Wind Energy in South Dakota

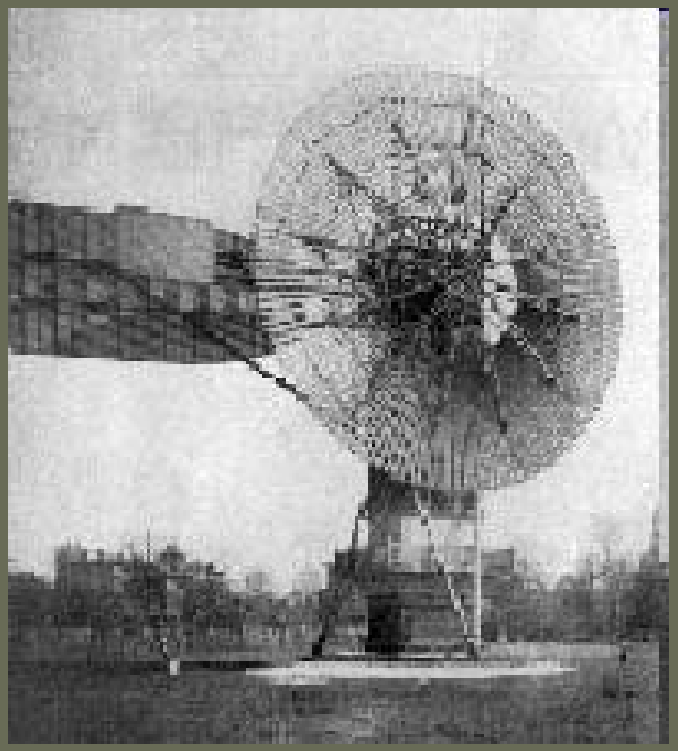
Public Utilities Commission

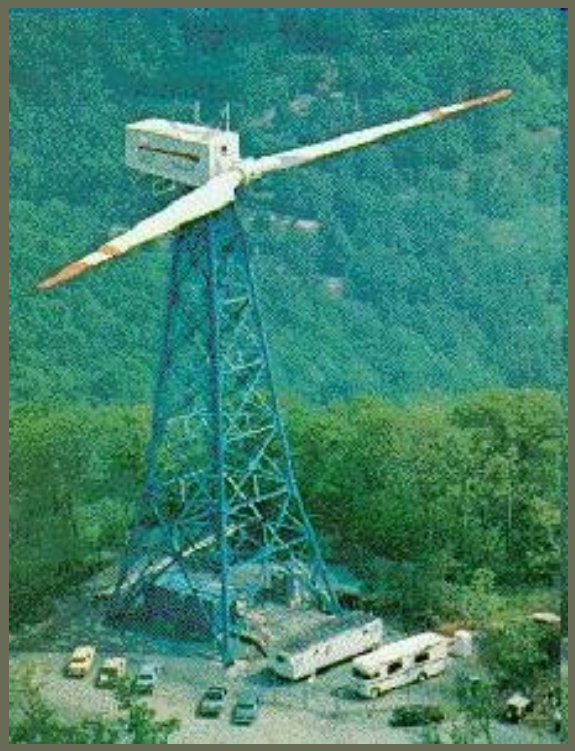
July 27, 2011

Gary Hanson - Chairman
Chris Nelson - Vice Chair

In the beginning…

In the beginning…





Today

The Basics

Large Wind Basics

- Farms sited in rural areas along ridges
- Farms are typically 20 MW to 300 MW - between 10 and 200 turbines
- Each turbine needs a concrete pad and access road
- Each turbine typically uses <1 acre of land

Large Wind Basics

- Towers are typically 250’ to 330’
- Blades @ about 125’ to 150’
- Total tower height is about 375’ to 480’

Small Wind Basics

- Small wind typically turbines < 100 kW
- Tower heights range from 30’ to 120’
- Typically used for residential consumption
- Siting small wind not at all the same as siting large wind farms

Photo courtesy DOE/NREL

SD Wind Industry

Smaller Projects

Chamberlain Prairie Wind– 2.6 MW

Rosebud – 750 kW

City of Howard – 200 kW

Oaklane Colony – 160 kW

City of Carthage – 100 kW

City of Canova – 100 kW

Gary, EMS – 90 kW

KILI-FM – 65 kW

Wind for Schools – 1.8 kW

Larger Projects (Completion Date)

SD Wind Energy Center – 40.5 MW (2003)

MinnDakota – 54 MW (1/1/2008)

Tatanka I – 88.5 MW (3/1/2008)

Wessington Springs – 51 MW (1/2009)

Buffalo Ridge I – 50.4 MW (2009)

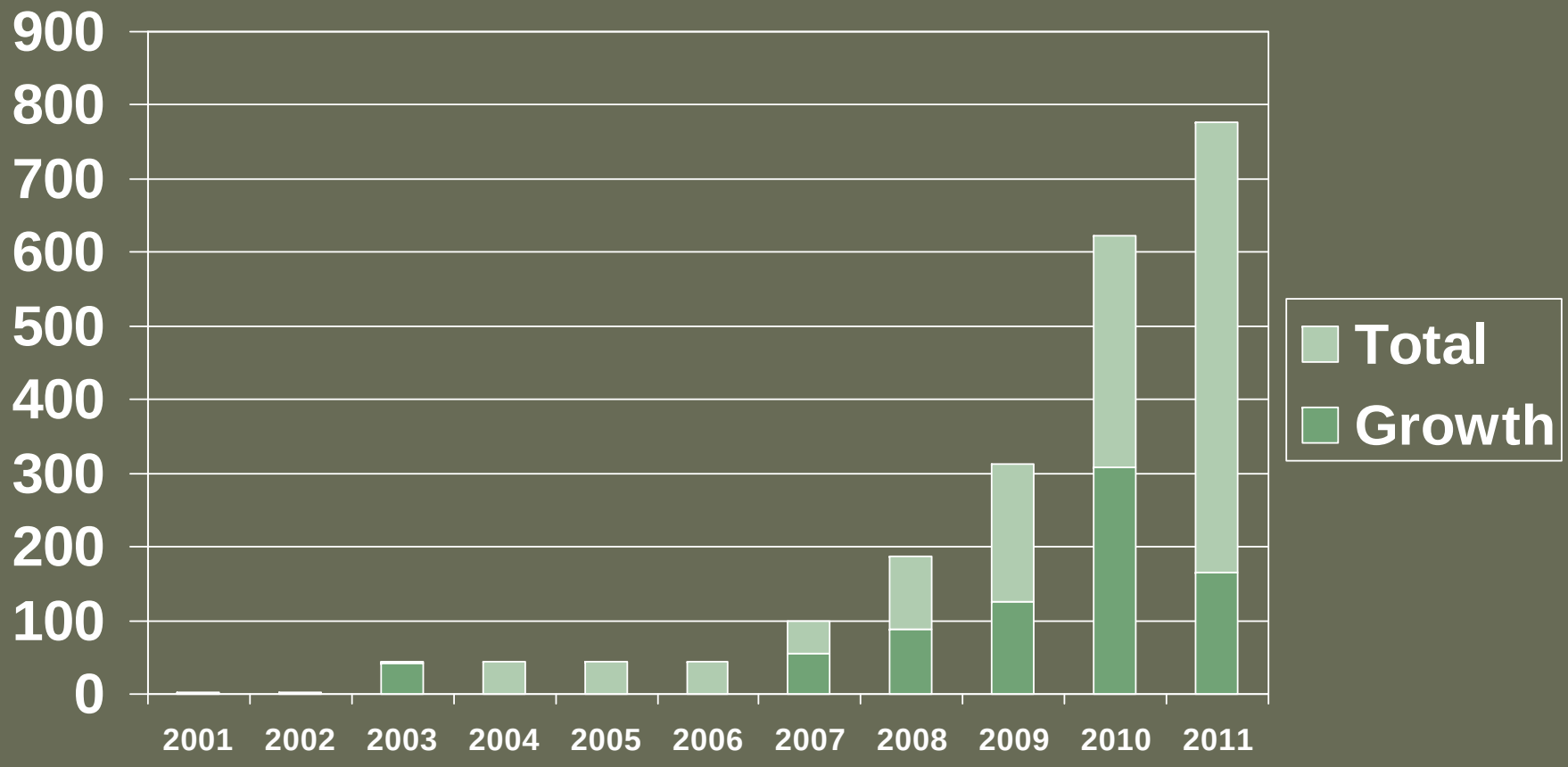
Titan I – 25 MW (12/2009)

Day County Wind – 99 MW (4/2010)

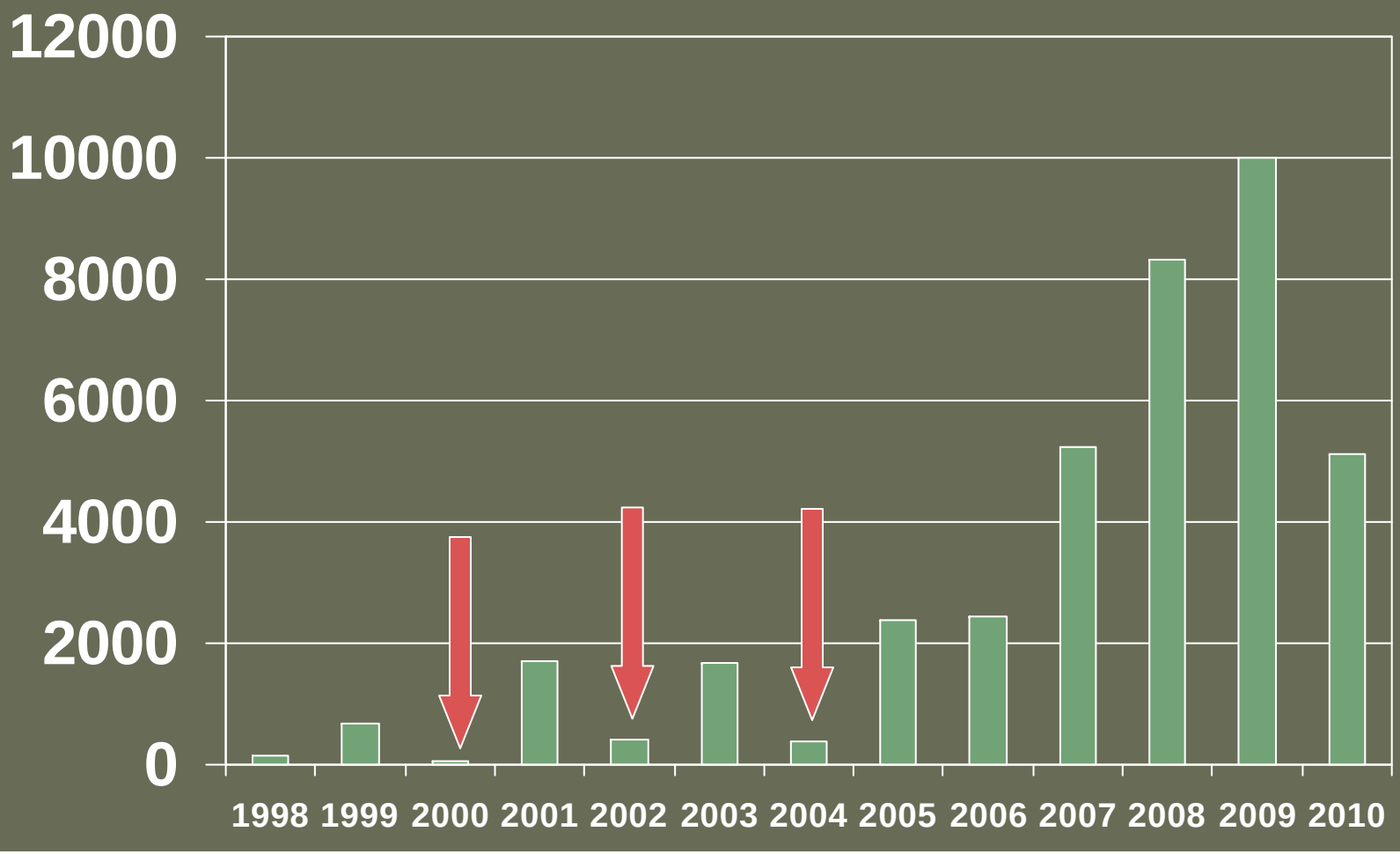
Buffalo Ridge II – 210 MW (12/2010)

Crow Lake Wind Project – 162 MW (2/2011)

