



"We lead North Dakota's efforts to attract, retain and expand wealth."

Renewable Energy Outlook

Ports to Plains Conference
10 September 2010

Presenter:

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Overview

1. Renewable Energy, definition and types
2. Current state of Renewable Energy
3. Renewable Energy outlook
4. Transportation

Definition of Renewable Energy

- Replenished naturally.
- Gathered from sunlight directly or indirectly.
- Acquired via natural movement in the environment.
- Doesn't use non-renewable fossil fuels.
- Doesn't produce non-natural waste.
- Is environmentally friendly.

Types of Renewable Energy



Hydropower



Hydrogen



Geothermal



Biomass



Wind



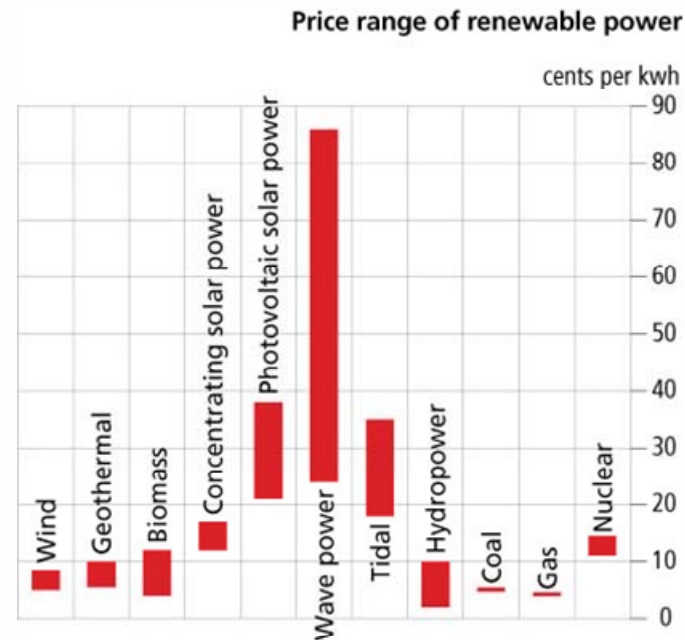
Solar power



New and Emerging Technologies

- Cellulosic Technology
- Nanotechnology thin-film solar panels

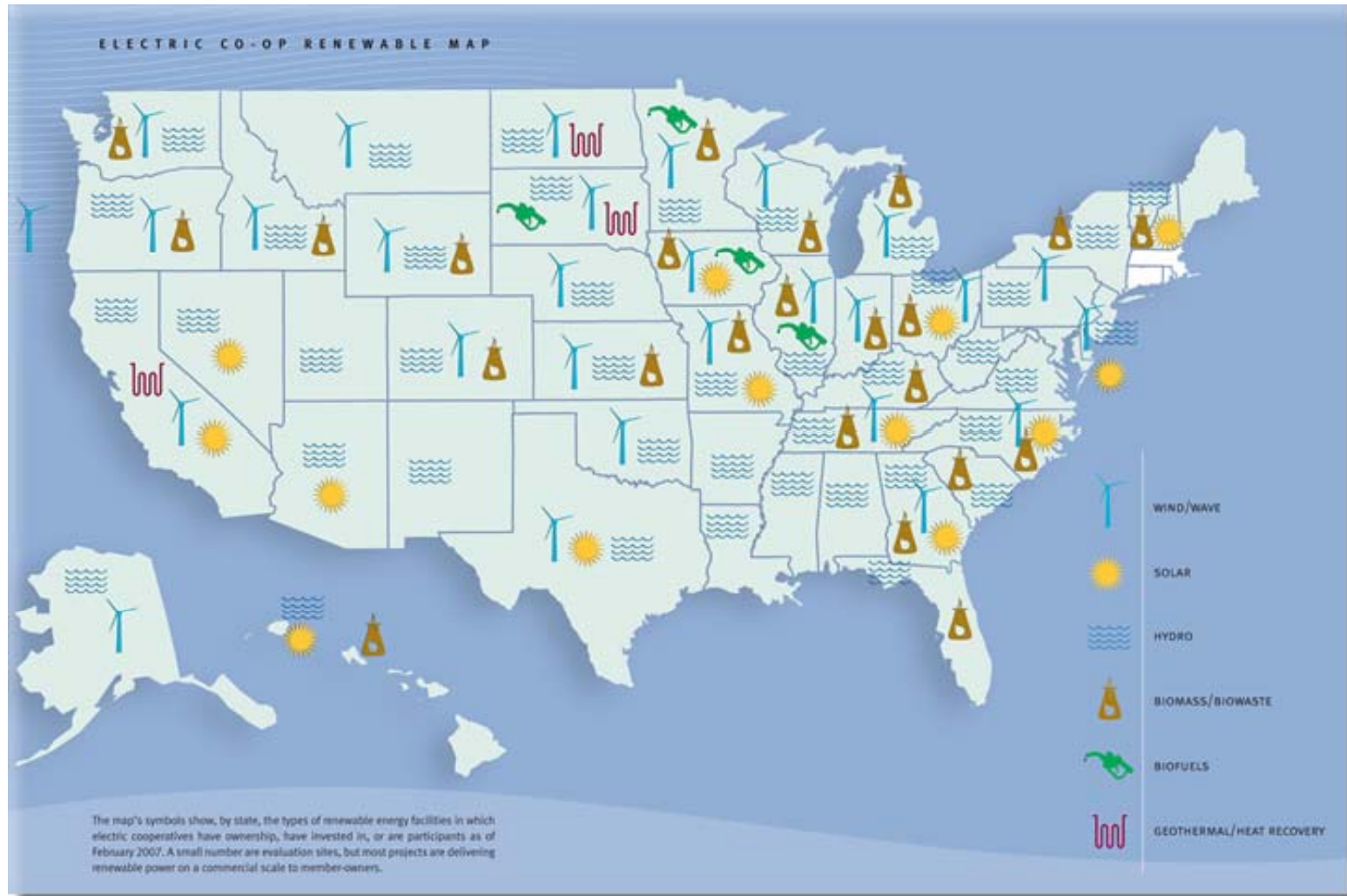
Cost of Energy Production



Sources: U.S. Department of Energy; Cold Energy.



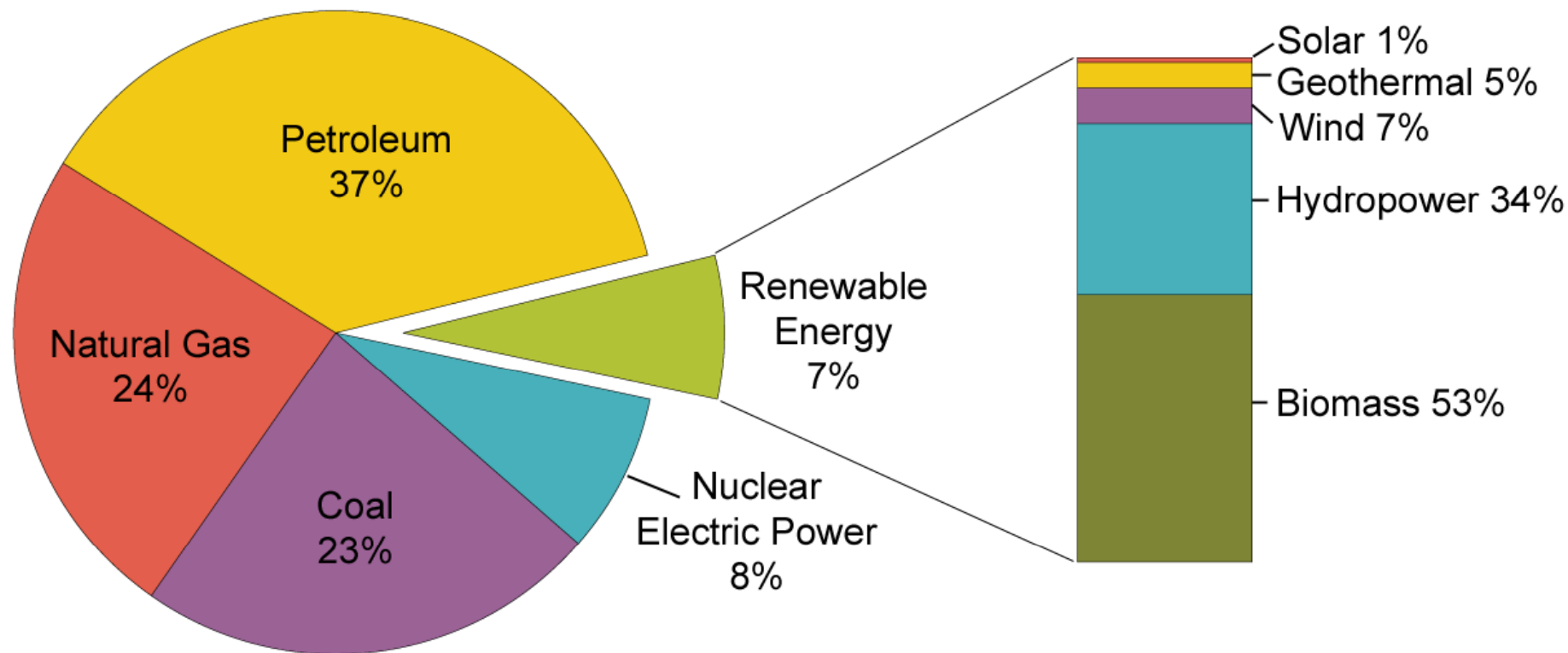
Distribution of Renewable Energy, U.S.



