**STATE OF VERMONT**
**PUBLIC UTILITY COMMISSION**

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| Petition of Chelsea Solar LLC, pursuant to 30 V.S.A. § 248, for a certificate of public good authorizing the installation and operation of the "Chelsea Solar Project," a 2.0 MW solar electric generation facility located off Willow Road in Bennington, Vermont | ) | Docket No. 17-5024-PET |

# REBUTTAL TESTIMONY OF SCOTT REYNOLDS ON BEHALF OF PETITIONER

August 10, 2018

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| Exhibit CS-SR-3 | Visualization of Re-attachment Area |

**Q1. Please state your name, occupation, and business address.**

A1. My name is Scott Reynolds. I am Senior Engineer and Manager of the Computer Aided Engineering Solutions group at M/E Engineering, PC. My business address is 441 South Salina Street, Syracuse, NY 13202, with our home office at 150 North Chestnut Street, Rochester, NY 14604.

**Q2. What is the purpose of your testimony?**

A2. This supplemental testimony provides information in response to certain claims that have been made in the recent testimony filed by Libby Harris ("Harris"), Lora Block ("Block"), and David Raphael ("Raphael") in this docket.

**Q3. Please summarize the conclusions of your original testimony and exhibits in this docket.**

A3. My original testimony and report (***Exhibit CS-SR-2***) in this docket evaluates the question of whether or not the proposed removal of trees for the Project will result in a perceptible increase in wind speeds experienced at the residences in the Apple Hill Neighborhood. By applying the well-established scientific technical concept of "wind re-attachment" and also by evaluating the site with a computational fluid dynamics model, I concluded that the existing trees on the Project Site are not currently providing a wind attenuating benefit to the residences in the Apple Hill Neighborhood; therefore, the removal of those trees will not result in perceptibly increased wind speeds in the Apple Hill Neighborhood.

**Q4. What claims were made by Harris?**

A4. Harris addresses the topic of wind speeds in her answer to Question 14 of her June 22, 2018 prefiled testimony in this docket (page 6). Harris claims that the proposed removal of trees (9.64 acres) for the Project will "unduly adversely increase the wind velocity hitting our homes." Harris also claims that wind in the area of her home "often comes from the south west with wind velocities of over 50 miles an hour." Harris offers no evidence or qualified analysis to support these claims.

**Q5. Will the proposed removal of trees for the Project unduly adversely increase the wind velocity hitting the homes in the Apple Hill Neighborhood?**

A5. No. My analysis concludes that any potential for changes in wind speeds following Project construction would border on the limit of perceptibility at Harris' home (or less) and would be nonexistent for all other homes in the Apple Hill Neighborhood; therefore, I believe it would be accurate to state that the Project will not result in adverse or unduly adverse increases in wind speed.

**Q6. Does wind in the area of Harris' home often come from the south west with wind velocities of over 50 miles an hour?**

A6. No. For my analysis of this scenario, I reviewed 20 years of recorded wind data from the nearby Bennington airport, which is only 2.6 miles away from Harris' home; this is a short distance in terms of atmospheric modeling and data collection. The airport and Harris' home are also located at similar elevations, approximately 800 feet above sea level. The airport data set provides an accurate representation of the wind conditions that would have been experienced at Harris'

home. Over the previous 20 years in this location, wind approached from a southwesterly direction about 18% of the time, and it *never* reached a sustained speed exceeding 50 mph. Wind gusts above 50 mph lasting less than 2 minutes (from any direction) occurred approximately 112 minutes per year, or 0.02% of the time. Wind speeds from the southwest exceeding 50 mph are quite uncommon and do not occur "often."

**Q7. What claims were made by Block?**

A7. Block addresses the topic of wind speeds in her answer to Question 11 of her June 22, 2018 prefiled testimony in this docket (page 4). Block claims that the proposed removal of trees (9.64 acres) for the Project will "increase the wind noise and wind damage to many neighborhood homes." Block also claims that my original testimony and report in this docket are "partial and faulty" and "inadequate" due to my use of a 25-mph wind speed in the computational fluid dynamics ("CFD") model I performed as well as my use of the wind speed data set from the Bennington airport. Block offers no evidence or qualified analysis to support these claims.

**Q8. Will the proposed removal of trees for the Project increase the wind noise and wind damage to many neighborhood homes?**

A8. No. Please refer to my answer to Question 5, above. In addition to that, I would state that my analysis clearly demonstrated that Ms. Harris' home was the only home in the Apple Hill Neighborhood that showed any potential for an insignificant and likely imperceptible increase in wind speeds per the CFD model that I performed. No other homes in the Apple Hill Neighborhood would possibly experience any effects due to their distance from the Project Site as well as the

existing vegetation throughout the neighborhood (Harris' home is the only home in the area with a large clear-cut yard facing the Project Site).

