Testimony of Dr. Michael Giberson

Concerning Substitute SB 58

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to the Public Utilities Committees of the Ohio Senate

I. Introduction

Good afternoon. I would like to thank Senate Committee Chairman Seitz, Vice Chairman LaRose, Ranking Member Gentile and the members of the Senate Public Utilities Committee for the opportunity to testify today.

My name is Michael Giberson. I am associate professor of practice in the area of Energy, Economics, and Law in the Rawls College of Business, Texas Tech University. I have taught Energy Economics and U.S. Energy Policy courses at Texas Tech for the last five years, as well as courses on the electric power industry and on alternative energy topics. Prior to joining Texas Tech University I was employed with Potomac Economics Ltd., a leading provider of independent market monitoring services to regional power markets in the United States.[1] In total I have over twenty years of experience in energy policy, energy regulation, and economic analysis.

Recently the Institute for Energy Research in Washington DC published a study I wrote examining wind energy cost estimates. I understand this report has been circulated within the committee by the

[1] My remarks and positions expressed today are my own and I do not represent the views of my current or former employers nor any other organization.

Chairman.[2] My purpose here today is to provide consideration of the costs and contributions of wind energy in the Ohio policy context.

I appear in support of SB 58 because it will reduce the burden on Ohio citizens and consumers of the high costs of mandated renewable energy purchases. I understand that SB 58, as well as the 2008 Energy Efficiency and Alternative Energy Portfolio Standard which SB 58 seeks to modify, addresses a number of other complex issues as well. I have not studied and am not in a position to comment on these other matters. While I appear in support of SB 58, I would much prefer an approach fully repealing the alternative energy resources purchase mandates imposed on Ohio consumers in 2008.

I would like to emphasize that I am not in principle opposed to wind energy technology. Indeed, Texas Tech University is home to one of the nation's finest university-based wind energy research programs and home to the first-in-the-nation wind science and engineering PhD program. I have contributed in a small way to both the wind energy research and wind energy education efforts at Texas Tech University and hope to continue to do so. I am not opposed to wind energy generation, but am opposed to energy policies that restrict choices and artificially raise the cost of energy to consumers.

II. Costly energy sources cannot reduce the cost of electric energy

The simple fact of wind energy is that it is, in most places under most circumstances, a high cost source of electric energy as compared to existing alternatives. Adding high cost energy to the grid will not reduce the cost of supply electric energy.

Mandates and subsidies can and do affect who bears the burden of adding high cost energy, but they do not reduce the overall cost of wind energy. Proponents of subsidies for wind energy will tout its low

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[2] Michael Giberson, *Assessing Wind Power Cost Estimates*, Institute for Energy Research, Washington DC, October 2013.

operating costs, its cost after consideration of the significant federal Production Tax Credit and other state and federal subsidies, and the artificial price suppression effects that wind energy can produce in regional power markets. These aspects of wind energy, along with the variety of other policy supports, shift the burden of paying the cost of wind energy: some onto taxpayers, some onto other generators, and some onto energy consumers. Shifting costs around doesn't reduce costs and, indeed, can cause them to grow; when consumers do not face the full costs of their actions in markets, when purchase of uneconomic products are mandated by government policy, then normal incentives for consumers and producers to operate efficiently are weakened and higher costs are not just possible, but likely.

In evaluating Ohio's Alternative Energy Portfolio Standards, a key issue is the cost of wind energy. The federal government has supported two long-standing and in-depth research efforts intended to examine the cost of wind energy, factors influencing those costs, and overall trends. These research efforts are documented in the National Renewable Energy Laboratory's *Cost of Wind Energy Review* series and the Lawrence Berkeley National Laboratory's *Wind Technologies Market Report* series.[3] In my recently distributed study, *Assessing Wind Power Cost Estimates*, I examine the most recent of these government estimates of wind energy costs and seek to provide a bit of additional context necessary when considering these cost estimates in public policy discussions, such as is before the this committee today.

