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Executive Summary

The Maryland Public Service Commission (PSC) approved two offshore wind projects as per Maryland's Offshore Wind Energy Act (MOWE Act) of 2013; US Wind's 248 megawatts (MW), and Skipjack's 120 MW projects. Together these companies will invest \$2.1 billion to generate 1,369,327 MWh of electricity annually, or about the legislated 2.5% target of Maryland's electric demand. The Maryland Renewable Portfolio Standard (RPS) requires 20% of the electric supply come from a list of qualified sources by 2022, with a 2% carve out for solar, and a 2.5% carve out for offshore wind. The offshore wind requirement was carved out of an existing requirement for wind power.

The PSC relied on an independent analysis of whether the projects met the legislated requirements for approval by PSC Staff consultant Levitan & Associates, Inc. This review builds off of the consultant's report titled "Evaluation and Comparison of US Wind and Skipjack Proposed Offshore Wind Project Application", Revised March 17, 2017,

(file:///C:/Users/dtste/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/85.pdf) to consider a portion of the requirements. Conclusions follow:

- The offshore wind projects commit Maryland electric customers to over \$5 billion in subsidies. The risk of offsetting benefits is left with the electric customers rather than the wind project developers.
- The publicized cost to a residential customer of \$1.40/month in 2012 dollars, for projects that will not become operational until 2021 and 2023, obfuscates the cost in both actual dollars of \$3.17/month, and the overall cost of \$760 over the life of the project. Some industrial customers could see an electric premium of almost a quarter million dollars a year, or \$4.75 million over the life of the projects. The residential cost/month should not be used as it intentionally minimizes the cost impact, and caps should be stated in current dollars, not discounted dollars to some remote date in the past.
- The legislated cost caps required for PSC approval of the projects were only met by ignoring the indirect and induced costs of higher electric rates, by using unrealistic estimates of future electric demand to spread the costs over a larger base, and by exaggerating future onshore wind REC prices. Electric demand has fallen 0.7% a year over the last decade, but future demand was estimated at 0.8% per year rate of increase.
- The projects were required to show a positive cost to benefit ratio, but costs were 1% higher than benefits even using the Maryland PSC consultant's formulas, and were 1.8 times higher if indirect and induced costs of higher electric rates are accounted for properly.
- The potential cost to Ocean City tourism and property values of unsightly wind turbines visible from the coast was not even considered.
- The same environmental and health benefits could be reached with onshore wind at 4% the subsidized cost of offshore wind. The added emissions of conventional generators running inefficiently to back up intermittent wind power was not considered.

Offshore Wind Renewable Energy Credit (OREC) Price Guarantee

Table 1 shows the agreed annual price ratepayers will pay for ORECs. An OREC is produced for each megawatt-hour (MWh) of power generated. The total cost is about \$5.1 billion over the twenty year contracts, or about \$254 million a year. The average price of ORECs is \$185.25.