**Q9. Is your analysis inadequate due to your use of a 25-mph wind speed in the computational fluid dynamics model?**

A9. No. The CFD model in my analysis is used as an illustration, an example to demonstrate the insignificant changes in wind behavior, if any, that would be experienced at Harris' home following Project construction. I do not purport to have evaluated each and every possible combination of wind speed and direction in the CFD model, nor would it be reasonable to do so. I explained my choice of a 25-mph wind from a direction of 215 degrees in my original report, and I maintain that this was a reasonable choice of values for the CFD example. Block's testimony specifically takes issue with my choice of a 25-mph wind speed for the CFD model, and she claims that my analysis did not consider wind speeds greater than 25-mph, which is incorrect. The CFD model in my original report uses a 25-mph wind speed as an illustrative example, but the conclusions of my analysis are valid for any wind speed; that the trees on the Project Site do not provide any significant attenuation of wind speeds for homes in the Apple Hill neighborhood, and that is true for 10-mph wind, 25-mph wind, 50-mph wind, or any other possible wind speed. Furthermore, the wind speed data set from the nearby Bennington airport that I utilized for my analysis indicates that cases of sustained wind speed exceeding 25-mph for longer than 2 minutes (from any direction) only occur in the area about 15 hours per year on average over the past 20 years, meaning that the wind speed used in my CFD example (25-mph) exceeds the sustained conditions experienced in the area for more than 99% of an average year. Additionally, wind gusts

(defined as events lasting less than 2 minutes in duration) in the area only exceeded 25-mph (from any direction) about 16 hours per year on average over the past 20 years, or less than 0.2% of an average year. I maintain that 25-mph is a reasonable and adequate choice for the illustrative CFD model in my analysis. I also maintain that wind events in the area exceeding 25-mph are uncommon and would not be accurately described as "routine."

**Q10. Is your analysis faulty and inadequate due to your use of a wind data set from the Bennington Airport?**

A10. No. The Bennington airport (William H Morse State Airport) is located only 2.6 miles away from Harris' home and at a similar elevation (approximately 800 feet). The data set from the Bennington airport is a high-quality wind speed and direction data set covering 20 years (December 30, 1998 to December 15, 2017) and comprised of over 192,700 wind speed and direction data points. It is completely appropriate for me to use this data set to evaluate expected wind behavior at Harris' property as it is the most robust and proximal data set available. I do not believe a data set generated directly at the location of Harris' property would have led me to different conclusions, and I do not believe the effort and resources required to collect a similar data set directly from Harris' property would have been reasonable in this case.

**Q11. What claims were made by Raphael?**

A11. Raphael mentions the topic of wind speeds in his Aesthetics and Orderly Development Report (***Exhibit PSD-DR-2***) on page 25. Raphael claims that the proposed removal of trees for the Project will result in the potential "increase of southerly and westerly winds" for some

(unidentified) "individuals living in the project vicinity." Raphael offers no evidence or qualified analysis to support these claims. Raphael's claims are similar to the unsupported claims made by Harris and Block, and I believe my responses to Harris and Block earlier in this rebuttal testimony also address Raphael's claims and demonstrate that Raphael's claims are unsupported.

**Q12. Are the trees on the Project Site providing a wind-attenuating benefit to any offsite area?**

A12. Yes, but that area sits within an adjacent parcel owned by an affiliate of the Petitioner (the 'orchard property,' as it has been referred to in this case). The boundaries of that area that receive some benefit does not extend so far as to include the home of Harris or any other home in the Apple Hill neighborhood. In my original testimony and report, I discuss the application of the "re-attachment" concept. Re-attachment is a widely industry-accepted principle which demonstrates that the typical wind-attenuating effect of trees on level ground will extend past the trailing edge of those trees a distance between 2 to 5 times the average height of the trees. This is the so-called re-attachment distance. Once past re-attachment distance, the prevailing wind has generally re-attained the speed at which it was traveling prior to encountering the trees, and the trees are no longer providing any meaningful wind-attenuating effect. A diagram that visualizes the application of re-attachment to the Project Site is included as ***Exhibit CS-SR-3***. This visualization assumes 50-foot tall trees on the Project Site (a conservative assumption) and a re-attachment multiplier of 5x (also conservative), which gives a re-attachment distance of 250 feet. The resulting re-attachment area for the trees that would be cleared for the Project is shown

in blue color on the visualization. The re-attachment area does not extend to Harris' home or any other home in the Apple Hill neighborhood, and the trees in question are not providing any significant wind-attenuating benefit to areas beyond the re-attachment area.

**Q13. For clarity, please restate the conclusions of your analysis.**

A13. I am a qualified expert in the field of air flow dynamics and my conclusions are as follows. 9.64 acres of trees are proposed to be removed for construction of the Project. These trees are not currently providing any significant wind attenuating benefit to the home of Libby Harris or any other home in the Apple Hill neighborhood. Removal of these trees will not result in a significant, adverse, or unduly adverse increase in wind speeds experienced at the home of Libby Harris or any other home in the Apple Hill neighborhood.

**Q14. Would the conclusions of your analysis change if the proposed adjacent Apple Hill Solar Project was also constructed?**

A14. No, because the trees that would be cleared for the Apple Hill Solar Project are even further away from the home of Libby Harris or any other home in the Apple Hill neighborhood than the trees that would be cleared for the Chelsea Solar Project.

**Q15. Does this conclude your testimony?**

A15. Yes.