For a snapshot comment one might just observe that the NREL levelized cost of energy estimate for wind turbines in 2011, the most recent estimate produced, was about $72 per MWh of energy produced.[4] We could stop at that point, observe that this NREL cost estimate is higher than the average

[3] Wiser, R. and M. Bolinger et al. (2013), *2012 Wind Technologies Market Report*, LBNL. DOE/GO-102013-3948; and Tegen, S., E. Lantz, M. Hand, B. Maples, A. Smith, and P. Schwabe (2013) *2011 Cost of Wind Energy Review*, NREL Technical Report, NREL/TP-5000-56266.
[4] Tegen et al., 2013, p. 5.

cost of energy in the PJM Interconnection, and conclude that building higher-than-average cost power cannot lower the average cost of power.

But the NREL estimate of $72 per MWh for wind energy is likely low in the Ohio context. NREL's estimated cost is intended to represent a well-designed large-scale project located in an area with higher than average wind speeds. Ohio wind energy facilities tend to be smaller than the scale assumed and average wind speeds in Ohio fall below the level NREL uses. These and other considerations suggest that wind energy costs in Ohio are much higher than the NREL estimate.

For example, just to focus on the wind speed assumption, in the NREL cost estimate they assume wind energy facilities will achieve a 37 percent capacity factor.[5] It turns out that the capacity factor is a very important assumption in the NREL's estimate of the levelized cost of wind energy – the cost estimate is quite sensitive to this assumption. Data from the U.S. Energy Information Administration for 2012 indicates Ohio wind farms realized an average capacity factor of 27.1 percent.[6] Repeating the NREL calculation, keeping all of their assumptions except using Ohio-specific preliminary 2012 data of 27.1 percent for capacity factor, results in an estimated levelized cost of wind energy in Ohio of nearly $99 per MWh. Yet even this estimate may be too low, as it employs other assumptions that bias the calculation down.[7]

Proponents of wind energy purchase mandates sometimes point to evidence of low-priced wind energy purchase agreements to suggest that wind power costs are not higher, but actually lower than the NREL

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[5] Tegen et al., 2013, p. 11; see also section p. 14: "[Assumptions concerning] capacity factor and discount rate show the highest influence with respect to an increase in LCOE relative to the reference project.".
[6] Calculations done by author based on EIA form 923 and EIA form 860 data. Note that capacity factor will vary from year to year based on wind speed, curtailments, and wind turbine equipment outages.
[7] If, for reasons detailed in *Assessing Wind Power Cost Estimates*, the NREL calculation is further adjusted to remove the subsidizing effect of accelerated depreciation, to reflect a discount rate assumption of 10 percent, and to employ more certain information about operation and maintenance costs, the estimated levelized cost of energy rises to more than $130 per MWh.

estimates. Representatives of the wind energy industry have cited the Blue Creek Wind-OSU agreement at an announced levelized price of $54 per MWh to this effect in earlier hearings on SB 58.[8] But prices are not costs. These prices sometimes quoted in news releases don't usually reflect costs shifted onto federal taxpayers because of the Production Tax Credit or Investment Tax Credit and favorable depreciation rules, don't include costs shifted onto Ohio electric power consumers through Renewable Energy Credit obligations, and don't include the costs of any local economic development or local tax abatement subsidies. In the case of Blue Creek Wind, the project received over $172 million in a cash grant from the U.S. Treasury, energy produced by the project gains the company an in-state Renewable Energy Credit currently worth about $13 per MWh, and the project enjoys access to Ohio's favorable PILOT alternative to property tax payments.[9]

The touted wind energy prices represent the costs that the energy consumer pays directly, but do not reflect the wind energy costs forced onto other persons and entities.[10]

