Wind Powering North Dakota

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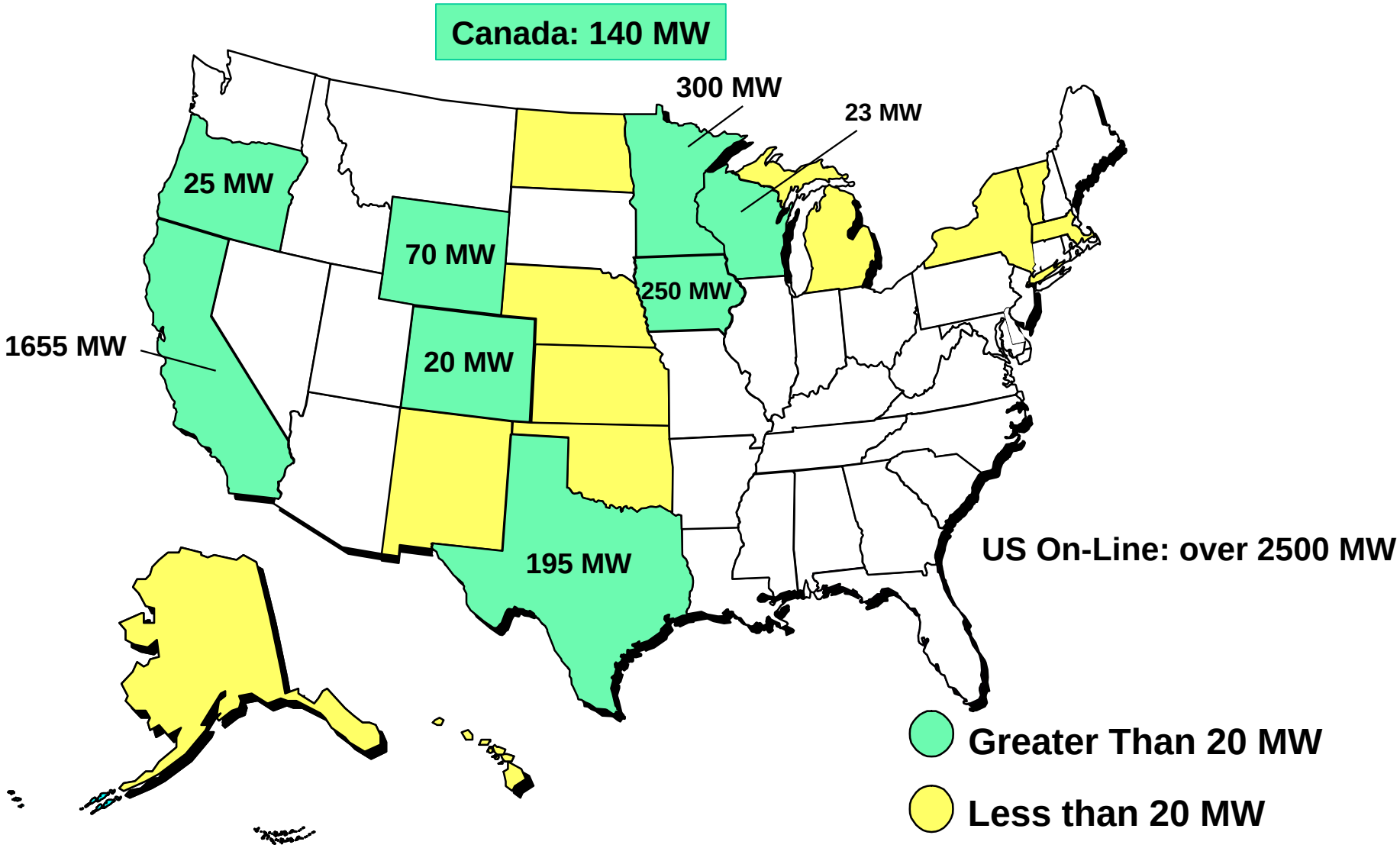
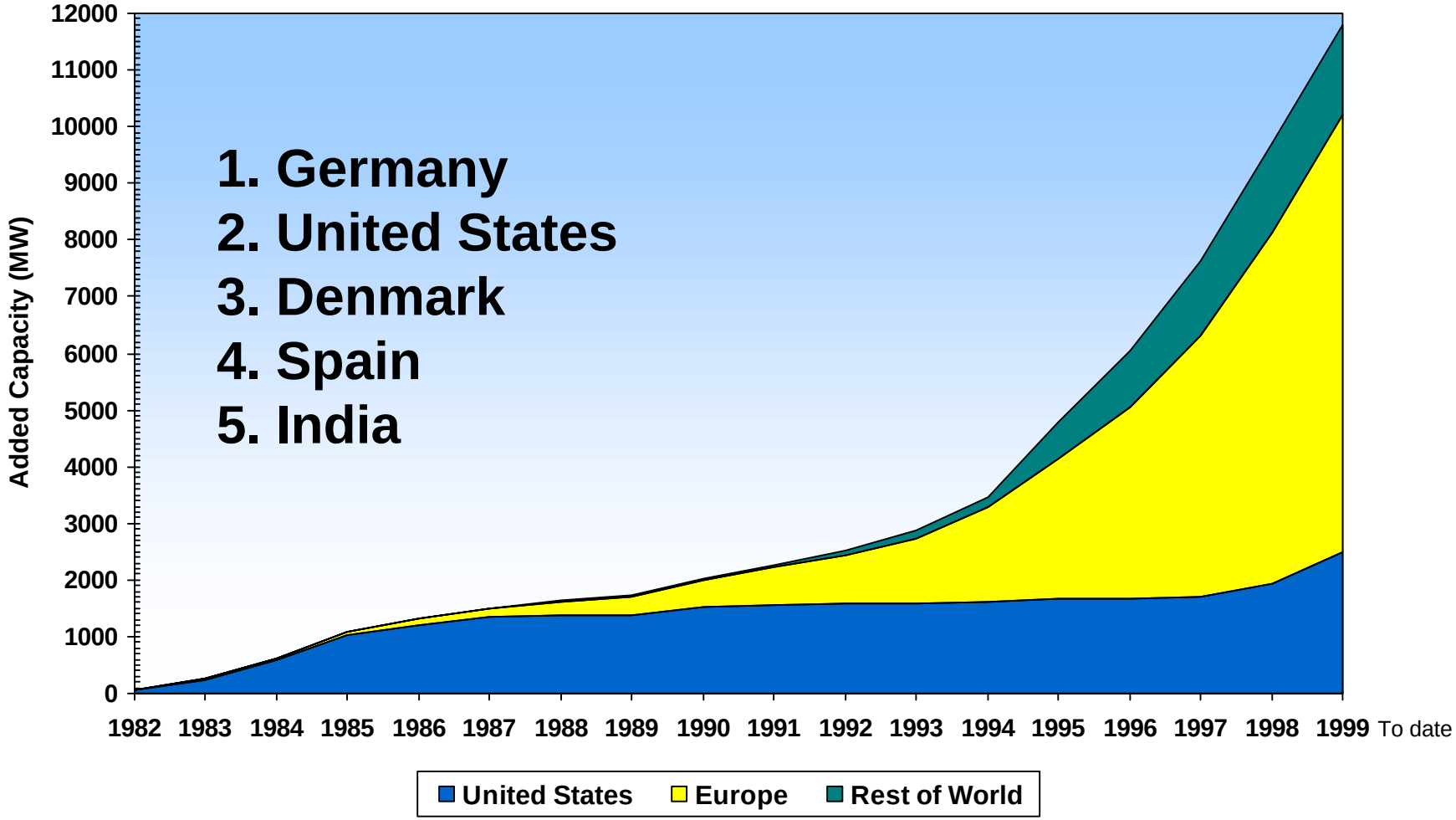
Sweeping Across North America



Wind Power Taking Off Worldwide



Based on information supplied by International Energy Agency.

