**STATE OF CONNECTICUT**
**CONNECTICUT SITING COUNCIL**

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| **Petition of BNE Energy Inc. for a Declaratory Ruling for the Location, Construction and Operation of a 3.2 MW Wind Renewable Generating Project on New Haven Road in Prospect, Connecticut ("Wind Prospect")** | **Petition No. 980** |
| | **March 2, 2011** |

## SUPPLEMENTAL PRE-FILED TESTIMONY OF WILLIAM F. CARBONI

**Q22. You have previously filed testimony in this proceeding. Why are you submitting this supplemental testimony?**

A22. On the day my pre-filed testimony was due, I received information from the petitioner, BNE Energy Inc. ("BNE"), including several revised site plans, pre-filed testimony of some of its witnesses and interrogatory responses related to my pre-filed testimony. I am submitting this additional pre-filed testimony to provide the Council with a more complete analysis of the stormwater and erosion impact of the proposed project on the Site. I am also submitting this testimony to provide an analysis of the likelihood that the Site would be able to support a subdivision of 47 properties and to correct one typographical error in my pre-filed testimony.

**Q23. Have you reviewed the revised site plans submitted by BNE on February 16, 2011?**

A23. Yes, I have. The plans were apparently created by BNE and its consultants in late January in response to concerns of the water company that owns the reservoir abutting the Site.

**Q24. Has your opinion that this project fails to comply with water quality standards changed as a result of your review of the revised site plans?**

A24. No. The revised site plans make some changes that may minimally reduce the impact of some of the activities and plans for portions of the Site, but they suffer from many of the deficiencies and errors I noted in my pre-filed testimony. The plans still fail to comply with the water quality standards of the State.

**Q25. What concerns do you have about the revised site plans?**

A25. One area changed in the revised site plans was the blade assembly area for Turbine 2. The blade assembly area was moved uphill and the size of the assembly area was reduced. The width of the blade laydown area was reduced from 50 feet wide to 30 feet wide. I have not seen any information provided by the petitioner regarding the width of the blades, which will be 50 meters long; nor have I been able to find information on the width of these blades online. I question whether a width of 30 feet will be adequate to accommodate the blade and the equipment necessary for assembly, but without more information from the petitioner on the specifications of the blade and the nature of the necessary equipment, I cannot offer an opinion on that issue. Therefore, the plans are incomplete.

**Q26. Will the changes to the blade assembly area of Turbine 2 in the revised site plans protect Wetlands 3?**

A26. No. I note that the disturbance area along the north leg of the blade assembly area for Turbine 2 is still located only 7 feet away from the area referred to as Wetlands 3 in the plans. This is potentially a very significant problem given the level of accuracy of BNE's wetlands delineation.

In BNE's responses to interrogatories issued by Save Prospect, BNE stated that its wetlands methodology using GPS receivers and post-processing resulted in "an ultimate

expected horizontal accuracy of less than one meter." (BNE's Response to Question 73 of Save Prospect's Second Set of Interrogatories, dated Feb. 16, 2011.) That means that the best accuracy that can be expected using BNE's methodology is a little more than 3 feet. Depending on the tree canopy and location of the satellites when that information was gathered, the best accuracy would be that the wetlands flag falls somewhere within a 6.5-feet circle.

Given that level of accuracy, locating the blade assembly area only 7 feet away from Wetlands 3 makes it safe to assume that the row of hay bales added in an effort to reduce potential erosion and sedimentation will be in or at the edge of Wetlands 3.

I also note that the length of this assembly area for Turbine 2 is still not sufficient to assemble 50-meter blades. The end of the north leg of the assembly area is 23 feet below the remainder of the assembly area. If the assembly area is to conform with Note 2 on Sheet C-102 stating that the "[b]lade assembly area shall not have flatness deviation of more than six inches over the length of blades," a significant amount of fill will have to be deposited in this area. The base of that fill will extend into the adjacent Wetlands 3.

