

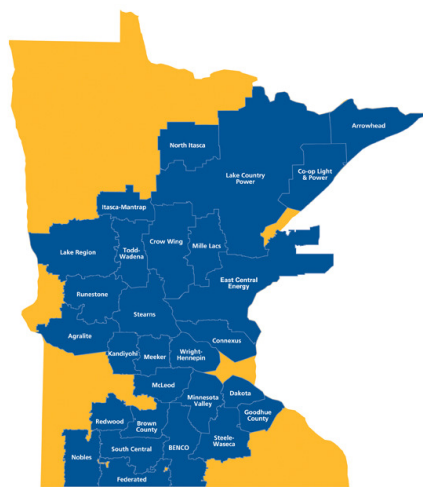
Energy Efficiency & The New Reality

Jeff Haase

Minnesota Geothermal Heat Pump Association
2012 Geothermal Conference | January 12, 2012



Great River Energy



- Not for profit generation & transmission cooperative providing wholesale electricity to 28 distribution cooperatives in Minnesota and into Wisconsin.
- Second largest utility in Minnesota, our member cooperatives distribute electricity to families, farms and businesses serving almost 1.7 million people.



“There’s nothing wrong with change, if it is in the right direction.” Winston Churchill

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Minnesota Energy Policy Goal

**Minnesota Statutes §216C.05, Subd. 2.
ENERGY POLICY GOAL**

It is the energy policy of the state of Minnesota that:

- (1) the per capita use of fossil fuel as an energy input be reduced by 15 percent by the year 2015, through increased reliance on energy efficiency and renewable energy alternatives; and
- (2) 25 percent of the total energy used in the state be derived from renewable energy resources by the year 2025.

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Heat Pumps Generate Significant Energy Savings for GRE Cooperatives

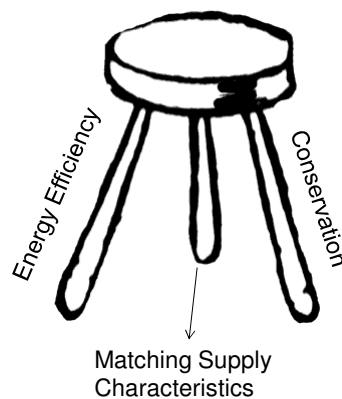
Program	Energy Savings (kWh)	Percent of Total Energy Savings
Residential Lighting	29,638,551	19.8%
Comm. Lighting	20,134,718	13.4%
GSHPs	17,724,829	11.8%
Appliances	15,284,509	10.2%
ASHPs	5,978,073	4.0%
Air Conditioning	1,630,582	1.1%
Load Management	804,584	0.5%
Total	91,195,846	60.8%

- Heat Pump Technologies account for nearly 15% of our annual energy savings achievements.
- These savings are largely based on energy savings over electric resistance heating.

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Demand Side Management



- Recognize the cost effectiveness of energy efficiency
- Managing and influencing technologies that are best able to utilize the unique characteristics of our energy supplies.

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Redefine Advanced Technologies



- Managing variable system resources, e.g. wind, will become a key characteristic of utility operations.
- Identifying technologies that are complementary to a utilities generation resources can help to drive down the overall system costs, and the costs to the end user.

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A Toxstone Energy Cooperative