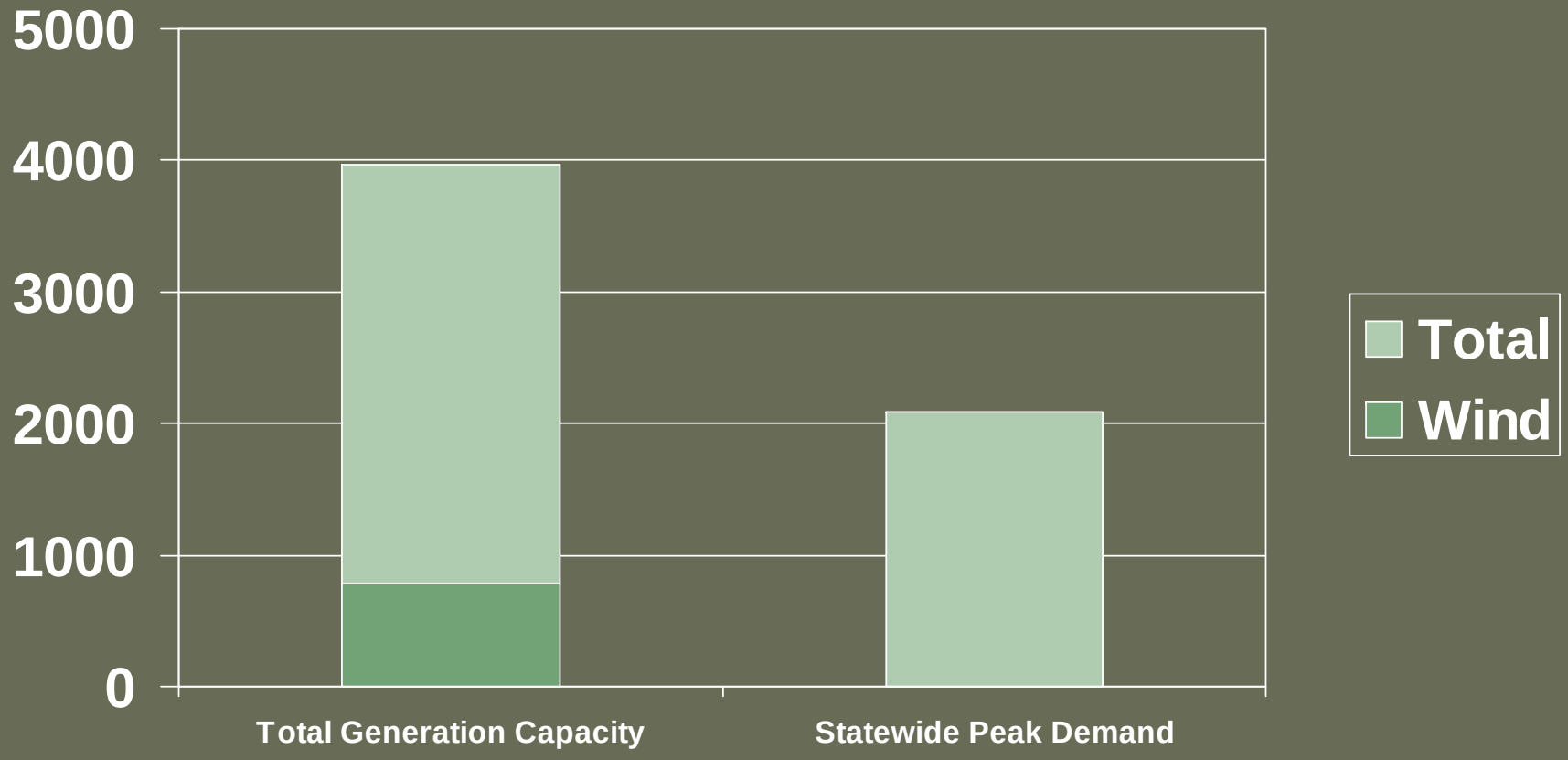
South Dakota Wind Development (MW)



US Wind Development (MW)

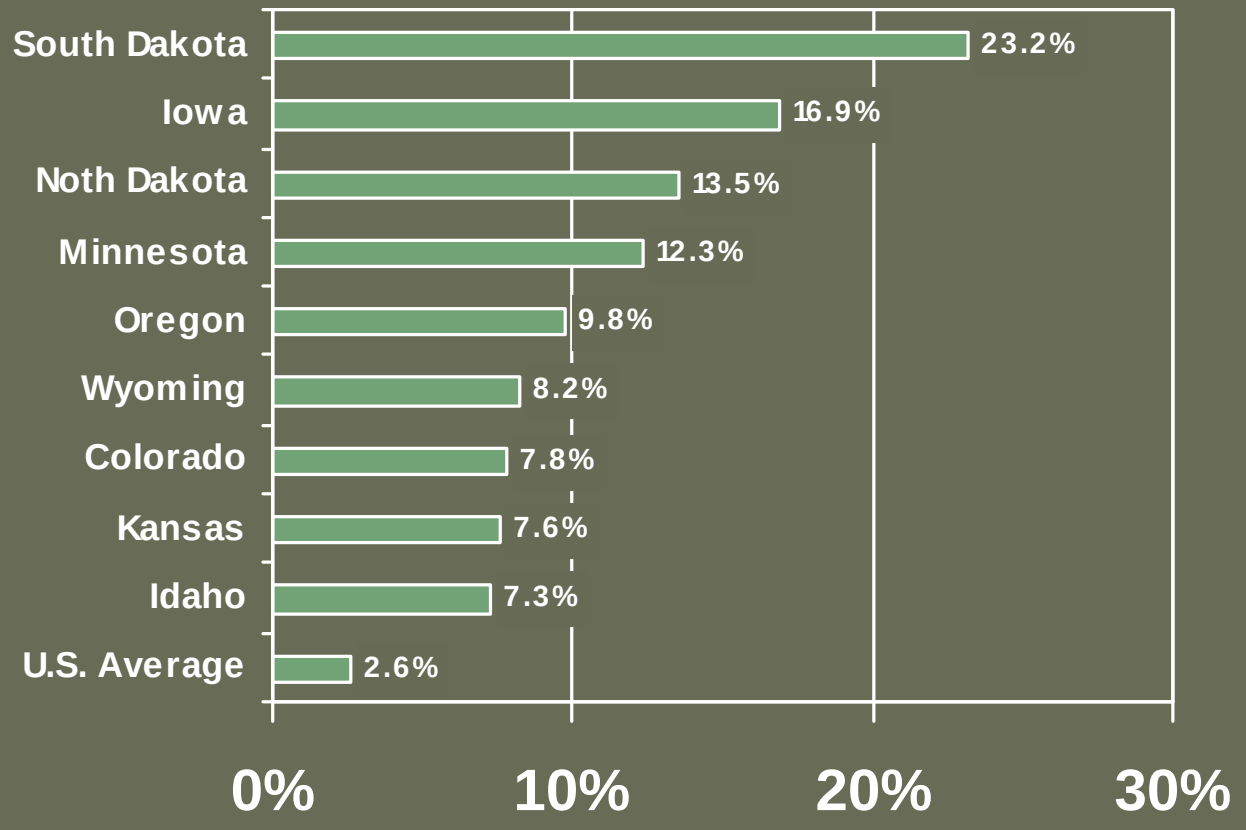


South Dakota Capacity Comparison (MW)



Source: EIA, Electric power plants generating capacity by energy source, by producer by state, year end 2009.
Known capacity additions since 2009 were included in the data.

US States With Most Wind as a Percentage of Total In-State Generation (end of 2010)



Source: 2010 Wind Technologies Market Report, Lawrence Berkeley Lab, June 2011

South Dakota Successes

- SD ranked 4th in new wind capacity in 2010
- SD ranked 3rd in percentage of growth in new wind capacity in 2010
- SD ranks 4th in wind as percentage of total state capacity
- SD ranks 1st in wind as percentage of generation
- ND's Basin Electric ranks 1st in coop total wind capacity

Source: 2010 Wind Technologies Market Report, Lawrence Berkeley Lab, June 2011
2011 AWEA Wind Industry Market Annual Report

Tomorrow…

Harvest Wind – 20 MW

Buffalo Ridge III – 170 MW

Wild Prairie Wind – 99 MW

Crowned Ridge – 150 MW

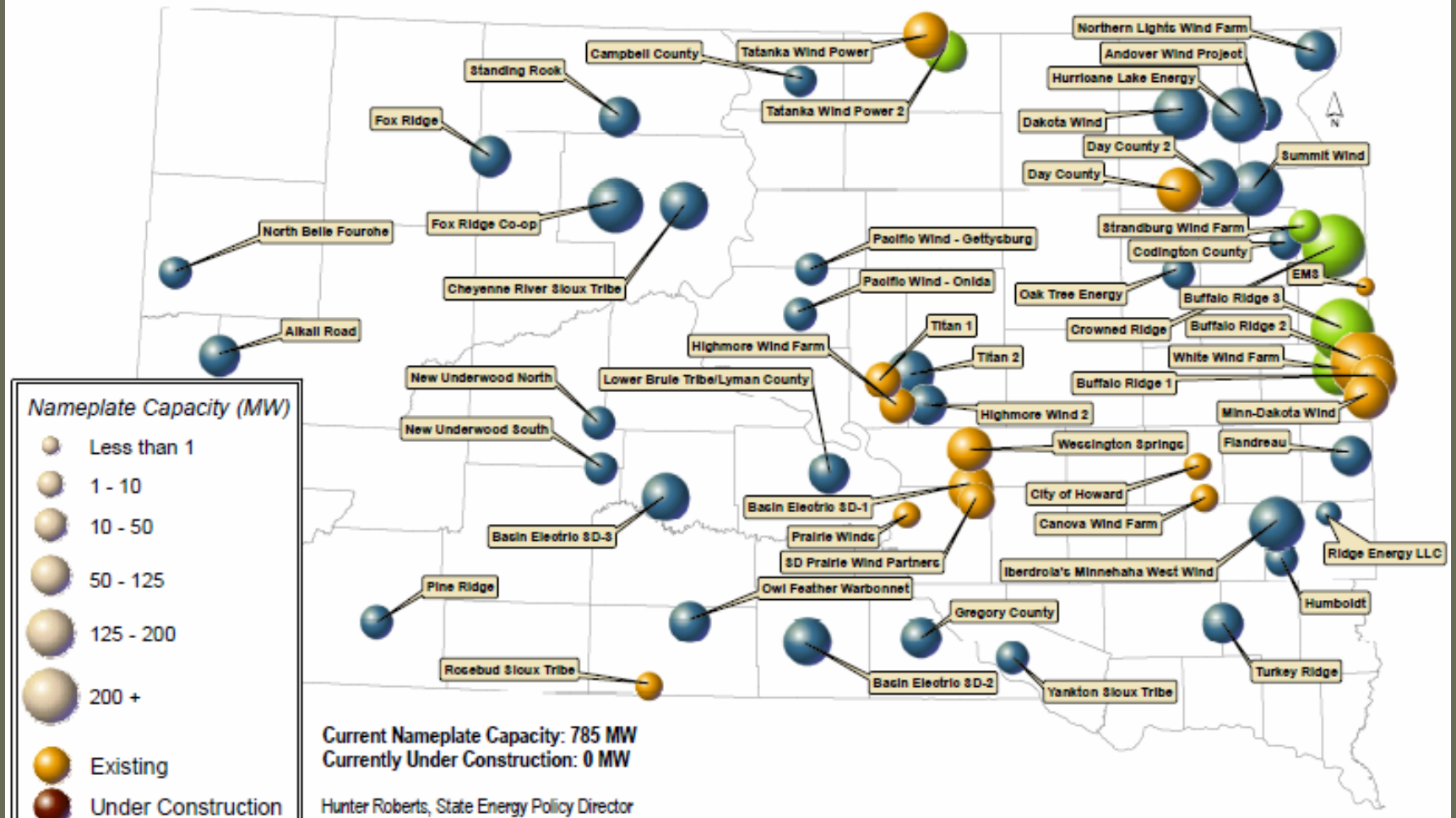
Hyde County Energy Center – 150 MW

Minnehaha County West – 350 MW

Northern Hills – 50 MW

South Dakota Wind Energy Development

by Capacity and Status



Current Nameplate Capacity: 785 MW
Currently Under Construction: 0 MW

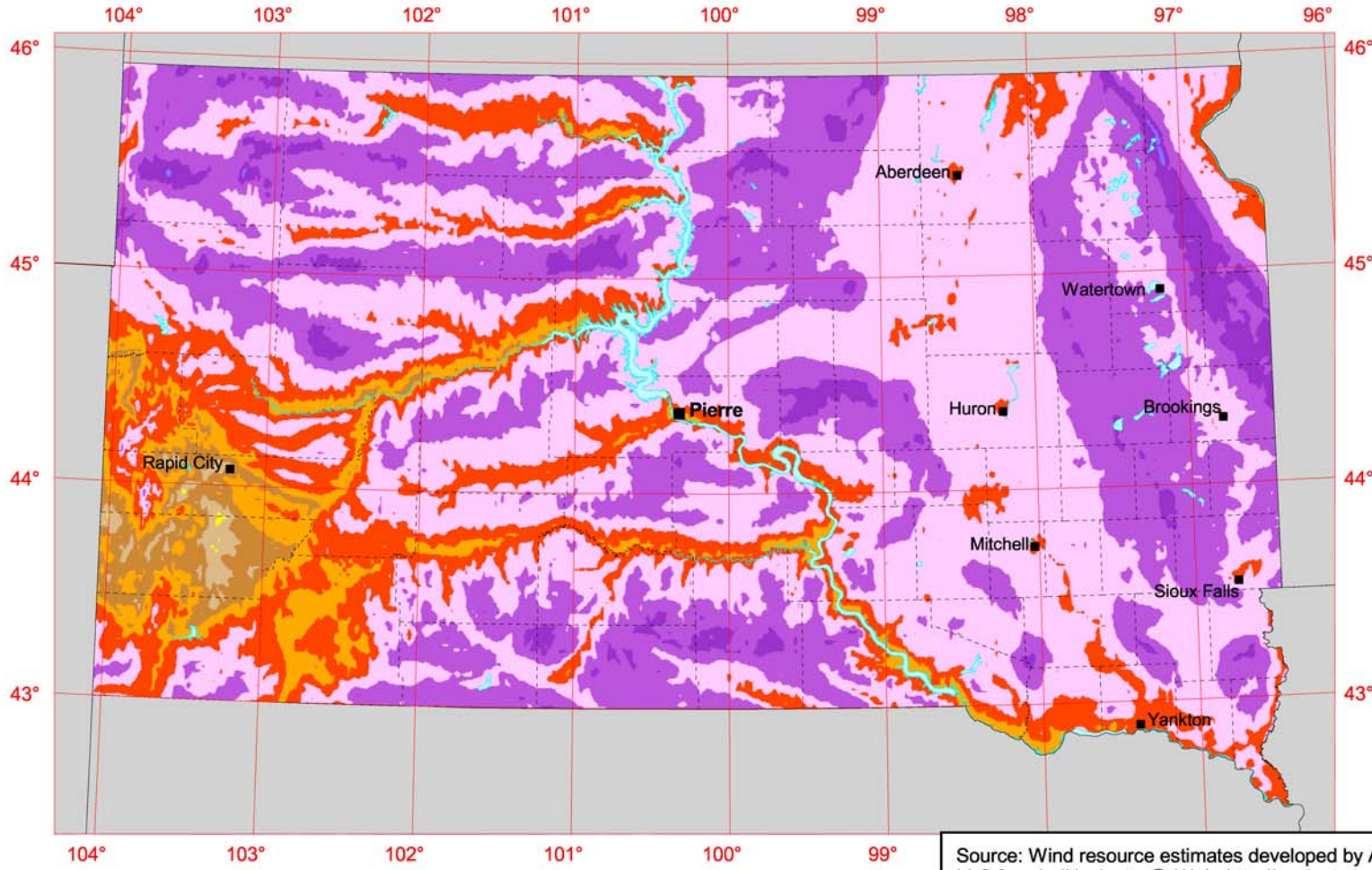
Hunter Roberts, State Energy Policy Director
hunter.roberts@state.sd.us
1-800-872-6190

SouthDakota ENERGY DEVELOPMENT

Please note: this map may not represent every proposed wind farm in SD, it only represents the wind farms that the SD Governor's Office of Economic Development has direct knowledge of.

