STATE OF VERMONT

PUBLIC SERVICE BOARD

Joint Petition of Green Mountain Power Corporation, Vermont Electric Cooperative, Inc. and Vermont Electric Power Company, Inc. for a Certificate of Public Good pursuant to 30 V.S.A. § 248, to construct up to a 63 MW wind electric generation facility and associated facilities on Lowell Mountain in Lowell, Vermont and the installation or upgrade of approximately 16.9 miles of transmission line and associated substations in Lowell, Westfield and Jay, Vermont	))))))))))	Docket No. _____

PREFILED TESTIMONY OF

IAN A. JEWKES

ON BEHALF OF GREEN MOUNTAIN POWER CORPORATION

May 21, 2010

Summary of Testimony

Mr. Jewkes describes the civil engineering site design, the process to be used in locating the access road and crane path, the proposes stormwater treatment practices and addresses Section 248 soil erosion and related criteria.

PREFILED TESTIMONY OF IAN A. JEWKES
ON BEHALF OF
GREEN MOUNTAIN POWER CORPORATION

1. Q. Please state your name, current position, employer and business address.

A. My name is Ian A. Jewkes. I am the President of Krebs and Lansing Consulting Engineers, Inc., State of Vermont Professional Engineer #7200. My business address is 164 Main Street, Suite 201, Colchester, Vermont 05446.

2. Q. Please state briefly your educational background and business experience.

A. I earned a Bachelor of Science degree in Civil Engineering in 1984 from the University of Vermont ("UVM"). In 1982, I was hired by UVM's Land Records Department as an Assistant Director to the Director of the Land Records Office Harris G. Abbott. During my employment, I performed drafting tasks and land surveys for the University of Vermont construction projects. I also performed geodetic and property surveys for the Mount Mansfield ridgeline in Stowe, Vermont.

In 1984, I joined Krebs and Lansing Consulting Engineers, Inc. During this time, my position progressed from junior engineer and surveyor to senior engineer and surveyor. In 2002, I became owner of Krebs and Lansing Consulting Engineers, Inc. As President, I perform extensive work in civil engineering design, permitting, and construction services for many commercial, industrial, residential, and institutional civil/site design projects. These projects include the design of roads, construction access roads, utility systems, storm control and treatment systems, on-site sanitary sewer systems, municipal sanitary sewer, domestic water supply, municipal water supply systems, mass earthworks, grading, and erosion & sediment control measures.

A copy of my resume detailing my relevant work experience is attached as **Exh. Pet.-IAJ-1**.

3. Q. Have you ever testified before the Public Service Board?

A. No.

4. Q. Please summarize your testimony.

A. I describe the Civil Engineering site design for the following proposed improvements associated with the Kingdom Community Wind Project (the "Project").

* Access road from Route 100 to the ridgeline
* Crane path along the ridgeline
* Wind turbine pads
* Site for proposed Project substation and maintenance building
* Stormwater treatment practices (STPs) associated with these improvements

I describe an approach to the road construction process called micro-siting which is described by the "Variable Road Location Detail," which will allow for safety, efficiency and cost savings in construction of the Project access road and crane path. I also describe how the design of these improvements is intended to comply with the water pollution, waste disposal, water supply, and erosion control criteria under section 248(b)(5). Finally, I conclude that the above-described components of the Project will not cause undue water pollution, unreasonable soil erosion or reduction in the capacity of the land to hold water so that dangerous or unhealthy conditions may result.

5. Q. Please describe your analysis and the scope of your review.

A. The primary civil site design objective is to design an access road and crane path that can provide safe and efficient access to the proposed wind turbine sites for the transport, erection, maintenance and operation of the turbines while avoiding any undue environmental impacts. The proposed wind turbine locations (also called "turbine sites"), for the 20 and 21 turbine configurations are being provided by Green Mountain Power Corporation ("GMP"). The design parameters I used to ensure safe and efficient construction and operational use of these facilities were based on turbine manufacturers' transportation specifications, information provided by an independent turbine transportation company, and information of actual field parameters used on other completed wind projects provided by the general contractor selected by GMP to construct the Project. The initial basic dimensional design components consist of: (1) the access road with a minimum passable width of 18 feet; (2) the crane path with a minimum passable width of 34 feet; and (3) the wind turbine pads, used for staging and erection of the turbines, with a radius of approximately 125 feet. Additional design components include, but are not limited to, horizontal curve minimums, vertical curve minimums, cross slope requirements, lengths and grades of slope transitions, and vehicle passing area requirements. The topographical information I used to develop the resulting design consisted primarily of a

LIDAR aerial topographic survey for the overall site, an "on the ground" conventional topographic survey of portions of the site in which improvements would be located, and an inventory of environmentally sensitive features found in the proposed construction zone as provided by GMP's consultant, VHB Pioneer.

