STATE OF VERMONT
PUBLIC UTILITY COMMISSION

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

PREFILED DIRECT TESTIMONY OF IAN JEWKES ON BEHALF OF PETITIONER

November 27, 2017

EXHIBITS

Exhibit CS-IJ-1	Resume of Ian Jewkes
Exhibit CS-IJ-2	Project Site Plans
Exhibit CS-IJ-3	Stormwater Risk Assessment

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

A1. 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.

Q2. Please describe your educational background and work experience.

A2. I received a B.S. in Civil Engineering from the University of Vermont in 1984. In 1984, I joined Krebs and Lansing Consulting Engineers, Inc. ("K&L") During this time, my position progressed from junior engineer and surveyor to senior engineer and surveyor. In 2002, I became an owner of K&L. 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 control measures. A copy of my resume is included as ***Exhibit CS-IJ-1***.

Q3. Have you previously testified before the Public Utility Commission or in other judicial or administrative proceedings?

A3. Yes. I have testified on several projects before the Public Utility Commission. Some of these projects include the Battle Creek 1 Solar Project (PUC Docket No. 17-3727-PET), Otter Creek 1 and 2 Solar Projects (PUC Docket Nos. 8797 and 8798), the Kingdom Community Wind Project (PUC Docket No. 7628), the CRL Solar LLC 2.2 MW solar project (PUC Docket No.

7822), the ERWR Whitcomb Farm Solar LLC 2.2 MW solar project (PUC Docket No. 8076), and the St. Albans Solar Farm 2.2 MW solar project (PUC Docket No. 7871).

Q4. What is the purpose of your testimony?

A4. My testimony introduces the site plan and civil engineering details for Chelsea Solar LLC's (the "Petitioner") Petition for a Certificate of Public Good ("CPG") to authorize the installation and operation of the Chelsea Solar Project (the "Project"), a 2.0 MW photovoltaic electric generation facility located in Bennington, Vermont. In addition to that introduction, my testimony specifically describes the proposed array design for the Project, addresses the civil engineering details, and provides an assessment of the Project's potential impacts on the following statutory criteria: air and water purity (30 V.S.A. § 248(b)(5)), soil erosion (10 V.S.A. § 6086(a)(4)), primary agricultural soils (10 V.S.A. § 6086(a)(9)(B)), waste disposal (10 V.S.A. § 6086(4)), and water conservation (10 V.S.A § 60860(a)(1)(C)).

Q5. What work have you conducted with respect to the Project?

A5. We have worked with the Petitioner to develop the site plan and civil engineering details. We have used information provided by the design team (engineering, electrical, environmental, etc.) and from our own surveying to assemble the final Project design. We have completed the erosion prevention and sediment control design and details necessary for the construction of the Project.

Q6. Please describe the general design of the Project and the Project site plan.

A6. The Project is located north of Willow Road, east of Route 7, and southwest of Apple Hill Road in Bennington, Vermont. The southern boundary of the Project array is approximately 760 feet northwest of Willow Road. The proposed site is currently predominately wooded, gently sloping down to the southwest at an average slope around 8%. The overall design of the Project footprint is detailed in the included ***Exhibit CS-IJ-2***. The grid interconnection point is located along the south portion of the Project array footprint. The interconnection area will be connected to a Green Mountain Power ("GMP") overhead three-phase circuit along Willow Road. The Project entrance will be off of Willow Road where it comes to an end at the southern boundary of the Project property. A new, approximately 1,180-foot long private gravel access driveway extends north and west from this point. A Project equipment skid is located at the north end of the access driveway. The Project equipment skid is comprised of switchgear equipment, inverters, and a medium voltage transformer mounted on a pre-manufactured steel base floor. A specification drawing of a typical equipment skid is shown on Sheet 102 of ***Exhibit CS-IJ-2***. A number (estimated 25) of DC string combiner boxes will be installed in locations spread throughout the center of the solar array footprint. As shown in ***Exhibit CS-IJ-2***, the Project solar array consists of thousands of crystalline photovoltaic solar modules over approximately 5.5 acres of the 27.3-acre parcel. Rows of modules will run east-west and are oriented due south and fixed at a tilt angle of 15 degrees. Racking systems will be approximately 2.0 to 3.5 feet tall on the low side and 6.5 to 7.5 feet tall on the high side. The racking systems will be installed to driven steel posts or screw-in foundation systems, generally without the use of concrete. The Petitioner may need to pour in place sub-surface concrete anchors (such as "Sonotubes") for some racking

foundation posts. These will only be for areas where underground rocks are encountered or pull testing fails. Our experience is that the total will likely be 1% to 3% of the total foundation posts. A specification drawing of a typical foundation and racking system is shown on Sheet 102 of ***Exhibit CS-IJ-2*** in the detail labeled "Typical Solar Array Cross Section." The distance between the arrays is approximately 7.6 feet. The total acreage surrounded by the Project's perimeter fence is 7.1 acres.

Q7. Please describe the site clearing work required for the Project.

