal-to-liquids is economical in comparison to today's oil prices.
- z Coal-to-liquids will create jobs.
- z **The CO₂ footprint will be equal to domestic produced fuels and greater than imported fuels.**
- z **GRE is involved to export energy with a carbon footprint less than the natural gas combined cycle.**





Great River Energy



- a GRE has demonstrated our commitment to the environment
- a GRE and ND have been great partners in energy development
- a Renewable Energy opportunities in North Dakota will grow the GRE/ND partnership

Thank You



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