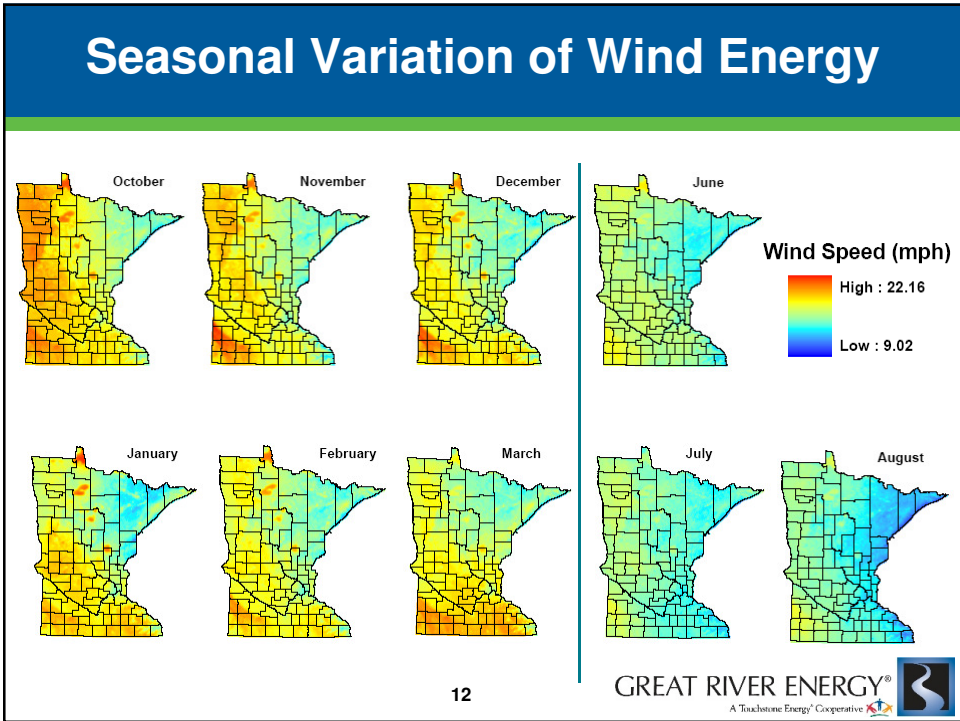
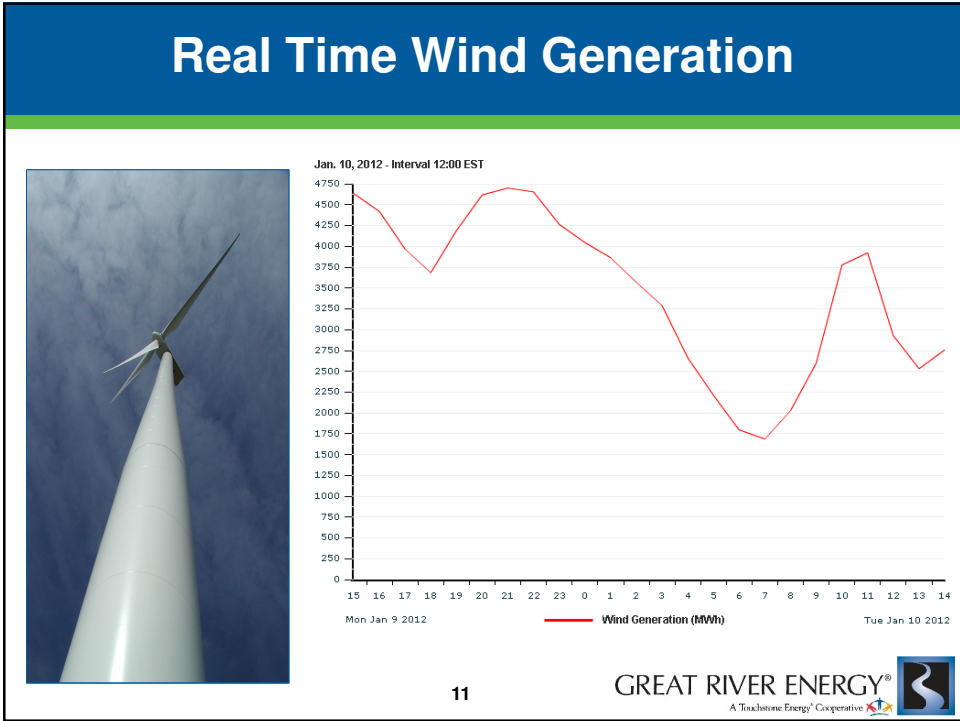
Future Heat Pump Advances