Table 1: OREC Cost Guarantee

Year	US Wind OREC \$	MWh Supplied	Annual Revenue	Skipjack ORECs	MWh Supplied	Annual Revenue	Total Revenue
2021	166.70	913,845	152,337,962				152,337,962
2022	168.37	913,845	153,864,083				153,864,083
2023	170.05	913,845	155,399,342	171.30	455,482	78,024,067	233,423,409
2024	171.75	913,845	156,952,879	173.01	455,482	78,802,941	235,755,820
2025	173.47	913,845	158,524,692	174.74	455,482	79,590,925	238,115,617
2026	175.20	913,845	160,105,644	176.49	455,482	80,388,018	240,493,662
2027	176.96	913,845	161,714,011	178.26	455,482	81,194,221	242,908,233
2028	178.72	913,845	163,322,378	180.04	455,482	82,004,979	245,327,358
2029	180.51	913,845	164,958,161	181.84	455,482	82,824,847	247,783,008
2030	182.32	913,845	166,612,220	183.66	455,482	83,653,824	250,266,045
2031	184.14	913,845	168,275,418	185.49	455,482	84,487,356	252,762,774
2032	185.98	913,845	169,956,893	187.35	455,482	85,334,553	255,291,446
2033	187.84	913,845	171,656,645	189.22	455,482	86,186,304	257,842,949
2034	189.72	913,845	173,374,673	191.11	455,482	87,047,165	260,421,838
2035	191.62	913,845	175,110,979	193.03	455,482	87,921,690	263,032,669
2036	193.53	913,845	176,856,423	194.96	455,482	88,800,771	265,657,194
2037	195.47	913,845	178,629,282	196.90	455,482	89,684,406	268,313,688
2038	197.42	913,845	180,411,280	198.87	455,482	90,581,705	270,992,985
2039	199.40	913,845	182,220,693	200.86	455,482	91,488,115	273,708,808
2040	201.39	913,845	184,039,245	202.87	455,482	92,403,633	276,442,878
2041				204.90	455,482	93,328,262	94,262,000
2042				206.95	455,482	94,262,000	94,262,000
Total		18,276,900	3,354,322,903		9,109,640	1,718,009,782	5,073,266,420

Source: US Wind Price schedule <file:///C:/Users/dtste/Downloads/123.pdf>, Skipjack Price schedule <file:///C:/Users/dtste/Downloads/SkipjackLetterofAcceptance.PDF>

OREC Cost Offsets

The cost of the ORECs will be partially offset by the sale of power in the PJM wholesale electric market, and capacity market. Power will be sold into the thirteen state PJM Interconnection electrical grid Reliability Pricing Model. Electric generators bid daily to supply electricity. The average wholesale price in 2015 in the Delmarva Power Zone was \$30.82/MWh (PJM Real Time LMP by month <http://www.pjm.com/markets-and-operations/energy/real-time/monthlylmp.aspx>). Electric generators also bid into an annual capacity market where they promise to keep the generating plant open for three more years in return for a fixed fee based on the size of the power plant. This cost shows up as a separate line item on electric bills.

We agree with Levitan, adding generation in the generation starved Delmarva Peninsula will lower both the wholesale power price and the capacity price. Levitan estimates power prices will be lowered by a net \$.66/MWh in Table 4, page ES36 of their evaluation report, lowering the 2015 wholesale price to \$30.16/MWh. The US Energy Information Agency (USEIA) reports in its report titled “Annual Energy Outlook 2017” (<https://www.eia.gov/outlooks/aeo/data/browser/#/?id=1-AEO2017&cases=ref2017&sourcekey=0>), electric prices will rise 2.5% a year through the contract period, so the average wholesale price is estimated to be \$45.39/MWh. Levitan Table 4 also estimates the net

average capacity price will be equivalent to \$3.28/MWh over the contract period. The combined total average annual revenue is estimated to be \$48.67/MWh, or \$66.6 million a year.

Levitan also expects offshore wind generation to offset onshore wind generation, so fewer regular Renewable Energy Credits (RECs) will be needed. RECs are in plentiful supply nationally, and, according to Kevin D. Mosier in his February, 2017 testimony representing the PSC staff (file:///C:/Users/dtste/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/9431-MosierDirect-km-021517.pdf), REC prices are falling rapidly with the latest market price of \$7.59/REC. At that price the 1,369,327 annual REC avoidance should be worth \$10.4 Million. Levitan used a REC price estimate of about \$16.

The total annual OREC offsets are estimated by me to be \$77 million, leaving net OREC cost at \$176.6 million.

The Cost to Customers

The MOWE Act requires the cost to residential customers not exceed \$1.50/month, or 1.5% of electric bills for industrial customers. The calculation discounts the actual cost to 2012 dollars. Levitan calculated the estimated cost to residential customers at \$1.40/month, and a 1.4% increase to industrial customers, so the projects met the criteria. The discount to 2012 dollars is crucial to the two windfarms meeting the legislated caps. US wind plans to complete their project by 2021, and Skipjack by 2023. Moving the projects up by two years, thus yielding two fewer years of discounting, would cause the projects to exceed the caps. Discounting costs and promoting those cost estimates in press releases causes a big disconnect between the publicized cost and the actual cost that will be seen on electric bills. Projects should be based on caps in current dollars, not discounted dollars to some remote date in the past.