The Role of Renewable Energy in the Nation's Energy Supply, 2008

Total = 99.304 Quadrillion Btu

Total = 7.300 Quadrillion Btu

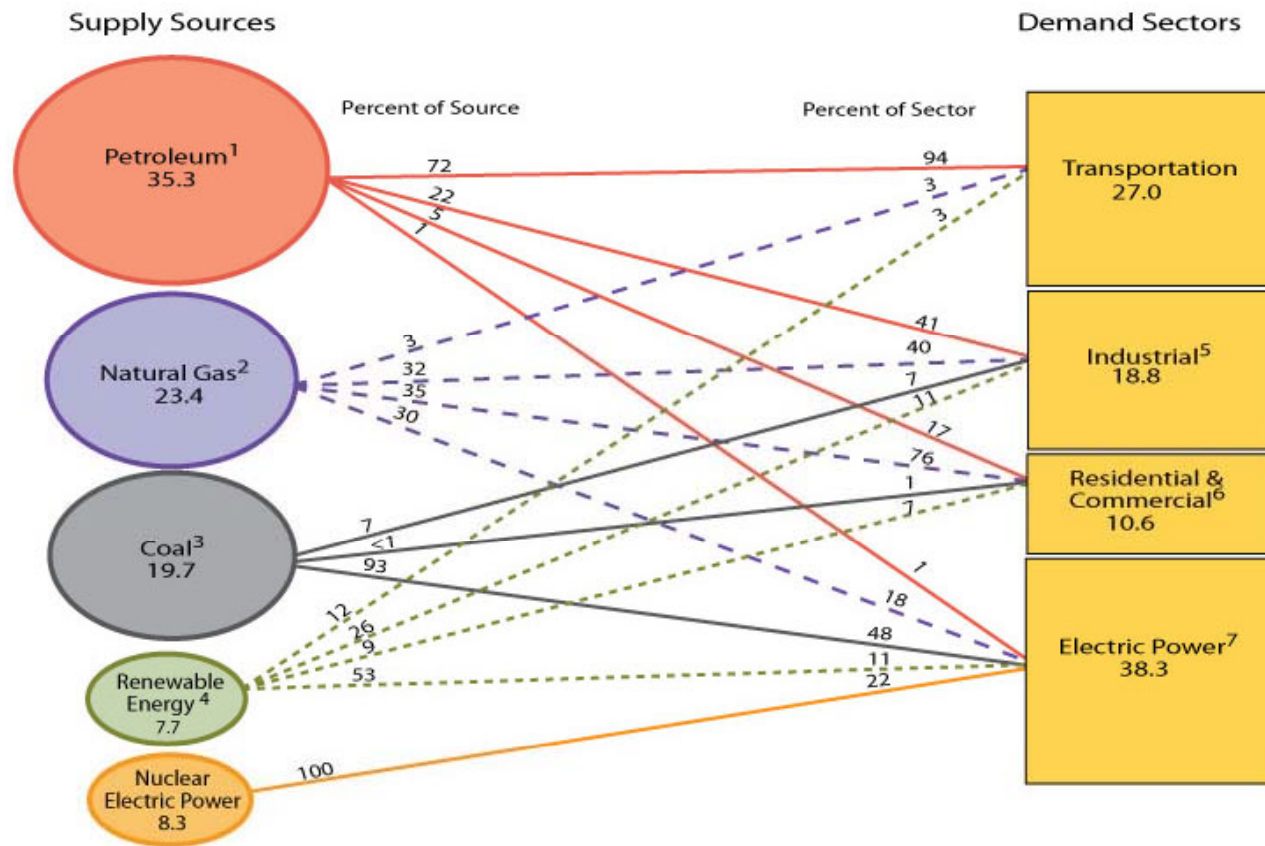


Note: Sum of components may not equal 100% due to independent rounding.

Source: U.S. Energy Information Administration, *Annual Energy Review 2009*, Table 1.3, Primary Energy Consumption by Energy Source, 1949-2008 (June 2009).