In response to an interrogatories issued by Save Prospect Corp about the lack of grading for the downslope blade at each blade assembly area, BNE stated that grading is not required because "[t]he construction method to be used will allow those blades to hang off the slope. The intent is to trim or remove trees as necessary to permit the blade to 'hang over' and be lifted into place." (BNE's Responses to Questions 81 and 87 of Save Prospect's Second Set of Interrogatories, dated Feb. 16, 2011.) BNE then goes on to say that "these are typical details that are finalized during the anticipated development and management phase of this proceeding." (BNE's Response to Question 87.)

Admittedly, I have never drafted site plans for the construction of a wind turbine project, but this "construction method" just does not seem possible. At the north turbine, Turbine 2, there is a 10-foot vertical drop located just 15 feet from the hub of the blades. A 50-meter (164 feet)

blade cannot be cantilevered from a point 15 feet from its end. The far end of the blade is 27 feet below the hub end of the blade. Those numbers comprise more than just "hanging over" the slope. BNE's interrogatory response indicates that the majority of the length of the blade will be 10 to 27 feet below the hub end of the blade. BNE's response also contradicts Note 2 on Sheet C-102 stating that the flatness deviation the length of the blade cannot exceed 6 inches. These are more than "typical details to be finalized" later, because if grading or fill is later required in these blade assembly areas, those activities will impact the wetlands on the site and will have consequences for BNE's stormwater and erosion control plans.

**Q27. Will the changes to the proximity of the temporary sediment basin at Turbine 2 in the revised site plans protect Wetlands 3?**

A27. In the revised site plans, the basins at Station 17+50 and 12+00 are moved. These relocations will to some minor extent lessen the impact on the wetlands, but moving the basin at Station 12+00 to Station 12+80 does not change my original testimony. BNE should explain why the entire location of Turbine 2, including the assembly area, cannot be moved about 200 feet to the northeast. That move would increase the distance between Wetlands 3 and Turbine 2, providing much more protection to Wetlands 3 than is provided by BNE's minor revisions.

**Q28. What other comments do you have about the new information provided by BNE regarding your slope stability concerns?**

A28. In my pre-filed testimony, I discussed BNE's extensive use of 1:1 slopes in these plans in the absence of slope protection, such as riprap, to provide the required slope stability. In my opinion, the extensive use of 1:1 slopes in this manner is atypical and does not comply with good engineering practices.

In two of BNE's interrogatory responses, BNE states that use of the 1:1 slopes was done "in an effort to reduce the construction footprint as much as possible" and states that the 1:1

slopes "will require more attention to slope stabilization during construction through the use of temporary seeding and erosion control blankets and other erosion control measures." BNE also states that the 1:1 slopes "will be utilized after geotechnical evaluations including soil analyses indicate it can be done with no increased risk, otherwise we will redesign at 1:2." (BNE's Responses to Questions 83 and 92 of Save Prospect's Second Set of Interrogatories, dated Feb. 16, 2011.) In his pre-filed testimony, Mr. Koning repeats these statements. (Pre-filed testimony of Thomas L. Koning, dated February 16, 2011, Question 6.) This reasoning is completely backwards.

In order to show compliance with Connecticut water quality standards and requirements, the normal engineering procedure is to grade the roads and other features to a stable condition. The 2002 Guidelines mandate that procedure, and further state:

> Exceptions: Slope limitations may be increased providing detailed soil mechanics analysis calculations are performed which confirm an acceptable safety factors for the finished slope.

(Guidelines, Chapter 5-2, Land Grading (emphasis added).) Therefore, under good engineering practices and under the requirements of the 2002 Guidelines, using steeper slopes should be considered as an alternative option only if subsequent in situ geotechnical testing shows that steeper slopes are possible. Unless and until in situ testing proves that steeper slopes are possible, the plans presented by BNE should be an alternative, not the proposed design. In my opinion, this is not something that should "be finalized in the anticipated development and management phase of this proceeding" – this is something that needs to be presented properly to allow for a realistic assessment of whether this project will ever comply with Connecticut's water quality standards.