My testimony is based upon the interim civil and stormwater designs included in the exhibits. We anticipate providing the final civil and stormwater designs during this proceeding.

6. Q. Please describe the entrance to the access road from Route 100.

A. The access point for the Project access road is at a field adjacent to Route 100, and north of Meek Road. The entrance to the access road is shown on **Exh. Pet.–IAJ-2**, Sheet C-101. The access point is adjacent to an existing field, up to 5 acres of which will be used as a temporary construction staging area for field offices and/or the storage of materials prior to transporting them up to the mountain. The surface of the staging area will consist of a temporary gravel fill placed on a geotextile fabric, which will be removed and revegetated after Project construction is complete.

As indicated by Mr. Pughe, Meek Road will be used for vehicle access in the initial stages of constructing the Project's access road. Use of Meek Road will reduce the length of the construction period by permitting GMP to construct the access road in two directions with two separate crews. Meek Road will also be used to provide alternate automobile and light truck access during the construction period, minimizing idling time by vehicles waiting pass oversize equipment in wider access road portions.

7. Q. Please describe the route of the access road.

A. The access road is approximately 2.5 miles long and at least 18 feet wide, and connects Route 100 with the turbine crane path. Along this 2.5 mile length, the access road widens to 32 feet in three locations to provide pull-over areas, which will be used to allow for construction and transportation vehicle passing. The initial grade is fairly flat for the first 1,400 feet, and then rises up the hillside. From that point, the access road follows an existing logging road up to an existing clearing, which is the site for the new collector substation, maintenance building, and outside storage yard. This existing clearing site is approximately 1.3 miles from Route 100. The existing clearing will be expanded from approximately two acres to approximately 4 ½ acres.

The maintenance building will include work space for GMP employees and space for equipment and spare parts. The maintenance building will be served by a new drilled well and an on-site wastewater disposal system which will comply with the State of Vermont Environmental Protection Rule, Chapter 1, Wastewater System and Potable Water Supply Rules.

Stormwater runoff from the new substation, maintenance building, and storage area will be collected and treated in several stormwater treatment practices (“STPs”) located just downhill of these improvements. I have assumed in my planning that the soils from Route 100 to the proposed Project collector substation are sand and silty sands and that generally the soil depth decreases as the terrain rises.

The access road above the collector substation generally follows an existing logging road to a point approximately two miles from Route 100. The access road grade in this area ranges from 4.2% to 13.9%. Beyond the end of the existing logging road, the access road will continue for approximately 0.6 miles and turn across a broad slope crossing several streams.

8. Q. Please describe the turbine crane path and turbine pads for the 21 turbine configuration.

A. As shown on **Exh. Pet.-IAJ-2**, Sheet C-107, at the end of the access road, adjacent to the nearest crane pad, the access road will widen to become the crane path, which will provide access to the planned turbine locations. The crane path will be located along the ridge line approximately 34 feet wide, and will run generally north to south.

Along the crane path, GMP will construct circular turbine pads constructed of the same materials as the roadway, which will be 250 feet in diameter, and will be used for staging and erection of the turbines while keeping the crane path clear for continuous construction and transportation activities at other turbine pad locations. The maximum design slope across a wind turbine pad area is 2% to 3%. Within each turbine pad is located a crane pad, which is approximately 100 feet by 75 feet, where a crane will be situated to erect the turbines. The cross slope of the crane pad is required to be 0% so that the crane can safely lift the wind turbine components. Not including the turbine foundations, the surface of the crane pad and turbine pad is expected to be permeable 3” to 5” minus stone.