Supply Source and Demand Sectors

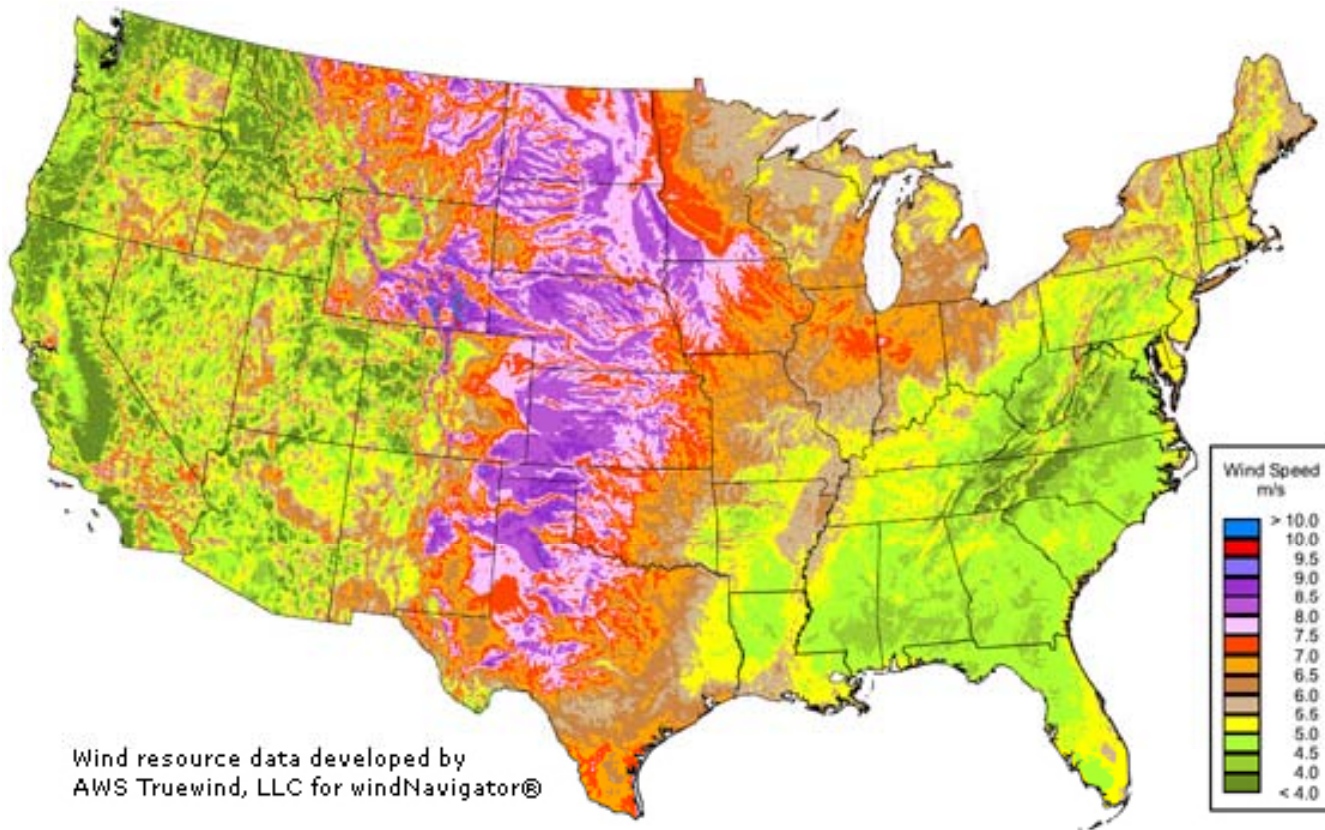


Elements of Wind Energy Projects

(100 Mw)

- Capital cost: \$200 million (minimum)
- Wind studies (1-2 years)
- Transmission
- Market

U.S. Wind Resources



Wind Power Capacities by State,

	April 09	April 10	Extra Mw	Change %
Texas	7,314	9,410	2,096	29%
North Dakota	714	1,203	489	68%
Oklahoma	708	1,130	422	60%
Kansas	815	1,014	199	24%
South Dakota	187	313	126	67%
Nebraska	73	152	79	108%
United States	25,388	35,161	9,773	38%
Canada	2,369	3,319	950	40%
Total	27,757	38,480	10,723	39%
World	120,645	159,241	38,596	32%

Biomass

- Alcohol fuels—ethanol, biodiesel, and green Diesel
- Garbage
- Landfill Gas
- Wood
- Waste

Renewable Energy Outlook

- SWAG
- Policy makers
- Experts
- Combination of all—multitude of variables

Crystal Ball



Alternative Energy Programs

President Obama's Commitment to Renewable Energy:

"In order to put people back to work today, and reduce our dependence on foreign oil tomorrow, we will double renewable energy production."



Alternative Energy Programs

"USDA is working to expand energy opportunities by producing alternative forms of energy and fuel, and to ensure that we are doing the research necessary to allow agriculture to transition away from its rather significant dependence on fossil fuels."