If BNE has conducted any such detailed soil mechanics analysis, it has not reported the results. Therefore, the only soils data available is the Soil Survey, which reports that soils in the area of the Site have limitations for road construction. Stabilizing all of the 1:1 slopes proposed by

BNE will require more than temporary seeding and erosion control blankets; stabilization will most likely require riprap slopes with reverse benches, retaining walls, gabions or any of the measures suggested in the 2002 Guidelines stabilization structures matrix. Without conducting a detailed soil mechanics analysis and including stabilization structures in its plans now, BNE cannot prove that its plans meet the state's water quality standards.

**Q29. Do you have additional testimony regarding the sedimentation facilities that will be required under the 2002 Erosion Control Guidelines?**

A29. Yes. Since my pre-filed testimony was submitted, I have done additional analysis of the drainage areas to each of the four temporary discharge points shown in the plans to determine the sedimentation facilities that will be needed at each discharge point.

The four temporary discharge points are located on the downhill side of the road at Stations 7+65, 12+00, 17+37 and 18+00. (See Sheets C-301, C-302, C-303, C-305, C-306, C-307.) The 2002 Erosion Control Guidelines requires temporary sediment basins for drainage areas larger than 5 acres. Temporary sediment traps are permitted for drainage areas of 1 to 5 acres.

Section 5-11 of the 2002 Erosion Control Guidelines provides the criteria for determining the volume of temporary sediment basin for drainage areas more than 5 acres. Under the Guidelines, the volume is the sum of the sediment storage and residence storage. These volumes are based on the area tributary to the basin, the erosion rates and the peak runoff rate and volume during a 10-year storm.

I calculated the peak runoff rates and volumes using a HydroCad analysis that relied on the BNE mapping, which is based on LIDAR data. According to research done by Michael Klein (who has submitted testimony in this proceeding), LIDAR data is of questionable accuracy and was never intended to be used for engineering design. Although I believe that BNE has significantly understated the estimated amount of disturbance, I used BNE's disturbance assumptions for this study. The subcatchment areas have been modified to correspond to each

discharge point. The Time of Concentration values are based on the sheet flow-shallow flow methodology in order to correctly represent the site conditions. (As I discussed in my response to Question 17 in my pre-filed testimony, BNE used a lag/CN methodology, rather than a sheet flow-shallow flow methodology, to calculate the Time of Concentration and represent flow conditions on the Site. BNE's methodology does not take into account the change in land use in critical portions of the drainage area.)

Section 5-11 of the Guidelines also provides the methodology for determining the volume of temporary sediment traps where appropriate (i.e., drainage areas less than 5 acres). The following table shows the storage volume required by the Guidelines for each of the discharge points, compared to the storage volume BNE provides in its plans.

**Table 3. Storage volume required by the Guidelines vs. provided in BNE's plans**

| Discharge Point | Tributary area (acres) | Type of facility | Disturbed area (acres) | Required Storage Volume (cubic yards) | Provided Storage Volume (cubic yards) |
|---|---|---|---|---|---|
| 7+65 | 1.92 | Trap | N/A | 257 | none |
| 12+00 | 5.81 | Basin | 4.02 | 1229 | 81 |
| 17+37 | 6.01 | Basin | 0.52 | 936 | 88 |
| 18+00 | 4.34 | Trap | N/A | 582 | none |

N/A = Not applicable. The 2002 Erosion Control Guidelines criteria is based on total tributary area only.

The results of my analysis show that BNE's plans fail to comply with the Guidelines. For the discharge points at Stations 7+65 and 18+00, the Guidelines require temporary sediment traps. There are no sedimentation facilities proposed at all. For the discharge points at Stations 12+00 and 17+37, temporary sediment basins are required. The facilities provided in the plans are grossly undersized. The volume of both sedimentation basins is less than 10 percent of the amount necessary to protect the downstream wetlands and drinking water reservoir.