04/11

South Dakota - Annual Average Wind Speed at 80 m



Source: Wind resource estimates developed by AWS Truewind, LLC for windNavigator®. Web: http://navigator.awstruewind.com | www.awstruewind.com. Spatial resolution of wind resource data: 2.5 km. Projection: Lambert Equal Area Azimuthal WGS84.

50 0 50 100 150 200 250 Kilometers

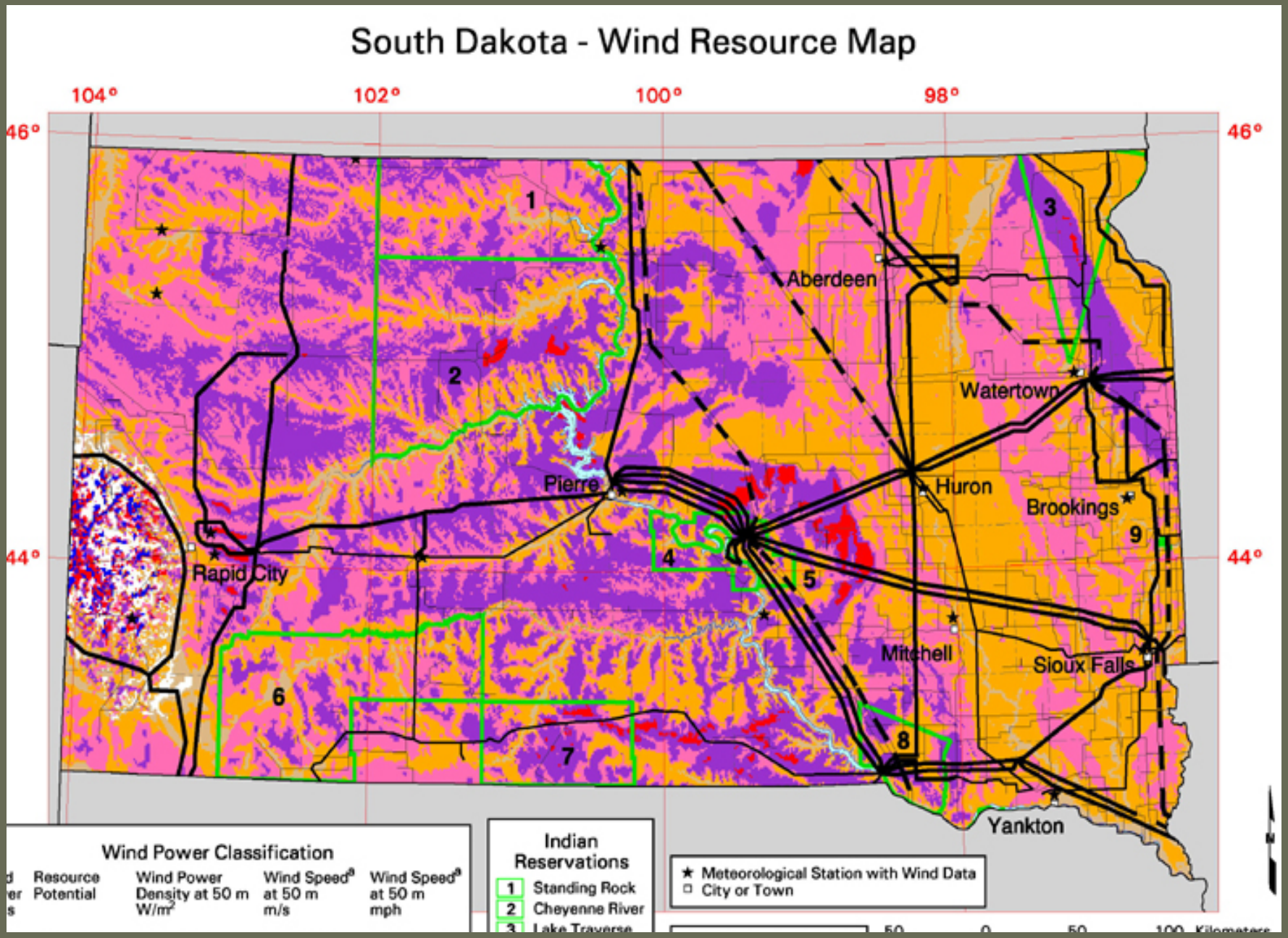
25 0 25 50 75 100 125 150 Miles

AWS Truewind

NREL National Renewable Energy Laboratory

Innovation for Our Energy Future

18-JAN-2010 10.1.1

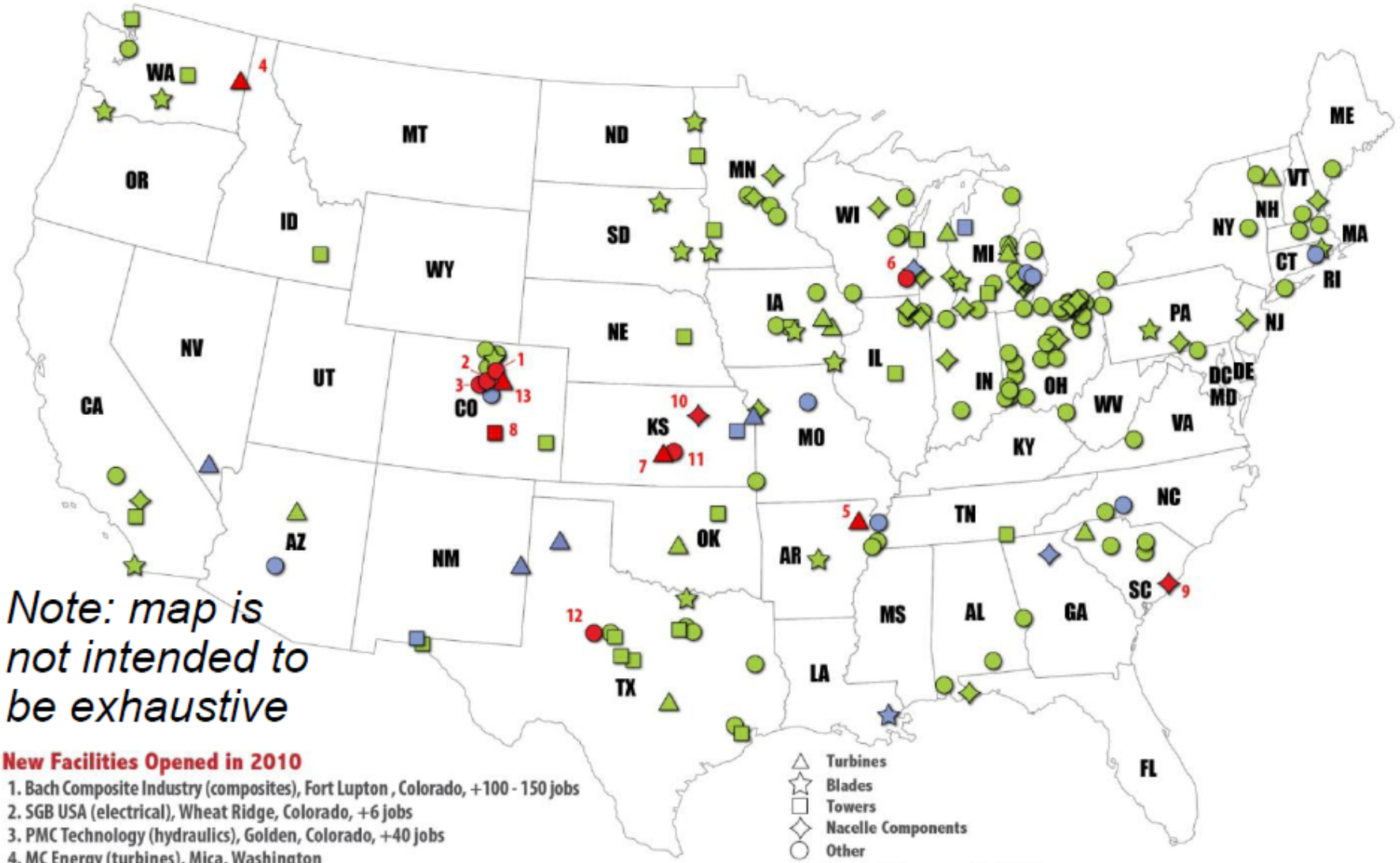

South Dakota - Wind Resource Map
104°
102°
100°
98°
46°
44°
Aberdeen
Watertown
Pierre
Huron
Brookings
Rapid City
Mitchell
Sioux Falls
Yankton
1
2
3
4
5
6
7
8
9
Wind Power Classification
Resource Potential
Wind Power Density at 50 m W/m²
Wind Speed at 50 m m/s
Wind Speed at 50 m mph
Indian Reservations
1 Standing Rock
2 Cheyenne River
3 Lake Traverse
★ Meteorological Station with Wind Data
□ City or Town
50
0
50
100 Kilometers

Wind Energy Ingredients

1. Wind Resource
2. Investment Capital
3. Buyer for Electricity
4. Transmission Capacity

Wind Energy Benefits

- Contribution to County through Property Taxes
  - $3/kW + gross receipts tax in lieu of property taxes
- Lease payments to landowners can be substantial
  - Typical leaseholders earn $3,000 to $5,000 per tower per year
- Temporary construction jobs
- Small number of permanent operation & maintenance jobs
  - Approx. 2.5 – 6.8 jobs / 100 MW capacity
- Possibility of permanent manufacturing jobs
- No emissions
- No fuel costs
- Reduced dependence on fossil fuels



New Facilities Opened in 2010

1. Bach Composite Industry (composites), Fort Lupton , Colorado, +100 - 150 jobs
2. SGB USA (electrical), Wheat Ridge, Colorado, +6 jobs
3. PMC Technology (hydraulics), Golden, Colorado, +40 jobs
4. MC Energy (turbines), Mica, Washington
5. Nordex (turbines), Jonesboro, Arkansas, +425 jobs
6. Avanti Wind Systems (fall protection), New Berlin, Wisconsin
7. Siemens (turbines), Hutchinson, Kansas, +400 jobs
8. Vestas (towers), Pueblo, Colorado, +500 jobs
9. IMO Group (nacelles and components), Charleston, South Carolina, +190 jobs
10. Jupiter Group (nacelle covers and spinners), Junction City , Kansas, +120 jobs
11. Draka (electrical), Hutchinson, Kansas, +20 jobs
12. EMA Electromecanica (electronics), Sweetwater, Texas, +13 jobs
13. Vestas (turbines), Brighton, Colorado, +700 jobs

Figure includes wind turbine and component manufacturing facilities, as well as other supply chain facilities, but excludes corporate headquarters and service-oriented facilities. The facilities shown here are not intended to be exhaustive. Those facilities designated as "Turbines" may include turbine and/or nacelle assembly and in some cases the manufacturing of towers, nacelle components, blades or other components.

