Excerpts from the Department Record Referred to in the Licensee's Response to the Appeal

- Letter from First Wind to D. Courtemanch dated January 27, 2014 Response to FMM Comments, including an excerpt from Weston & Sampson December 2011 report on Town of Falmouth, MA Wind Energy Facility Mitigation Alternatives Analysis

- Letter from Sewall to First Wind dated February 7, 2014 regarding salvage value estimates

Bertocci, Cynthia S

From: Knapp, Dale <dale.knapp@stantec.com>
Sent: Friday, February 07, 2014 9:20 AM
To: Courtemanch, Daniel
Cc: Dave Cowan (dcowan@firstwind.com); David Fowler; Browne, Juliet (jbrowne@verrilldana.com); McPherson, Kate
Subject: RE: Response to FMM Comments
Attachments: 2014 02 07 Letter DFowler.pdf

Morning Dan,
Attached please find our response to your additional information request.

Please give me a call if you want to touch base.

Dale

Stantec

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From: Courtemanch, Daniel [mailto:Daniel.Courtemanch@maine.gov]
Sent: Monday, January 27, 2014 3:25 PM
To: Knapp, Dale
Cc: Dave Cowan (dcowan@firstwind.com); David Fowler; Browne, Juliet (jbrowne@verrilldana.com); McPherson, Kate
Subject: RE: Response to FMM Comments

Dale,
Can you provide me with information as to why the scrap metal from decommissioning is #1 steel as used in your decommissioning plan instead of #2 steel that FMM asserts you should have used?

Thanks,

Dan Courtemanch
Environmental Specialist
Maine Department of Environmental Protection
Division of Land Resource Regulation
(207) 446-1806

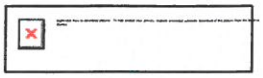
From: Knapp, Dale [mailto:dale.knapp@stantec.com]
Sent: Monday, January 27, 2014 2:44 PM
To: Courtemanch, Daniel
Cc: Dave Cowan (dcowan@firstwind.com); David Fowler; Browne, Juliet (jbrowne@verrilldana.com); McPherson, Kate
Subject: Response to FMM Comments

Afternoon Dan,
Attached please find a copy of our response to the FOMM comments as well as a copy of the Falmouth study for reference.

If you have any questions please do not hesitate to get back in touch with me.

Dale

Dale Knapp
Stantec
Phone: 207-729-1199
dale.knapp@stantec.com



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SEWALL
JAMES W. SEWALL COMPANY / Since 1880

February 7, 2014

David Fowler,
Director, Development New England
First Wind, LLC

Via email: dfowler@firstwind.com

Dear David:

We understand that the Maine Department of Environmental Protection (DEP) has requested information on the reason for using #1 steel as opposed to #2 steel in the salvage estimates included in our August 20, 2013 Decommissioning Budgets for the Bingham Wind Project. This letter provides the requested information.

The salvage estimates included in our reports were based on discussions with a local scrap dealer in the Bangor, Maine area. The dealer determined that the scrap should be characterized as #1 steel based on the thickness, which is why we referenced it as such in our reports. There may be some confusion between #1 and #2 steel and the significance of such classifications. For example, the Institute of Scrap Recycling Industries states that #2 steel is "black or galvanized," which does not apply to the material at issue here. See, e.g., Scrap Specifications Circular 2013 at p. 17. Importantly, the classifications are intended as guidelines and deviations from the classifications may be agreed to by mutual consent of the buyer and seller. Id.

Because of the DEP's questions, we took the added step of contacting five additional scrap dealers in Maine to verify our assumptions regarding the characterization of the material. Each of the dealers uses slightly different classifications for steel for determining scrap value. Two of the dealers do not use the classification of #2 steel at all and several dealers define #2 steel in the same manner as a subcategory of #1 steel. Please note that the material referenced in our reports was classified as #1 steel by all six of the scrap dealers that we contacted. Also important, each of the dealers stated that painted steel (such as the material here) does not affect the price.

We hope this helps to clarify. Should you have any questions, please let us know.

Sincerely,
James W. Sewall Company

Janine S. Murchison, PE
Project Manager

#83411

Offices nationwide
sewall.com
PO Box 190
Caribou, Maine 04736
207 492 1014
fax: 207 492 1025

Bertocci, Cynthia S

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Sent: Monday, January 27, 2014 2:44 PM
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Subject: Response to FMM Comments
Attachments: Response to FMM Comments.pdf; falmouth%20turbine%20mitigation%20study.pdf

Afternoon Dan,
Attached please find a copy of our response to the FOMM comments as well as a copy of the Falmouth study for reference.

If you have any questions please do not hesitate to get back in touch with me.

Dale

Dale Knapp
Stantec
Phone: 207-729-1199
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firstwind
CLEAN ENERGY. MADE HERE.

Dan Courtemanch, Project Manager
Bureau of Land and Water Quality
Maine Department of Environmental Protection
17 State House Station
Augusta, ME 04333-0017

Re: Response to Friends of Maine's Mountains Comments on Bingham Wind Project

Dear Dan:

The following information responds to comments regarding the Bingham Wind Project (the "Project") that were submitted to the Department by Friends of Maine's Mountains ("FMM") in a letter dated September 30, 2013, but that were provided to the Applicant in late December ("FMM Comments").

FMM's comments purport to be "fact-based and empirical" but in reality are unsupported by any identifiable technical expertise or reference to appropriate source material. FMM has no known expertise or experience in energy markets, project financing, project decommissioning, greenhouse gas emissions, or any of the other technical subjects on which it offers its analysis. Furthermore, FMM's comments lack citation to third-party sources, let alone sources that would be considered objective, credible or relevant. FMM states that their comments are based on "available data from objective sources like the US Energy Information Agency (EIA) and the Independent System Operator – New England (ISO-NE)," FMM Comments at 1, but its claims are tellingly lacking in citation to specific sources. By contrast, First Wind and its consultants have extensive expertise and experience in all facets of wind power development, and the responses below are supported by specific citation to credible, neutral sources as indicated.