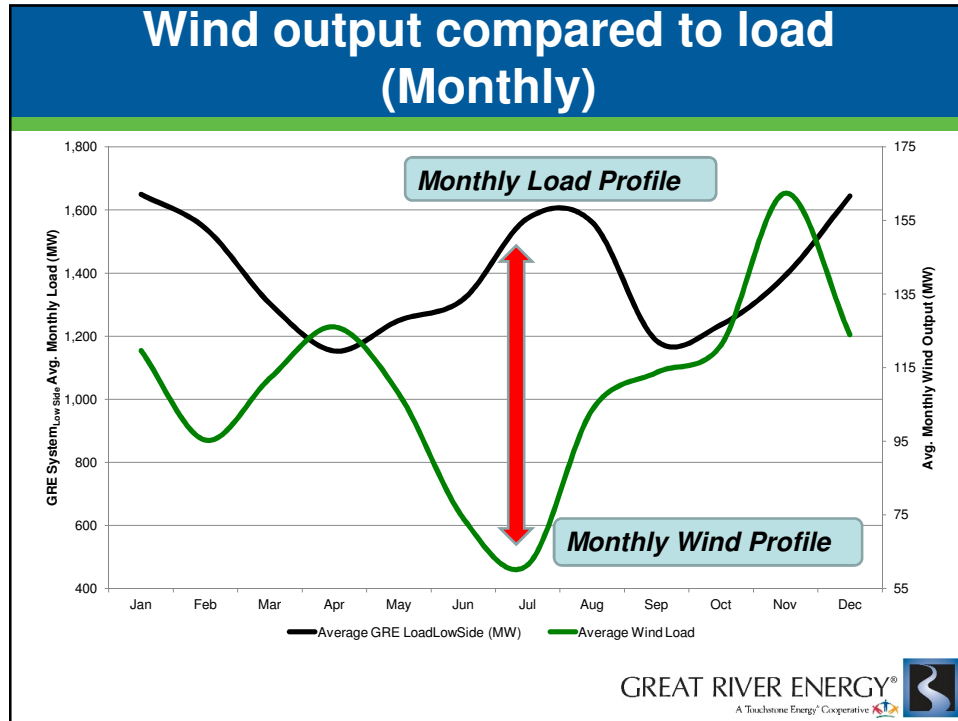
- Traditional heating technologies are reaching their efficiency limitations
 - Systems that generate heat will not be able to go beyond 100% efficiency.
- Heat pump technologies will continue to realize incremental improvements that allow higher COPs.
 - Refrigerants
 - Vapor Compression Cycles

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Renewable Energy Costs

- In 2010 the estimated wholesale rate impact of the Renewable Energy Standard requirement was approximately \$22 million.
 - Approximately \$0.002/kWh
 - About \$24 for an average member
- Primary cause:
 - Cost of purchasing wind energy was higher than the value of that energy, on average, during the times of production.