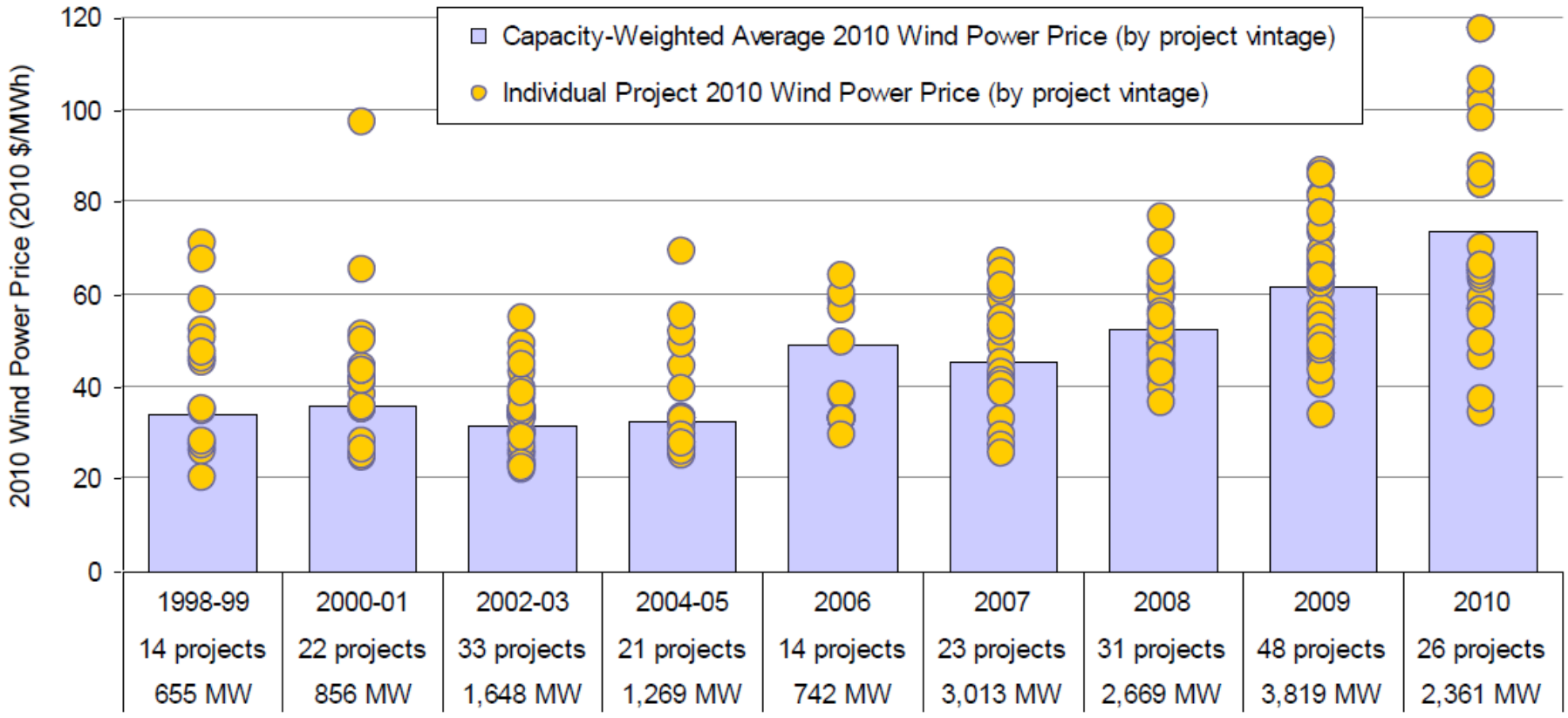
NREL
NATIONAL RENEWABLE ENERGY LABORATORY

This map was created by NREL for the U.S. Department of Energy.
April 25, 2011
Billy J. Roberts

Wind Energy Prices

- Wind prices became competitive in the mid-2000s, but have since rebounded.
  - Wind prices are above wholesale market prices, nationally
- Wind typically competes with coal and natural gas generation.
  - Natural gas price volatility?
  - Coal & national environmental policy?
- Wind costs vary greatly on location
  - Wind resource quality
  - Transmission need
- Wind prices may be declining again

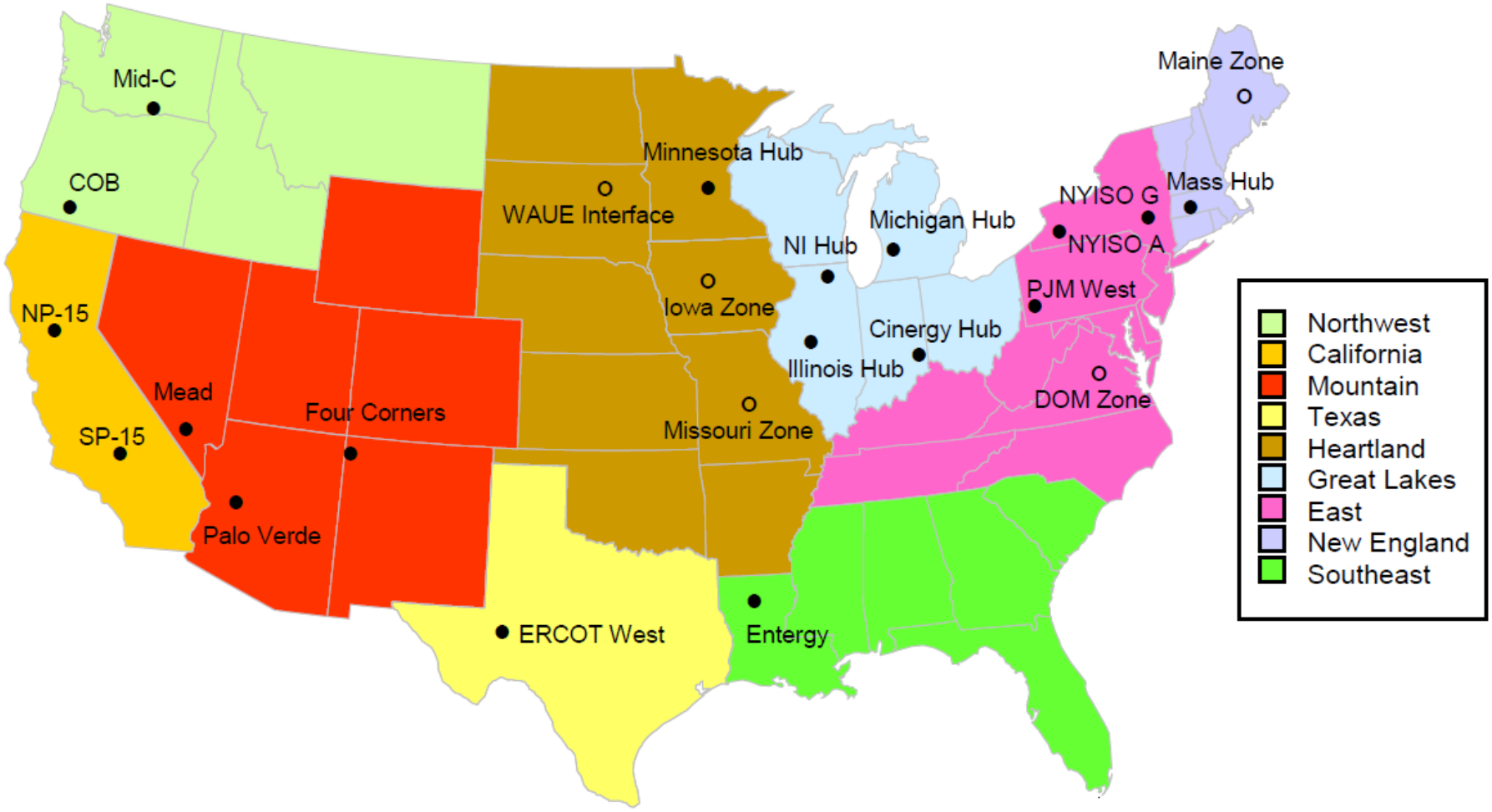
Binning by Commercial Operation Date Shows that Prices Have Increased Since 2005



Graphic shows prices in 2010 from projects built from 1998-2010

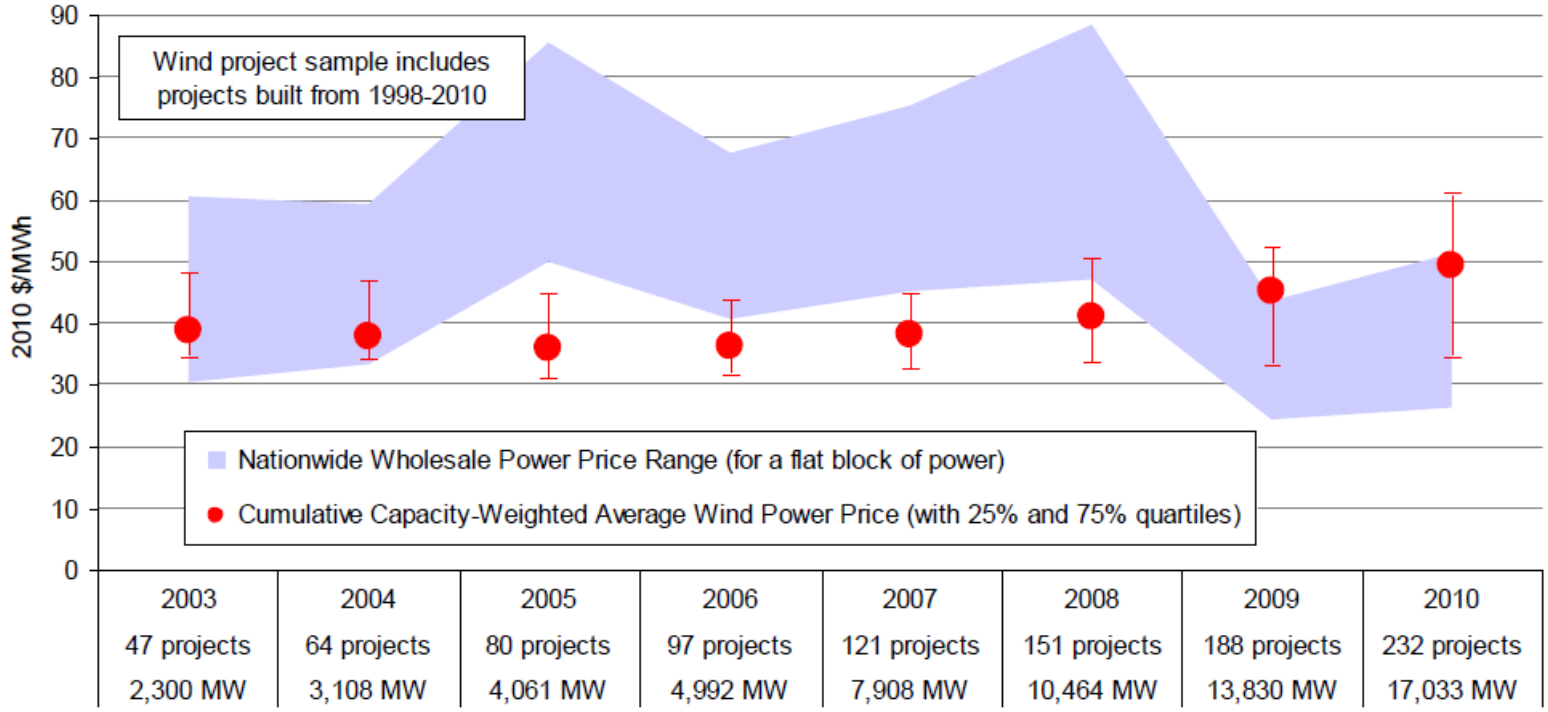
Source: 2010 Wind Technologies Market Report, Lawrence Berkeley Lab, June 2011

Regions and Wholesale Price Hubs Used in Analysis



Source: 2010 Wind Technologies Market Report, Lawrence Berkeley Lab, June 2011

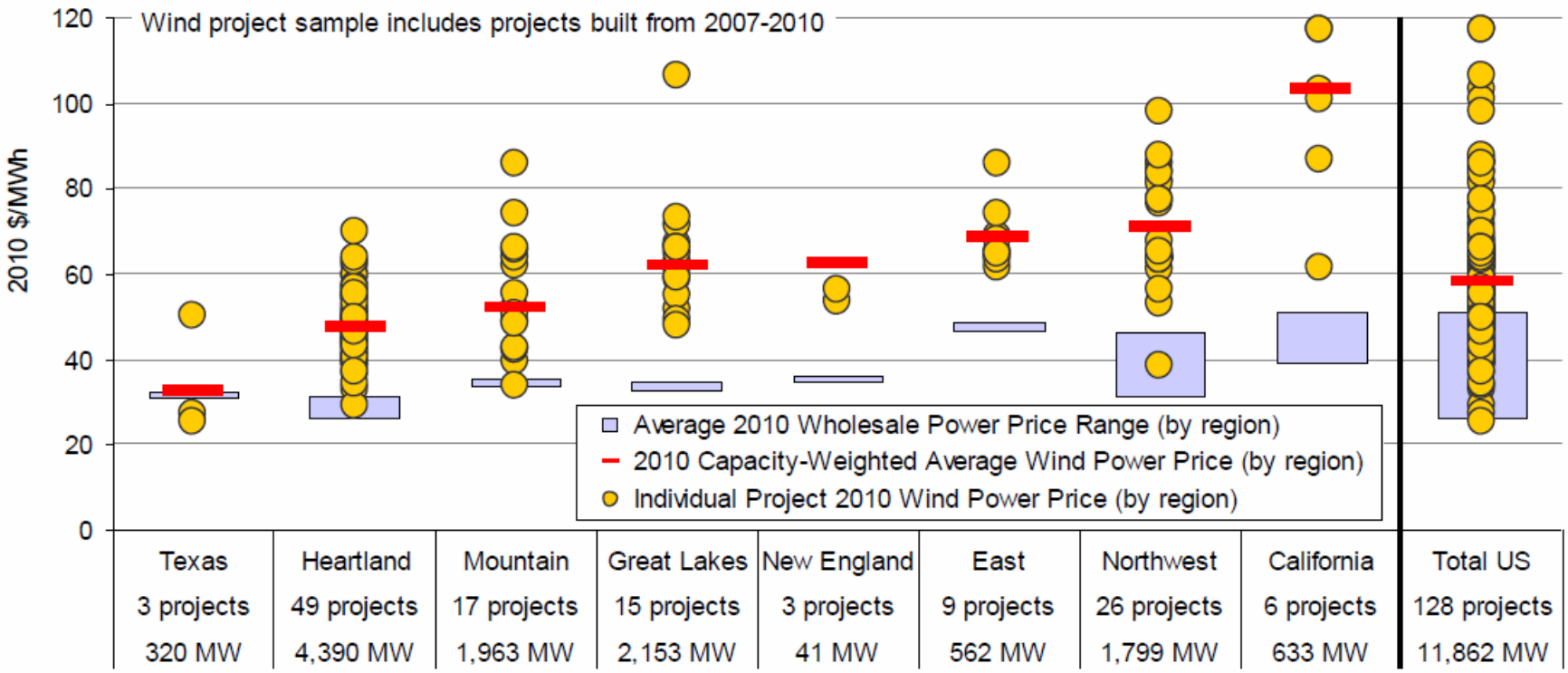
Low Wholesale Electricity Prices Continued to Challenge the Relative Economics of Wind Plants Installed in Recent Years



