Economics and Electricity 101

33rd Annual Lignite Education Seminar
Bismarck, ND
June 12, 2018

Commissioner Brian Kroshus
North Dakota Public Service Commission
OVERVIEW

- My Background
- Opportunities in North Dakota
- Cost of Energy in North Dakota
- Lignite Coal, Energy Security, and Reliability
- Path Forward
• Born in Fargo, North Dakota
• Graduate of North Dakota State University
• 30-years private-sector business experience
• Appointed to ND Public Service Commission in March 2017 by Governor Doug Burgum
• Serve on numerous non-profit boards, runner and cycler and overall outdoor enthusiast
• Landowner, small grain and cattle operation in western ND
WHERE IS NORTH DAKOTA IN THE GRID?
ENERGY OPPORTUNITIES IN NORTH DAKOTA
## ENERGY SITUATION

- Coal Generation is on the range of 4300 MW
- Hydroelectric Power (Garrison Dam) 510 MW
- Wind Power (PSC approved almost 3,000 MW built) ... more proposed
- Natural Gas (PSC approved over 700 MW)... 400 MW built
- ND “needs” another 2500–3000 MW in next 20 years
- Power must be reliable and affordable!
MISO and SPP are the RTO’s in our area.

2nd largest oil producer in the U.S. (1.2 Million Barrels a day)

N.D. has a “strategic resource” - i.e. Lignite Coal!

Natural Gas processing plants (by product of the oil wells) – Growing segment

CO₂ has been used for EOR in our region for 30 years.

Several companies are exploring how to expand CO₂ use.
<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
<th>Cost</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseload</td>
<td>Coal Nuclear</td>
<td>Low</td>
<td>Very High</td>
</tr>
<tr>
<td>Peaking</td>
<td>Hydro Natural Gas Oil</td>
<td>Low to Medium</td>
<td>High</td>
</tr>
<tr>
<td>Intermittent</td>
<td>Wind Solar</td>
<td>Varies</td>
<td>Low</td>
</tr>
</tbody>
</table>
ENERGY PRODUCTION AND TRANSMISSION LINES

North Dakota - Wind Resource Map

Wind Power Classification

- Marginal
- Fair
- Good
- Excellent
- Outstanding

Wind Speed at 50 m

Transmission Line Voltage

Indian Reservations

Meteorological Stations with Wind Data

City or Town

U.S. Department of Energy
National Renewable Energy Laboratory

Fargo

Grand Forks

Minot

Jamestown

Bismarck

Dickinson

Williston

98°

98°

102°

100°

104°

48°

48°

104°

102°

100°

48°

Wind Power Density at 50 m

Wind Speed at 50 m
How does the System Work - where power comes from and how it gets to me

Simple model showing how electricity reaches a home or business – Note that model requires three distinct functions to deliver power to consumer: (1) generation; (3) transmission; and (5) distribution
Residential Customer’s Functionalized Cost

- Production: 52%
- Transmission: 8%
- Distribution: 40%
Sources of Electricity Generation
United States - 2016

- Natural gas: 33.8%
- Coal: 30.4%
- Nuclear: 19.7%
- Hydro: 6.5%
- Wind: 5.5%
- Biomass: 2.6%
- Other: 1.5%

Legend:
- Natural gas
- Coal
- Nuclear
- Hydro
- Wind
- Biomass
- Other
FEDERAL SUBSIDIES AND SUPPORT FOR ELECTRICITY PRODUCTION, FY 2013
(MILLION 2013 DOLLARS)
Federal Electric Subsidies Per Unit of Production, FY 2013
(2013 Dollars per Megawatt Hour)

- Coal: 0.57
- Natural Gas & Petroleum: 0.67
- Hydroelectric: 1.47
- Geothermal: 1.48
- Biomass: 2.07
- Nuclear: 2.10
- Wind: 35.33
- Solar: 231.21
TYPES OF ELECTRICITY PROVIDERS IN ND

Investor-Owned Utilities (IOUs)
* MDU, Ottertail, & Xcel

Cooperatively-Owned Utilities
* Basin Electric, Capital Electric, North Central, etc.

Government-Owned Utilities
* Valley City, Western Area Power
1. Prevent market abuses
2. Assure adequate earnings so that utilities can compete for investors
3. Ensure maximum public safety and reasonable quality of service
RATEMAKING CONSIDERATIONS TO ENSURE FAIRNESS

- Rates should reflect cost of service (i.e., avoid cross-subsidization between customer classes)
- New rates should not be significantly different from old rates (i.e., avoid “rate shock”)
- Rates should not drive customers away (i.e., through fuel-switching or moving)
COAL IS IMPORTANT TO NORTH DAKOTA

Provides for 15,000 direct and indirect jobs; supported by both political parties.

2 million people in the upper plains states depend on North Dakota-generated electricity for their low-cost, dependable power.

Fifth largest industry in the state; $100 million annually paid in state taxes.

Diverse Resource (Syn-Fuels Plant, Urea, Rare Earth Metals)
EFFECT ON FAMILY BUDGETS

Changes in energy prices typically affect young families and the elderly the most.

Average cost breakout
1. Housing
2. Transportation
3. Food
4. Insurances
5. Other
ADDITIONAL PSC ROLES

“Siting” of jurisdictional energy facilities

- Electricity Transmission Lines
- Wind Farms
- Coal Mines
- Natural Gas Facilities
- Pipelines

Land Reclamation for coal mines

- ND First in the nation on rules
- Excellent program
Public Service Commission (PSC) Jurisdictional Project Siting Process Flow Chart

- Application
- PSC Staff Review
- Public hearing
- Commission work session
- Commission Findings of Fact, Conclusions of Law, and Order
- Public Input
- Pre-construction meeting
- Post-construction inspection
FINAL THOUGHTS

• We need more baseload power

• Rising energy costs affect young families and elderly the most

• N.D. leads the nation in coal land reclamation procedures

• Ratepayers & Policy Makers need to “ensure” coal generation continues; ensuring reliability in the power grid

• Coal is a strategic resource that must be used, if we are ever going to truly have energy security
North Dakota Public Service Commission
600 E. Boulevard Ave  12th Floor
Bismarck, ND  58505-0480

www.psc.nd.gov
701.328.4195 (office phone)
701.471.7965 (cell)

Brian Kroshus
ND Public Service Commissioner
bkroshus@nd.gov