I. ENVIRONMENTAL IMPACTS

FMM asserts that the environmental impacts will be massive. FMM Comments at 1. In fact, First Wind has taken care to avoid siting its projects, including this one, in areas of ecologically sensitive habitats. Additionally, with its contractors and the input of regulatory officials, First Wind has developed construction techniques that minimize the impacts associated with construction and operation of both wind turbines and associated electrical facilities. These techniques have proven successful in five First Wind projects in Maine. As a result, impacts associated with construction and operation of the Project have been minimized, and they are well within the level of disturbance allowed under the Site Law. Each of the topics identified by FMM as "big" impacts is addressed below. Because no specific issues were identified by FMM with respect to these topics, we generally reference where they are addressed in the Application and other record material.

Wildlife and habitat impacts are discussed in detail in Sections 1 and 7 of the Application. Additionally, the Applicant has worked cooperatively with Maine Inland Fish & Wildlife to develop

appropriate protocols for pre-construction surveys to assess the habitat and other features present in the Project area, and identify mitigation measures to reduce potential impacts to habitat and species. These are detailed in the Application and were the subject of numerous site visits and supplemental submissions following submission of the Application.

FMM's reference to landscape impacts does not include any specific objectionable impact, but rather just the distance of crane paths, roads, size of the turbine pads and amount of cut and fill associated with the Project. As noted above, construction techniques carefully developed for wind energy developments ensures that this type of activity can occur without significant adverse environmental impacts. Additionally, the majority of the Project area is used for commercial logging and many of the roads the Project will use are in place and used by the current landowner. All road construction will not only benefit that underlying activity, but will do so in a particularly environmentally sensitive manner.

FMM's reference to scenic impacts simply identifies resources in the area, but fails to acknowledge that many of those resources will not have any visibility of the Project and the remaining resources will have very limited visibility of the Project. The scenic impacts of the Project are detailed in Section 30 of the Application. As noted by the Department's third-party scenic expert, the lack of proximity to and visibility of the Project from scenic resources makes this "such a suitable location for a wind project." August 1, 2013 Review of the Bingham Wind Project Visual Impact Assessment Part I: Adequacy, at p. 42.

II. ECONOMIC IMPACTS AND ENVIRONMENTAL BENEFITS

FMM makes a number of arguments related to the impact of the Project on electrical rates and the more general energy and environmental benefits associated with wind energy development. FMM Comments at 2-4. The Wind Energy Act specifically requires the permitting agency to assume the energy and environmental benefits set forth in the Act. This was intentional and reflects the fact that environmental permitting agencies were not tasked with nor do they have the expertise to evaluate the energy and environmental impacts of various forms of energy generation. As a result, many of FMM's arguments concerning electrical rates and energy and environmental benefits associated with wind development are not only contrary to the facts, but are not relevant to criteria to be applied by the Department in connection with this Project. Nonetheless, and for informational purposes only, we are providing a response to some of the key issues raised by FMM on these topics. The Project's energy, environmental and economic impacts are discussed more fully in Section 28 of the Application.

FMM's argument rests on the fundamentally flawed premise that wind power projects impose significant economic costs on Maine citizens. The facts are to the contrary. For example, FMM argues that the Project will require significant upgrades to the electrical grid that will be paid for by ratepayers, and that these "costs" must be considered when evaluating net tangible benefits. FMM Comments at 2.

In fact, the developer, not the ratepayers, is paying for the generator lead line necessary to connect the Project to the grid as well as upgrades to the grid necessary to accommodate the Project's output.

FMM also suggests that there will be additional ratepayer costs because of the high cost of wind power. FMM Comments at 2. Even FMM acknowledges that the cost of wind power has fallen, although it erroneously asserts that wind power is "at best" double the market rate. Id. In fact, wind power is competitive, not just compared to other renewable resources, but compared to "market." See: *Wind power now competitive with conventional sources, Boston Globe, Sept 23, 2013.* Wind power is cost-effective in a number of ways:

1. Because the cost of operating and generating wind power is delinked from commodity markets (oil, natural gas, etc.), prices with utilities/customers can be fixed and guaranteed with long term contracts (15-30 years).

2. While the PPA price paid by utilities/customers is cost competitive, wind power has the secondary effect of suppressing market clearing prices for wholesale power, which are based on real-time, relative variable/operating/marginal costs of generation throughout the supply stack.

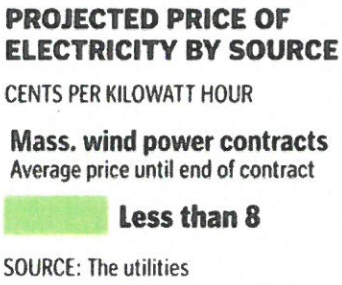


Figure: Boston Globe – Wind power now competitive with conventional sources

Note: Bingham is one of the projects included in this average

FMM also argues that there are significant "taxpayer" costs that must be considered when evaluating overall tangible benefits. FMM Comments at 2. Wind projects, like other forms of qualifying renewable energy generation sources, may be eligible for a tax credit – not government funded cash "appropriation" as critics would like to believe.[1] Although wind projects are eligible for

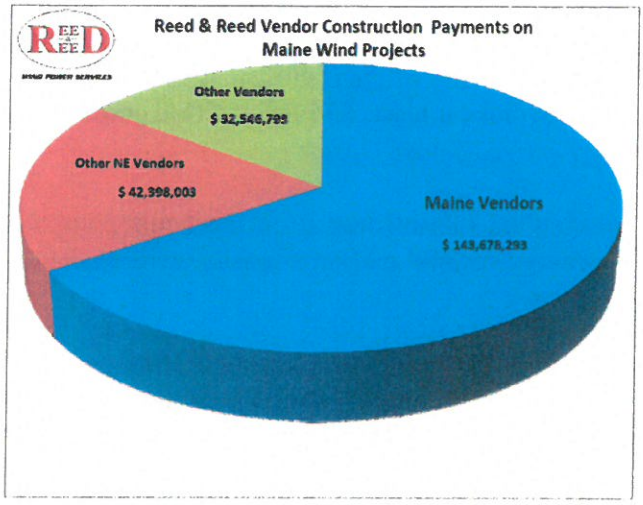
---

[1] The exception is the acceleration and discounting of tax credits as grants issued by the Depart of Treasury during the American Recovery and Reinvestment Act of 2009.

certain tax credits, those credits are limited in scope and therefore over their life, wind projects are an asset to U.S. taxpayers. As a production tax credit mechanism, a project reduces government revenue only in comparison to the facility's full tax liability – that is: *not building the project* does not save taxpayer money. Tax credits are a common and effective mechanism for incentivizing private sector investment and extend well beyond the wind industry. Moreover, in addition to federal taxes, the Project will pay significant state and local taxes, including an estimated $2.1 million in property taxes. See Section 28 of the Application.