- Wholesale price range reflects flat block of power across 23 pricing nodes (see previous map)
- Recent wholesale prices reflect low natural gas prices, driven by weak economy and shale gas
- Price comparison shown here is far from perfect – ***see full report for caveats***

Source: 2010 Wind Technologies Market Report, Lawrence Berkeley Lab, June 2011

The Gap Between Wholesale Prices and Wind Prices Crossed all Regions in 2010

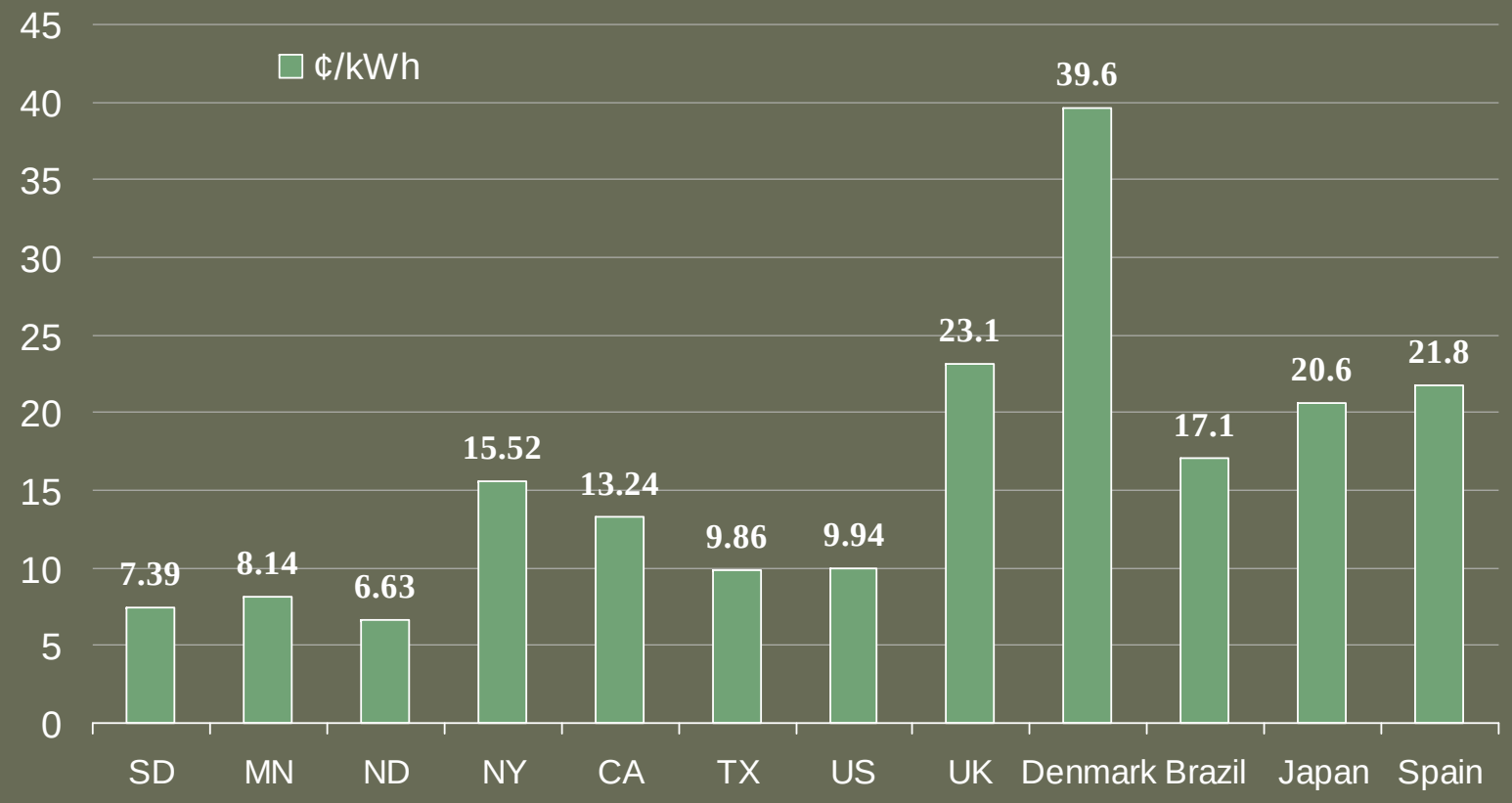


Notes: Within a region there are a range of wholesale power prices because multiple wholesale price hubs exist in each area (see earlier map); price comparison shown here is far from perfect – ***see full report for caveats***