A7. The Project array, driveway, and interconnection point areas are currently covered by existing invasive species and tree vegetation. Approximately 9.64 acres of existing vegetation will be cleared prior to Project construction. There are existing delineated Class II wetlands and 50-foot wetland buffers south west of the access driveway and Project array location. All of the areas that will be cleared are outside of any Class II wetland or associated wetland buffer. Clearing will consist of cutting all trees, brush, and shrubs within the designated areas. The portion of the cleared area that would be utilized for the Project is illustrated on Sheet 104 of ***Exhibit CS-IJ-2***. Materials accumulated from clearing will be ground on site and used for erosion prevention and sediment control on site and/or removed from the site to an appropriate local disposal/recycling facility. Grubbing of the entire site is not planned; rather, stumps will be cut flush with existing grade and left in place. If stumps interfere with Project installation or site grading in specific location, they will be ground in place or removed and disposed of in an approved stump dump off-site. No on-site stump dump is proposed.

Q8. Please describe the civil earthwork proposed for the Project.

A8. There are three main activities involving earthwork on the Project; the main private gravel access driveway, site grading in the southeastern portion of the array field, and preparation of the equipment pad and main conduit trench areas. The main access driveway will be approximately 1,180 feet long and 14 feet wide with a 50-foot long hammerhead turnaround. See ***Exhibit CS-IJ-2*** for actual location and detail of the access driveway. The Project will also grade a portion of the site in the southeastern area of the Project array footprint. This proposed grading will involve an area of approximately 1.78 acres and will be done to create a more consistent slope that will support Project installation and Project operation. All grading activities planned onsite will total an area of 4.53 acres, which includes the array smoothing portion, equipment skid pad area, and access driveway.

Q9. What ground cover will be used underneath the solar module arrays and how will it be maintained?

A9. After completion of Project construction, the site will be seeded with a native grass seed mix. The Petitioner will work with a local landscape architect to determine an appropriate seed mix once the site has been cleared and construction is nearing completion. Ultimately, the site ground cover will be a mixture of new grassy and the existing brushy vegetation. This ground cover will be periodically cut low with a brush hog or mower up to five times per year. Chipped tree material will also be spread as ground cover to assist with erosion control as mentioned in my earlier response to Question 7. This cutting will be performed to keep the ground cover vegetation

from growing tall enough to cast shade on the solar modules and also to keep a well-maintained appearance at the Project site.

Q10. How much impervious area will be added by the Project?

A10. The total impervious area added for this project is 0.41 acres (~18,000 square feet). The majority of this area is the proposed access driveway having a surface area of 0.38 acres (~16,500 square feet). The remainder is the footprint of the Project equipment skid and interconnection equipment areas. These areas consist of the Project switchgear/transformer/inverter equipment and their secondary oil containment system located near the southern boundary of the Project.

Q11. Please explain any potential noise from Project construction.

A11. The noise generated by the Project construction will be of limited duration and will be similar to the noise generated by typical light construction equipment. The construction activities for this Project using motorized construction machinery will be limited to between the hours of 8:00 AM and 5:00 PM Monday through Friday. Non-machinery construction activities will be limited to between the hours of 7:00 AM and 6:00 PM Monday through Friday and 8:00 AM to 5:00 PM on Saturdays (although generally work on Saturdays is not anticipated). No construction activities will occur on Sundays or state/federal holidays.

Q12. Please describe the transformer oil containment proposed for the Project.

A12. The Project will have one pre-fabricated equipment skid. The equipment skid will house a 2,000 kVA medium voltage transformer. The transformer will use a non-petroleum

biodegradable cooling oil such as Envirotemp FR3. This fluid would biodegrade in the environment if accidentally spilled. Further protection against spill is provided by including secondary transformer oil containment in the design of the equipment skid. The base floor of the equipment skid will contain a hollow chamber with open grates surrounding the transformer and leading into the chamber. Spilled transformer oil would be captured and held by this chamber. The volume of the containment chamber will be based upon recommendations from the Vermont Agency of Natural Resources ("ANR") and will be sized to hold 110% of the oil volume plus a 5-inch freeboard in the containment moat. The containment chamber will incorporate a petro-pipe valve that will allow rainwater and snow melt to freely pass to the ground while holding any oil that finds its way into the chamber. See Sheet 103 of ***Exhibit CS-IJ-2*** for an example drawing of an equipment skid that incorporates this type of secondary containment system.

Q13. Will the Project result in undue water or air pollution?

A13. No. The proposed secondary transformer oil containment system will protect the groundwater from the potential of contamination. The Project has no other components that have any potential for releasing harmful water or air pollutants.

Q14. Will the Project cause unreasonable soil erosion or reduction in the capacity of the land to hold water so that a dangerous or unhealthy condition may result?

A14. No. The implementation of the erosion prevention and sediment control measures consistent with the Vermont Standards & Specifications for Erosion Prevention and Sediment Control during construction and the establishment of vigorous permanent vegetative ground cover

will ensure that the Project's lands will retain the ability to hold water. The Project is designed in compliance with requirements of all applicable rules and regulations regarding erosion and stormwater control.

Q15. How is stormwater runoff managed in the Project design?