To come up with an estimate of the cost that will actually show up on electric bills requires an estimate of future electric demand in Maryland. Levitan started with total actual demand in 2016 of 61.3 million MWh and increased demand by 0.8% a year with the forecasted demand rising to about 74 million MWh by 2042 (page 18 of the Introduction section). Maryland excludes industrial customers using more than 75,000 MWh a year from the OREC costs, so the electric demand used in spreading the cost of the OREC program needs to be lowered. I estimated 80% of the industrial demand would be excluded leaving the 2016 starting demand at 58.3 million MWh. Between 2007 and 2016 demand has actually fallen about 0.7% a year, according to US EIA reports. The United States becomes about 2% more efficient in energy use every year. In addition, Goods Production in Maryland fell about 7% between 2007 and 2015 according to the US Bureau of Economic Analysis, while industrial electric demand fell 37%. Maryland has the tenth highest electric rates in the contiguous states, so we expect manufacturing is shifting elsewhere for lower cost.

I estimate the net average OREC cost will be spread over 55.7 million MWh yielding a cost estimate of \$3.17/MWh (\$176.6 million/55.7 million MWh). The MOWE Act establishes residential electric demand at 12 MWh a year, so residential customers estimated annual cost is \$38, not \$17 as the publicized estimate suggests. Industrial customers could pay up to \$237,750 a year (\$3.17 X 75,000 MWh).

The high future demand estimate Levitan used also contributes significantly to the calculation the projects meet the legislated cost caps. The \$1.40/month and 1.4% of industrial project cost estimates rise to \$1.86, and 1.86% using the lower electric demand estimate, well over the \$1.50 and 1.5% caps. In my opinion the projects do not meet the cost caps in the MOWE Act.

Environmental and Health Benefits

The MOWE Act requires there be environmental and health benefits. Levitan summarizes expected reductions in carbon dioxide, sulfur dioxide, nitrogen dioxide, fine particle, and mercury pollutants in Table 2, page ES26. Wisely, Levitan did not attempt to tread into the minefield of monetizing the reductions. There are two problems with the Levitan estimates. The first is potential emissions from back up generation is ignored. Wind power is intermittent, electric demand is not. When wind is not available either base load generators using nuclear power, coal, or natural gas must kick in, or natural gas fired “spinning reserve” generators must provide the power needed to prevent power failure. Spinning reserve units run at a low level all the time to allow quick ramp up. When they do ramp up they are basically jet engines that are about half as efficient as baseload power plants emitting large amounts of CO₂ and air pollutants. Various estimates show the wind power emissions reductions should be adjusted downward between 5% and 102%.

The second problem is Levitan states offshore wind generation will replace onshore wind generation that would have the same emissions reductions. There is no net gain in emissions, and therefore no net gain in health benefits. US EIA estimates the comparative Levelized Cost of Electricity for various generating technologies in Table 1b (https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf). Offshore wind electricity costs are estimated to be almost three times as high as onshore wind after tax credits (\$145.90/MWh vs. \$52.20/MWh). My opinion is there are no added environmental or health benefits from expensive offshore wind, so that requirement of the MOWE Act has not been met.

Cost to Benefit Analysis

Levitan never completed a public summary of the cost to benefit calculation in common year dollars after Skipjack and US Wind submitted their final submission of the OREC price schedule on 5/24/2017 and 5/25/2017 respectively. The Levitan report of 3/17/2017 provide an “Independent Estimate of Net Ratepayer Costs” in 2016 dollars in Table 4, page ES36, and an “Independent Estimate of In-State Economic Benefits” in 2015 dollars in Table 5, page ES39. The Net Ratepayer Cost needs updating, as we did in Table 1, adjustment to 2015 dollars using a discount factor of 0.988 available at US BEA (<https://bea.gov/iTable/iTable.cfm?reqid=9&step=3&isuri=1&903=13#reqid=9&step=3&isuri=1&903=13>). We do so below in Table 2 and show Costs exceed benefits.

