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TO: The Idaho Public Utilities Commissioners

FROM: John F. Gardner, Ph.D., P.E., Professor of Mechanical Engineering

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IDAHO PUBLIC
UTILITIES COMMISSION

RE: AVU-E-07-02

Date: 21 September 2007

I offer these comments regarding the above-referenced case currently before the commission dealing with the future of wind energy projects under the provisions of the federal PURPA law.

I am a professor of mechanical engineering, currently at Boise State University, but have been an active professor for over 20 years with more than 50 referred publications and 2 textbooks to my name. For the past 4 years, my research has been focused on wind turbine technology. Most recently, my team has been focusing on local energy storage for wind farms, a technology that has the potential for mitigating the intermittency problems which lie at the root of the cases you now consider.

I am considered an expert in dynamic modeling of energy systems and I have a thorough understanding of the intricacies involved in the issues presented here. I have read the wind integration studies offered by the utilities as well as several others commissioned throughout the country in the past years.

I have no financial interest (that I know of) in a wind farm, current or planned. Neither am I a shareholder (to the extent that I'm aware, some of my retirement investments may well hold some stock in one of the utilities) in any of the companies who are party to the complaint.

I offer my comments as a state employee who has particular expertise in the matter in front of the commission and I do so in a sincere attempt to be impartial and unbiased.

That said, I would like to address the request of this petition point-by-point.

Point 1: Reducing the published avoided cost rates applicable to purchases by Avista of electric power from wind-powered QFs by 12%, as a percentage reduction to be applied against scheduled avoided cost rates in those circumstance, except where the QF developer agrees in the power purchase and sale contract with Avista to deliver QF output to Avista on a firm hourly schedule, in which case the percentage reduction shall be 6%;

This, of course, is the core of the complaint. The interconnect plans commissioned by Avista and Idaho Power concur that a) the cost associated with wind energy rises with the market energy costs and b) those costs are currently in the neighborhood of \$10/MW hr. As I'm sure you're aware, these results stand in stark contrast with the vast majority of the results of similar studies done throughout the United States in the past 5 years. In particular, I refer you to a study done by the National Renewable Energy Laboratory, part of the US Department of Energy, summarizing the recent results of wind interconnect studies, summarized in Table I.

Table I: Key Results from Major Wind Integration Studies (2003-2006)

Date	Study	Wind Capacity Penetration	Cost (\$/MWh)				TOTAL
			Regulation	Load Following	Unit Commitment	Gas Supply	
2003	Xcel-UWIG	3.5%	0	0.41	1.44	na	1.85
2003	We Energies	4%	1.12	0.09	0.69	na	1.90
2003	We Energies	29%	1.02	0.15	1.75	na	2.92
2004	Xcel-MNDOC	15%	0.23	na	4.37	na	4.60
2005	PacifiCorp	20%	0	1.6	3	na	4.60
2006	CA RPS (multi-year)	4%	0.45*	trace	na	na	0.45
2006	Xcel-PSCo	10%	0.2	na	2.26	1.26	3.72
2006	Xcel-PSCo	15%	0.2	na	3.32	1.45	4.97
2006	MN-MISO 20%	31%	na	na	na	na	4.41**

* 3-year average ** highest over 3-year evaluation period

Source: National Renewable Energy Laboratory.

Note the total cost of integration per MWh (right-most column) ranges between \$1.85 and \$4.97. This is consistent with the results of the study done by the Bonneville Power Administration in which the cost of wind integration was found to vary from \$1.90 (at 5% wind penetration) to \$4.60 at 30%. Finally, the study commissioned by the Minnesota Public Utilities Commission in 2005, in which the utility companies took part, arrived at a cost of \$4.20 per MW hr.

One of the patterns that emerge from consideration of these varying studies is that the lower numbers tend to come from studies commissioned by independent and government agencies. Whereas studies commissioned by the utilities themselves tend to result in higher numbers.

A reasonable and probable explanation of this correlation is that the utilities are attempting (as well they should) to find the best way to integrate wind, both into

their technical management plan and their business model. I have no doubt that the studies commissioned by Idaho Power and Avista are accurate projections based on the assumptions and constraints provided by the utilities at the outset of the study.

Additionally, both the Avista study and the Idaho Power study are simulations run under the same assumptions and algorithms currently in place today, with little wind on their grids. For example, the Avista study refers to their optimization algorithm which uses a linear programming technique to optimize their operations. The question the report fails to answer is: What is being optimized? Clearly the results will be different if the optimization is attempting to minimize rate payer costs than if the goal is to maximize company profit. While both are worthy endeavors, the reality is no doubt some weighted average of the two. It seems reasonable to assume that small changes in the optimization target will bring about different results.

In conclusion, it is interesting to note that PacifiCorp's related petition sets the cost of integration at \$5.04/MWhr, which is much more in line (albeit still slightly higher) with the national average. In an effort to provide a uniform environment for wind development throughout Idaho, I would argue that the integration rate requested by PacifiCorp be implemented for all PURPA wind projects in the state.