Source: 2010 Wind Technologies Market Report, Lawrence Berkeley Lab, June 2011

Price of Electricity

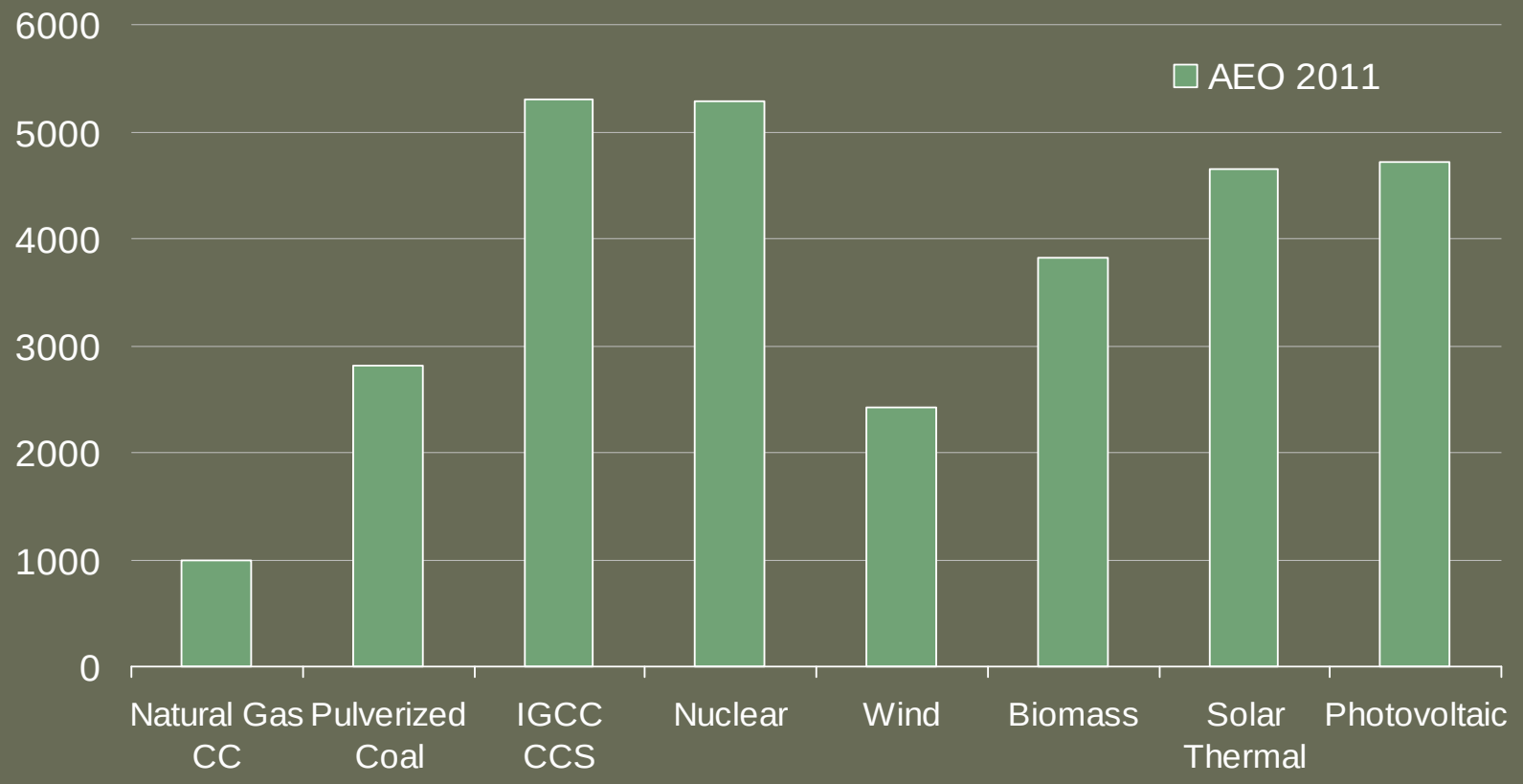
Cents/kilowatt



Source: EIA

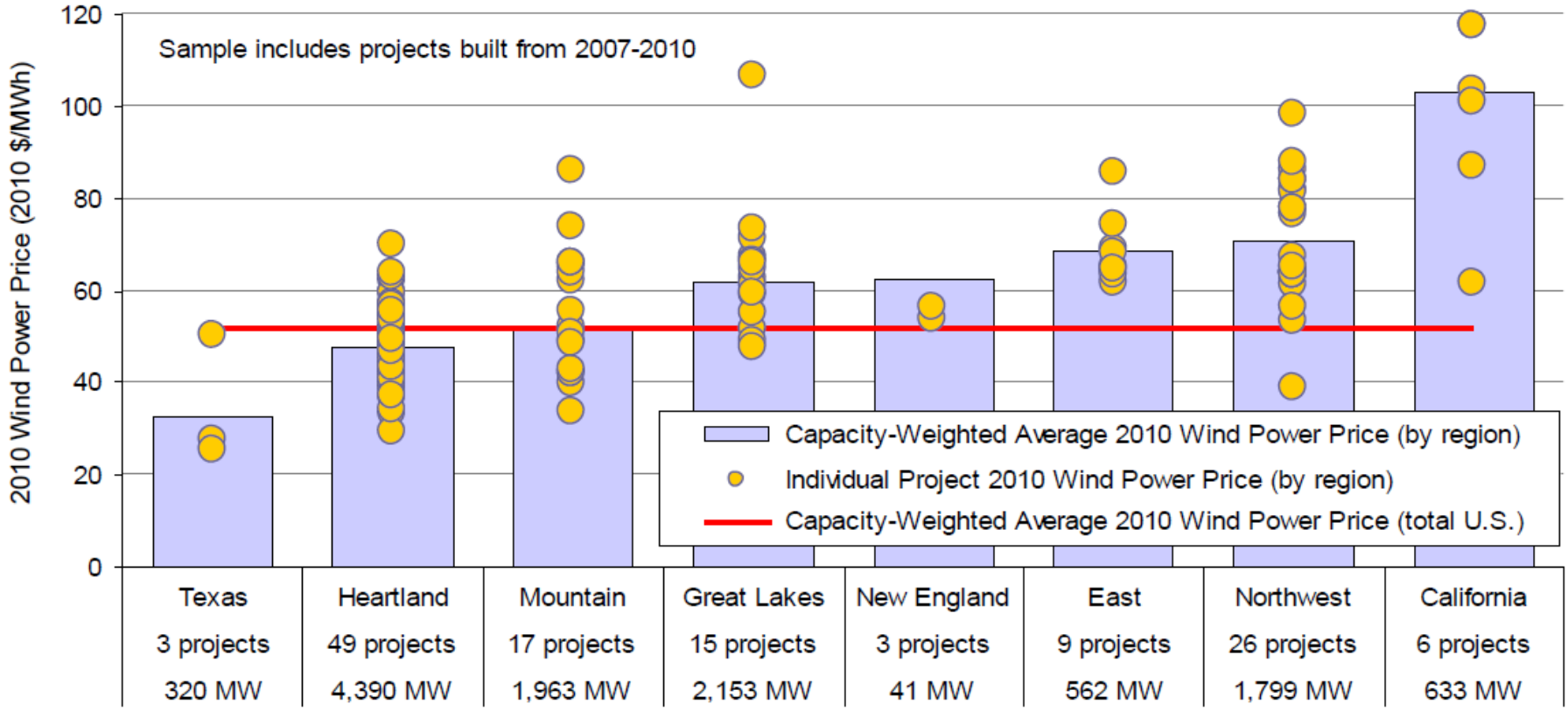
Current Capital Costs

in 2009 Dollars/kilowatt



Source: EIA, *Annual Energy Outlook 2011*

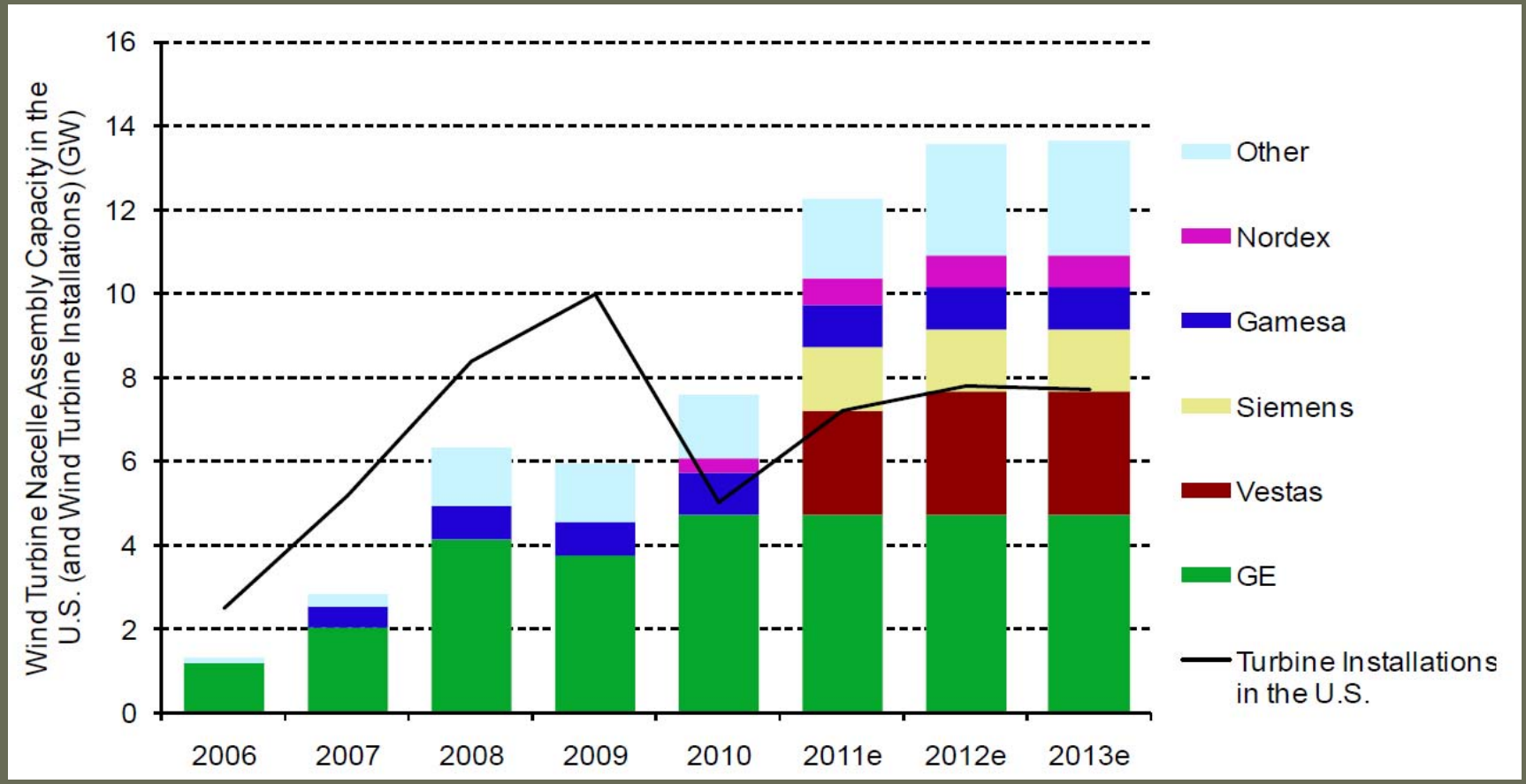
Regional Differences Explain Some of the Underlying Variability in Wind Sales Prices



Though sample size is problematic in both regions, Texas and California represent opposite extremes of the regional breakdown

Source: 2010 Wind Technologies Market Report, Lawrence Berkeley Lab, June 2011

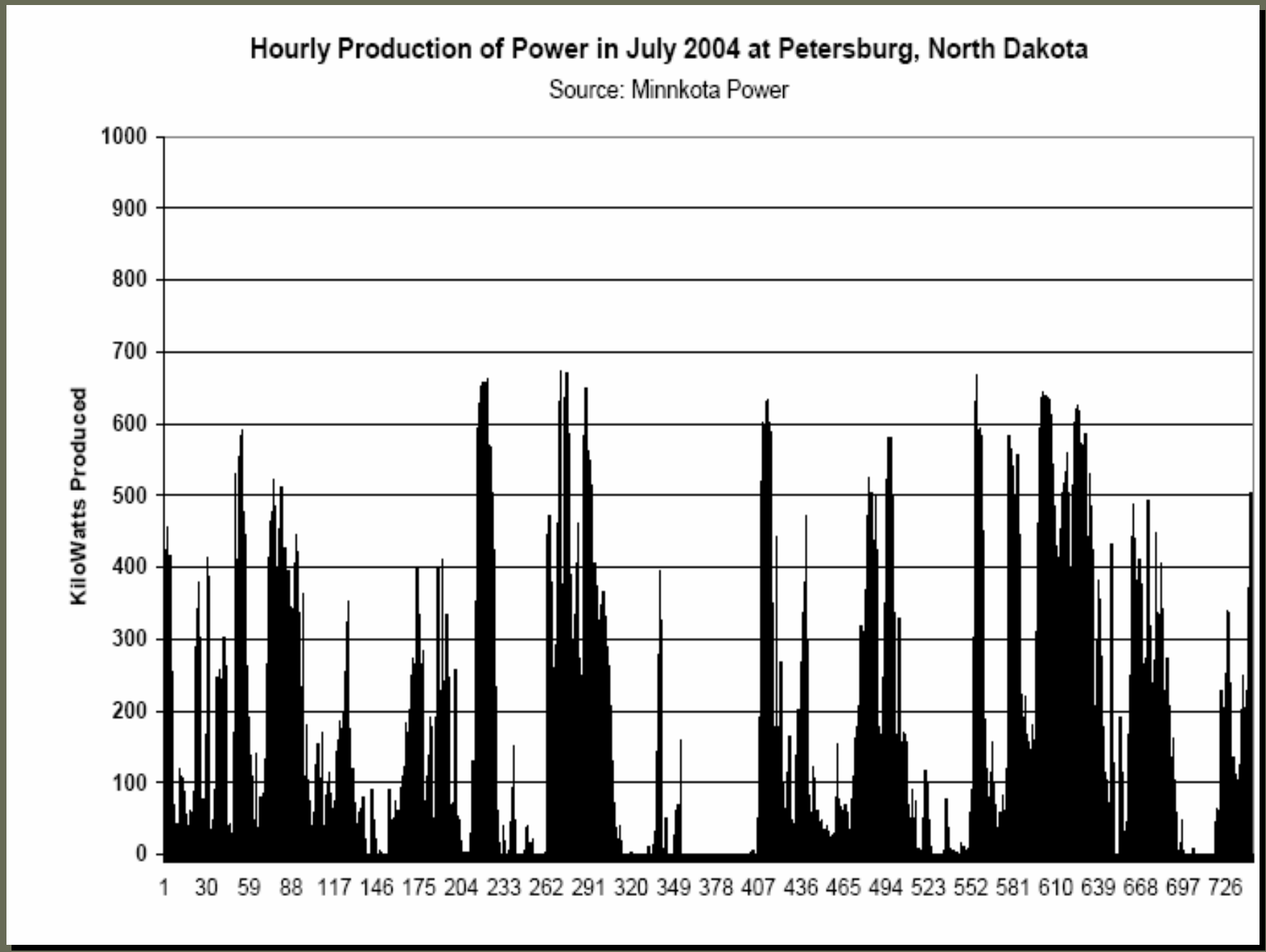
Market Oversupply



Source: 2010 Wind Technologies Market Report, Lawrence Berkeley Lab, June 2011

Wind Challenges

1. Unpredictability
2. Generation Profile vs. Load Profile
3. Storage
4. Location
5. Transmission!!!


Hourly Production of Power in July 2004 at Petersburg, North Dakota
Source: Minnkota Power
KiloWatts Produced
1000
900
800
700
600
500
400
300
200
100
0
1 30 59 88 117 146 175 204 233 262 291 320 349 378 407 436 465 494 523 552 581 610 639 668 697 726

Wind Farm Output Pattern (2004)