9. Q. Please describe the considerations that went into the location of the access road, crane path and turbine pads.

A. Krebs & Lansing analyzed various alternatives for the location of the proposed civil site design requirements and reviewed associated environmental impacts. VHB Pioneer identified, tabulated, and assigned “recommended design buffers” for all the environmental impacts. The buffers provided a systematic method for evaluation environmental impacts and are based on the buffer guidelines provided by the Agency of Natural Resources (“ANR”).

Krebs & Lansing located the proposed civil site design requirements in a manner intended to minimize environmental impacts while providing for safe and efficient transport and erection of turbine components. In the proposed design, I have minimized the width of the access road and crane path and avoided the excessive use of spurs to reach more remote turbine sites.

10. Q. Have you prepared a comparable set of plans for the 20 turbine configuration?

A. Yes. See **Exh. Pet.-IAJ-2**. It should be noted that the length of the access road and crane path will wary slightly from the 21 turbine configuration described above, but the width will not.

11. Q. Please describe the construction process called micro-siting which is described by the Variable Road Location Detail and explain its advantages.

A. The current designs of the access road and the crane path are identified on **Exh. Pet.-IAJ-2**. GMP will further reduce access road and crane path impacts, by using a proven field micro-siting technique in its road construction. This micro-siting technique is described within our design in the "Variable Road Location Detail" ("VRLD") detail found on Sheet C-119 of **Exh. Pet.-IAJ-2.**

To understand the proposed micro-siting technique, it will be helpful to give a simplified overview of a conventional road building process over varied terrain. In conventional road design, the road location is fixed by the civil design prior to commencement of construction. A conventional civil design identifies where existing topography must be excavated (cut) or where the existing topography must be filled in (fill), to assure the proper design elevation for the road. In almost all road construction projects, there will be an excess of either cuts or fills and when this occurs it is known as an "unbalanced" site.

The micro-siting process, on the other hand, will balance the cuts and fills of the road on a local basis (approximately every 300 to 500 linear feet), by having the ability to vary the actual road elevation and/or the actual road location within a corridor, instead of constructing the road in a fixed location, as with a conventional civil design. See **Exh. Pet.-IAJ-3**.

Balancing the cuts and fills on our site provides a number of benefits. The micro-siting process reduces the amount of material that must be transported by dump trucks either to or from the site along public roads, thus reducing exhaust emissions, fuel consumption, and truck traffic. If built with a conventional road building process, the civil design included in the exhibits would generate an excess of cuts of approximtely125,000 cubic yards. In this case, by balancing the site, we would avoid transporting that 125,000 cubic yards which translates to avoiding approximately 9,000 – 12,000 dump truck round trips to haul this excess fill off site.

The micro-siting process is efficient and will significantly reduce the overall project site work schedule. Thus, a shortened schedule will reduce site equipment emissions and fuel consumption. The shortened schedule will also reduce potential erosion arising during the period between soil disturbance and final site stabilization. The shortened schedule will also reduce construction costs

Micro siting also reduces the overall disturbed area of the Project below that established by using a conventional design and road-building approach.

12. Q. Are there any other effects of using micro siting?

A. Micro siting requires more tree cutting than conventional road building. This is because the technique requires detailed knowledge of the affected topography, which can only be obtained through visual measurement by experienced field personnel knowledgeable about the variables of subsurface rock topography in mountainous terrain. In densely forested areas, an accurate terrain assessment over 300-500 linear feet cannot be made. This visual measurement therefore requires tree removal in the potential road corridor so that the affected topography and potential road locations can be examined. Based on the progress design submitted as **Exh. Pet.-IAJ-2**, I have calculated that the quantity of additional trees cut is approximately 17.5 acres for the 21 turbine scenario and approximately 19 acres for the 20 turbine scenario. The VRLD detail outlines the conditions and variable widths where additional tree cutting occurs. The width of the additional tree cutting will never be greater than 30' on either side of the road, and averages approximately 10.5-11.5 feet. Additional trees that are cut are left with stumps in place, which as Mr. Nelson points out in his testimony, minimizes the potential for erosion and enables vegetative regrowth within a relatively short period of time. The impact of additional tree clearing is more than offset by the reduced disturbed area, reduction in erosion potential, reduced exhaust emission, fuel consumption, reduced truck travel on public roads, shortened schedule and reduced cost as outlined above.