A related point comes from claims about the ability of renewable energy to reduce wholesale energy market prices. There are a variety of analyses presented on this issue. I'll focus on the staff report of the Public Utilities Commission of Ohio, "Renewable resources and wholesale price suppression," which, while limited in its focus, is revealing.[11]

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[8] Eric Thumma, Testimony before the Ohio Senate Public Utilities Committee on SB 58, October 2, 2013 at p. 3.
[9] U.S. Treasury presents information on the Section 1603 cash grant program online at http://www.treasury.gov/initiatives/recovery/Pages/1603.aspx; the Public Utilities Commission of Ohio provides information on renewable energy credits on its website at http://www.puco.ohio.gov/puco/; information on Ohio's Qualified Energy Property Tax Exemption is available from the Ohio Development Services Agency, http://development.ohio.gov/.
[10] If contracted prices paid by energy consumers actually covered all costs of wind energy, there would be little reason to continue paying a Production Tax Credit or to impose purchase mandates on consumers. Yet the industry lobbies for these benefits.
[11] "Renewable Resources and Wholesale Price Suppression," Public Utilities Commission of Ohio, August 2013. [Henceforth, "PUCO staff report"].

The PUCO staff report summarizes results from market simulations – a base case without utility-scale renewable power and two scenarios with varied amounts of utility-scale renewable energy added to the Ohio generation mix. The price suppression effect comes about because the low marginal cost of wind energy allows such resources to be offered at low price into the PJM energy market and push higher-priced resources out of the market. As a result, the market clears at a lower price than it would have otherwise, *assuming no changes in other generator availability or bidding behavior*. But this last assumption, not clearly stated in the analysis, is key.

To the extent renewable energy suppliers reduce revenues received by other generation resources, either through reducing market prices or by displacing their energy sales altogether, eventually some other generators will be pushed out of the market due to the presence of wind energy.

As that happens, the shape of the supply curve will change and no longer is a true price suppression effect guaranteed. Depending on which units become pushed from the market, the overall effect could be average prices that were higher or lower than before. By the way, there is nothing especially special about renewable energy in this analysis. Subsidizing the entry of any generator with low per-unit operating costs would, as a first effect, tend to reduce average electric power prices, again at least until other generators have a chance to react to the subsidized entry. The price suppression effect is only guaranteed for the short run, and frankly, it isn't really a net benefit of the Ohio renewable energy policy.

Recall, prices are not the same thing as costs. The costs of wind energy depends on the costs of resources devoted to building and operating wind farms. The high capital costs of new wind energy turbines are a clear signal that these resources – the steel, concrete, fiberglass, wires, rare-earth magnets, and other component parts – all have other potentially valuable uses in the economy. The real cost of wind energy is the value of these other uses that we give up in order to generate more electricity

from the wind. The price suppression effect, while it lasts, mostly just affects who pays and who benefits from the policy without much changing overall costs or benefits.

Two more points from the PUCO staff report bear emphasis. First, even in their scenario with the most renewable energy added, the price suppression effect was quite small: an average of about $0.17 per MWh, or about one half of one percent of the energy price.[12] Second, there is no guarantee that consumers actually benefit from the price reduction since consumers are not directly exposed to wholesale electric power market prices. The PUCO staff report suggested Ohio's transition toward competitive generation procurement would ensure this small price reducing effect is passed along to consumers, but note that it comes along with the significant costs incurred by utilities to comply with alternative energy mandates.[13] These costs, which are and will remain higher than the projected price suppression effect according to the Commission staff report, would also be passed along to consumers.[14]

Some of the subsidies available to renewable energy developers may trickle down to consumers through this modest price suppression effect, but overall Ohio citizens and energy consumers would be better off without these policies mandating purchases from high-cost renewable resources.

The very existence of the mandate is evidence that the cost of renewable electricity is high: consumers do not have to be required to buy low-cost electricity. It makes sense for consumers to buy low-cost electricity even without government mandates.