FMM makes the curious claim that 8% of the Project's costs, or $32 million, will be extracted from the Maine economy. FMM Comments at 2. There is absolutely no support for this statement, which appears to be based on a misunderstanding (or misrepresentation) of how transmission costs are paid for. Although other transmission costs, such as the costs of projects needed to maintain the reliability of the regional bulk transmission grid, may be socialized across New England with Maine ratepayers absorbing 8% of such qualifying costs, as noted above, the ratepayers are not paying for any of the generator lead or transmission upgrades necessary to accommodate the Bingham project. Under the ISO-NE interconnection process, all costs for upgrades necessary to interconnect a new generator are paid for by that generator. Moreover, contrary to FMM's erroneous assumption that costs are extracted from the Maine economy, in fact, the Project will inject money into the Maine economy through construction spending, an increase in local jobs, annual tax revenue, and savings to Maine ratepayers from reduced electrical prices. These figures are detailed in Section 28.2 of the Application and are supported by economic studies and analysis, not hypothetical and unsupported assertions.

Finally, Reed & Reed, a Maine-based general contractor that has worked on most major wind farms in the state, breaks down the proportion of Maine and non-Maine vendors in their subcontractor supply chain in the following diagram:



Their data shows that Maine vendors and suppliers have received direct payments of more than $143 million based on construction of seven Maine projects. These are real dollars to real Maine people and have helped Maine citizens during dire economic times when there has been little other new economic investment in the state.

FMM's arguments regarding the environmental benefits of wind power are also flawed. By way of background, wind is dispatched to the grid "as-available" in deregulated markets such as ISO-NE because the low marginal cost of generation gives wind capacity priority in the bid stack.

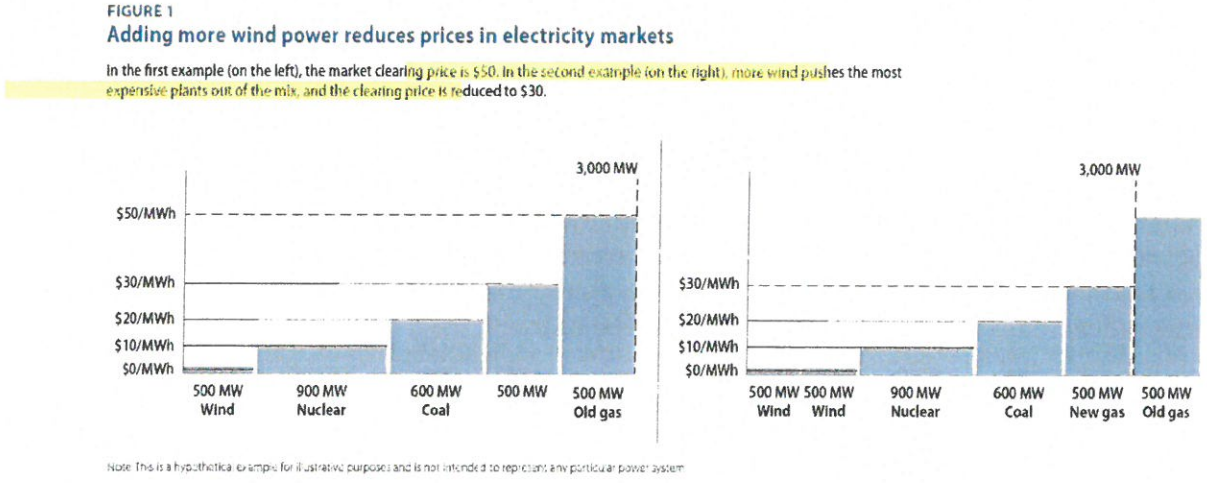


Figure: USCAP – Wind Power Helps to Lower Electricity Prices

The simple environmental equation is: when wind is "on," it pushes more expensive generation – usually thermal fossil fuel facilities (in the above example, the "500 MW Old gas" plant) – off-line. In New England, the average CO_2e intensity of the electrical system is 834 lbs/MWh. So each megawatt-hour generated by a wind farm avoids (at least) 834 lbs of CO_2e emissions. These impacts add up. *EPA eGRID Subregion Emissions for Greenhouse Gases*

The U.S. Energy Information Administration cites penetration of wind energy as one of the "key drivers" for reduction in the energy sectors' carbon intensity, even as the economy grows. *U.S. Energy Related Carbon Dioxide Emissions*

In addition to avoiding thermal emissions during generation, wind energy facilities require no physical fuel transport or supply lines, source emissions from excavation or drilling, water resources for operations, and do not contribute physical effluent to watersheds or particulate matter to the atmosphere.

While FMM dismisses the avoided emissions as insignificant when compared to emissions associated with for example, the transportation, industrial and commercial sectors, FMM Comments at 3, the avoided emissions are quantifiable, verifiable, and real. No one has argued that wind power will solve our most pressing environmental problems, but there is no dispute that wind power offsets emissions from other sources of energy generation. That is something that should be encouraged, not denigrated because it does not eliminate emissions associated with fossil-fuel based sources of energy generation or other industrial sectors.

III. PROJECT DECOMMISSIONING

The majority of FMM's comments relate to decommissioning. FMM Comments at 5-11. FMM states that "abandoned turbines can have a catastrophic impact," that failure to heed FMM's warnings regarding decommissioning "will be catastrophic," and that "inadequate decommissioning planning is at best irresponsible, and worst calamity." FMM Comments at 5, 9, 11. This unsupported hyperbole is hardly the "critical thinking," FMM Comments at 1, that FMM purports to provide with its comments, and it undermines their potential objectivity or credibility with respect to the issues they raise. When the hyperbole is stripped away, FMM's comments essentially are as follows: The applicant has underestimated the costs of decommissioning and overestimated the salvage value of component parts; salvage values are difficult to predict; and, the risk that a project will require decommissioning by the state is significant. Each of these issues is addressed below.