Wind Energy Getting Cheaper

1979: 40 cents/kWh

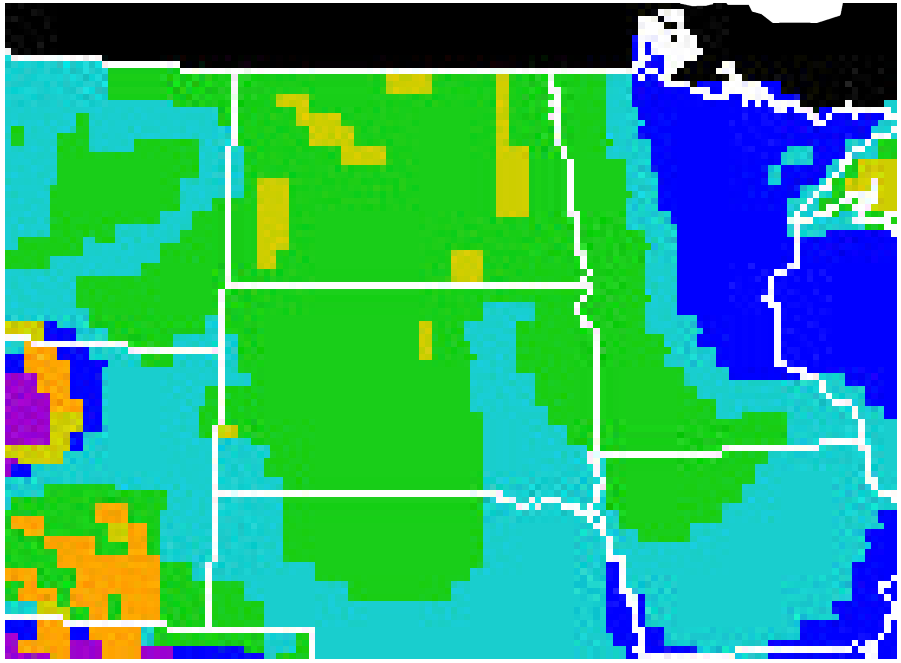
- Increased Turbine Size
- R&D Advances
- Manufacturing Improvements

1999: 4 cents/kWh (unsubsidized)
NSP 107 MW Lake Benton wind farm

North Dakota: “The Saudi Arabia of Wind”

Rank	State
1	**North Dakota**
2	Texas
3	Kansas
4	South Dakota
5	Montana
6	Nebraska
7	Wyoming
8	Oklahoma
9	Minnesota
10	Iowa
17	California

