



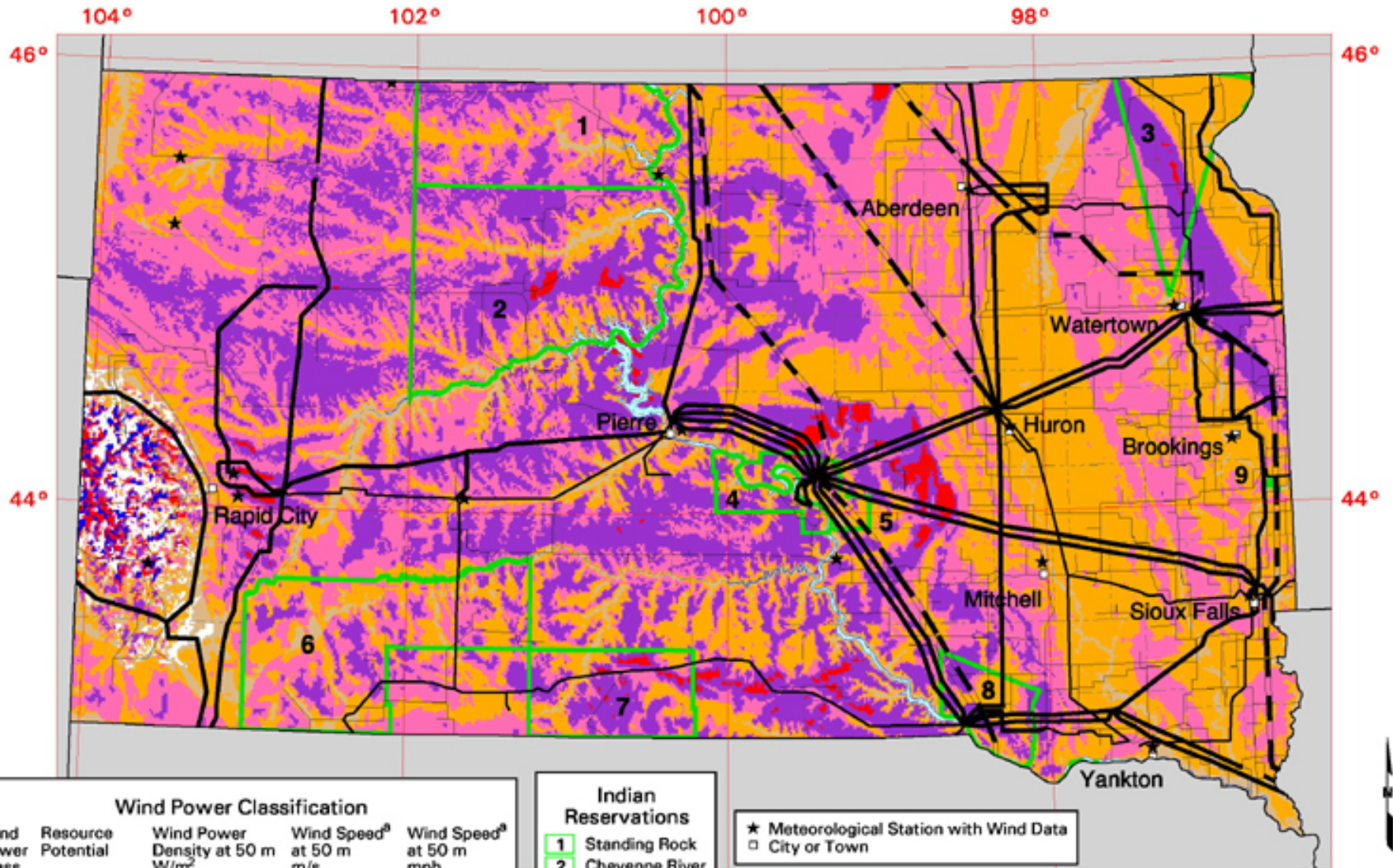
Realities of Wind Power

presented by

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South Dakota - Wind Resource Map



Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m ²	Wind Speed ^a at 50 m m/s	Wind Speed ^a at 50 m mph
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

^aWind speeds are based on a Weibull k value of 2.0

Indian Reservations

- 1 Standing Rock
- 2 Cheyenne River
- 3 Lake Traverse
- 4 Lower Brule
- 5 Crow Creek
- 6 Pine Ridge
- 7 Rosebud
- 8 Yankton
- 9 Flandreau

★ Meteorological Station with Wind Data
 □ City or Town

Transmission Line Voltage

- 69 Kilovolts
- 115 Kilovolts
- 230 Kilovolts
- 345 Kilovolts

50 0 50 100 Kilometers

25 0 25 50 75 Miles

Challenges & Obstacles to Wind Power



- Finding a Buyer
- Transmission Constraints
- Economics of Wind Generation
- National Level
- Cost Examples

Who are the Potential Buyers?



- Consumers of South Dakota
 - Green Energy Programs
 - Insert into the system
- Export it to Other States

Who are the Potential Buyers?