A. The Decommissioning Costs and Salvage Values Are Well Supported

The decommissioning cost estimates were developed by a Maine consultant with significant experience with wind projects and information gathered from contractors with experience building wind projects in Maine. Application, Exhibit 29A: Decommissioning Budget ("Sewall Report") at 1; August

20, 2013 Sewall Estimate for Vestas Turbines ("Sewall Vestas Report") at 1; August 20, 2013 Sewall Estimate for Siemens Turbines ("Sewall Siemens Report") at 1. The estimates are based on their professional judgment, which is informed by years of experience. Additionally, the budget reflects a contingency of 10% of the total cost as an additional measure of conservatism. Id. at 2.

By its own admission, FMM has no expertise in construction projects or decommissioning a wind energy project. It relies on two projects to support its assumption that decommissioning costs have been significantly underestimated. First, it cites to the cost in California to remove 100 kW turbines. The removal costs there – reportedly $15,000-$30,000 per turbine although no back-up support is provided for those numbers – are substantially less than the budgeted costs here. FMM's apparent argument is that it may be reasonable to assume that the removal costs are approximately 10% of the erection costs. FMM Comments at 5. FMM does not provide any support for its assumption that decommissioning costs should be at least 10% of erection costs. Assuming, for the sake of argument, that it were a relevant benchmark, the budgeted removal costs here are substantially in excess of 10% of the erection costs, thereby meeting FMM's own benchmark. Specifically, the cost of erecting the turbines is $13 million, or $209,677 per turbine. Application at Section 3.1. The budgeted removal and disposal costs for the foundations, turbines and met towers for the Siemens turbines are $3,912,800, or $63,109 per turbine, approximately 30% of the erection costs. Sewall Siemens Report at 3-5. Likewise, the budgeted removal and disposal costs for the foundations, turbines and met towers for the Vestas turbines are $3,995,200, or $64,438 per turbine, also approximately 30% of the erection costs. Sewall Vestas Report at 3-5.[2]

FMM also references the costs for removing turbines in Falmouth, Mass. and states that the decommissioning cost is $2 million per turbine for that project, and the costs for the Bingham project should be in excess of that amount. FMM Comments at 6. In fact, the estimated costs for removing those turbines, as determined by the consultant hired by the town, was $350,000 per turbine. See Town of Falmouth Massachusetts Wind Energy Facility Mitigation Analysis, prepared by Weston & Sampson, December 2011 ("Weston & Sampson Report"), at 2-2 (attached as Exhibit A).[3] Moreover, that per turbine cost reflects a dismantling process designed to allow for the reuse of the turbine, Weston & Sampson Report at Sections 2 and 3, a process that is substantially more time consuming and expensive than a dismantling process in which the turbines are sold for scrap. The $2 million figure cited by FMM reflects the cost to relocate and install and commission the turbines for use at an alternative site. Weston & Sampson Report at ES-1 and Table 3-1. The costs include, among other things, construction of new

---

[2] This comparison is based on the costs for erecting and removing and disposing of the foundation, turbines and met towers. It does not reflect other construction or decommissioning costs including, for example, costs associated with the generator lead and interconnection or new roads.

[3] Elsewhere in the report the cost is identified as $210,000 per turbine. Weston & Sampson Report at 3-3.

foundations ($500,000 per turbine), electrical infrastructure improvements for the newly installed turbines ($200,000 per turbine), wind turbine erection ($350,000 per turbine), testing and re-commissioning of the turbines ($150,000 per turbine), permitting, planning and design associated with the re-use of the turbines ($200,000 per turbine), and a host of other costs none of which has any relevance to the decommissioning process that would be used in connection with the Bingham project. Id. Simply put, FMM's claim that the decommissioning cost for that project is $2 million per turbine is wrong, and it reflects either a fundamental lack of understanding of the data or a deliberate attempt to mislead the Department.

FMM also argues that the Project has overstated the salvage value of the turbines and associated infrastructure that would be recouped in the event of decommissioning. FMM Comments at 7. This speculative assertion is based on "cursory research" that did not include any contact with actual scrap pricing sources. Id. In contrast to FMM's admitted lack of expertise in calculating salvage values, the Project's estimated salvage values were calculated by an independent consultant and reflect quoted prices from an actual scrap dealer in Maine. Sewall Vestas Report at 10; Sewall Siemens Report at 10. The Weston & Sampson Report apparently relied on by FMM acknowledges that any decommissioning costs could be offset by salvage value if the turbines could not be sold or re-used and, like Sewall, that report based the salvage value on the weight of steel (and other metals) in the turbine and components and quotes from regional scrap dealers. Weston & Sampson Report at ES-1 and 2-2 to 2-3. The salvage value used in the Falmouth report for steel was $270 per ton, whereas the Sewall Reports assumed only $230 per ton. FMM also erroneously claims that the salvage values are too high because they do not reflect the costs of transporting the scrap to the facility. FMM at 6 and 7. In fact, Sewall included a separate line item for the costs of transporting scrap to a reclamation site. Sewall Vestas Report and Sewall Siemens Report at Sections 4.2, 5.2, 6.2 and 7.2. The scrap prices and costs for preparing and transporting the scrap in the Sewall reports are consistent with the assumptions used in the Weston & Sampson Report.

Finally, FMM also claims that a "third party" evaluated the salvage value estimates used in the Beech Ridge Wind project and concluded that the developer there had overestimated salvage costs and, by implication, the costs here must also be overstated. FMM at 7. Once again, no data is provided. Instead, an undated letter by Tom Hewson that is not on his company letterhead is attached. FMM at 13. No supporting information on the assumptions used by the developer or Mr. Hewson is included, and it is unclear what relevance, if any, his comments have. While Mr. Hewson has testified in opposition to projects in Maine before, his testimony focused on power output, avoided emissions and transmission congestion. FMM has not provided any information on Mr. Hewson's qualifications, if any, to assess decommissioning costs or salvage values. Moreover, the two critical flaws identified by Mr. Hewson in connection with the Beech Ridge Wind project were the use of outdated scrap prices and the failure to take into account transportation costs. FMM Comments at 13. Neither of those flaws is present here. Mr. Hewson also notes that one developer failed to take into account the costs for crane rentals, an issue also not present here. Finally, it is worth noting that Mr. Hewson assumes a decommissioning cost of

$97,000 per turbine, which is less than the per turbine cost used by Sewall in either of its reports, further undermining FMM's claims that the Project decommissioning costs have been underestimated.