Source: AWEA



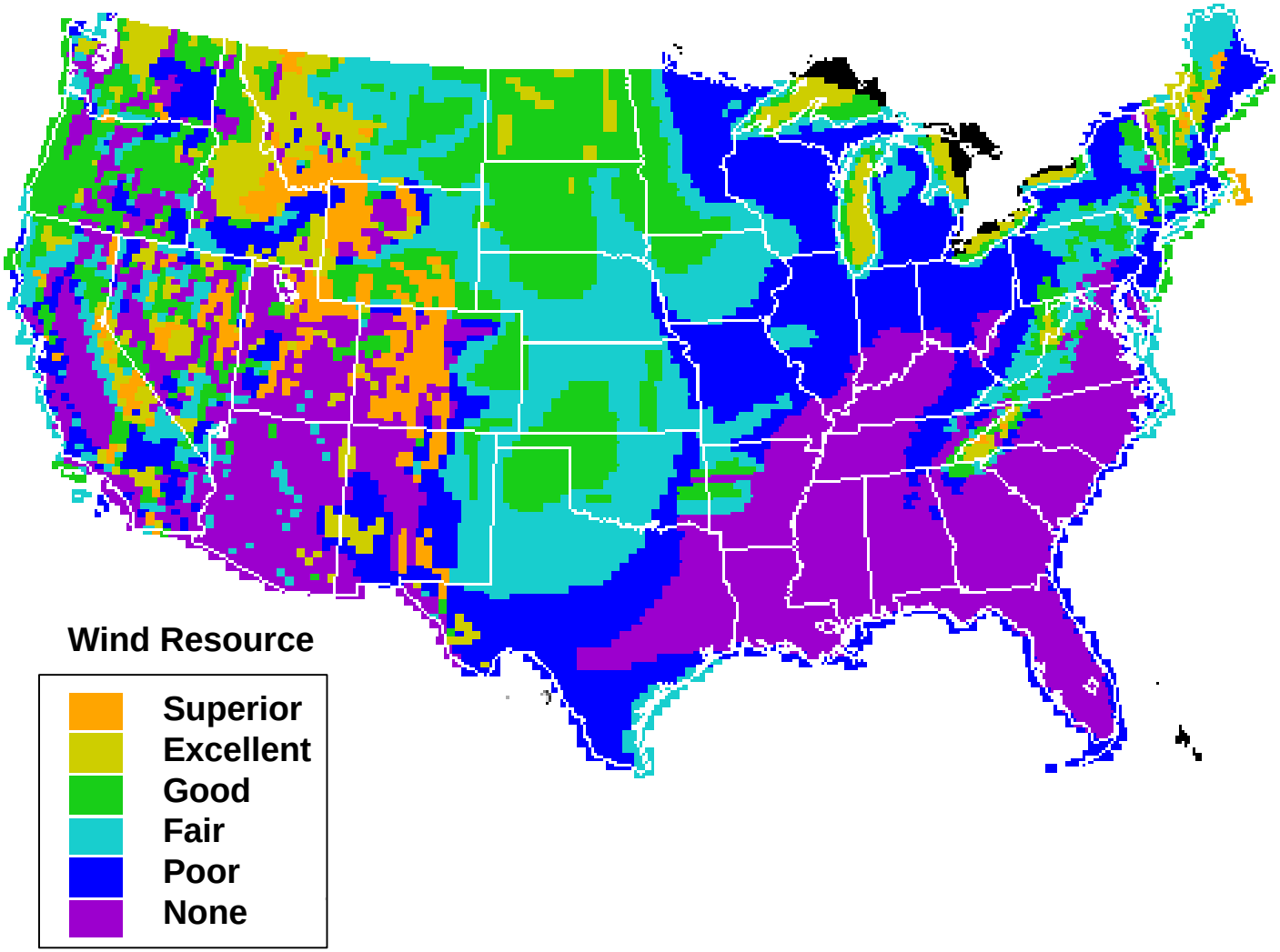
Wind Resource

- **Excellent**
- **Good**
- **Fair**
- **Poor**

World Class Wind Potential

Germany’s Potential: 100 GW
North Dakota’s Potential: 250 GW

Wind: An All-American Resource



Farmers: The Original Wind Pioneers

Then: Pumping water for crops and livestock

Farmers: The Modern Wind Entrepreneurs

Now: Exporting power for profit

The Answer is Blowing in the Wind

“We grow corn on the ground and generate power in the air -- all on the same piece of property.” - Delbert Watson, Iowa farmer

The Economics of Wind Farming

A 1000-acre farm could earn as much as $80,000 per year in royalties from wind generation:

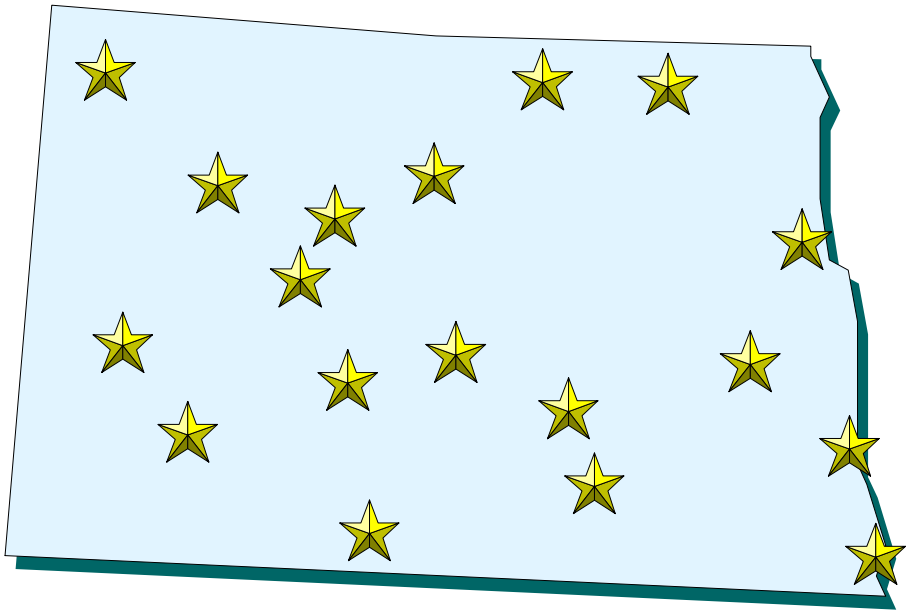
- Spacing of one 750 kW turbine per 26 acres (one-acre footprint): 40 turbines
- Average royalty of $2,000 per turbine per year

National Benefits

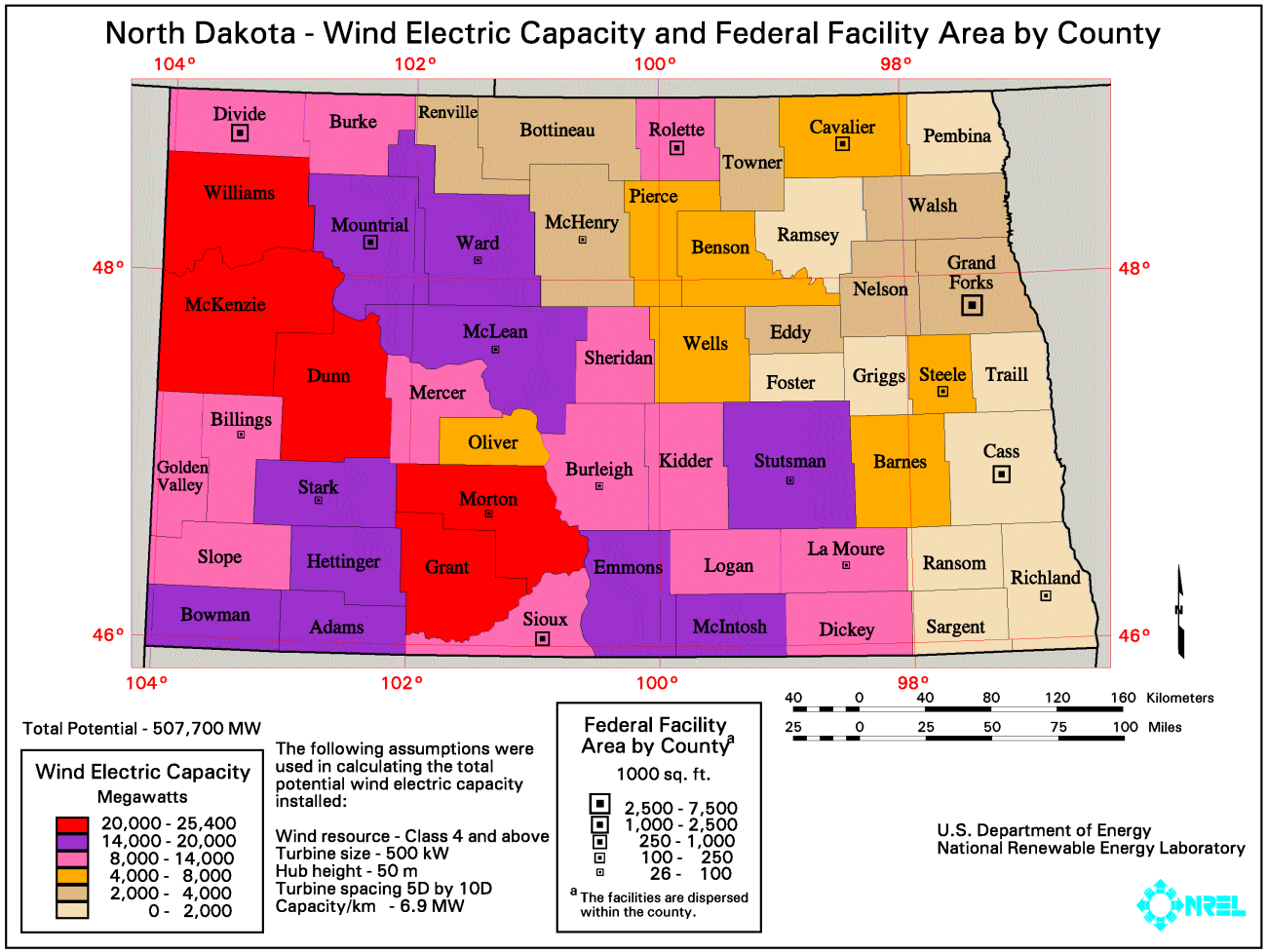
- $60 billion in capital investment in rural America over 20 years
- $1.2 billion in new income for farmers, Native Americans, and rural landowners over 20 years
- 35 million tons of carbon displaced in 2020
- 80,000 permanent jobs by 2020