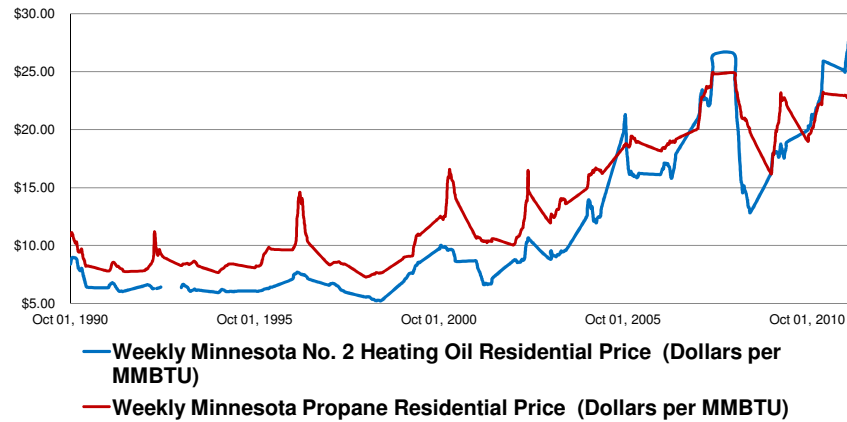
Time of Use (TOU) Rates

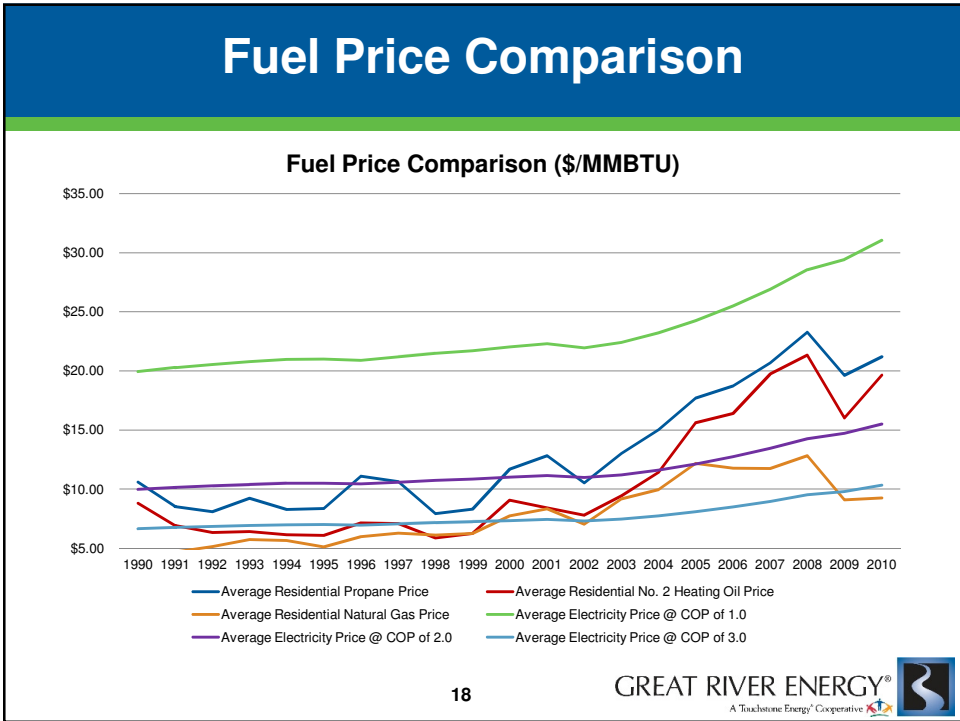
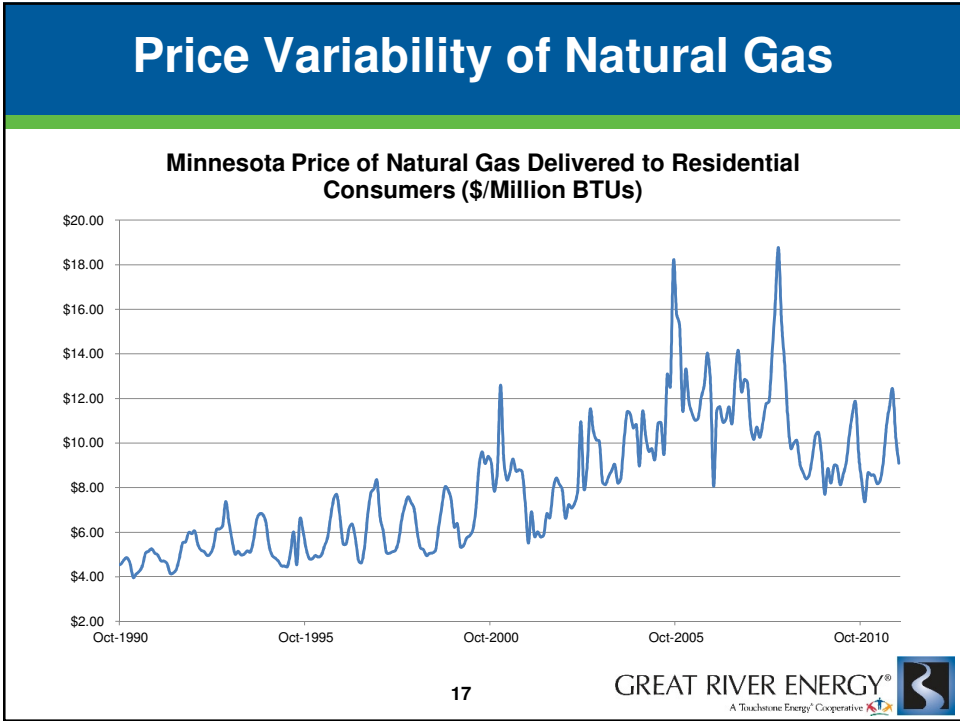
- Connecting electricity consumers to the market forces that are impacting utilities.
- Driving different equipment choices to reflect the cost of energy at different times of the day.
 - Maximizing the amount that is used during off-peak (low-cost) hours
 - Minimizing consumption during the peak periods