B. The Difficulty in Predicting Future Scrap Values is Addressed

FMM's concerns about price volatility are also addressed. FMM Comments at 7. The decommissioning plan requires that assumptions both on decommissioning costs and salvage values be reassessed in Years 5, 10 and 15. Application at Section 29.3. This periodic true up eliminates the need to try to predict future scrap values.

C. The Risk to the State is Low

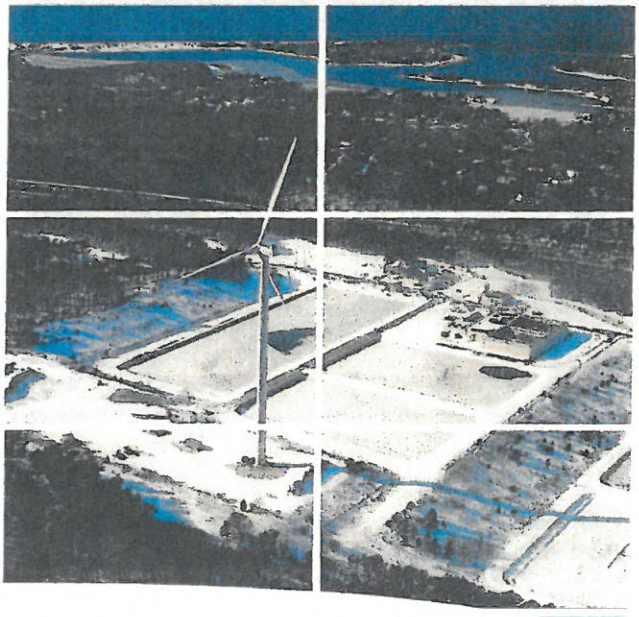
The sole reason developers are required to fund a decommissioning plan is to mitigate against the **risk** that the developer will not have the funds available to decommission the project when and if decommissioning is required. The funding requirements, however, should be commensurate with the risk that decommissioning will be required and the developer will not undertake that decommissioning. FMM asserts repeatedly and without substantiation that there is a significant risk not only that the Project will require decommissioning during its useful life, but also that the developer will not pay for such decommissioning (as would be required in its permit). FMM has not provided any support for its assumption that there is a high risk the Project will require decommissioning. To the contrary, with respect to its claims regarding what lenders might or might not do, FMM has absolutely no expertise. It is undisputed that as compared to other sources of energy generation, wind power is capital intensive for construction, but has among the lowest operating costs because it has no fuel costs. This means that there will be a strong economic incentive, for the operator (or a successor entity including a lender) to take reasonable measures to ensure the turbines continue to operate and generate power. The assumption that a lender lacks the expertise to take over and operate a project and therefore the Project will remain idle and scar the landscape reflects a lack of expertise in this area. Entities investing in wind energy projects are sophisticated. They have substantial expertise in valuing these types of assets. They will evaluate the revenue that would be generated from operation of the Project and take reasonable measures to either sell the asset or hire an expert to operate the asset for a period of time until it can be sold.

Finally, there are very few types of development in Maine that require a developer to fund a plan for decommissioning a project at the end of its useful life. The environmental and other risks associated with a wind power project are limited (not withstanding FMM's hyperbole to the contrary), and the state has already adopted a very cautious and conservative approach by requiring developers to fully fund the decommissioning plan at the outset of project construction.

prepared by:
Weston&Sampson®
Five Centennial Drive
Peabody, MA 01960-7985
tel: 978-532-1900 fax: 978-977-0100

Wind Turbine

wind turbine mitigation analysis



Town of

Falmouth

MASSACHUSETTS

Wind Energy Facility Mitigation Alternatives Analysis

December 2011

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FALMOUTH RENEWABLE ENERGY FACILITIES MITIGATION STRATEGIES

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FALMOUTH RENEWABLE ENERGY FACILITIES MITIGATION STRATEGIES

EXECUTIVE SUMMARY

At the request of the Town of Falmouth, Weston & Sampson has evaluated the cost of several options associated with operation of the Town-owned wind turbines. The options included dismantling one or both wind turbines, relocation of one or both wind turbines and the cost and revenue impact of curtailing operations to minimize sound, shadow flicker and ice throw. Dismantling both of the wind turbines would cost the Town on the order of $14.69 million dollars. This is based on the $9,857,000 in principal debt incurred to build the projects; $2,983,000 in interest; $838,000 in construction cost to dismantle the turbines, and repayment of approximately $1,010,000 to repay an advance REC payment made to the Town by the MassCEC. These costs assume no revenue generated from operation of the wind turbines.

Relocating each wind turbine to an alternate location would cost approximately $2.0 million per turbine or $4.0 million dollars. This is based on the cost for dismantling, installation of new foundations, and reassembly and commissioning at the alternate location. Major components which could be reused are the wind turbine generators themselves, and potentially electrical components such as switches, transformers, metering and similar hardware. The cost for installation in alternate locations assumes that they are Town-owned land, without any additional cost for use of the land, and with interconnection and permitting certainty.

The resale value of the turbines to a third party, without a manufacturer warranty, is estimated to be on the order of $300,000 each for a total of $600,000, excluding dismantling and shipping costs. The salvage value for the steel and copper is estimated at $102,000 and the miscellaneous components, if there were a buyer for use as spare parts, is valued at $80,000, for a total estimated salvage value of $182,000, also excluding dismantling, material preparation and transportation costs. When considering dismantling, material preparation and transportation costs, the salvage value is near zero.