Federal Facilities: Major Wind Opportunities

- Executive Order 13123
- Wind Powering America goal: 5% of Federal electricity use by 2010
- Projects under way:
  - San Clemente Island, U.S. Navy Project
  - Ascension Island, U.S. Air Force Project
  - Utility-scale project planned at Fort Bliss (TX): A model for replication across the country
  - Alaska Army base potential site



Federal Facilities: Major Wind Opportunities



San Clemente Island Naval Station

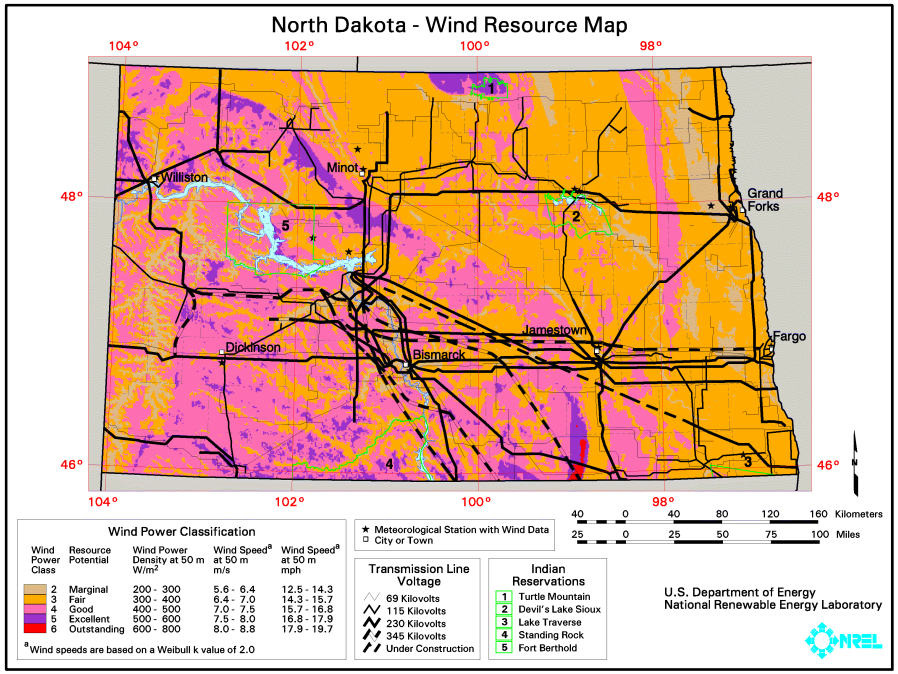
Three wind turbines operational July 2, 1999

