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My name is Bob Ball. I am a retired electrical engineer and resident of Jefferson, NH. I would like to provide comments to the Site Selection Committee regarding the 33 turbine wind farm being proposed by Granite Renewable Power in Northern Coos County. Please forward these comments to the appropriate members of the committee for review.

In general, I support wind power and believe that, when incorporated in a well-engineered system, wind can be a great asset in solving our energy problems. I also believe that the proposed site for this wind farm represents a poor site choice and will result in an inefficient system that does not support the overall intent of Governor Lynch's "25 in 25" goal for power generation in the state.

I see three reasons why I believe the proposed site is a poor choice.

A. Geographic Location Relative to the Customer Load

From an electric transmission viewpoint, the proposed site for this wind farm results in a system that is about as inefficient as any power engineer could possibly imagine. This is because:

1. It is to be located at virtually the furthest point away from the customer load and
2. It would be connected to the regional grid via a 50 year old electrical line that was designed for *local distribution* rather than *high power transmission*.

To use a common analogy, using the Coos distribution loop at full capacity for this high power transmission is like trying to get high pressure water through a long garden hose that is full of holes. You end up with a lot of wasted water along the way.

It does absolutely no good to disturb an area to create a large wind farm and then burn up the power in transmission heat before it ever reaches the customer.

While Public Service of New Hampshire has indicated that the transmission facility will carry the additional load at near full capacity, it is my belief that it will most certainly come at an inherent inefficiency. The laws of Physics tell us that for a given constant conductor resistance and line voltage, the power loss in the transmission line increases by the square of the power being delivered to the customer. So, if the power being carried on the Coos County Loop is doubled, the resulting power loss for all power on the line will go up by a factor of 4.

Most modern power systems engineers are aware of this and use dedicated transmission lines at higher voltages and decreased line resistances/geometries to increase the efficiency. Even with these efficient lines, the national average for distribution losses has been estimated at about 7%. Due to the outdated technology, the transmission efficiency for the Coos *local distribution loop* is likely to be less efficient than this national average. ***Even at a conservative assumption of an 8% loss, this would imply that the power of 1 windmill in every 12 would be wasted, simply heating up the transmission equipment on the way to the customer load.***

And, since a combined *distribution/transmission* line is being proposed, it should also be pointed out that the increased losses will be shared for distribution of power within the loop. ***This means that additional power will be lost in supplying our homes and businesses in the county after connection of the wind turbines.***

Providing an efficient transmission system is not a technology issue but a business consideration. Neither the wind power company nor Public Service of New Hampshire intends to spend the capital to upgrade the transmission line to reduce the losses, because that would result in decreased profits. But on the other hand, they will both be collecting healthy profits from the generation and transmission of the power.

In my opinion, the selection committee should not allow this project to proceed unless the power generation company is willing to supply capital to provide efficient transmission facilities for the power to reach the connection grid.

Having the generation company provide capital for transmission facilities, which is required under the current law, will force the company to initiate reasonable, efficient plans with realistic business cases to support them. This will allow them to get the power to market and better support the intent of the Governor's goal.

B. Inability to Upgrade Technology at the Chosen Site

Wind generation equipment technology is changing at an enormous rate. Vertical wind generators that have small footprints and can handle rapid wind direction changes as that experienced in these New Hampshire mountains are now common in Europe. Ultrasonic wind detectors that allow direction and blade pitch correction are now emerging. It is quite evident that the wind turbine technology that has been used today will quite likely be totally outdated in less than 10 years.

This site, due to its' remoteness and environmental access issues, is a poor choice to permit technology upgrades. Many wind farms being built in other parts of the country are being built in open fields, near roads with good access. Technology upgrades can and will be applied to these sites and the generation systems to keep the turbines economically competitive.

From descriptions released by the power generation company, the proposed turbines represent technology that was introduced about 10 years ago. These turbines would soon be outdated and likely not be replaced when smaller footprint, more efficient models are developed. This will likely eventually lead to higher maintenance costs, on-going environmental impacts, and abandoned turbines when they are no longer economically viable.

Part of the spirit of Governor Lynch's goal was long-term sustainable systems. In my opinion, the committee should not allow construction in places where technology changes cannot be easily applied.

C. Carbon Dioxide Pollution Levels and the Overall Carbon Footprint

The major driving force of the Governor's goal was to reduce CO2 pollution levels and the overall carbon footprint. Ironically, it appears that locating the wind farm at this location will only increase the pollution and carbon footprint for Coos County. This is because:

1. Removal of healthy trees and use of carbon based construction and maintenance equipment will increase the overall regional carbon footprint.
2. There is absolutely nothing in the generation proposal that would decrease the carbon footprint for Coos County. All the power is planned to be sent out of the county. Coos County is already carbon neutral relative to electric energy consumption and this wind farm would only tip the overall carbon scale in the wrong direction.

In addition, the transmission of this power to other states will likely hamper state efforts to reduce CO2 and mercury levels in northern New Hampshire. The reason that pollution levels will not be decreased is due to the following business cycle:

- So-called "green energy" will be wheeled to other high carbon producing states and sold at inflated prices (usually 4 - 6 cents per KWH). In addition, Renewable Energy Credits, or RECs, will be sold to the highest commercial bidder, usually at about \$20 per million kilowatt hours.
- The power companies, or some large corporations, who are currently expending excessive amounts of carbon will buy these RECs and will use them as a "carbon neutral offset" to delay upgrading their outdated polluting facilities (usually coal-fired plants).
- Without these critical upgrades, the carbon-dioxide and mercury will continue to return to Coos County via the prevailing winds, since we which sit directly in the "tailpipe" of these large carbon dioxide producers.

It is my belief that the selection committee should not allow wind farm sites where the overall carbon footprint for the local area may be impaired in any way. In addition, "Green Power" from the site should not be marketed via RECs such that it will, in the end, increase the pollution levels where the power was produced. The site being proposed fails to meet either of these criteria.

Concluding Thoughts

I believe the proposed wind farm location should *not* be approved since the inefficiencies of the chosen site will greatly outweigh any gains to the local region and the state. Disturbing sensitive habitat to generate power, wasting the power before it gets to good use while disturbing the overall local carbon footprint for the region seems to be a poor choice. ***Overall, this site fails to meet the spirit of Governor's goal to reduce carbon emissions and pollution in the region.***

Rather, sites which are adjacent to the customer load and/or the more efficient regional grid should be given priority for selection. And finally, restrictions should be placed on the generation companies so power generated at local sites does not result in the sale of RECs that will eventually delay the cleanup of CO2 and mercury from our neighbor states.

Respectively Submitted,

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