Operating the wind turbines generates revenue for the Town from energy production (net metering credit) and renewable energy certificates (RECs). The annual revenue from the operation of both wind turbines is expected to be $975,000. Any time the wind turbines are not operating, whether through voluntary curtailment or down time due to circumstances beyond the Owner's control, revenue is lost. In general, there are seasonal variations in average wind speed which affects generating capacity of the wind turbines. The higher average wind speeds, the higher the resulting revenue. Expected revenues are highest in the winter months ($265,557), followed by spring ($254,203) and fall ($239,900), with less wind and revenue expected during the summer ($216,161). Shutting down of both wind turbines concurrently for a six months period, would cost the Town on the order of $453,000 to $523,000, depending upon which months the turbines were shut down.

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Any curtailment of the wind turbine operation will have an impact on revenue. Statistically, the operation of both wind turbines generates $111.30 per hour ($975,000/8,760 hours per year). The current curtailment, which has Wind I turbine operation suspended when the average wind speeds are at or above 10 meters per second (in place since March 1, 2011) has resulted in "lost" revenue of approximately $325,000 through November 31, 2011 (nine months). Curtailment under this scenario would result in full year revenue losses of approximately $500,000 per turbine. The actual dollar amount will vary, based on actual versus predicted wind conditions.

Based on the prior sound studies and modeling, sound impacts above 10 dBA were predicted to occur only during light winds and quietest background sound levels, which occur between 12:00 midnight and approximately 3:00 am. A curtailment plan for the wind turbines, consisting of increased cut in speeds from 3.5 meters per second to 8.0 meters per second during night time hours of 12:00 midnight to 3:00 am, would result in operational curtailment of approximately 694 hours and annual revenue losses of approximately $38,500 per year. An expanded curtailment plan for the wind turbines, consisting of increased cut in speeds from 3.5 meters per second to 8.0 meters per second for one turbine during night time hours of 11:00 pm to 5:00 am, would result in operational curtailment of 1,388 hours per year and annual revenue losses of approximately $77,000 per year.

HMMH began the sound insulation feasibility evaluation by conducting an on-site survey of existing home constructions. Nine homes were inspected in total. The study suggests sound insulation would provide modest improvement (4 to 8 decibels) in the homes with windows closed. Six of the 9 homes we surveyed would likely require air conditioning to be added, so the windows could be closed during noisy periods in the summer and the sound insulation treatment would work. The cost is estimated to be about $30,000 per home with central A/C and $45,000 per home that does not currently have central air conditioning.

Physical noise barriers (i.e. sound walls) were determined to be prohibitively expensive an impractical based on a cost benefit analysis. The barriers likely could not be placed close enough to the homes to have a significant effect. It is estimated that the walls would need to be 40-45 feet high to benefit the first floor of homes closest to Blacksmith Shop Road, with 7 to 9 decibels of noise reduction, assuming it is located 25 feet north of the road. A 50 foot high wall would be needed to improve second floors. The cost of the sound wall is estimated to be $250,000 to $500,000 per home benefited.

Design and implementation of control technology to minimize shadow flicker would have an initial cost of $15,000. A curtailment plan for the wind turbines, consisting of shutting down the turbines to mitigate the occurrence of flicker at a specific receptor which experiences 25 hours of flicker annually, might result in annual revenue losses of approximately $2,780 per year per receptor.

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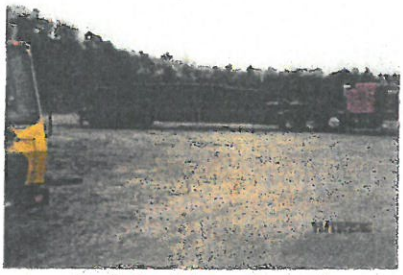
Design and implementation of automated control technology to minimize the potential for ice throw would have an initial cost of $25,000. Use of lower technology, operational awareness and usury (human) intervention would have an initial cost of approximately $5,000. Curtailment due to automated ice detection is estimated to results in projected annual down time as much as 40 hours per year, or revenue losses of approximately $4,450 per year. Ice detection equipment for use in curtailment is only in experimental stages of development, and is not considered fool proof. The risk for significant ice throw is considered relatively low.

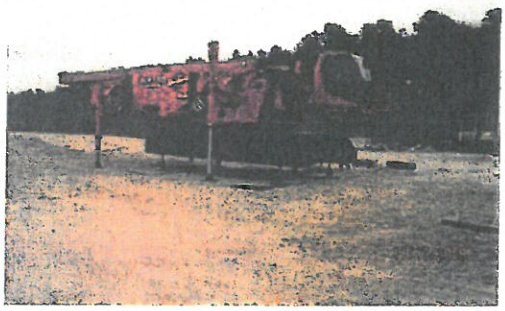
FALMOUTH RENEWABLE ENERGY FACILITIES MITIGATION STRATEGIES

2.0 COST TO REMOVE WIND I AND WIND II

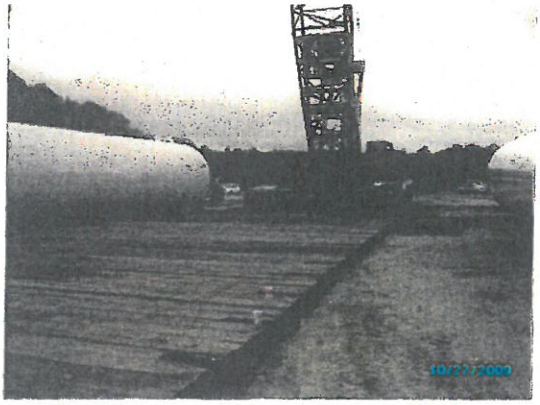
2.1 Decommission and Removal Procedure and Costs

Analysis of this option is first based on cost for the Town to hire a Contractor to dismantle the wind turbines. The turbines would then presumably be stored on site, transported and re-installed on another site, sold or scrapped for the salvage value of the turbines. Essentially, dismantling of the turbines is the reverse order of erection. There is a variety of equipment and specialized labor required to dismantle a wind turbine; including a large (300 ton, 300 foot tall) crane, smaller 75-ton "tailing" or "helper" crane needed to assist the large crane, as well as rigging, slings, tag lines and tools to accomplish the job. There are a limited number of cranes of this size that are available and therefore, long lead time and premium fees are typical. The large crane needed for the task is shipped to the site in multiple pieces and assembled on site.





