



Do Wind Turbines Reduce Greenhouse Gas Emissions?

Industry Spin vs. Fact

Many Vermonters are conflicted about the need to save the planet by building large wind turbines on Vermont's mountains; some are willing to make the sacrifice if it will really make a difference in slowing climate change. The wind industry says building 300,000 MW of wind turbines by 2030 will cut emissions by 20-25%. A recent study projects much lower amounts, 15% of installed wind capacity, while pointing to the need for new fossil fuel or nuclear generation to compensate for large hourly deficits created by the variations in wind speed.

Industry spin: Looking at a scenario of 20% wind energy by 2030, the Department of Energy recently reported wind energy could avoid 825 million tons of CO₂ annually by 2030, **cutting expected electric sector emissions by 20-25%.**

Wind Power and Climate Change
American Wind Energy Association

FACTS: A recent paper looked at what electricity load would have looked like during 2007, under various levels of wind penetration. Bushnell, also a member of Cal-ISO's Market Surveillance Committee, found that large investments in wind only modestly reduce the need for thermal generation. In California, going from no wind to more than 11 GW reduces the need for fossil-fuel power only by 1,200 MW -- from 20,810 MW to 19,561 MW.

The results were the same in the Northwest Power Pool, the Arizona-New Mexico area, and the Rocky Mountain Power Pool -- **"the reduction in thermal capacity averages only about 15 percent of the new installed wind capacity,"** Bushnell found.

Study Finds More Wind Means More Expensive Peakers
Energy Prospects West, March 2, 2010

FACTS: Another study found: **"the hour-to-hour variations in wind energy** (speed) will create large hourly energy deficits that require installation of other, more predictable, compensation generation capacity and infrastructure. Compensating for the energy deficits of wRPS15 **could potentially cost tens of billions in additional dollar expenditure for fossil and / or nuclear generation capacity.** There is a real possibility that carbon dioxide and other greenhouse gas (GHG) emission reductions will miss the California Assembly Bill 32 (CA AB 32) target by a wide margin once the wRPS15 compensation system is in place."

Effect of Wind Intermittency on the ElectricGrid: Mitigating the Risk of Energy Deficits
Sam O. George, Member, IEEE, H. Bola George, Ph.D. and Scott V. Nguyen, Ph.D.

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Industry spin: For every MW of wind energy generated, 1 MW of fossil fuel generation is displaced.

FACTS: “From our analytics, compensating for random probability energy production inherent in wRPS15 requires planning for wind energy far in excess of the macro exchange equation that suggests 1 GWh of wind energy may replace 1 GWh of fossil-based energy. To make wind energy reliable, **the total nameplate capacity must exceed the demand profile by a possible factor of 10.** And this fundamentally assumes that the wind is blowing. The oversized nameplate provisioning represents a capital cost that greatly exceeds available budgets for wRPS implementation / compensation.” Effect of Wind Intermittency...

Industry spin: Building wind turbines in Vermont will make a difference.

FACTS: “The effectiveness of wind power introduction in the light of GHG emissions reduction is dependent on the average emission rate of the power plants under operation in the system. **Typically, the largest reductions in GHG emissions are obtained in the more polluting systems, where wind power is outperforming coal power plants.** The impact of the system on GHG emissions is practically in contrast with its impact on the cost reduction. Where the gas-based systems benefit most from wind power in terms of cost, it is the coal-based systems that see the most reductions in GHG emissions with the introduction of wind power. By imposing a CO₂-tax, wind power can more effectively reduce GHG emissions in any system.

Effect of the Generation Mix on Wind Power Introduction
Patrick J. Luickx, Erik D. Delarue, William D. D’haeseleer



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