13. Q. Please describe the stormwater treatment practices used in the design of the access road and the crane path.

A. The water quality criteria of Section 248 are intended to protect waters in the state by reducing stream channel instability, pollution, sedimentation and local flooding and by protecting groundwater quality and quantity (groundwater recharge). These goals are met through the design of a stormwater treatment, collection, and detention system that meets the standards of the State of Vermont Stormwater Management Manual ("VSWMM"). These standards include the Water Quality Treatment Standard ("WQTS"), Channel Protection

Treatment Standard, Groundwater Recharge Standard, Overbank Flood Protection Standard, and Extreme Flood Protection Standard. The objectives of these standards are described below:

* WQTS – This standard requires the capture of 90% of the annual storm events, and the removal of 80% of the average annual post development suspended solids load (TSS), and of 40% of the total phosphorus (TP) load.
* Channel Protection Treatment Standard – This standard protects stream channels from degradation. It requires that storage of the channel protection volume (CPv) be provided by means of 12 to 24 hours of extended detention storage (ED) for the one-year, 24-hour rainfall event. If stormwater is discharged into a coldwater fish habitat, 12 hours of extended detention is required. If stormwater is discharged into a warm water fish habitat, 24 hours of extended detention is required.
* Groundwater Recharge Treatment Standard – The standard requires that the average annual recharge rate for the prevailing hydrologic soils group(s) (HSG) shall be maintained in order to preserve existing water table elevations. Recharge volume (Re_v) is determined as a function of annual predevelopment recharge for a given soil group, average annual rainfall volume, and amount of impervious cover at a site.
* Overbank Flood Protection Treatment Standard – The standard requires that post-development peak discharge rate shall not exceed the pre-development peak discharge rate for the 10-year, 24-hour storm event.
* Extreme Flood Protection Treatment Standard – The standard requires that post-

development peak discharge rate shall not exceed the pre-development peak discharge rate for the 100-year, 24-hour storm event. The purpose of this treatment standard is to prevent flood damage from infrequent but very large storm events, maintain the boundaries of the pre-development 100-year floodplain, and protect the physical integrity of a STP.

By meeting these standards, the stormwater design will manage the entire frequency of storms anticipated over the life of the stormwater management system. These include storms ranging from the smallest, most frequent storm events that produce little or no runoff, but make up the majority of individual storm events and are responsible for the majority of groundwater recharge, up to the largest, very infrequent storm events that can cause catastrophic damage. Adherence to these principles will ensure compliance with the water protection criteria of Section 248.

14. Q. Please describe the types of STPs that will be used.

A. The stormwater treatment system will be designed in a manner that meets all VSWMM requirements, including standards mentioned above. Standard STPs employed in the design for the Project may include level spreaders, stormwater ponds, grass lined swales, vegetated filter strips, all as approved and required for stormwater permitting.

A level spreader consists of a ditch and level berm on the downhill side that allows the stormwater to be distributed uniformly over the ground surface as sheet flow, thereby preventing concentrated erosive stormwater flows and promotes infiltration of the stormwater. Level spreaders involve a smaller environmental footprint than other standard STPs.

A stormwater pond is a depression or impoundment consisting of two parts, a permanent pool and storage volume above the permanent pool. The permanent pool provides water quality treatment by removing sediment from the stormwater runoff. The volume above the permanent pool provides stormwater quantity treatment (channel protection, overbank flood protection, extreme flood protection) by detaining the stormwater runoff during the storm events. These elements control peak discharge rates and promote gravity settling of particulates. Grass lined swales are open channels that provide treatment by filtering out pollutants. Vegetated filter strips are vegetated pervious areas which allow for either infiltration or overland flow that is slow enough to allow for filtering. Level spreaders and stormwater ponds are shown on the plans attached as **Exh. Pet.-IAJ-2**, Sheet C-119.