Tom Vilsack
Agriculture Secretary





Congress Takes Another Piece out of Renewable Energy Loan Funding

Wind Energy Weekly (AWEA)
August 2010



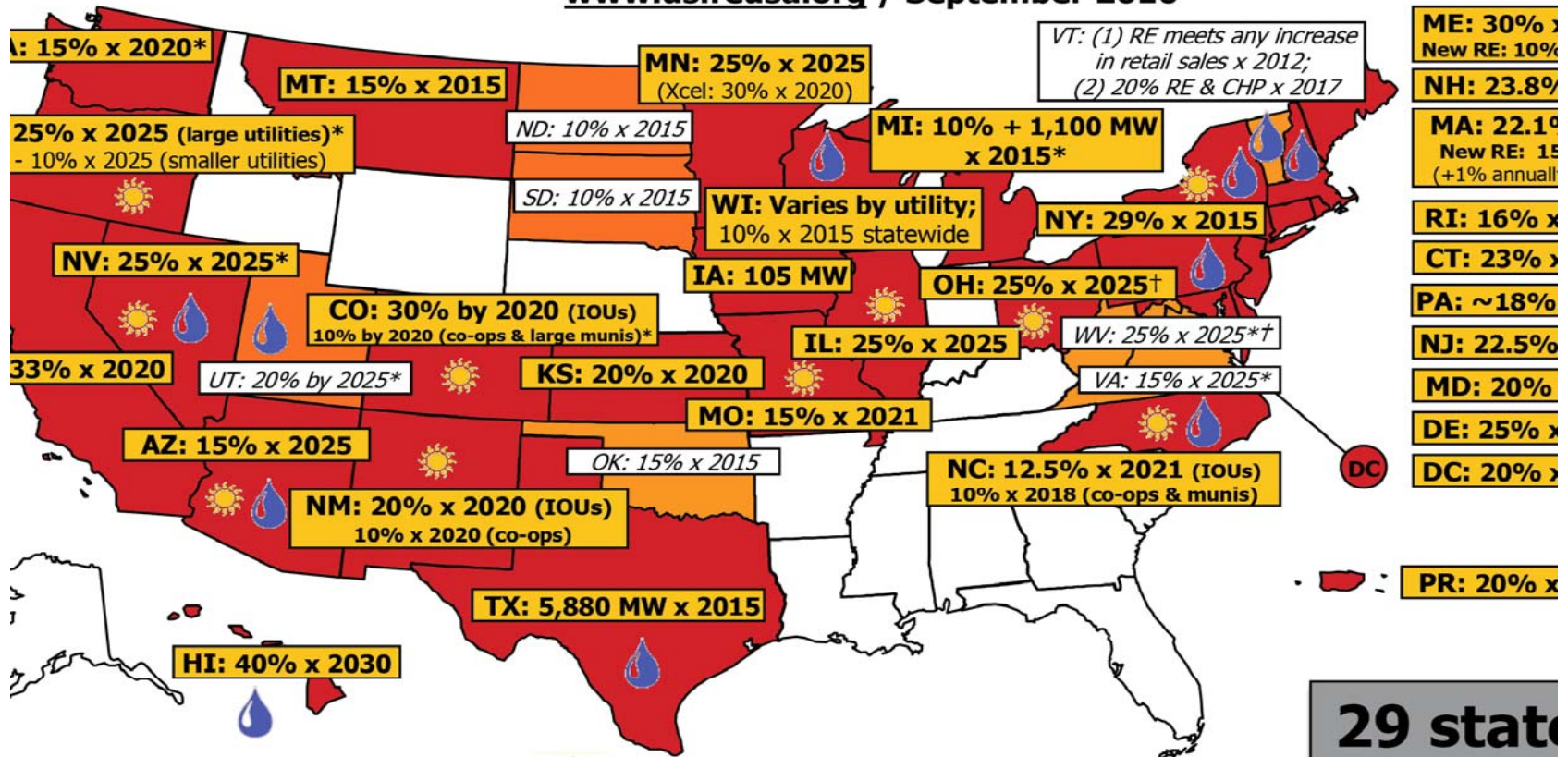
Nebraska Gov. touts state to wind firms

LINCOLN — Two of the nation’s largest wind-energy developers said that Nebraska could jump-start the lagging development of wind here with one simple yet controversial step — adopt a renewable energy standard, to require the use of “green” energy.

By Paul Hammel
WORLD-HERALD BUREAU

RPS Policies

www.dsireusa.org / September 2010



Renewable portfolio standard
Renewable portfolio goal
Solar water heating eligible