Table 2: US Wind & Skipjack Offshore Wind Projects Cost to Benefit Summary

	Millions 2015\$
Estimate of Net Ratepayer Cost	
Gross OREC Cost	\$ 3,276.3
Energy Credit	(\$ 1,096.7)
Capacity Credit	(\$ 112.6)
Energy Price Effect	(\$ 16.8)
Capacity Price Effect	(\$ 26.7)
REC Price Effect	(\$ 10.3)
Net Ratepayer Cost	\$ 2,013.2
Estimate of In-State Economic Benefit	
Direct Expenditures	\$ 1,034.8
Indirect & Induced Expenditures	\$ 799.8
Tax	\$ 153.6
Net Benefit	\$ 1,988.2

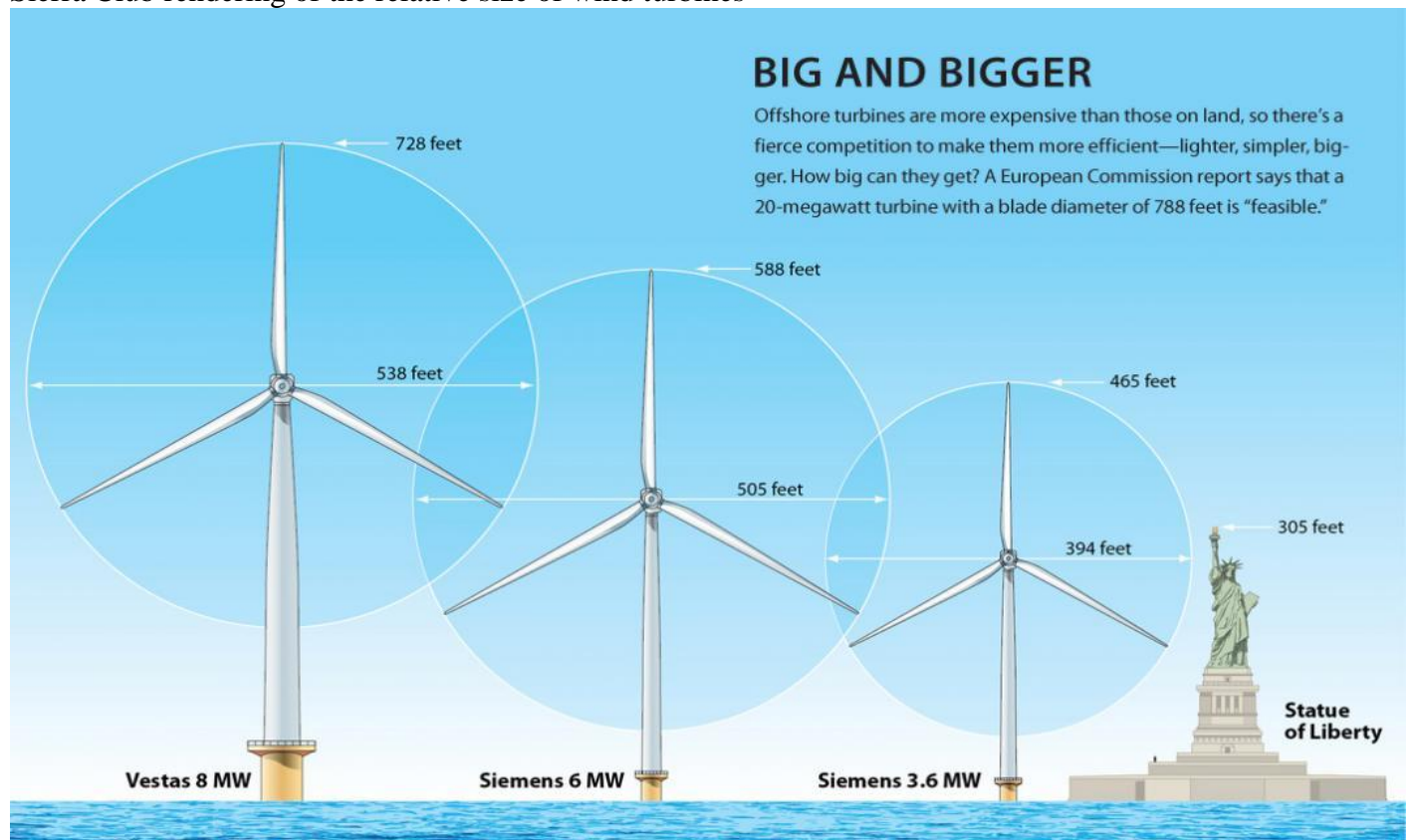
Also, Levitan missed two additional cost issues. The primary issue is Levitan did not calculate the indirect and induced effects of higher electric rates, only the direct effect. Higher electric rates mean families and businesses have less to spend elsewhere. Money not spent on capital investment by businesses, and on everyday needs of families cost jobs elsewhere. There is not enough detail in the Levitan report to do a full analysis. However, we can use the same ratio of direct to indirect/induced expenditures in the benefit calculation to roughly estimate the impact on the cost side. Doing so increases the cost by \$1,556 million, and the total cost goes to \$3,569 million, 1.8 times the \$1,988 million in estimated benefits. Onshore wind could be built with about 4% of the offshore wind subsidy. The projects do not meet the MOWE Act requirement of a positive cost to benefit calculation.