Color scale: 80MW = 100%

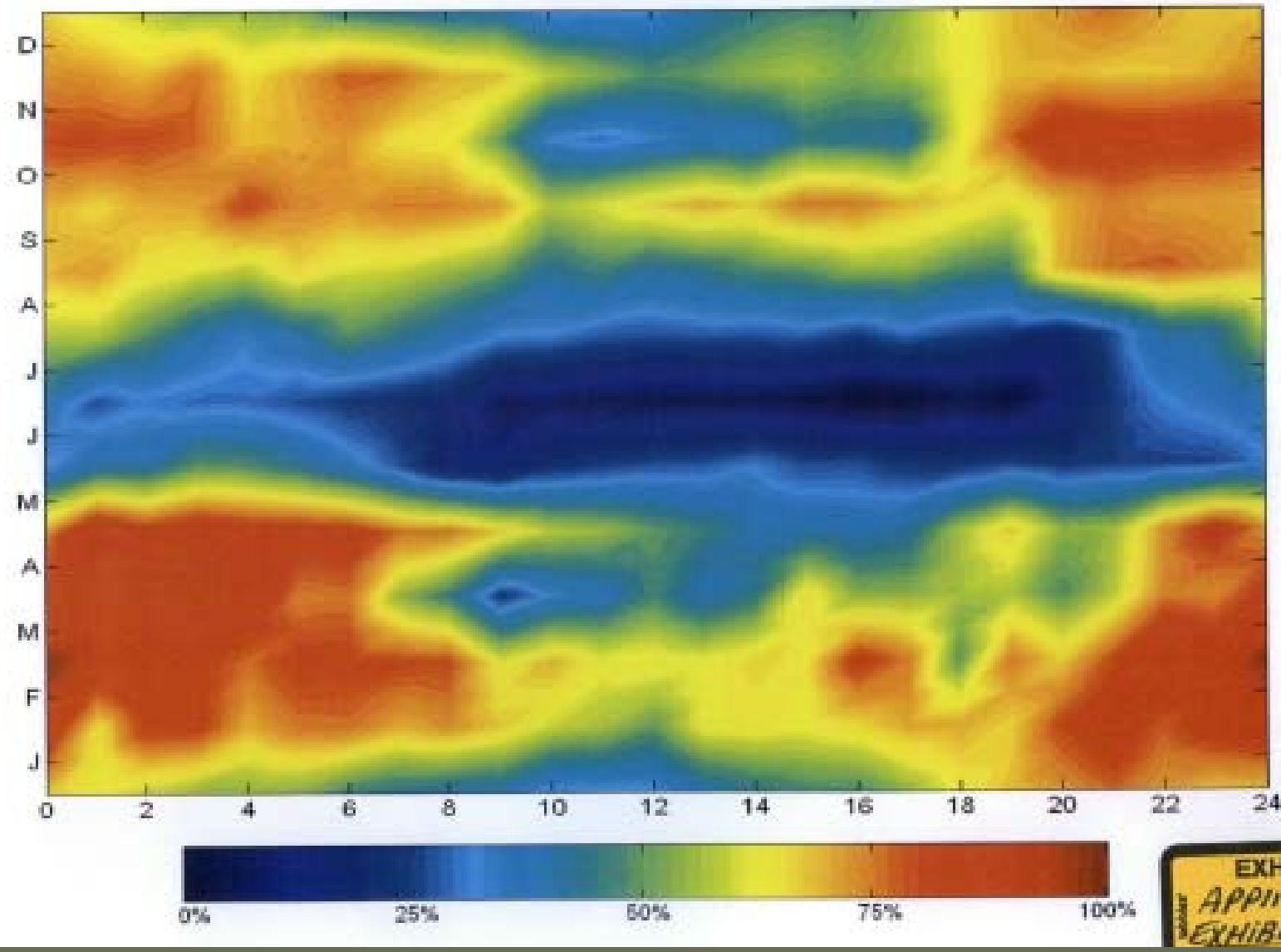
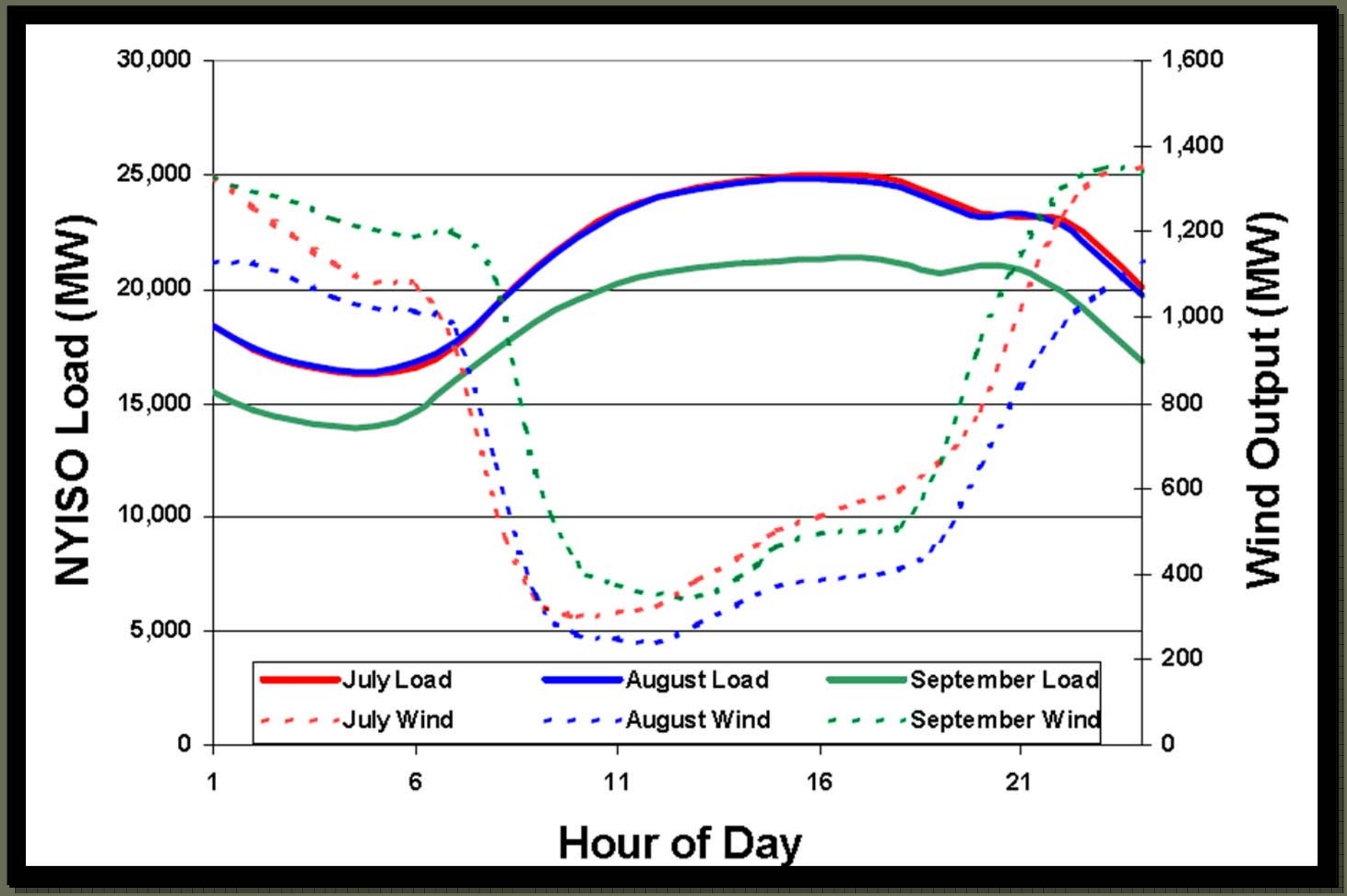
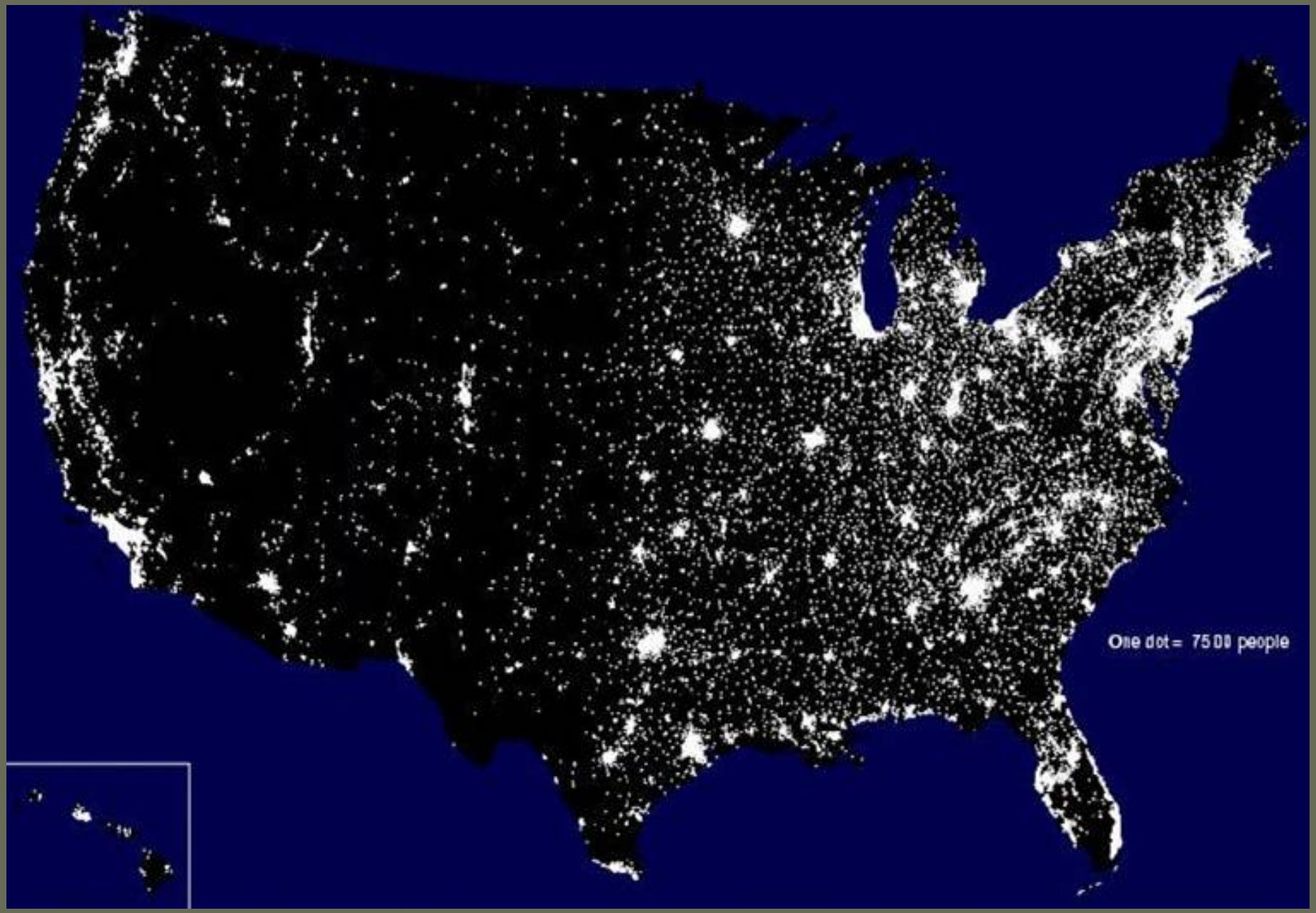
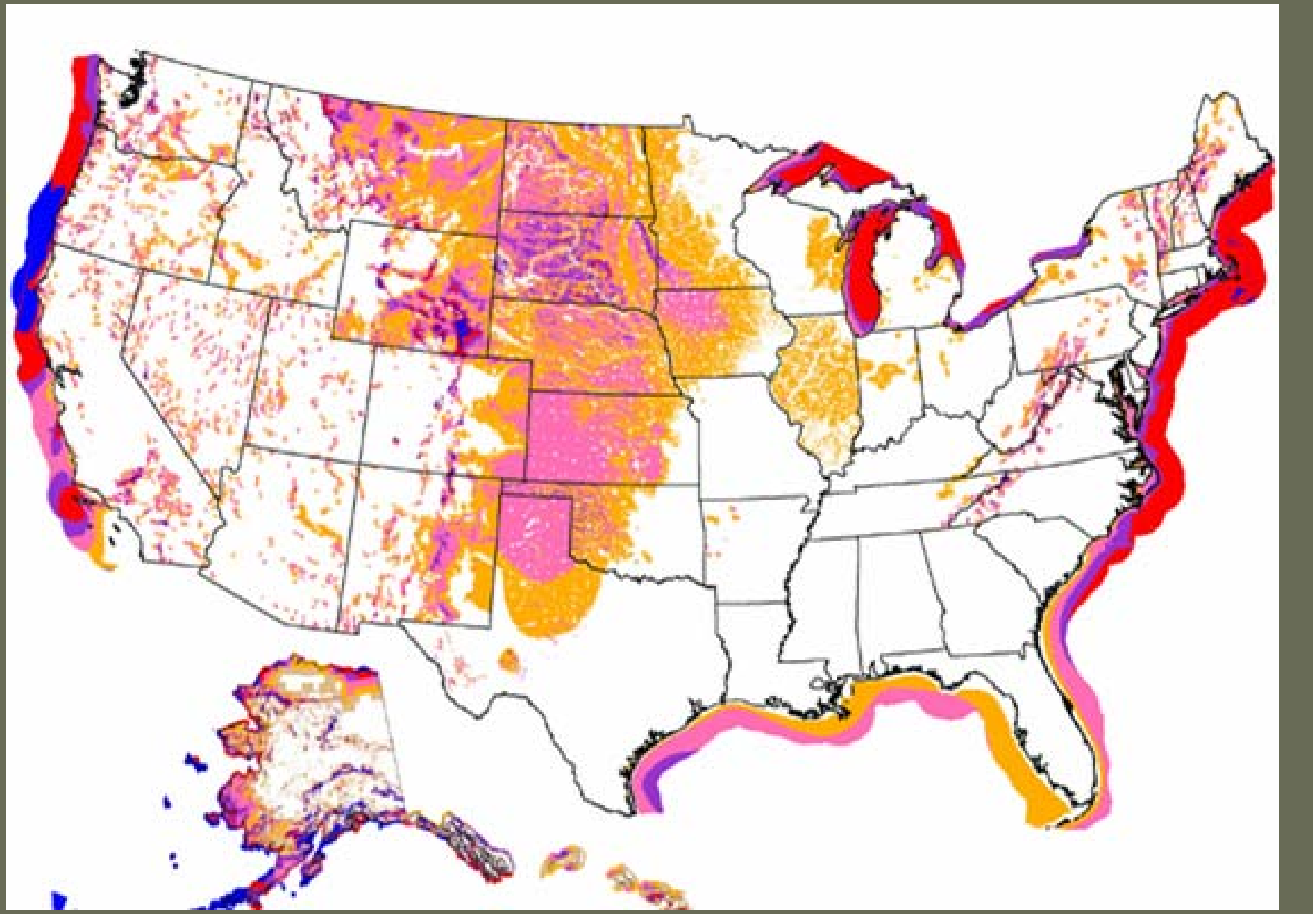


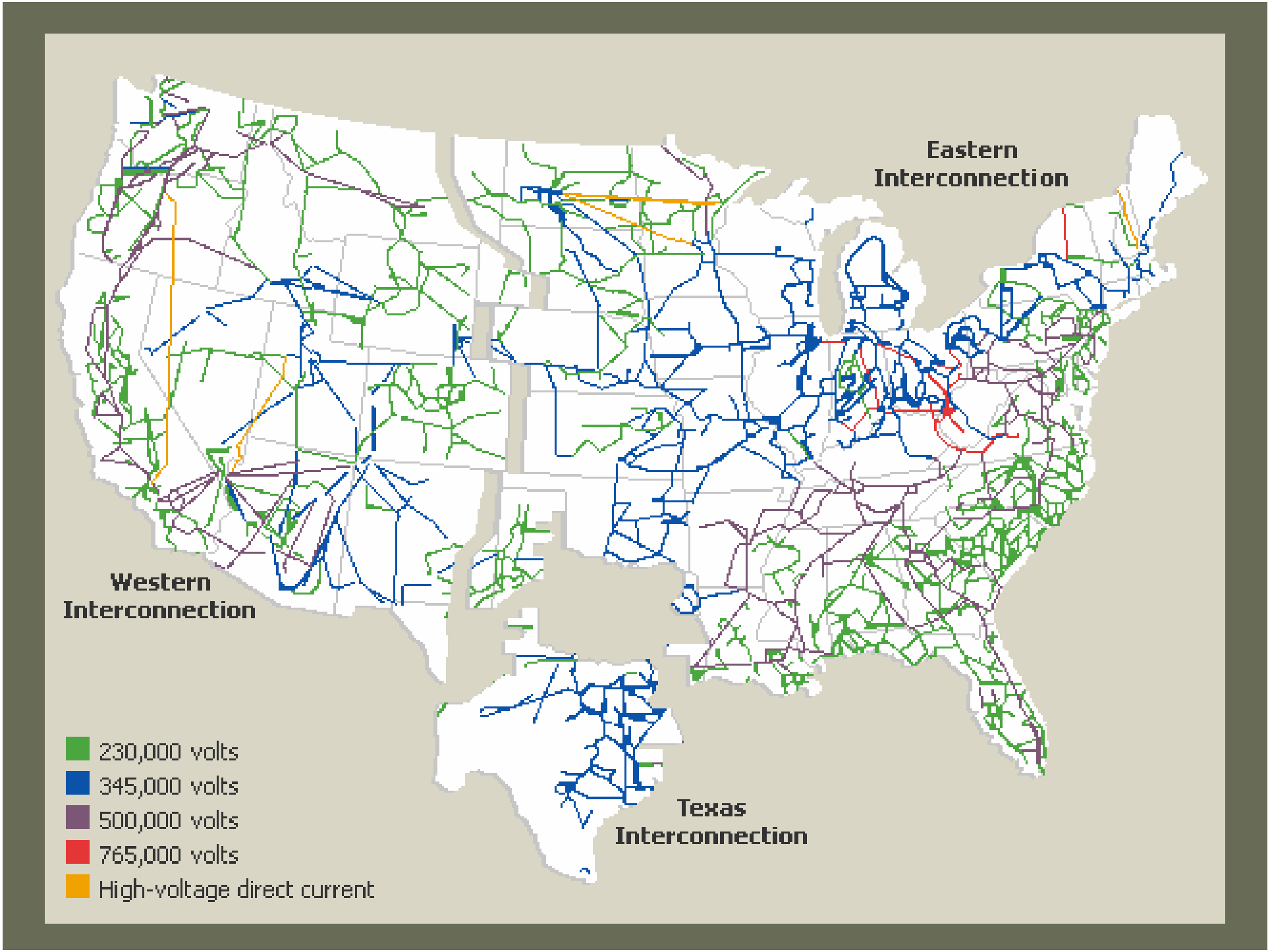
EXHIBIT
Applicant
Exhibit 40

Generation Profile vs. Load Profile




One dot = 7500 people




Eastern
Interconnection
Western
Interconnection
Texas
Interconnection
230,000 volts
345,000 volts
500,000 volts
765,000 volts
High-voltage direct current