Therefore, even using BNE's mapping, which I am told is of questionable accuracy, and BNE's disturbance estimate, which is based on extensive use of 1:1 slopes in violation of good engineering practice, these plans fail to comply with the Guidelines, and accordingly fail to comply with Connecticut water quality standards. If accurate disturbance estimates based on the good engineering practice of using 2:1 slopes was used in these calculations, even larger sedimentation facilities would be needed. In my opinion, using those accurate disturbance estimates might show that this Site cannot support this project, or at a minimum would required a significant redesign of the entire project site.

**Q30. Do you have anything else to say about sedimentation facilities?**

A30. Yes. In the Erosion and Sediment Control Plan submitted as Exhibit H to BNE's petition, Appendix C contains calculations and notes about sedimentation facilities. In those notes, Zapata's engineer wrote, under the heading "Sediment Trap":

> The installation of sediment basin is not practicle [sic] given site conditions. Although project is large the disturbed area will be limited and includes roadway structures. Device will utilize sediment trap configuration but will be oversized.

(Petition No. 980, Ex. H, App'x C, page C-2.) The Zapata statement may be an accurate evaluation of the Site's ability to accommodate the project. If the site conditions cannot support the sediment erosion control measures required by the Guidelines to protect the water quality of the State, then the Site cannot support the project. If the Guidelines require sediment basins, using sediment traps is not acceptable. Moreover, the statement that these plans will use "oversized" sedimentation facilities is not true in the plans' current form, as demonstrated by the numbers in my chart above.

Although BNE claims that it will use sediment traps rather than sediment basins (which does not comply with the Guidelines), the Zapata calculations in Appendix C are for temporary sediment basins, not the sediment traps specified. The calculations are also incomplete because they only calculate sediment storage in basins. Based on my study, sediment storage volume is less

than 5 percent of the total storage required in a temporary sediment basin. The larger portion of the volume in a basin is the residence storage volume, which is not included in Zapata's calculations.

Based on the less stringent criteria of temporary sediment traps which were actually specified, the required volume for the facility at Station 12+00 would be 778 cubic feet and at Station 17+37 would be 805 cubic feet. These values are based on Section 5-11 of the Guidelines, which states that the minimum storage volume is 134 cubic yards per acre of drainage area. The project proposes sediment facilities at only two of the four discharge points. The sediment facilities proposed do not meet the criteria for temporary sediment traps, which are only permissible for smaller drainage areas.

**Q31. Do you have any other comments about information provided by BNE in its February 16, 2011 responses to interrogatories?**

A31. Yes. BNE was asked, in Question 89 of those interrogatories, why the temporary sediment basins do not conform to the height, width and slope requirements of the Erosion Control Manual. BNE responded: "This project uses temporary sediment traps as per drawing C-503. References to basins on other sheets are typographical errors and will be corrected." As discussed above, the sediment facilities should be basins, not traps. However, BNE's plans to not demonstrate that even a trap conforming to the Erosion Control Manual could be constructed at Station 17+37 without the toe of slope extending into the wetlands. At Station 7+65, a conforming trap would extend into the adjoining property.

BNE was also asked, in Question 90, how its plans prevent stormwater from reconcentrating and causing erosion and sedimentation into wetlands downgradient of the two sediment basins. BNE responded: "The temporary sediment trap apron acts as a level spreader to prevent concentration that would cause erosion and sedimentation into wetlands down gradient of the two temporary sediment traps." Temporary sediment trap aprons cannot act as a level spreader when they are at a 1:1 slope. According to Section 5-10 of the Erosion Control

Guidelines, "The grade of the channel for the last 20 feet of the dike or diversion entering the level spreader shall be no steeper than 1%. The grade of the level spreader shall be 0.0%."

The discharge points at Stations 7+65 and at 18+00 have neither a sediment trap nor a level spreader. It does not appear that a trap and level spreader conforming to the Erosion Control Manual standards could be constructed at Station 7+65 without extending onto the adjoining property. Also, at discharge point Station 17+37, the grading for a level spreader after the temporary sediment basin would extent into the wetlands.