Long range plan for 100% renewable power supply

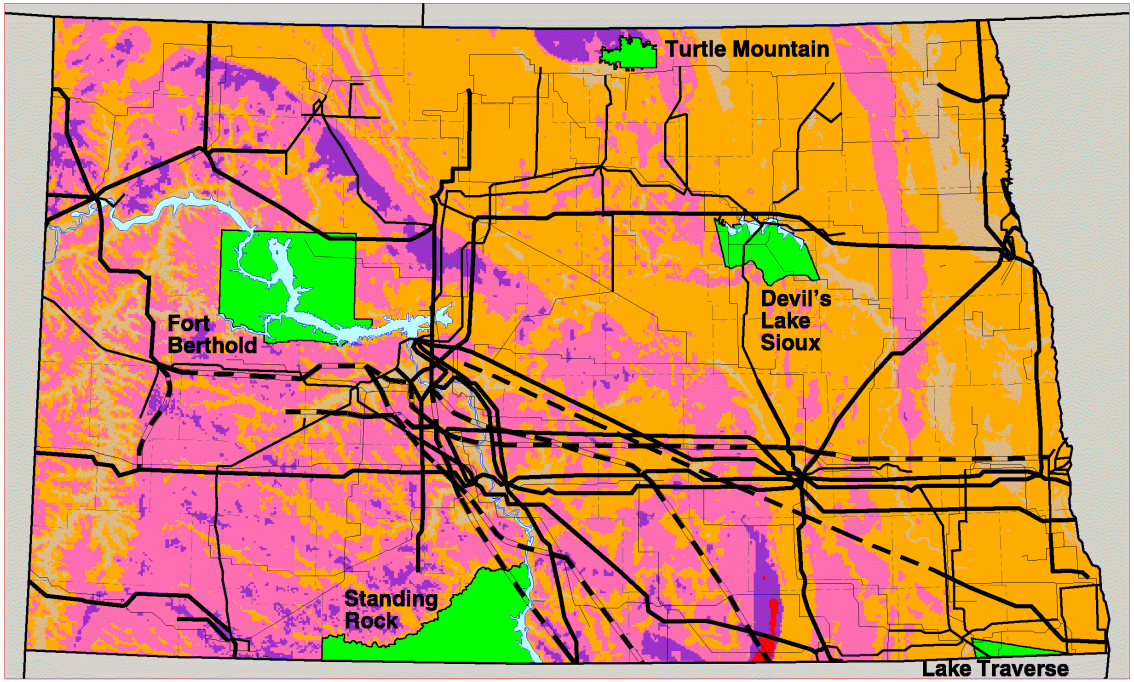
$346,000 Projected annual savings vs. diesel fuel

North Dakota Opportunities

- Out of State Green Power Demand
- Transmission System Expansion
- New Income for Farmers
- Potential Synergy with Coal



Native American Opportunities



Wind Power Classification

Wind Power Class	Resource Potential
2	Marginal
3	Fair
4	Good
5	Excellent
6	Outstanding

Transmission Line Voltage

- 69 Kilovolts
- 115 Kilovolts
- 230 Kilovolts
- 345 Kilovolts
- Under Construction

