

Providing Minnesota With Reliable, Low-Cost Electricity

North Dakota's Contribution to Minnesota's Current and Future Energy Supply

Minnesota electric consumers want affordable, reliable power that meets environmental expectations. However, Minnesota's daily needs for electricity cannot be met exclusively by in-state coal, nuclear or intermittent renewable facilities. For several decades, Minnesota's electric utilities have used the domestically abundant reserves of lignite coal from neighboring North Dakota to power more than 800,000 homes and businesses in the state. This baseload source provides consumers access to affordable power 24 hours a day, seven days a week.

Minnesota needs more and cleaner baseload power, yet recent policies restrict access to the most reliable domestic source of electricity. Since 2007, plans for three new coal-based power plants in North Dakota have been postponed or cancelled. The cancellations are due to a variety of reasons including federal uncertainty regarding regulations for stationary carbon dioxide sources, including power plants. However, passage of the 2007 NextGen Act also has had an adverse effect as all three proposed facilities would have sold at least some of their electricity in Minnesota.

NORTH DAKOTA: AT THE FOREFRONT OF CARBON-CAPTURE TECHNOLOGY

Here are a few examples of efforts underway in North Dakota to identify technologies for effective, efficient carbon-capture:

- The Great Plains Synfuels Plant, located near Beulah, North Dakota, currently hosts the largest carbon capture and sequestration project in the world. Approximately 16 million tons of carbon dioxide have been captured from the Synfuels Plant since 2000.

- A pioneering effort is underway at Basin Electric Power Cooperative, owner and operator of the Antelope Valley Station that serves a number of Minnesota customers. The plan is to commence commercial operation on a large-scale, field demonstration project in 2012-2013 for CO₂ capture with the target of 90 percent CO₂ capture to provide an additional one million tons of CO₂ that can be used for enhanced oil recovery.
- A consortium of utilities and the Electric Power Research Institute are exploring emerging technologies through a carbon-capture study at Great River Energy's Coal Creek Station. This study will identify the most efficient and effective technologies for capturing CO₂.

To date, the North Dakota Industrial Commission has committed \$3.4 million in state funds for CO₂ capture

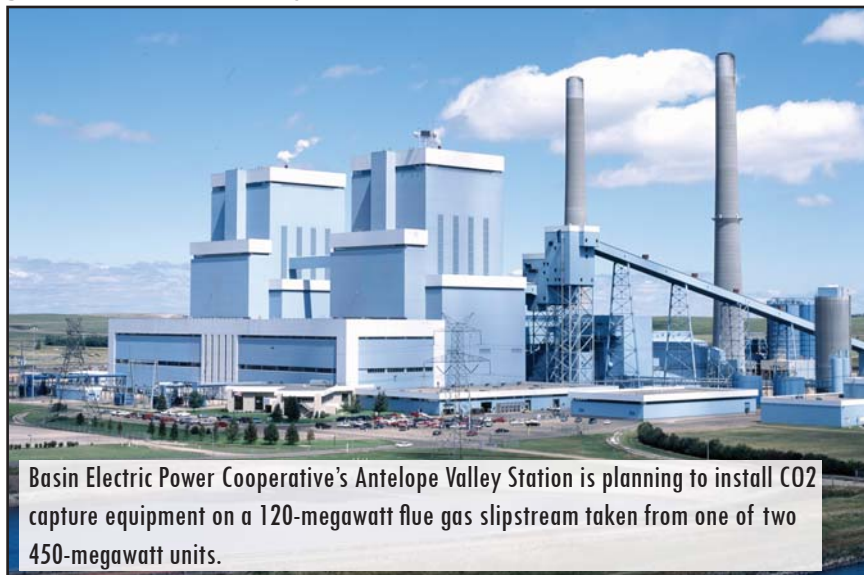
projects and another \$3.1 million for CO₂ sequestration projects to complement private investments in research and development.

Minnesota customers can also be assured their North Dakota-provided electricity is generated in compliance with stringent federal standards. North Dakota and Minnesota are two of 13 states to meet all of the U.S. Environmental

Protection Agency's ambient air quality standards.

RESEARCH REQUIRES SIGNIFICANT INVESTMENT

Technologies to capture CO₂ from coal-based power are still in their infancy. As utilities gain commercial experience with CO₂ capture, the per-ton cost of collecting CO₂ will likely decrease. But today, research efforts require significant investment. For example, the cost of implementing the post-combustion CO₂ capture demonstration project at the



Basin Electric Power Cooperative's Antelope Valley Station is planning to install CO₂ capture equipment on a 120-megawatt flue gas slipstream taken from one of two 450-megawatt units.

Antelope Valley Station is estimated to be \$300 million. To put that number in perspective, the large-scale, demonstration project at Antelope Valley Station will scrub less than 10 percent of the plant's total emissions for CO₂ during the tests. A full-scale demonstration would be much more costly.

Today's data also suggests energy efficiency of plants will decrease at the same time as the costs increase.

Without additional demonstration projects of CO₂ capture technology, North Dakota's seven power plants could lose 35 percent of the electrical output through retrofitting of its plants. The National Energy Technology Laboratory, a branch of the U.S. Department of Energy, estimates that the output loss due to capture projects through sustained research could be reduced to between 5 and 30 percent. NETL also estimates the cost to generate electricity could increase by 30 to 80 percent with the addition of capture technology.

This data argues for continuing to invest in the research and development necessary to make carbon capture commercially viable. The Lignite Research, Development and Marketing Program represents a partnership by the state of North Dakota and the lignite industry to develop the newest technology for lignite energy conversion facilities.

MORE RESEARCH DATA NEEDED

Commercial operation for projects the size of the one planned for Antelope Valley Station is still three to four years out, and it's difficult to predict actual costs as technologies advance. Because of the lack of large-scale field demonstration test data, which will not begin to be collected at Antelope Valley Station until the 2012-

2013 timeframe, it is not reasonable to expect utilities to invest \$500 million to \$1 billion per plant on technology that has not been proven without significant private/public partnerships that will invest in the needed technology.



THE IMPORTANCE OF COAL

If the Minnesota consumers need more baseload generation – and with a moratorium on nuclear and coal – the choice is to import Canadian electricity from Manitoba Hydro, if available, or build more natural gas-fired generating facilities. In either case, it will add to our nation's reliance on foreign energy sources and increase our trade deficit with other countries.

About 50 percent of the electricity consumed in the United States comes from coal and in our region, the percentage is higher. Thus it is important that the United States be a leader in discovering and implementing cost-effective carbon capture and sequestration technologies. The federal government has a Clean Coal Power Initiative that will help fund emerging CO₂ capture

technologies. Also, the federal government has approved \$300 million in loan guarantees for Basin Electric's Antelope Valley Station project.

SUPPORTING PUBLIC/PRIVATE INVESTMENT IN CARBON-CAPTURE TECHNOLOGY

A smart path toward energy independence, affordability, reliability and environmental progress includes

collaboration between the public sector and private interests to encourage more investment in carbon-capture technology. Commercializing the technology needed to significantly reduce carbon emissions will require states and private energy companies to work together to bring energy production to the level of environmental performance we all want to achieve.

Great River Energy's Coal Creek Station is one of five sites to host studies of retrofitting existing plants with post-combustion CO₂ capture technology through the Electric Power Research Institute.