Minimum solar or customer-sited requirement



Extra credit for solar or customer-sited renewables



Includes non-renewable alternative resources

29 states
DC and PR
an RPS
(7 states have

U.S. Energy consumption by Fuel, 2008-2035

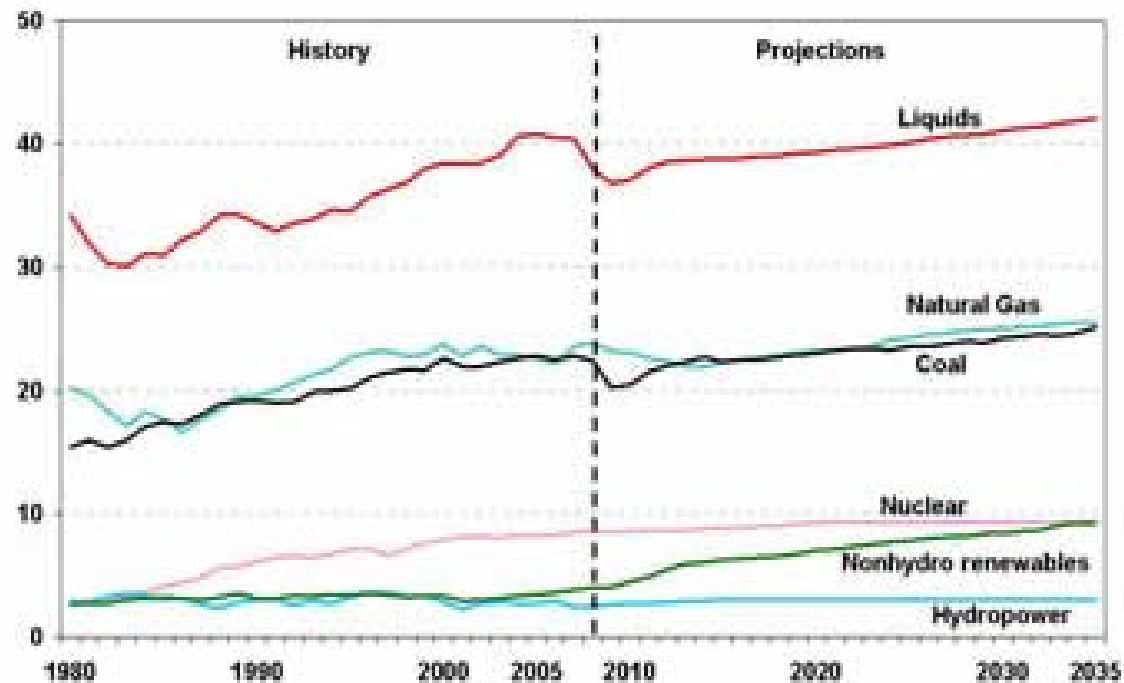
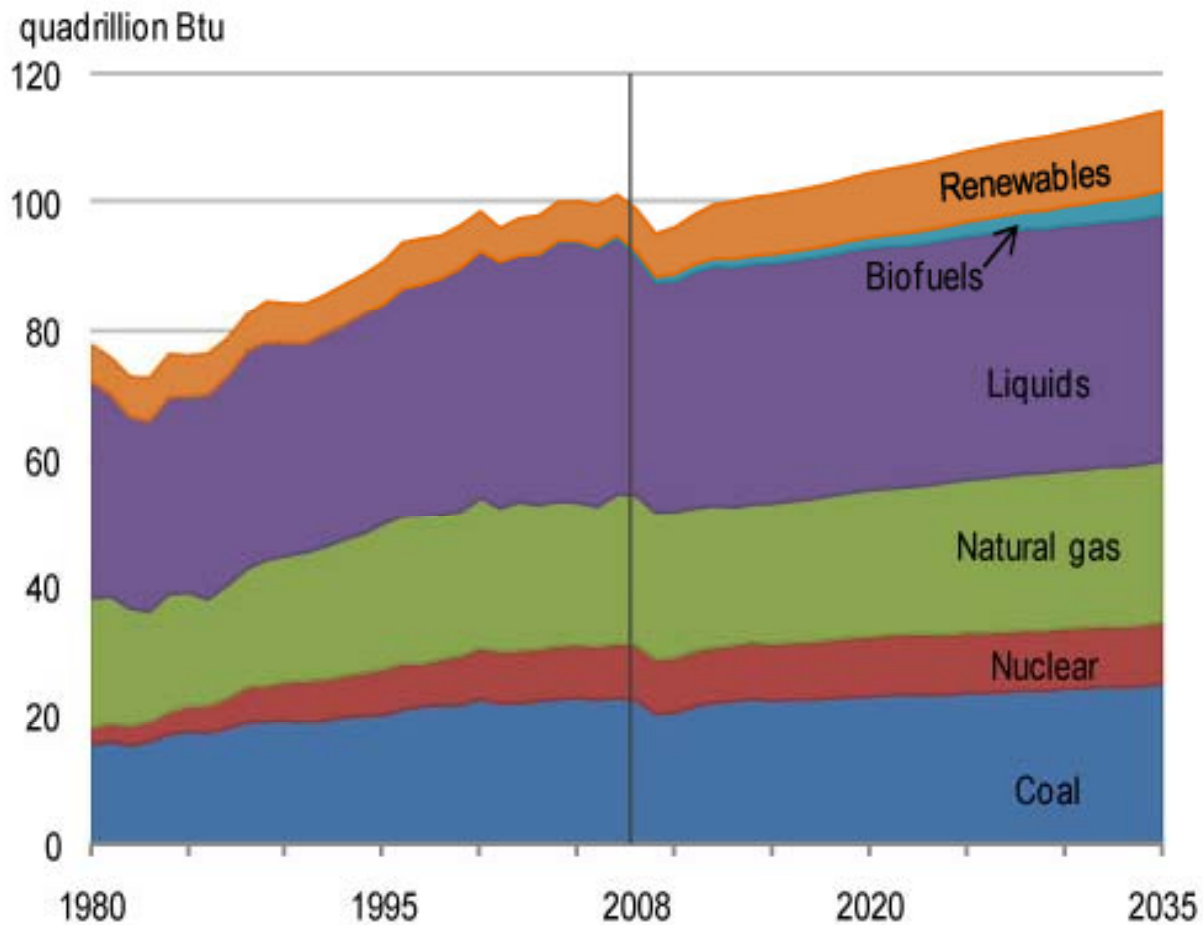
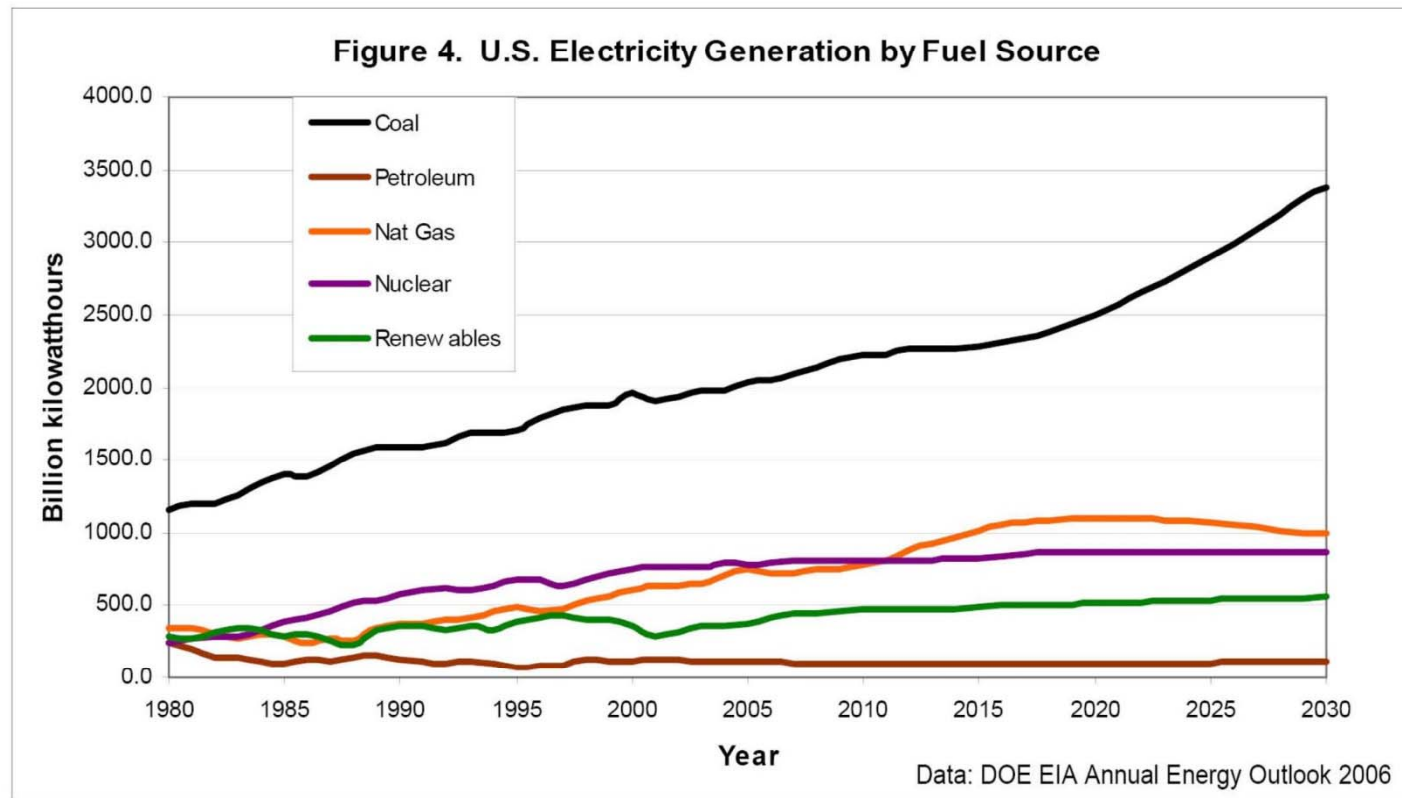