A15. A low proportion of the Project area (roughly 1.5%) will be made impervious. 0.41 acres of new impervious surface will be created within the 27.3 acre Project property. Stormwater runoff will be treated at the source by having it flow across the vegetated Project site. This will provide ample opportunity for vegetative uptake and for the sediment to filter out of the stormwater runoff while it flows slowly across the grass/brush surface of the array field. The stormwater runoff from the new gravel drive will be treated via flow over vegetated areas including grass lines swales.

Q16. Will the project result in increased off-site stormwater runoff compared to the current site conditions?

A16. No. The establishment of a vigorous permanent vegetative ground cover and the low proportion of impervious surface will ensure that no significant change in the stormwater runoff from this site occurs.

Q17. Will the Project require a construction stormwater permit?

A17. Yes. The Project will disturb approximately 6.44 acres of soil. The Appendix A Risk Evaluation for this site scores it as a "Moderate Risk" site. A copy of the Risk Evaluation form for the Project is included as ***Exhibit CS-IJ-3***. Therefore, it will need to be covered by a State of

Vermont General Permit for Stormwater Runoff from Construction Sites (3-9020). This will include a site specific Erosion and Sediment Control Plan that conforms to the Vermont Standards & Specifications for Erosion Prevention and Sediment Control. Given the fact that the unstabilized project area disturbed by the Project will be under 5 acres at a single time, it is unlikely that the ANR would request that an Individual State of Vermont Permit for Stormwater Runoff from Construction Sites be pursued in lieu of the General Permit. The Petitioner will obtain the appropriate construction stormwater permit from ANR for the Project prior to beginning Project construction.

Q18. Will the Project require an operational stormwater permit?

A18. No. The 0.41 acres of impervious area proposed for the Project is well below the 1-acre operational permit threshold.

Q19. Please describe the grading plans for the Project.

A19. The site grading associated with this project is for the new access drive and a 1.78 portion of the site that will be "flattened out". The new access drive is approximately 1,180 feet long and 14 feet wide. The design for the road incorporates an upstream diversion ditch and several culverts. This will preserve the existing stormwater runoff flow. The portion of the site being flattened out involves cuts and fills generally ranging from a depth of 1 to 3 feet. The profile of this is shown on Section A-A on Sheet C-101 of ***Exhibit CS-IJ-2.*** The purpose of this earth work is to allow for reasonable access to the solar modules over a portion of the site with irregular grade changes.

Q20. Does the project impact any primary agricultural soils as defined by 10 V.S.A. § 6001(15)?

A20. Yes, but the impacts will not be adverse or unduly adverse. The primary agricultural soils mapped on the site area are shown on Sheet C105 of ***Exhibit CS-IJ-2***. A small portion (0.16 acres) of array field along the eastern edge is located on Stockbridge Loam soils, which are designated as "Prime" soils. While there is no array construction proposed within this area, there are plans to install standard fence posts and to cut the existing vegetation within this area (0.16 acres). No heavy vehicular travel, grading, or stump removal will occur during construction in the areas with the "Prime" agricultural soil. This is detailed on Sheet C105 of ***Exhibit CS-IJ-2***. The primary agricultural soils in this area will remain undisturbed through the life of the project. The proposed tree clearing and fence post installation activities in this 0.16 acre area will not result in any significant, adverse, or unduly adverse impacts to primary agricultural soils.

Q21. Will the proposed Project significantly interfere with or jeopardize the continuation of agricultural or forestry potential of the soils?

A21. No. The soils on a vast majority of the Project site will not be disturbed. There will be is approximately 6.44 acres of soil disturbance area planned for the site, which includes 4.53 acres of site grading activities. All topsoil excavated will be preserved and reused onsite.

Q22. Is there a plan to reclaim stockpiled agricultural soils following decommissioning of the Project?

A22. No. There is no need or plans to stockpile any primary agricultural soils associated with this Project.

Q23. Is mitigation for primary agricultural soils necessary for the Project?

A23. No.

Q24. Will the Project meet any applicable health and department of environmental conservation regulations regarding the disposal of any generated waste?

A24. Yes. Some solid (trash) waste will be generated during construction. All waste will be recycled or disposed of in accordance with all applicable health and environmental conservation regulations regarding the disposal of waste. Also, there will be no injection of waste materials or any harmful or toxic substances into the groundwater.

Q25. Has the design of the Project considered water conservation, incorporated multiple uses or recycling where technically and economically practical, utilized the best available technology for such applications, and provided for continued efficient operation of these systems?

A25. Yes. No water will be required for the construction of this Project other than that used for dust control. The only water required during the operation of the Project would be for occasional module surface cleaning, which would take place less than annually, on average.

Q26. Will the Project use an existing water supply and does the Project have sufficient water available for its reasonably foreseeable needs?

A26. No. The water required during construction for dust control would be imported to the site by a water tank truck. Water required for module surface cleaning would be imported to the site by small vehicles, pickup trucks, and 4-wheelers. Since the Project will not require any regular water use, it will not place any additional demand, strain, or burden on existing water supply in the Project vicinity. Therefore, the Project will not result in any undue adverse impact on existing water supplies.

Q27. Does this conclude your testimony?

A27. Yes, it does.