Black Oak Wind Farm

Decommissioning Plan

Anticipated Life of Wind Turbines

Megawatt-scale wind turbine generators available on the market today have a life expectancy of more than 20 years. The tubular steel towers supporting the generators have a simple, rugged design and with basic routine maintenance will serve many years beyond the life expectancy of the generators.

As the turbines to be installed for the Black Oak Wind Farm (the Project) approach the end of their serviceable life, technological advances should make available more efficient and cost-effective generators that will economically drive the replacement of the existing generators and thus prolong the economic life of the Project. In the event that this doesn't happen and the turbines need to be decommissioned, the following plan provides a description of the decommissioning work and the estimated costs associated to perform it.

Estimated Cost of Decommissioning

Research in the US is lacking to support actual decommissioning costs of wind farms, since little decommissioning has been performed due to the recent development of the wind industry. Estimates have been prepared by a range of sources, with numbers between $40,000 and $170,000 per turbine proposed based on estimates of labor, materials, and scrap value. (Falmouth, MA Mitigation Plan, 2011; Knauth, Ridgeline Wind 2011; New Grange Wind Farm DEIS, 2008).

Published research from Sweden in 2014 looked at actual decommissioning costs of two wind projects. One project cost $21,141 per turbine to remove only the turbines themselves. The other project removed all foundations, roads, crane pads, and cables, and cost $63,000 per turbine to perform (Giovannini 2014). No other published research is available to the Applicant's knowledge.

In reality, in the unlikely event that the Project had to be decommissioned it is more likely that turbines and associated equipment would be sold to another power provider rather than sold for scrap for the value of the raw materials. Individual rotors, generating equipment and towers would likely have value and demand on the open market. Ten to twenty-year old turbines being decommissioned in Europe are commonly reconditioned and sold as operating machines rather than for scrap.

Ensuring Decommissioning and Site Restoration Funds

According to the Town of Enfield Wind Energy Facilities Local Law, the Project will continuously maintain a fund, bond, letter of credit, or equivalent financial security instrument payable to the Town of Enfield for the removal of non-functioning wind turbines and appurtenant facilities, in a form and amount approved by the Town Board for the period of the life of the facility. Prior to approval of the project by the Building Department of the Town of Enfield, the Project will, in writing, provide a surety bond or financial security instrument in a proposed amount not less than $180,000 per turbine, or a total of $1,250,000 (assuming 7 turbines), plus an additional $100,000 for assuring road repair during decommissioning, renewable on an annual basis, for the removal of non-functioning turbines and associated facilities. Per the local law, this amount may be periodically reviewed by the Town at its discretion, and the amount altered accordingly for the estimated costs of removal, decommissioning, and restoration. The Project Sponsor will fully comply with the local law concerning decommissioning and site restoration. As per a vote held on August 16, 2016, the Project will replace any surety bond with a letter of credit or cash escrow account by the time turbines are commissioned, and letter of credit or cash escrow will be the financial instrument used for the life of the project, rather than a surety bond.

Decommissioning Process

All decommissioning and restoration activities will adhere to the requirements of appropriate governing authorities, and will be in accordance with all applicable federal, state, and local permits. The decommissioning and restoration process comprises removal of above-ground structures; removal of below-ground structures to a depth of 36 inches; restoration of topsoil, re-vegetation and seeding; and a two-year monitoring and remediation period. Access roads, fencing and residual minor improvements will not be removed unless the landowner requests that they be removed. Above-ground structures include the turbines, transformers, overhead collection lines, wind farm-owned portions of the substation, maintenance buildings, and access gates. Below-ground structures include turbine foundations, collection system conduits, and drainage structures. The process of removing structures involves evaluating and categorizing all components and materials into categories of recondition and reuse, salvage, recycling, and disposal. In the interest of increased efficiency and minimal transportation impacts, components and material may be stored on-site in a pre-approved location until the bulk of similar components or materials are ready for transport. The components and material will be transported to the appropriate facilities for reconditioning, salvage, recycling, or disposal. The presence of Teet's Scrap Recycling within the project boundary makes the recycling of all metal components an easy and cost effective process.

Wind turbine removal

Access roads to turbines may be widened temporarily to sufficient width to accommodate movement of appropriately sized cranes or other machinery required for the disassembly and removal of the turbines. High value components will be stripped. The remaining material will be reduced to shippable dimensions and transported off site for proper disposal. Control cabinets, electronic components, and internal cables will be removed. The blades, hub and nacelle will be lowered to grade for disassembly. The tower sections will be lowered to the ground where they will be further disassembled into transportable sections. The blades, hub, nacelle, and tower sections will either be transported whole for reconditioning and reuse or dissembled into salvageable, recyclable, or disposable components. Useable parts will be sold into the secondary market for parts or installation elsewhere. The area will be thoroughly cleaned and all debris removed.