The design also reflects two modifications from standard STP design. First, although level spreaders are typically used for slopes of up to 5%, we have met with ANR and discussed the use of level spreaders for slopes of up to 15%. This alternative design avoids the need for more extensive STPs. Pursuant to VSWMM requirements, this approach requires post construction testing to demonstrate compliance with applicable standards. In my professional opinion, if any deficiencies are discovered in post-construction stormwater testing, those deficiencies would be very minor, such as lengthening selected level spreaders by up to 20%. In the unlikely event that more significant issues were identified, we would revert to the "conventional" STPs. The additional footprint associated with use of conventional STPs is identified in **Exh. Pet.-IAJ-2**. These conventional STPs meet all applicable requirements VSWMM and Section 248 requirements. **Exh. Pet.-IAJ-2** identifies the impact of replacing designed STP with conventional ones. Where a proposed STP could be replaced by conventional ones, its footprint is noted on the design plans (e.g. “STP replaced by LS 16 & 17” **Exh. Pet.-IAJ-2**, sheet C-107).

Second, in areas that are relatively distant from the receiving waters, and consist of shallow soil cover and steeper grades, the road bed will consist of “shot rock” consisting of 3”-6” stone. Shot rock disperses stormwater runoff to a greater extent than a soil based road cross section, by allowing stormwater to flow from above the road through a more permeable road base to the other side without the need for culverts. This reduces the number of culverts, and their associated level spreaders, required to route runoff from the uphill watershed past the access road. It is expect that this approach will be used for the upper portion of the access road, as well as the crane path, and the turbine pads.

15. Q. Please describe the proposed Erosion Prevention and Sediment Control Plan (“EPSC”) for the Project.

A. We will be collaborating with VHB Pioneer to design our improvements in a fashion that will facilitate adequate erosion prevention and sediment control during construction. The final EPSC plan will be incorporated into the Individual Discharge Permit for Stormwater Runoff from Construction Sites and will incorporate the EPSC design details and design features into the final design drawings. The primary physical erosion and sediment control measures employed on the site will include, where required, demarcation of Project limits, silt fence, stone lined swales, stone check dams, erosion control blanket, erosion control channel lining, fiber roll, temporary sedimentation basins, mechanical stabilization with stone, stabilized construction entrances, water bars, upslope diversion swales, and rip rap outlet protection.

16. Q. Please describe the proposed construction sequence.

A. The basic construction sequence will be as follows:

1) Access Road - Construction on the access road will commence at two locations: the intersection with Route 100 and the new maintenance building and collector substation area. The work from Route 100 will first consist of creating the new Project entrance on Route 100 and the staging area. The access road will then be extended into the site.

Construction of the access road at the second location (the new maintenance building and collector substation area) will proceed both uphill and downhill from the new substation area. This work will require access by construction equipment from Meek Road for the first weeks of the Project.

Clearing operations will proceed 1,000 to 2,000 feet in front of the earthmoving work. The initial erosion control work will follow behind the clearing work. The access road and the associated STPs will be stabilized as the work proceeds out from the starting points, by means of an erosion control blanket or stone.

2) Crane Path and Turbine Pads - The work on the crane path and turbine and crane pads will proceed in the same manner as the access road both north and south of the intersection of the access road and the crane path.

3) Foundations - Once access to each turbine pad area is complete,

final borings for foundation design will be completed. After the turbine pads are constructed to a rough grade, the concrete foundations and the connections to the underground electric transmission system will then be completed.

4) Turbine Installation - The turbine erection crane will be assembled at the north end of the Project. The wind turbine components will then be delivered to each turbine site, where cranes will assist with installation. Where possible, the components will be delivered on a "just in time" basis. This eliminates the need to unload and stage all of the components at a different area other than the turbine work pads of the Project site. It is anticipated that the turbine assembly work will proceed from the north end of the Project to the south end.

5) Electric Transmission and new substation - The work on the Substation and the electrical collector system will commence after the access road is complete, and will be timed to be completed at the same time the wind turbines become operational.

17. Q. Please describe the proposed blasting plan.

A. A significant portion of the Project will be built in areas with shallow depths to ledge. Blasting will be required in those areas to create the material necessary to build the access roads and crane paths. The final project blasting plan will be completed by the contractor after the appropriate geotechnical investigations and landowner notifications are complete. Further details are contained in the preliminary blasting plan, attached as **Exh. Pet.-IPC-4**.

18. Q. Will the civil works cause undue water pollution or unreasonable soil erosion?

A. Based on the analysis detailed in this testimony, it is my conclusion that the Project will not cause undue water pollution or unreasonable soil erosion.

19. Q. Does this conclude your testimony?

A. Yes.