State Government Involvement

State Government

- Financial
  - Property Taxes
  - Contractors' Excise Taxes
  - Energy Infrastructure Authority
- Information
  - Tower Working Group
  - Landowner Guide
  - Community Meetings
  - Wind for Schools
- Developers
  - WRAN
  - Relationships

State Government

- Regulatory
  - Expedited Siting
    - Reduced siting process from 18 months to 6
    - Established 100 MW as the size of project required to obtain siting permit
    - Receive input from other state agencies
      - DENR, GF&P, SHPO, DOT
  - Renewable Energy Objective (2008)
    - 10% by 2015
  - Transmission Cost Recovery
  - **Regional Transmission Planning**
    - Cost Allocation

SD PUC Permitting Process

- Application for Permit
  - SDCL 49-41B-11 and ARSD 20:10:22.04 - 40
- Public Hearing within 60 Days
  - SDCL 49-41B-15 - 16
- Decision within Six Months of application
  - SDCL 49-41B-25

Land Procurement

- SDCL 43:13:17-19
- Maximum of 50 years per easement or lease
- Option for easement or lease void if no development occurs within five years
- Wind rights are not severable from the land

Transmission Siting - Wisconsin

Arrowhead –Weston

–220 miles of 345 kilovolt transmission line
–850 property owners
–10,000 pieces of opposition correspondence
–8 counties opposed project initially
–25 town/village boards opposing project initially
–75 legal challenges to project

Permitting 72 months
Construction 27 months
Cost to build $439 m

Transmission Siting - Minnesota

- Big Stone II - 230 kV line and a 345 kV line
  - 230 kV line 44 miles (4 in SD, plus substation additions) ending near Morris, MN
  - 345 kV line 90 miles (33 miles in S D) ending near Granite Falls, MN
- Siting process - More than three years

Transmission Siting - South Dakota

Project	Size (kV)	Length (mi)	Interstate /Intrastate	Filed	Closed
EL10-016 – CapX2020	345	10.6	Interstate	11/30/10	6/14/11
EL08-001 – Xcel	115	6.5	Interstate	01/31/08	02/05/09
EL08-016 – East River	115	9.5	Intrastate	06/12/08	10/03/08
EL08-010 – East River	115	13	Intrastate	04/02/08	08/21/08
EL06-002– Big Stone II	230	5.45	Interstate	01/17/06	01/16/07
EL06-002- Big Stone II	345	33	Interstate	01/17/06	01/16/07

Average < 9 months per docket during the last 4 yrs

Drivers of Transmission Development

- Load requirements
- Reliability
- Cost allocation
- Planning
- Government policies
- Regulatory processes

Requisites for Nationally Expanded Transmission

- Justification for need
- Cost recovery that eliminates uncertainty
- Tariff that fairly matches cost with benefit
- National energy policy

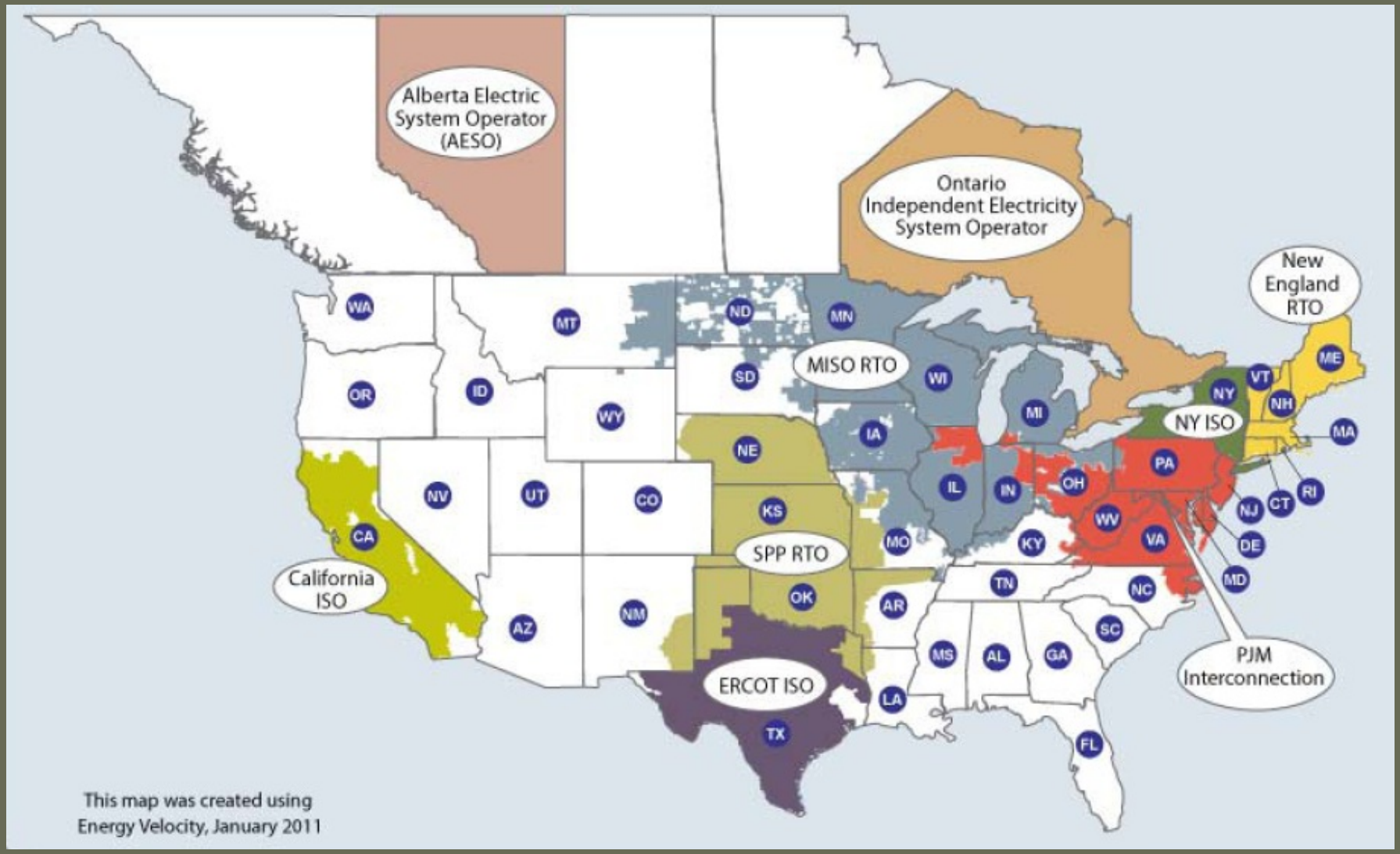
The Players

- President & Congress
- FERC: Federal Energy Regulatory Commission
  - Approve or deny plans submitted by the RTO/ISO
  - Decisions may be appealed through federal courts
- EPA
- PUC / PSC State Regulatory Commissions
  - Permitting for siting and generation in their state
- Regulatory Agencies and Courts
  - approve use of eminent domain

The Players

- ISO - Independent System Operator
- RTO - Regional Transmission Owner
  - Generator interconnections, grid planning, dispatch/operations
  - Use stakeholder process and final board approval to set formulas for allocating costs of transmission lines
  - Planning across multiple RTO regions
  - Different rules in different RTOs
  - State regulators are contributors in these processes

Regional Transmission Organizations (RTOs)



Source: FERC: Electric Power Markets – National Overview, ferc.gov/market-oversight/mkt-electric/overview.asp, July 2011

Federal Energy Regulatory Commission (FERC)

- PURPA (1978): promoted new generation from independent producers; required purchase at avoided cost
- Energy Policy Act (1992): mandated open access of the transmission grid.
- FERC Order 888 (1996): functional unbundling of generation and transmission; open access non-discriminatory access to transmission; encouraged ISO participation

FERC cont.

- FERC Order 2000 (1999):put transmission under the control of an RTO; improve grid operations
- EPAct2005 (2005): new FERC authority for reliability; required the ID of transmission congestion corridors; provided "backstop" siting authority
- FERC Order 890 (2007): mandated an open and transparent transmission planning process
- FERC Order 1000 (last week)…

- "Local politics and parochialism in one state should not be allowed to prohibit the economic and environmentally friendly construction of renewable energy facilities in another state. And our nation's energy future is far too important to allow this practice to continue."

- "To have the greatest economical and environmental benefits transmission facilities, similar to renewable portfolio standards, should not be localized or nationalized; practical considerations require they need to be regionalized."

- Testimony by Chairman Gary Hanson
US Senate Committee on Energy & Natural Resources

Transmission Challenges

- Current Policies are out-of-date
- Transmission Cost Allocation
  - Who should pay?
- Transmission Planning
  - How do we decide what gets built?
- RGOS, UMTDI, CARP, EISPC…

Upper Midwest Transmission Development Initiative (UMTDI)

Formed by Midwest Governors' Association (MGA)

Stakeholders (SD, ND, IA, MN, WI)

- Commissioners & staff
- Governors' staff / Department staff
- Utilities
- Transmission companies
- MISO

UMTDI

Goals

- Develop a plan to facilitate the construction of interstate transmission in 5 states
- Develop an equitable way to distribute the costs {cost allocation}
- Site the Lines

UMTDI Planning Method

- Focus on the needs of 5 states
- Rely on Midwest ISO studies
- Agree on plans for transmission expansion
- Identify options for cost allocation
- Create a plan that meets everyone's needs
- All lines should be considered to be "no regrets" lines

UMTDI Results

- Accepted CARP's cost allocation and limited their task to siting transmission
- Used MISO wind production studies to choose locations while staying within the "no regrets" goals

The UMTDI lines are first on the consideration list of MISO MVP projects

Regional Generation Outlet Study (RGOS)

- Informed by UMTDI results
- Analyzed new wind generation siting options to determine optimal placement of wind
- Determined that a combination of local and regional wind generation zones offers the least cost to meet state RES

Cost Allocation Resource Planning (CARP)

- Stakeholders
  - 14 states and 2 Canadian provinces
- Goal
  - Achieve a method of cost allocation that would match benefit with cost
    - **Spring 2010 - completed its work**
    - **July 2010 - MISO filed with FERC**
    - **December 2010 - FERC substantially approved**

CARP's MVP Cost Allocation

- Under **RECB 1** allocation if a line was necessary for reliability and 345 kv or larger then 80% of cost stayed with utilities/generators, and 20% was shared across MISO.
- **RECB 2** required a 3:1 economic benefit cost ratio
- Under **Multi-Value Project** classification the benefit to cost ratio must exceed 1:1 for reliability and economic benefits. The entire cost is then borne by the MISO system based on MWH consumption

  SD has less than 1% of MISO MWH consumption

CARP'S MVP Cost Allocation

- Lines < 345 kv
  - 100 % cost stays with the constructing utility if built to serve only native load
  - Cost is shared based on LODF if serves > native load
  - 50% Generator - 50% Utility when generator is upgrading the utilities local network
- 345 kv and > for 'reliability only'
  - 80% LODF* 20% Postage stamp

*Line Outage Distribution Factor

Eastern Interconnection States' Planning Council (EISPC)

- Designed to function similar to CARP with similar goals
- Expanded to 39 states and 8 Canadian provinces
- Scheduled to go into the Summer of 2013

Commissioner Lauren Azar, WI, organized the process for both CARP and EISPC

Eastern Interconnection Planning Collaborative (EIPC)

- EIPC is a companion group working with EISPC
- EIPC is comprised of engineers and system planners
- EISPC represents the policy/regulation input to EIPC
- CARP relied on MISO staff to model systems; and EISPC is relying upon EIPC
- EIPC has authority to go its own way

FERC Docket RM10-23

June 2010 - Notice of Proposed Rulemaking (NOPR)

Sought to address:

- Transmission Planning: FERC identified deficiencies that hinder wholesale power markets
  - Need for stronger regional plans
  - Lack of coordination among planning regions
  - Potential for discrimination because of a “right of first refusal” (ROFR) for development
- Cost Allocation: current methods hinder development and may not be “just and reasonable”

FERC Order 1000

July 2011- FERC Order released

- 620 pages released last week, only beginning to evaluate, conference calls with FERC
- Main Points:
  - Requires public utilities to develop and participate in regional planning and cost allocation that satisfy certain principles
  - Requires public utilities to coordinate planning and cost allocation between regions
  - Requires consideration of public policy-driven transmission needs (State RPS, EPA Emissions, etc.)
  - Removes ROFR for FERC-jurisdictional projects
  - 1 year compliance for utilities, 1.5 year compliance for regions

Thank You!

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