Indian Reservations

U.S. Department of Energy
National Renewable Energy Laboratory

Exporting Green Power

Foote Creek Rim, Wyoming

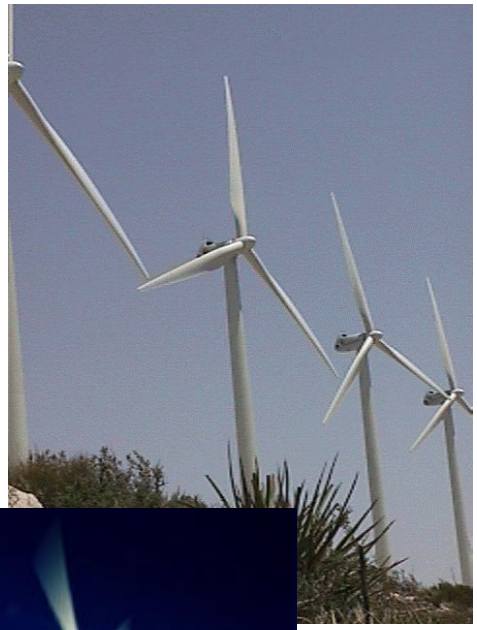
- 41 MW wind power plant -- 69 turbines
- Power exported to Washington and Oregon to serve green power demand
- Generation equivalent to a $140,000/year royalty payment to landowners

The Time is Right

- Wind Technology Readiness
- Rural Economic Development Needs
- Electric Industry Restructuring
- Climate Change

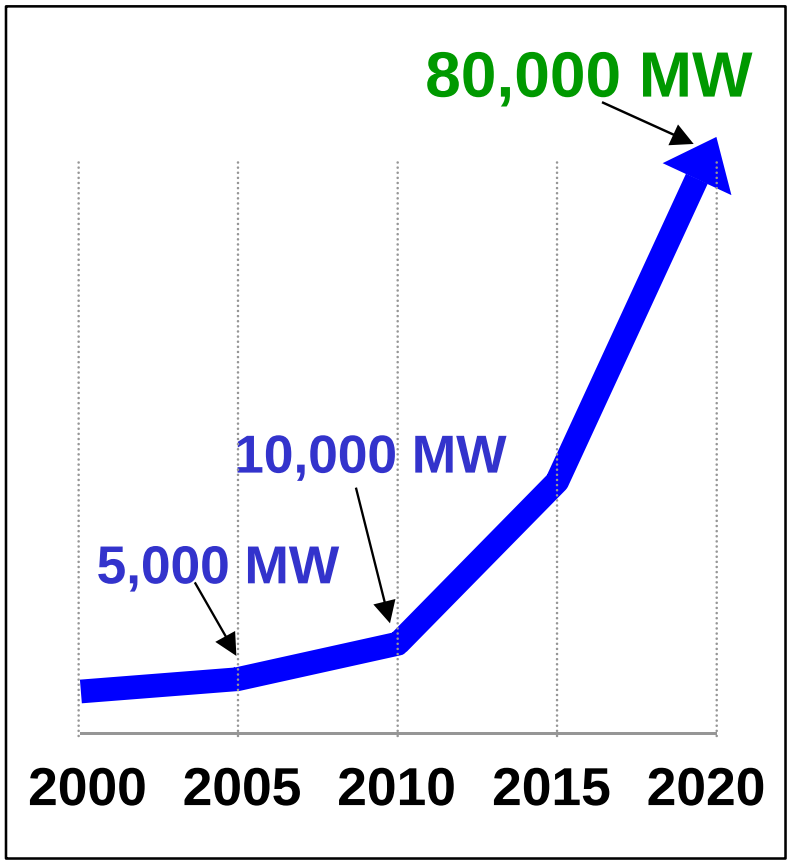
National Strategy

- Provide Federal Leadership
- Develop State and Local Partnerships
- Accelerate Technology Development
- Educate American Public



Three Goals

- 5% of nation's electricity by 2020
- Double the states with 20 MW installed to 16 by 2005, and then to 24 by 2010
- 5% of Federal electricity use by 2010 (1,000 MW)



North Dakota Actions

- WAPA transmission study
- Updated North Dakota wind map, siting study
- Wind Empowerment Zones
- Native American developments
  - *Fort Berthold Reservation wind project*
  - *Tribal wind power capacity assessment (NREL)*
- Building a Partnership

Challenges

- Cost of Electricity
- Small Load In-State
- Transmission
- Siting
- Lack of Public Understanding