One goal of the Energy Efficiency and Alternative Energy Portfolio Standard is to help drive down the high cost of renewable energy through an "economies of scale" effect. Unfortunately, the economy-of-

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[12] PUCO staff report, p. 5.
[13] *Ibid.*, p. 6.
[14] *Ibid*.

scale effect is not automatic. As the *Wind Technologies Market Report* series shows, the average cost of wind energy capacity was falling up to 2004, but rose as overall installed capacity of wind energy grew from 2004 to 2009.[15] In recent years the costs have dropped, but the lack of any correlation between overall installed capacity and average costs undermines the assumption of automatic economies of scale.

Representatives of the wind energy industry have made the bold claim that wind energy's costs have fallen by 50 percent since SB 221 was passed in 2008.[16] This claim exceeds that of the Lawrence Berkeley National Lab, in the most recent *Wind Technologies Market Report*, which reported wind turbine "price declines of roughly 20%–35% since late 2008." Yet even these somewhat more modest declines do not represent rapid advances in wind energy technologies. Average installed wind project costs reached a low of $1,279 per kW in 2004, but were at $1,943 per kW in 2012.[17] Even after the recent "tremendous cost reductions" since 2008 advertised by the wind energy industry, wind energy costs were 50 percent *higher* in 2012 than they were eight years earlier.

Wind's electricity conversion and economic efficiency has improved since 2000, however, I suggest that research and development spending, not subsidized construction of wind turbines, would be the faster way to further reduce wind energy costs.

III. Subsidized wind energy tends to compromise grid reliability

In the longer-run, subsidized wind energy may compromise grid reliability, and by the way the "price suppression" effect touted by wind energy proponents may be part of the problem. Over the last several

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[15] Wiser et al., 2013, p. 34.
[16] Eric Thumma, Testimony before the Ohio Senate Public Utilities Committee on SB 58, October 2, 2013 at p. 2.
[17] Wiser et al., 2013, p. 34; data available in a spreadsheet accompanying the *2012 WTMR* that is distributed by the U.S. Department of Energy Wind Program, see http://www1.eere.energy.gov/wind/resources.html.

years wind power capacity has been added rapidly in Texas and the state boasts the largest installed wind power capacity of any of the United States. At the same time the wind power capacity has risen quickly, additions of non-wind capacity has slowed and some existing capacity is being mothballed or retired. In the view of some analysts in Texas, subsidized wind power is among the key contributors to the perceived resource adequacy problems faced in the state. A year ago Donna Nelson, chairman of the Public Utility Commission of Texas, told Texas state legislators:

> Federal incentives for renewable energy… have distorted the competitive wholesale market in ERCOT. Wind has been supported by a federal production tax credit that provides $22 per MWH of energy generated by a wind resource. With this substantial incentive, wind resources can actually bid negative prices into the market and still make a profit…. The market distortions caused by renewable energy incentives are one of the primary causes I believe of our current resource adequacy issue… [T]his distortion makes it difficult for other generation types to recover their cost and discourages investment in new generation."[18]

A key aspect to the reliability issues raised comes because subsidized intermittent wind energy capacity is discouraging investment in dispatchable generation capacity.

ERCOT, when compared to PJM or the Midcontinent ISO (MISO), is a smaller grid with a much higher penetration of wind power capacity with a higher average wind energy resource. In addition, ERCOT has an "energy only" market design whereas the PJM and MISO control regions include a capacity market

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[18] Donna Nelson, Testimony before the Texas Senate Natural Resources Subcommittee (September 6, 2012), quoted in Frank Huntowski, Aaron Patterson, and Michael Schnitzer, "Negative Electricity Prices and the Production Tax Credit," The NorthBridge Group, September 14, 2012. Note that even without negative prices, subsidized entry of renewable resources will reduce sales and revenues collected by existing electric generation resources and tend to contribute to resource adequacy concerns.

with separate capacity market revenue streams intended to support resource adequacy.[19] Each of these differences heightens the reliability concerns for ERCOT, and mitigates adverse consequences of intermittents for Ohio and the PJM market. Nonetheless, policymakers in Ohio should be aware of the potential for wind energy's subsidized entry into the market to undermine investment in dispatchable generation.