One final comment on this point. It's unclear to me why, if the QF can provide hourly firm power, there should be any integration costs at all. I believe that the utility has failed to make the case for this point and it should be rejected out of hand.

Point 2: Removing the requirement that the 90%/110% performance band requirement not be applied to purchases from wind-powered QFs;

On this point, most people are in complete agreement. My colleagues involved in wind energy research (not commercial operations) across the country are perplexed and troubled by the existence of this requirement. It requires that small wind farm operators (spanning in size from the approximately 300 kW Lewandowski Farm to the 10.5 MW Fossil Gulch installation) predict the wind conditions 4 to 6 months in advance. Anyone who watches the nightly weather report and looks out the window the following morning understands the impossible nature of that requirement. Finally, it's important to note that, according to the very best experts in the field of wind forecasting, the best current predictor of wind is persistence. That is, your highest chance of being correct in prediction what the wind will do in the next hour is to say that it will continue to do what it has been doing in the previous hour. Clearly, such a prediction is often wrong, yet we still can do no better than that.

Therefore, I would argue that the rule should be eliminated regardless of the other actions by the commission. It provides no real value to the utilities or the QF operators and serves only to penalize the operators of small wind farms, and does so in an arbitrary and unpredictable manner

Point 3: Authorizing Avista to purchase state-of-the-art wind forecasting services to provide Avista with forecasted wind conditions in those geographic areas in which wind generation resources are located, provided that QFs will reimburse Avista for their share of the on-going cost of the wind forecasting service, in proportion to their percentage share of the wind-generator capability being supplied to Avista from that area.

Some of my concerns with this issue stem from my comments related to point 2. It is unclear that such 'state of the art' forecasting models are effective enough to justify their cost. But more to the point, there are several problems associated with this requirement. First, it would provide an unfair barrier to the early developers of PURPA wind farm in Idaho. The language is unclear, but it might be a reasonable interpretation that 'their fair share' of the costs of a single wind farm would be 100%. It's also not clear how these forecasting efforts relate to similar efforts that must be carried out for larger wind farms with separate PPA's. Clearly there is opportunity for economy of scale here. I believe the utilities need to make a better case and be more explicit about both the efficacy of these models, the actual costs associated with them, and how they are to be charged.

Point 4: Requiring QFs to deliver a "mechanical availability guarantee" to Avista to demonstrate monthly, except for scheduled maintenance and events of force majeure or uncontrollable force, that the QF was physically capable and available to generate a full output during 85% of the hours in a month;

This request seems both reasonable and prudent.

Point 5: Clarifying the rules governing the entitlement to published rates to prevent all QFs, whether wind or non-wind, capable of delivering more than 10 aMW per month from structuring or restructuring into smaller projects solely for the purpose to qualify for the published avoided cost rates

This point deals with legal and business issues which lie far outside my expertise.

Point 6: Clarifying that the cap on entitlement to published avoided cost rates shall be raised to 10 aMW only until Avista's total wind portfolio from all sources totals 400 MW

I have had insufficient time to form a well-informed opinion on this point.

In closing, I respectfully remind the commissioners of the 2007 Idaho Energy plan, which calls for the following actions:

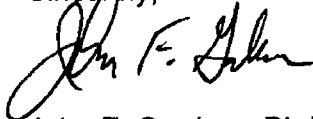
1. Idaho utilities should acquire reliable, diverse, cost effective and environmentally sound resource portfolios sufficient to meet their customers' long-term electricity needs.
2. Idaho utilities should have access to a broad variety of resource options consistent with Idaho's policy objectives, including both renewable and conventional resources.
5. When acquiring resources, Idaho and Idaho utilities should give priority to: (1) Conservation, energy efficiency and demand response; and (2) Renewable resources; recognizing that these alone may not fulfill Idaho's growing energy requirements.
7. It is Idaho policy to encourage the development of customer-owned and community-owned renewable energy and combined heat and power facilities.
10. Idaho and Idaho utilities should encourage technologies that minimize emissions of harmful pollutants and consumptive use of water.
11. Idaho and Idaho utilities should prepare for the possibility of federal regulation of greenhouse gas emissions.

Clearly, any policy that encourages the development of wind farms in Idaho is consistent with all of these policy goals. Conversely, policies which discourage, or preclude the economic viability of, wind farms in Idaho stand in direct conflict with these goals.

Finally, I encourage the commission to take a long view in debating these requests. The question we should ask is: What path will lead to lower power rates 5 or 10 years from now? Like any prudent investment portfolio, an approach in which geographic, fuel source and ownership is diversified is the most conservative and safest approach.

I would be pleased to make myself available to the Commissioners or the staff of the Public Utilities Commission at any time in the future.

Sincerely,



John F. Gardner, Ph.D., P.E.
Professor of Mechanical & Biomedical Engineering