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Wind Energy Will Not Reduce US Oil Dependence

One of the false claims made by “wind energy” advocates is that greater use of this potential energy source would reduce US dependence on oil, including oil imports.

In fact, adding more wind turbines will have no significant impact on US oil consumption.

Unfortunately, many well-meaning people (including some prolific authors of letters to editors and reporters) have accepted the wind advocates’ claims about reductions in oil use. This brief paper explains why the reduced oil use claim is false.

The claim about reduced oil dependence is only one of many false and misleading claims made on behalf of wind energy by the wind industry, US Department of Energy (DOE), DOE’s National Renewable Energy “Laboratory” (NREL) and other wind advocates. Other such claims are discussed elsewhere.¹

Facts about oil use in electric generation in the US

1. The only potential use of wind turbines is to produce electricity.
2. Very little oil is used in the US to produce electricity. In 2002, only 2.45% of the electricity produced in the US was produced by using oil.² The US Energy Information Administration (EIA) expects that percentage to drop to 1.68% by 2025.³
3. Most of the use of oil in the US for electricity generation occurs in a few states, as shown in the attached. For example, in 2002, 3 states (Florida, New York and Hawaii) accounted for nearly 58% of all the electricity in the US generated by using oil.
4. Oil accounted for more than 5% of electric generation in only 9 states and the District of Columbia. Those states are Hawaii, Florida, Massachusetts, Delaware, Alaska, New York, Connecticut, Maine and Virginia.
5. Oil accounted for less than 1% of electric generation in 31 states. Twenty-six of those were under ½ of 1%.

Reasons why wind energy will have no significant impact on oil use for electric generation

6. Even in those few states where oil accounts for more than 1% of electricity generation, adding wind turbines would have very little, if any, impact on oil consumption. The facts supporting this are complex and many of those who have believed the false claims might be forgiven for their errors. However, the complexity does not excuse officials from DOE, NREL or the wind industry who should know better. But, in any case, here is why wind energy is highly unlikely to reduce oil use in electric generation:

- a. About 17% of the oil used in electric generation in 2002 was “distillate” oil⁴ used in combustion turbine and internal combustion electric generating units.⁵ The cost of this oil is high and such units are used almost exclusively in times when electricity demand is at its highest level (e.g., during hot weekday afternoons in August). Little if any wind generated electricity would be available during those times.
- b. The remaining 83% of the oil used in electric generation was “residual oil” (#4 & #5) that is used in older, oil-fired steam-electric generating units (oil is burned to heat water and create steam to drive a turbine).
- c. These older oil-fired steam-electric units are quite unlikely to be the units that are backed down or ramped up to adjust for the intermittent, highly volatile (output often varies widely minute to minute) and largely unpredictable output from wind turbines – which produce electricity only when the wind is blowing in the right speed range.⁶
- d. Instead, the generating units that are likely to be used to “back up” the intermittent wind turbines will be units that are either:
 - 1) Designed and designated to serve in an Automatic Generation Control (AGC) mode to keep an electric grid in balance (i.e., frequency and voltage),
 - 2) Producing at less than full capacity and capable of ramping up or down on short notice, or,
 - 3) Operating in a “spinning reserve” mode.⁷

Electricity supply and demand must be kept in balance. Electricity production is constantly adjusted to meet electricity demand. The generating units that serve best in backing up intermittent, volatile wind turbines are hydropower units because the output from these units can be increased or decreased almost instantaneously. The next best alternatives are gas-fired turbine-based generating units (e.g., combined-cycle or larger simple cycle). Oil-fired units are less likely to be used in the required balancing role for wind turbines because (a) the oil-fired combustion turbine and internal combustion units are unlikely to be running except in times of peak demand, and (b) the oil-fired steam-electric units are likely to have slower response times than is necessary to back up wind turbines.

- e. The generating units used to “back up” intermittent and volatile wind generation will depend on the generating mix and other conditions in the grid *control area* that is receiving the electricity from wind turbines. In the Pacific-Northwest, for example, hydro power would likely serve in the balancing role – with no savings in oil. In New England, with its heavy dependence on natural gas and a significant amount of newer gas-fired generating capacity, a gas-fired unit would likely serve in the balancing role, again with little or no savings in oil use.
7. In summary, there is very little likelihood that any oil use in electric generation would be reduced by adding wind turbines. This would certainly be true in those 31 states with less than 1% -- or less than ½ of 1% of their electric generation from oil.

The electric industry officials who will have the exact data on the generating units that are run to balance the intermittent and volatile output from wind turbines are those who handle the day to day management and control of electric grids and transmission systems; i.e., depending on the region of the US, the power pool, the independent system operator (ISO), or the regional transmission organization (RTO).

Where is the oil used in the US?

During 2002, US oil use⁸ averaged 19,761,000 barrels per day.⁹ The shares of US oil consumption by sector were as follows:¹⁰

• Transportation.	-	67.5%
• Industrial	-	24.1%
• Residential	-	3.9%
• Electric Generation	-	2.5%
• Commercial	-	<u>1.9%</u>
Total	-	100%

As the above table suggests, those seeking a reduction in US oil consumption will need to focus primarily on oil use in transportation.