Figure 1. U.S. primary energy consumption, 1980-2035

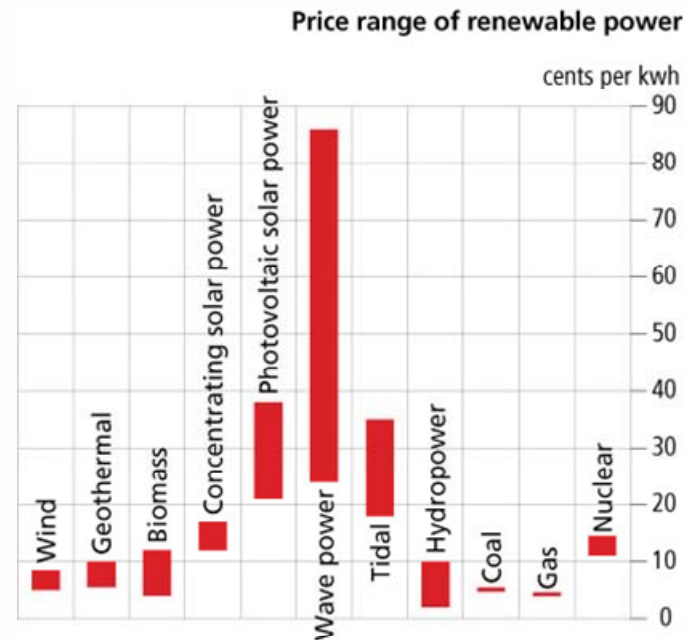




“Wind and solar power could become the world’s main sources of energy.”

Walter Kohn, Ph.D.,
Nobel-prize winning scientist

Cost of Energy Production



Sources: U.S. Department of Energy; Cold Energy.