There is a second cost not calculated. The Mayor of Ocean City, Richard W. Meehan, and the City Council sent a letter of opposition to the proposed Maryland wind project to Governor Hogan, the Maryland PSC, and federal officials after seeing the renderings below, according to an article in the Ocean City Dispatch on April 4, 2017, titled “Proposed Wind Farm Project Draws Opposition Due to Beach Visibility”. The first rendering was supplied by the developer, U. S. Wind, and depicts the view with a 480 foot tall (36 MW) turbines. The second rendering was depicted in a 12/11/2016 Levitan report and is credited to the Sierra Club. According to documents submitted to the Maryland PSC, U. S. Wind is considering turbines as tall as 586 feet (6 MW). The concern is the turbines will obstruct views and hurt tourism even at night when each turbine will flash red lights to warn aircraft away. The second Maryland approved offshore wind project will be located off Rehoboth Beach, Delaware, and is considering turbines 735 feet tall (8 MW), almost two times as high as the below first rendering. I have made no attempt to monetize this cost.

US Wind rendering of visual appearance of its proposed wind farm using 3MW capacity turbines



Sierra Club rendering of the relative size of wind turbines



Concluding Remarks

A proper accounting would show these offshore wind projects do not meet legislated requirements for the cap on costs, or for a positive cost to benefit ratio. The most egregious issues are the exaggeration of future electric demand to spread the cost over a wider base, and not including the indirect and induced cost of higher electric rates. The projects will add billions to electric rates when onshore wind or solar could deliver the same benefits at a small fraction of the cost.

The Delaware Offshore Wind Working Group needs to consider the Maryland experience and reject similar legislation. While Delaware does not have practical potential for onshore wind as exists in western Maryland, we do have the potential to develop utility scale solar with essentially zero state or electric customer subsidies.

Cost caps in renewable energy legislation need to be very clear about the calculation method, and should be determined in nominal dollars not by discounted costs to a remote date in the past. Cost caps should be transparent about the real impact instead of showing costs to a monthly residential customer designed to make the cost look de minimis. Indirect and induced costs of higher electric rates need to be specifically included. Calculation of benefits of externalities such as environmental and health benefits should be specifically excluded as they are very controversial. Project development risks should not be off loaded to electric customers as was done in the Qualified Fuel Cell Project in Delaware, and this offshore wind project in Maryland. In approving a project such as this the Delaware Public Service Commission needs to be very careful of using exaggerated future cost of electricity and electric demand.