The crane assembly alone generally requires one week for transporting and assembling. The cranes pad site requires ground improvements and wooden cribbing to minimize the potential for sudden differential settlement. The number of personnel needed for the erection or dismantling of a wind turbine is 11 to 12 individuals, including operators for each crane, two man rigging crew for the crane, two up-tower, two down-tower, plus labors and line tenders. The cost for the cranes, rigging, tools and labor is on the order of $350,000 per turbine, plus project management and coordination. The cost for removal of the second wind turbine would be perhaps $50,000 less, as the large crane would still need to be dismantled and re-built for the second location. Additional cost for preparation of the crane pad and storage area would result in a total cost of approximately $838,000.



FALMOUTH RENEWABLE ENERGY FACILITIES MITIGATION STRATEGIES

Table 2-1
Estimated Cost to Dismantle Both Wind Turbines

Task	Cost/Value	Quantity	Total
Dismantle WTG, Crane and Rigging, per turbine	$350,000	2	$700,000
Preparation of On Site Storage Area, each	$30,000	1	$30,000
Short/Long Term Care, month	$4,500	24	$108,000
Sale (No Warranty)	$300,000	2	$600,000
Or Salvage Value	$51,000	2	$102,000

The storage area sub-grades must be stabilized and level and specialized racking must be provided to maneuver and store each tower section, hub, blades and nacelle. Other sensitive electronic components, located within the nacelle and first two stories of the turbine, should be removed and stored in a climate-controlled environment. This can be accomplished on site, or off site. On site storage would require the construction of appropriate storage shed or other suitable covered storage to protect sensitive equipment or arrange for off-site storage.

Wind turbines are design for operation and not long term storage. Equipment must be rotated manually and lubricated regularly to prevent the development of flat spots in major bearings, which would result in premature failure if and when the unit is placed back into service.

2.2 Costs to Remove Turbines and Abandon Facility

The cost for the preparation of a staging area, equipment and short term care would be on the order of $75,000, plus $35,000 per year of short or long term preventive maintenance and care. There is a small market for used wind turbines and sale of the turbines "as is" may be possible, if there were any interested buyers. The value of turbines would be higher if the manufacturer's warranty were still in place and available to a new owner. Weston & Sampson contacted Blue Sky Wind, LLC of White Plains, NY, and inquired about the potential value of the turbines. Blue Sky suggested that if a warranty continued with the turbines, they would have a value in the range of $400,000 to $600,000 each. Without a warranty, the value would be $300,000 to $400,000 each and taking them down and shipping would run $200,000 to $300,000 each,

depending on how far they needed to be transported. Based on the warranty and service agreement with Vestas, no warranty would likely be available to a new Owner. Therefore, a value for each turbine of $300,000 should be used for planning level budgeting purposes.

2.3 Salvage Value

If a buyer could not be found, there is the possibility of scrap salvage value for the wind turbine components. Raw materials which have salvage values are generally steel (tower) and copper (generator windings and wiring). The wind turbine consists of four steel tower sections, totaling 119,500 kilograms (approximately 131.7 tons) of steel. There are an estimated five tons of copper in the wiring and windings of the generator and transformer for each wind turbine. According to Gateway Metal Recycling of Salem, NH, the salvage value for No.1 unprepared steel, at the time of this assessment, was $270 per ton and value of electric motor and generator copper (unprepared) was on the order of $600 per ton. When contacted, representatives from Gateway Metals warned of high volatility and downward pricing on the scrap steel market, suggesting prices could go down by $100 per ton over a short period of time.

Based on this data, the scrap value of steel and copper is estimated to be $51,000 per turbine, or $102,000 total, less the cost of some minor materials preparation and transportation. No scrap value is assigned for the blades, which are composed of wood and fiberglass. The cost of preparation and transportation could be on the order of $30,000, resulting in a net scrap value of $72,000. The various components may also have some residual value as spare parts for use by other wind turbine owners with the same make and model wind turbine. For the purpose of this estimate, a value of $40,000 for each turbine has been assigned as a value for spare parts, provided you could find a willing buyer.

The cost estimate for dismantling and salvage value of the wind turbines should be considered a planning level evaluation and implementation cost from the information available at the time the estimate was prepared. The final cost or value of the project will depend upon the actual labor, materials and market conditions at the time the project is undertaken and advertised for competitive; therefore, actual amounts may vary from the values provided herein. Below is an estimated cost for turbine removal, and resale or salvage:

Table 2-2
Estimated Salvage Value

Item Description	Salvage Weight	Unit	Rate (11/1/11)	Total
Tower (Four Sections)	131.7	Ton	$270.00	$35,559.00
Nacelle (Gearbox, Frame, etc.)	28.0	Ton	$270.00	$7,549.20
Copper (Generator)	16,020	Pound	$0.30	$4,806.00
Copper (Transformer)	8,100	Pound	$0.30	$2,430.00
Copper Cabling	2,500	Pound	$0.35	$875.00
Total, each turbine				$51,219.20
Total Salvage				$102,438.40

2.4 Debt Obligations

The cost associated with dismantling the turbines must be added to debt encumbered by the Town to procure and install each of the wind turbines. The Town is obligated to deliver RECs to the Massachusetts Clean Energy Center as part of the Standard Financial Offer under the Community Wind Program, in which the Town is a participant. The Town would likely be required to repay the $1,010,623 it received from the Renewable Energy Trust as prepayment for the RECs scheduled to be generated in years 2015-2029. The contract stipulates that the turbine output not fall below 30% of the forecasted production.

The Town used this advance payment to assist in the short term project construction costs. The DEP has indicated that the Wind II project funding, which was administered by the DEP under the State Revolving Funds (SRF) program with 100% forgiveness of both principal and interest (i.e. ARRA Grant), would revert to the standard 2% loan, if the wind turbine was not used for generating electricity as the Town intended and represented in the application for funding. The principal and interest debt repayment schedule for Wind I is provided in Table 2-3.