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Attachment: 2002 Electric Generation by State & US Total – All energy sources & petroleum

Endnotes:

¹ For facts about other false and misleading claims, see my paper entitled: “Facing up to the true costs and benefits of wind energy,” June 24, 2004.

² US Energy Information Administration, Electricity Data Base, Generation.
http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts.html

³ US Energy Information Administration, Annual Energy Outlook 2004, Table A8, Page 145.

⁴ US Energy Information Administration, Annual Energy Review, Table 5.13d, page 151.

⁵ A small amount of distillate oil may be used as a start up fuel in oil or coal-fired steam electric generating units or occasionally to assist in flame stabilization.

⁶ Larger wind turbines now being installed begin producing electricity when wind is around 6 miles per hour, reach rated capacity at around 33 MPH and are shut down to avoid equipment damage around 56 MPH.

⁷ That is, running and synchronized with the grid but not inputting electricity.

⁸ Technically, “products delivered.”

⁹ US Energy Information Administration, Monthly Energy Review, Table 3.1a.

¹⁰ US Energy Information Administration, Monthly Energy Review, Tables 2.2 – 2.6.

2002 Electric Generation By State & US Total*

All Energy Sources & Petroleum in kilowatt-hours & Percent Petroleum

<u>State</u>	<u>Kilowatt-hours Generated -- All Energy Sources</u>	<u>Kilowatt-hours generated by using Petroleum</u>	<u>% of State's Electric Generation from Petroleum</u>	<u>State Share of US oil-fired electric Generation</u>
FL	203,352,775,000	33,681,351,000	16.56%	35.62%
NY	139,591,687,000	11,534,110,000	8.26%	12.20%
HI	11,663,070,000	9,466,990,000	81.17%	10.01%
MA	42,015,689,000	6,800,295,000	16.19%	7.19%
VA	75,005,651,000	3,792,604,000	5.06%	4.01%
KY	92,106,668,000	3,068,498,000	3.33%	3.24%
PA	204,322,878,000	2,732,945,000	1.34%	2.89%
CT	31,311,218,000	2,337,885,000	7.47%	2.47%
MD	48,279,088,000	2,282,432,000	4.73%	2.41%
CA	184,210,031,000	1,961,066,000	1.06%	2.07%
LA	94,970,964,000	1,864,536,000	1.96%	1.97%
TX	385,628,542,000	1,620,965,000	0.42%	1.71%
ME	22,535,033,000	1,229,485,000	5.46%	1.30%
GA	126,512,215,000	1,204,565,000	0.95%	1.27%
MI	117,889,087,000	1,103,485,000	0.94%	1.17%
AK	6,767,325,000	962,369,000	14.22%	1.02%
DE	6,002,489,000	949,695,000	15.82%	1.00%
NJ	61,569,387,000	730,633,000	1.19%	0.77%
MN	52,777,965,000	652,790,000	1.24%	0.69%
NH	15,953,078,000	649,709,000	4.07%	0.69%
IN	125,608,139,000	617,132,000	0.49%	0.65%
NC	124,468,030,000	592,026,000	0.48%	0.63%
MO	81,162,198,000	529,395,000	0.65%	0.56%
KS	47,188,446,000	509,078,000	1.08%	0.54%
MT	25,473,705,000	469,659,000	1.84%	0.50%
WI	58,431,438,000	422,677,000	0.72%	0.45%
OH	147,068,850,000	389,119,000	0.26%	0.41%
AL	132,920,670,000	312,048,000	0.23%	0.33%
SC	96,563,498,000	300,337,000	0.31%	0.32%
WV	94,761,751,000	297,587,000	0.31%	0.31%
TN	96,114,262,000	269,613,000	0.28%	0.29%
DC	261,980,000	261,980,000	100.00%	0.28%
IL	188,054,449,000	222,683,000	0.12%	0.24%
AR	47,611,644,000	159,706,000	0.34%	0.17%
WA	102,765,048,000	73,302,000	0.07%	0.08%
IA	42,528,384,000	63,864,000	0.15%	0.07%
RI	7,056,765,000	57,533,000	0.82%	0.06%
AZ	94,131,666,000	57,446,000	0.06%	0.06%
UT	36,608,003,000	53,519,000	0.15%	0.06%
OK	59,183,419,000	49,871,000	0.08%	0.05%
WY	43,783,839,000	40,104,000	0.09%	0.04%
ND	31,306,312,000	38,576,000	0.12%	0.04%
NM	30,661,707,000	33,089,000	0.11%	0.03%
MS	42,900,941,000	30,302,000	0.07%	0.03%
NV	32,088,935,000	25,472,000	0.08%	0.03%
CO	45,600,388,000	23,180,000	0.05%	0.02%
NE	31,618,494,000	20,549,000	0.06%	0.02%
VT	5,456,190,000	9,406,000	0.17%	0.01%
OR	47,099,369,000	6,704,000	0.01%	0.01%
SD	7,721,958,000	4,961,000	0.06%	0.01%
ID	9,786,933,000	65,000	0.00%	0.00%
US-TOTAL	3,858,452,253,000	94,567,394,000	2.45%	100.0%

Data Source: US Energy Information Administration, Electricity Data Base, Generation
http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts.html

* All electric generation, including utilities, non-utility generators & combined heat & power.