Renewable Energy and Transportation



Modern Version – Biomass



Modern Version – Wind



Wind Power and Transportation

Equipment	Pounds	L x W x H (ft)	Associated Truck Loads
Nacelle	150,000-218,000	36.5-120.6 x 11.5-12.6 x 12.3-14.6	One to Two 19 Axle Trucks per nacelle with permits, restrictions and Escorts
Hub	57,099	14 x 14 x 9.9	One legal lowboy load – just oversized
Spinner	1,103	9.4 x 9.4 x 12.6	One legal lowboy load – just oversized
Blades (3 each)	26,456-90,000	131-170 x 7.2-8.6 x 11.2-14.6	Two to Three specialized blade trailer loads with permits and escorts
Tower Base design "E"	84,000-232,000	34-177 x 12.6-15.1 x 13-15.11	One Schnable trailer load with permits and escorts
Tower Mid design "E"	59,250-176,000	71.3-156.5 x 11.6-14.2 x 10.10-15.6	One Schnable trailer load with permits and escorts
Tower Top design "E"	44,500-134,000	78.6-124 x 7.8-11.6 x 7.8-14.2	One extended Schnable trailer load permits and escorts
Power Unit	17,639	12.5 x 10 x 11.4	One combined for a legal lowboy load – no restrictions
Container	39,683	40	One legal load
Ancillary Equip	228,496		Two combined permit and legal load
Generator Power Unit	5,512	8.3 x 6.6 x 7.4	One combined for a legal lowboy load – no restrictions
TOTALS	766,650-1,349,532		8-10 Permitted and escorted loads 5 legal loads 13-15 total truck loads per wind tower



Source: NCDOT Highway Report

Wind Power and Transportation

<u>Equipment</u>	<u>Pounds (000)</u>	<u>LxWxH (ft.)</u>	<u>Associated Truck Loads</u>
Nacelle	150-250	121x13x15	1 to 2 19-axle
Blades	26-50	170x9x15	2-3 Specialized Trailers
Tower	84-232	177x15x15	One Schnabel Trailer

Wind Power and Transportation

Totals:

- 766,650 to 1,349,532 Pounds
- 8-10 Permitted and escorted loads
- 5 Legal loads
- 13 to 15 Total truck loads per wind tower

Ethanol and Transportation

Potential Ethanol Production Truck Traffic

A 100M Gallon Plant will:

Consume 35,600,000 bushels of corn = 44,500 truck loads, 122/day

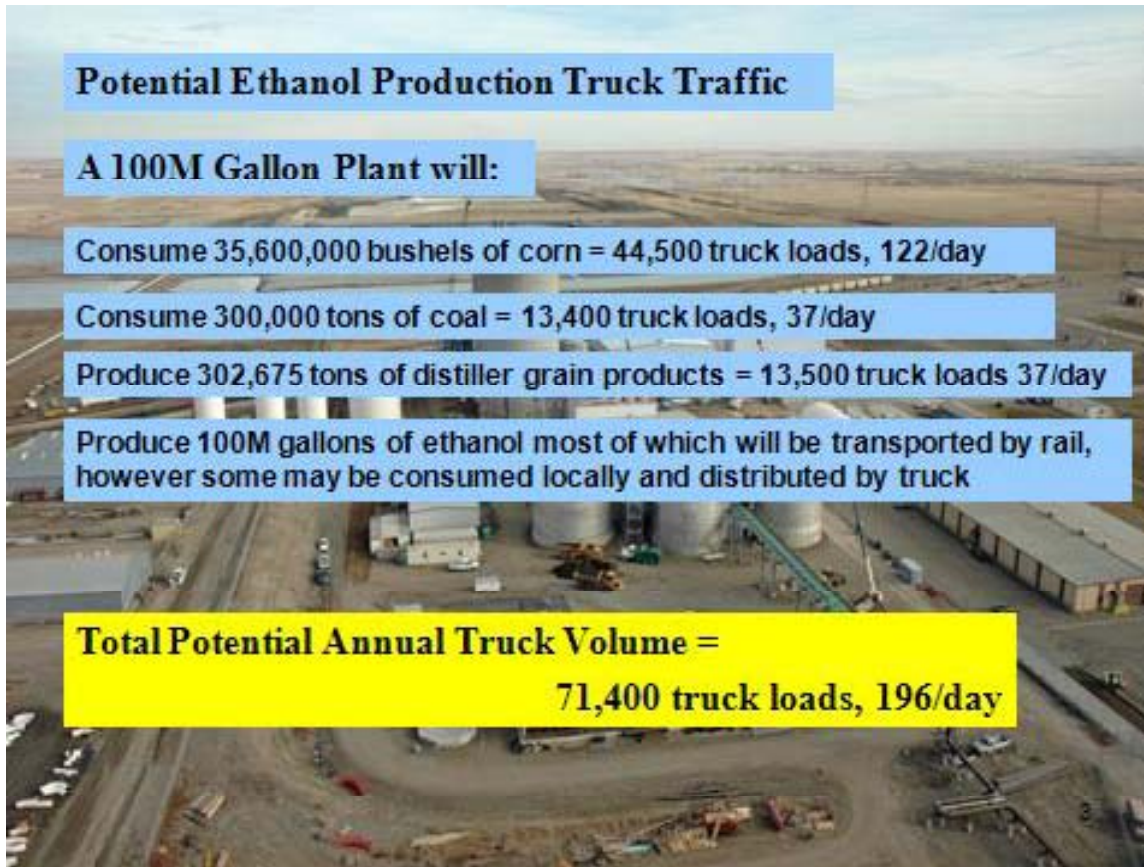
Consume 300,000 tons of coal = 13,400 truck loads, 37/day

Produce 302,675 tons of distiller grain products = 13,500 truck loads 37/day

Produce 100M gallons of ethanol most of which will be transported by rail, however some may be consumed locally and distributed by truck

Total Potential Annual Truck Volume =

71,400 truck loads, 196/day



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