- Consumers of South Dakota

- Challenges and Obstacles

- Low growth in SD's electricity needs
- SD's existing electricity needs are met predominately with low cost Hydro & Coal generation with some smaller amounts of Natural Gas, Nuclear and Other mixed in
- Inserting Wind Energy into our current mix can mean an increase in current electric rates (Economics)

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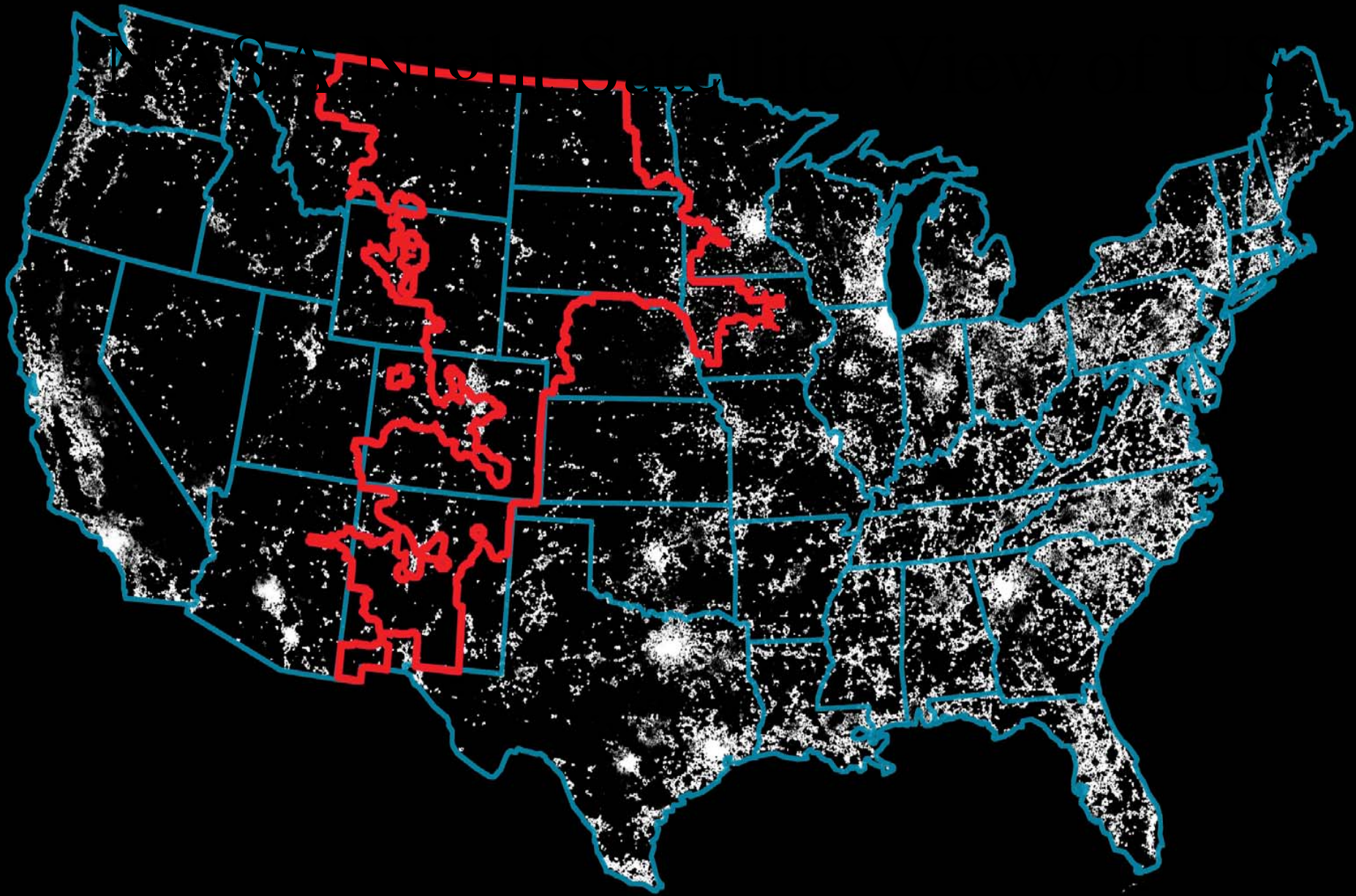
■ Consumers of South Dakota

- Challenges and Obstacles
 - Low Growth in SD's Electricity Needs
 - Existing Electricity Needs are met with low cost Hydro & Coal generation
 - Can mean an increase in current electric rates (Economics)

■ Export to Other States

- Problem – Transmission constraints







Transmission Costs

- 345 kV ~ \$350,000-\$500,000/mile
- Substations ~ \$3-5 Million Each
- 500 miles of line ~ \$200-\$250 million



Economics of Wind Energy

Generation costs for Wind Energy

- 4 to 7 cents per Kwh (without PTC)
- 2.2 to 5.2 cents per Kwh (with PTC of 1.8 cents)
- PTC expired 12/31/03



Economics of Coal & Hydro

- 1.5 cents per Kwh for hydro (Rushmore Electric and East River)
- 3.4 cents per Kwh for coal fired generation (Rushmore Electric and East River)
- Wholesale average rate of 3.2 to 3.4 cents per Kwh (Rushmore Electric and East River)



Comparison of Wind to a Mix of Coal and Hydro

- Generation cost are similar
- Comparing apples to oranges
- Coal, Hydro, Nuclear, NG are FIRM sources
- Wind is INTERMITTENT

Wind Combine

- Cost \$150,000
- Only operates when the wind blows



Diesel Combine

- Cost \$150,000
- Operates on demand





What is Going on Nationally

- Push for Renewable/Green Energy
- SD Legislation – Highmore Project
- Renewable Portfolio Standards (RPS)
- Net Metering
- Transmission



QUESTIONS???

Cost Examples....