Consider the analysis of wind power in MISO, a market nearer to PJM in size. In an analysis of resource adequacy for MISO in its *2012 State of the Market Report*, the independent market monitor (IMM) warned the ISO that it likely overstated the likely contribution of wind energy resources under emergency conditions—that is to say, under conditions in which wind energy's displacement of other generation resources is most likely to be critical. The IMM said:

> Wind resources receive capacity credits … that are only a fraction of their installed capacity. This is because their output is variable and intermittent, and their full capability cannot be relied upon during peak load times. Credits averaged 14.9 percent for Planning Year (PY) 2012–13 and 13.3 percent for PY 2013–14. These credits reflect the average performance of wind resources during prior years' peak load hours.
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> We believe that these UCAP credits substantially exceed the true capacity value of the wind resources. As much as possible, wind UCAP credit should be estimated in a manner that produces a comparable level of expected availability to other types of generating resources.

[19] Note that lost revenue to non-renewable generators due to energy market price suppression effects may simply get recovered through changes in capacity market prices.

> However, this is not the case under MISO's methodology, which produces wind credits that will likely not be achieved in most peak load hours.[20]

To assess wind energy's contribution to resource adequacy in MISO on a basis more comparable to other resources, the IMM recommended a metric based on the lowest quartile of output during peak hours rather than mean output during peak hours. The IMM's conservative approach, as befits a market policy addressing reliability issues, produces an average capacity credit for wind resources of just 2.7 percent of nameplate capacity for wind resources for the 2013-14 planning year in place of the current 13.3 percent.[21]

PJM uses a method for calculating initial capacity values similar to that used by MISO, and as a result it credits new wind resources with a capacity value of 13 percent of nameplate capacity, just lower than MISO's 13.1 percent for 2013-14.[22] But the analysis of the MISO IMM applies here as well, and the 13 percent figure will overstate the minimum amount of wind energy resources likely to be delivered across all peak hours. Fortunately, at present wind energy capacity is less than one percent of overall PJM capacity and so not yet a significant reliability concern in Ohio

IV. Conclusions

Looking back at July 2008, at the time that the Ohio Legislature adopted the Alternative Energy Portfolio Standards for the state, one can understand the motivations to act. Wholesale energy prices in the PJM region had been running between $50 to $70 per MWh on average for most months, but were headed upward and in June 2008 had exceeded $100 per MWh. If such prices had continued, market forces

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[20] Potomac Economics, Ltd., *2012 State of the Market Report for the MISO Electricity Markets*, June 2013, p. 15.
[21] *2012 State of the Market Report* at p. 16. Note that the capacity factor applied to wind resources in the PJM capacity market is 13 percent.
[22] See PJM, *PJM Manual 21: Rules and Procedures for Determination of Generating Capability*, Revision: 9; Effective Date: May 1, 2010.

would have driven the addition of new generation resources – and because some of that high electricity price was driven by then-high natural gas prices, that new generation would likely have included wind energy.

As it has turned out, the prices of June and July 2008 were an anomaly, not a harbinger of the future. Since late 2008 and over the last five years monthly average power prices in PJM have dropped into the $40 to $65 per MWh range during summer months, and frequently near or even below $40 per MWh in other seasons. A policy mandating purchase of wind energy and other alternatives might have appeared sensible in July of 2008, but they do not now make sense.

Ohio electricity consumers will not benefit from a policy that continues to mandate the purchase of high cost wind energy. For these reasons I would urge repeal of the mandate, but in the absence of repeal an approach such as SB 58 which seeks to minimize the burden of the Alternative Energy Portfolio Standard would benefit Ohio electricity consumers and is worthy of your support.