**Q32. What typographical error in your original pre-filed testimony would you like to correct?**

A32. On page 15 of my testimony, in the second-to-last sentence of the first paragraph, the text reads "However, the restored meadow would have a CN value of 58, which is higher than 65 for woods and would contribute to an increase in the rate of runoff." That should read "higher than 55 for woods."

**Q33. Do you have additional testimony to offer?**

A33. Yes, I have some comments about the pre-filed testimony submitted by Joel Rinebold on behalf of BNE. Specifically, I have an opinion about the accuracy of his assumption that the Site would support 47 residences if subdivided.

**Q34. What experience do you have with subdivisions?**

A34. I have personally been involved in the preparation of several hundred subdivisions and site plans in towns throughout Connecticut and California. I have worked on the preparation and evaluation of development plans since 1973. These plans have been for both residential and industrial subdivisions. These subdivision and site plans have involved the construction of many miles of roads. In addition, I prepared the highway plans when I worked for the California Division of Highways.

**Q35. Do you have experience with subdivisions in Prospect?**

A35. No, but I have reviewed Prospect's zoning regulations, zoning map, subdivision regulations and inland wetland regulations. They are largely similar to regulations that exist in towns across the state. Based on that review and my experience with subdivision development, I can comment on the likelihood that this Site could support a subdivision of 47 residences.

**Q36. What is your opinion of Mr. Rinebold's economic analysis?**

A36. Mr. Rinebold's economic analysis compares the proposed project to single-family residential use of the Site, and his analysis is based on the assumption that the Site could support 47 lots. That assumption appears to ignore many of the regulatory requirements and conditions present on the Site that will limit development of the Site as a residential subdivision. Development of the Site will be limited by regulations regarding the minimum lot size, the minimum rear lot size, the minimum buildable area, the open space requirement, lot frontage and maximum road grades.

The zoning regulations requires each lot contain a minimum buildable area. This presents significant difficulties for residential development of the Site. The minimum buildable area is a contiguous area containing at least 18,000 square feet and bounded by four sides with no side less than 100 feet in length. No wetlands, watercourses, or water bodies shall be present within the minimum buildable area. No more than 25 percent of the minimum buildable area shall contain slopes in excess of 25 percent. The maximum road grade of 10 percent will also present difficulties, because a large portion of the Site, excluding the wetlands areas and the meadow, has slopes of more than 20 percent.

**Q37. Will the Site support a subdivision into 47 lots?**

A37. No. Based on a preliminary review of the Site plans and my review of Prospect's zoning and subdivision regulations, my opinion is that the actual number of lots feasible for the

site is closer to 22 to 25. That opinion assumes that receiving soils for the septic system are available. According to the SCS Soil Survey, the soils on the Site likely have severe limitations to the proper functioning of septic tank adsorption fields. Soil testing on Site might reveal that it would support even fewer than 22 to 25 lots.

**Q38. Do you have any other comments about Mr. Rinebold's analysis?**

A38. I would like to note that it is well known that residential land uses rarely are able to pay for themselves, so conducting an analysis comparing the proposed project to a residential subdivision was guaranteed to show a drain on Prospect's finances. In my opinion, a complete analysis should have compared Wind Prospect to other uses allowed on the Site under its present zoning. As presently zoned, uses of the Site could include convalescent homes, day care home, funeral homes, green houses, nurseries or nursery schools. An economic analysis of those uses of the Site may well result in an economic benefit to Prospect.

The statements above are true and accurate to the best of my knowledge.

March 2, 2011
Date

William F. Carboni
William F. Carboni, P.E., No. 22722

## CERTIFICATION

I hereby certify that a copy of the foregoing document was delivered by first-class mail and e-mail to the following service list on the 2nd day of March, 2011:

Carrie L. Larson
Paul Corey
Jeffrey J. Tinley
Hon. Robert J. Chatfield
Thomas J. Donohue, Jr.
Eric Bibler
Andrew W. Lord
Cindy Gaudino

and sent via e-mail only to:

John R. Morissette
Christopher R. Bernard
Joaquina Borges King

Emily Gianquinto