Wind turbine foundation removal

Topsoil will be removed from an area surrounding the foundation and stored for later replacement. Turbine foundations will be excavated to a depth sufficient to remove all anchor bolts, rebar, conduits, cable, and concrete to a depth of 36 inches below grade. After removal of all noted foundation materials, the hole will be filled with clean sub-grade material of quality comparable to the immediate surrounding area. The sub-grade material will be compacted to a density similar to surrounding sub-grade material. All unexcavated areas compacted by equipment used in decommissioning shall be de-compacted in a manner to adequately restore the topsoil and sub-grade material to the proper density consistent and compatible with the surrounding area. The area will be thoroughly cleaned and all debris removed, and re-seeded to vegetation acceptable to the landowner.

Underground electrical collection system

The cables and conduits contain no materials known to be harmful to the environment and will be cut back to a depth of at least 36 inches. All cable and conduit buried greater than 36 inches will be left in place and abandoned.

Substation

The Project substation is generally valuable to the local transmission owner. As per the interconnection rules of the NYISO, the Project substation reverts to the ownership of the transmission owner and thus the Project Sponsor does not intend to decommission the substation.

Site Restoration Process

To the extent necessary, topsoil will be removed prior to removal of structures from all work areas and stockpiled, clearly designated, and separate from other excavated material. Prior to topsoil replacement, all rocks six (6) inches or greater will be removed from the surface of the subsoil. The topsoil will be de-compacted to match the density and consistency of the immediate surrounding area. The topsoil will be replaced to original depth, and original surface contours reestablished where possible. All rocks six (6) inches or larger will be removed from the surface of the topsoil. Any topsoil deficiency and trench settling shall be mitigated with imported topsoil consistent with the quality of the affected site.

In accordance with guidelines provided by New York State Department of Agriculture and Markets, topsoil de-compaction and replacement will be avoided after October 1, unless approved by the landowner in consultation with the New York State Department of Agriculture and Markets since areas restored after October 1 may not obtain sufficient growth to prevent erosion over the winter months. If areas are restored after October 1, provision will be made to restore any eroded areas in the springtime to establish proper growth. Following decommissioning activities, the sub-grade material and topsoil from all affected agricultural areas will be de-compacted and restored to a density and depth consistent with the surrounding fields or to a depth of 18 inches. The affected areas will be inspected, thoroughly cleaned, and all debris removed.

All disturbed soil surfaces within agricultural fields will be seeded with a seed mix agreed upon with the landowner in order to maintain consistency with the surrounding agricultural uses. All other disturbed areas will be restored to a condition and forage density reasonably similar to original condition. In all areas restoration shall include, as reasonably required, leveling, terracing, mulching, and other necessary steps to prevent soil erosion, to ensure establishment of suitable grasses and forbs, and to control noxious weeds and pests.

In accordance with the guidelines of the New York State Department of Agriculture and Markets, a monitoring and remediation period of two years immediately following the completion of any decommissioning and restoration activities will be provided. The two-year period allows for the effects of climatic cycles such as frost action, precipitation and growing seasons to occur from which various monitoring determinations can be made. Any remaining agricultural impacts can be identified during this period and follow-up restoration efforts will be implemented.

In the event that operating, maintaining or decommissioning of the Project requires use by the Company of over-sized or overweight vehicles, prior to entry upon Roads with such vehicles, the Company shall inspect the affected Roads and produce to the Town an Updated Post-Construction Report. In the event of subsequent damage caused by operating, maintaining or decommissioning of the Project (measured against the Updated Post-Construction Report), the Parties agree that the terms of the Town of Enfield Road Use Agreement would be incorporated within the present agreement, re-instated, and/or otherwise enforced for a term necessary to repair such damage.

References

Tetra Tech. 2008. *New Grange Wind Farm DEIS, Exhibit 9: Decommissioning Plan*. Available at: http://www.horizonwindfarms.com/northeast-region/documents/underdev/arkwright/Exhibit9_DecomissioningPlan.pdf.

Weston and Sampson. 2011. *Town of Falmouth MA Wind Energy Facility Mitigation Alternatives Analysis*. Available at: http://www.falmouthmass.us/selectmen/falmouth%20turbine%20mitigation%20study.pdf.

Knauth, Jonathan. 2011. *Knauth's Analysis of cost to decommission turbines, Public commentary on the Ridgeline Energy LLC Monticello Hills Application, Decommissioning estimate*. Available at: http://www.protectrichfield.com/documents/Decommissioning%20Estimate%20for%20Ridgeline%20Energy%20Monticello%20Hills%20Project.pdf.

Giovannini, Gabriele. 2014. *Wind Farm Decommissioning: A Perspective on Regulations and Cost Assessment in Italy and Sweden.* Available at: https://www.diva-portal.org/smash/get/diva2:767553/FULLTEXT01.pdf