Price Variability of Delivered Fuels

Minnesota Fuel Oil & Propane Residential Price (\$/Million BTUs)





Ever-changing Resource Mix

Published January 06, 2012, 01:00 AM

Battle of the resources: Coal and wind energy abundance fuels use debate

While North Dakota is known for its oil, it is not the only major resource in the state. Coal and wind energy have the potential to produce vast quantities of electricity, officials said Friday; however, there is a debate on which is better.

By: **April Baumgarten**, The Dickinson Press

While North Dakota is known for its oil, it is not the only major resource in the state.

Coal and wind energy have the potential to produce vast quantities of electricity, officials said Friday; however, there is a debate on which is better.

North Dakota can produce up to 1.2 trillion kWh of electricity each year, which is enough to power more than a quarter of the country, according to Windustry, a Minneapolis-based organization that promotes wind energy development.

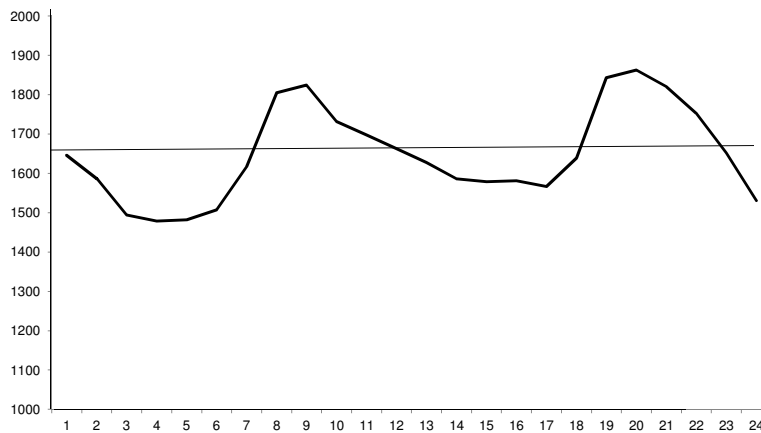
North Dakota has some of the largest reserves for lignite coal used for electricity, said Daryl Hill, Basin Electric Power Cooperative supervisor of media and communications relations. He added there are eight plants for producing electricity from lignite in the state.

"There is enough lignite in the state to fuel all those plants for the next 800 years," he said. "That is a lot of coal."

Hill said coal is a domestic, affordable resource that is economical. But a disadvantage is environmental regulations.



Ideal vs. Typical Load Curve



An Energy Efficient System

- Realizing an efficient energy supply system requires looking at all aspects of generation and consumption:
 - Energy Efficiency at Supply & Demand
 - Load Management
 - Conservation
 - Renewables
 - Complementary Technologies

Heat pumps are a critical element to realizing an efficient energy supply system

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Thank you!

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