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Table 2-3 Wind I Debt Repayment Schedule			
Year	Principal	Interest	Total
2011	$215,000	$139,551	$354,551
2012	$215,000	$172,705	$387,705
2013	$252,000	$173,916	$425,916
2014	$255,000	$166,638	$421,638
2015	$260,000	$157,169	$417,169
2016	$260,000	$147,706	$407,706
2017	$260,000	$138,306	$398,306
2018	$260,000	$126,306	$386,306
2019	$265,000	$113,981	$378,981
2020	$265,000	$103,931	$368,931
2021	$265,000	$93,881	$358,881
2022	$270,000	$81,356	$351,356
2023	$270,000	$68,456	$338,456
2024	$275,000	$59,334	$334,334
2025	$275,000	$50,275	$325,275
2026	$280,000	$40,650	$320,650
2027	$280,000	$30,500	$310,500
2028	$285,000	$19,988	$304,988
2029	$285,000	$9,375	$294,375
Total	$4,992,000	$1,894,025	$6,886,025

FALMOUTH RENEWABLE ENERGY FACILITIES MITIGATION STRATEGIES

3.0 COST TO RELOCATE WIND I AND WIND II

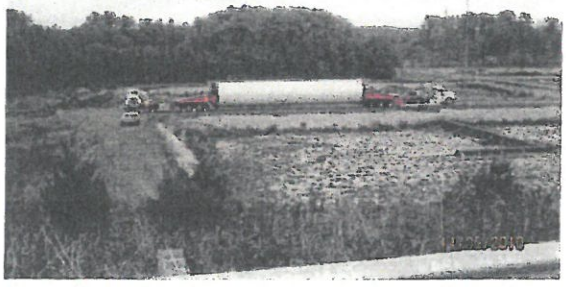
3.1 Relocating Wind I and Wind II

The Town requested that Weston & Sampson provide an estimate of the cost to relocate the wind turbines, presumably to another Town-owned property. This could also include relocation of one or both of the wind turbines within the footprint of the WWTF property.

The major construction tasks include delivery of equipment to the construction sites. This task requires a 300 ton to erect and dismantle the turbines and a 75 ton crane and specialized trailers designed to accommodate moving the components based on the size and dimensions of the tower, nacelle and blades, with care to prevent damage to the components, especially the blades.

3.2 Estimated Costs to Relocate Wind Turbines

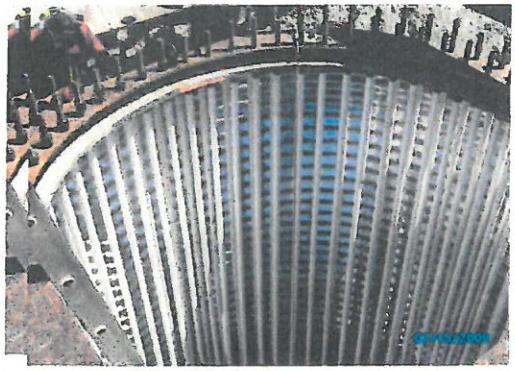
The costs to relocate the wind turbines would be comparable to the original cost for design, permitting and installation of each of the first two wind turbines. There are certain tasks, such as wind measurements studies and Phase I Avian Studies, which would not necessarily need to be repeated, whiles some studies, such as geotechnical exploration, air space obstruction analysis and electrical interconnection studies and processes, would be considered essential. The costs associated with engineering design and permitting would generally tend to follow industry standard fees that could be estimated as a percentage of construction cost. The items that would be included are geotechnical studies, civil, structural and electrical design plans and specifications. Items which are unique to wind turbines, include additional studies, such as wind measurement programs, avian studies, shadow flicker, sound impact studies, etc. which, if necessary, increase project costs.



Based on the Town's recent experience with bidding of the first two projects, and the number of other similar projects in the Commonwealth, the Town could reasonably rely on cost data for most of the elements of turbine relocation. Also, the wind turbines themselves as a capital expenditure represent approximately 60% of the

total value of each project, which the Town would already own, serves to increase the cost estimate certainty. Other tasks cannot however, be estimated or the outcome predicted, until actual locations are selected.

The turbine foundation represents a significant percentage of the contract value. The foundation systems for the two existing wind turbines consist of a 32-foot deep by 14-foot diameter outer corrugated metal pipe (CMP) set around a 10-foot diameter inner CMP, with anchor bolts running the full depth. The annular space and cap is then filled with reinforcement steel and concrete. The complete foundation system is on the order of $500,000 for each turbine.



The wind turbine is connected to the electrical distribution grid through an electrical duct bank with 25 kilovolt (kV) cabling and includes current transforms, protective relays, switches, meters, various manholes, and related appurtenances. The average cost for electrical infrastructure improvements is on the order of $400,000, including a nominal length of concrete encased underground duct bank of 1,000 feet.

Increased distances can be covered using traditional overhead lines, where permitted; however, the cost could also be higher for greater distances if placed underground. The installed cost of utility grade switches and 600 volt to 23,000 volt transformers are $50,000 and $75,000, respectively. Balance of plant construction items, such as communication cabling, pad and tower grounding, road cuts and asphalt patching, fencing, loam and seeding, and testing and commissioning, are estimated to cost on the order of $310,000.

FALMOUTH RENEWABLE ENERGY FACILITIES MITIGATION STRATEGIES

Table 3-1
Estimated Cost to Relocate Wind Turbines

Task	Cost, per turbine	Quantity	Total
Planning, Design, Permitting	$200,000	2	$400,000
De-Commission Wind Turbine	$210,000	2	$420,000
General Conditions, Bond, Insurance, Mob.	$225,000	2	$450,000
Site Work and Preparation	$100,000	2	$200,000
WTG Transport	$125,000	2	$250,000
Wind Turbine Foundation	$400,000	2	$800,000
WTG Installation, Crane and Rigging	$350,000	2	$700,000
Primary Electrical Duct, Conduit and Cabling	$125,000	2	$250,000
Transformers and Switches	$200,000	2	$400,000
Manhole Frames and Covers	$50,000	2	$100,000
Communication Cabling	$15,000	2	$30,000
Pad and Tower Grounding	$25,000	2	$50,000
Road Cuts and Asphalt Patching	$25,000	2	$50,000
Fencing	$25,000	2	$50,000
Loam and Seeding	$15,000	2	$30,000
Testing and Re-Commissioning	$150,000	2	$300,000
Total Cost			$4,480,000