20 Church Street
20th Floor
Hartford, CT 06103
Telephone: 860-525-5065
Fax: 860-527-4198
www.lockelord.com

Kathryn E. Boucher
Direct Telephone: 860-541-7714
Direct Fax: 860-955-1145
kathryn.boucher@lockelord.com

December 7, 2018

Via Electronic Mail and First Class Mail
Melanie A. Bachman, Esq.
Acting Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

RE: ***Petition No. 1352*** – Nutmeg Solar, LLC, petition for a declaratory ruling, pursuant to Connecticut General Statutes §4-176 and §16-50k, for the proposed construction, maintenance and operation of a 19.6-megawatt AC solar photovoltaic electric generating facility on approximately 162 acres comprised of 9 separate parcels located generally south of Bailey Road and east of Route 191 (Broad Brook Road), and associated electrical interconnection to Eversource Energy's Scitico Substation at 20 Bailey Road in Enfield, Connecticut.

Dear Ms. Bachman:

On behalf of the petitioner, Nutmeg Solar, LLC, enclosed please find an original and 15 copies of responses to the Connecticut Siting Council's interrogatories CSC-1 through CSC-72 in connection with the above-referenced proceeding.

Please feel free to contact me or David Bogan of this office (860-541-7711) if you have any questions or require additional information.

Very truly yours,

Kathryn E. Boucher

cc: Service List

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STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

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Company:

Nutmeg Solar, LLC

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CSC-1 If the project is approved, identify all permits necessary for construction and operation. Which entity will hold the permit(s)?

Response:

The following permits will be required for the Project:

- CT Department of Energy and Environmental Protection, Registration in accordance with the Construction General Stormwater Permit
- CT Department of Transportation, Encroachment Permit (Construction Permit)
- Town of Enfield, Building Permit
- Town of Enfield, Electrical Permit

The permits will be obtained and held by Nutmeg Solar, LLC.

Additional necessary regulatory approvals include:

- CT Siting Council, Decision granting Petition for Declaratory Ruling
- CT Siting Council, Decision approving Development & Management Plan
- CT Public Utilities Regulatory Authority, Class I Certification

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CSC-2 What entity/subcontractor will be constructing the facility? Has this entity/ subcontractor constructed other solar projects 5 MW or greater in the Northeast? If so, list similar projects.

Response:

As is typical for this type of infrastructure project, an engineering, procurement, and construction (EPC) contractor has not yet been selected for this facility. An EPC will be selected pursuant to a competitive procurement process when the Project approaches actual construction. The selection process will evaluate many factors, including the bidders' experience successfully constructing solar photovoltaic projects of comparable size in the Northeast. The Petitioner, as a subsidiary of NextEra Energy Resources, LLC (NEER) has successfully constructed 2,035 MW of solar energy facilities across a diverse range of sites in North America and Spain. In addition, NEER is on target to complete construction of Coolidge Solar, a 19.6 MW AC solar photovoltaic facility located in Ludlow, Vermont by year's end. Through its ample experience in North America and recent experience in the Northeast, NEER has refined a rigorous EPC selection and management process that will screen for experienced, qualified firms capable of performing timely and responsible Project construction.

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CSC-3 Page 3 of the Petition notes that the proposed project was selected in DEEP's Small-Scale Clean Energy RFP. Was the proposed project also selected in the Tri-State RFP? If yes, when was a proposal submitted in response to the Tri-State RFP, and on what date was the project selected under the Tri-State RFP?

Response:

The proposed Project was also selected in the Tri-State RFP as Enfield Solar. The Tri-State RFP response was submitted on January 28, 2016 and was selected to proceed to contract negotiations on October 25, 2016.

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CSC-4 Per the power purchase agreements (PPAs), would the Petitioner sell both the electricity and renewable energy certificates (RECs) to The Connecticut Light and Power Company d/b/a Eversource Energy (Eversource) and The United Illuminating Company (UI)? On page 3 of the Petition, Nutmeg notes that 80.4 percent of the electricity will be sold to Eversource and 19.6 percent will be sold to UI. Is that based on energy (i.e. MWh) or capacity (i.e. MW) or both?

Response:

Public versions of the PPAs were filed in PURA Docket 17-01-11, *PURA Review of Public Act 15-107(b) Small-Scale Energy Resource Agreements*.

UI:
http://www.dpuc.state.ct.us/dockcurr.nsf/8e6fc37a54110e3e852576190052b64d/0b1a5ec020705c9d8525814b005f176c/$FILE/UI%20Exhibit%20C-15.pdf

Eversource:
http://www.dpuc.state.ct.us/dockcurr.nsf/8e6fc37a54110e3e852576190052b64d/499c0ebeb2ce08668525814b00670440/$FILE/Exhibit%20C-15%20Nutmeg%20Solar.pdf

Yes. Pursuant to the PPAs, the Petitioner would sell both electricity/energy and RECs ("Products") to Eversource and UI ("Buyers"). The percentage of the Products, including electricity, the Buyers are entitled is based on both MWh and MW in that it is tied to a Contract Maximum Amount (defined term in PPA) that is expressed in MWh per hour, which is functionally MW. For example, Eversource's Contract Maximum Amount is 15.751 MWh per hour, which is equal to 15.751 MW, which in turn is 80.4% of 19.6 MW.

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CSC-5 What are the lengths of the PPAs? Are there provisions for any extension of time in the PPAs? Is there an option to renew?

Response:

See CSC-4 for links to PPAs.

The Service Term (defined term in PPA) commences on the Commercial Operation Date (defined term in PPA) and continue for a period of twenty (20) years. There are no provisions to extend the service terms of the PPAs, nor is there an option to renew.

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CSC-6 At what alternating current (AC) megawatt (MW) output are the PPAs based on? Is the proposed AC MW of the facility fixed at a certain amount per the PPAs and/or either RFP? Is there an option within the PPAs to allow for changes in the total output of the facility based on unforeseen circumstances?

Response:

See CSC-4 for links to PPAs.

The PPAs are based on the Proposed Facility Size (defined term in PPA) of 19.60 MW AC.

The facility's capacity in MW AC is permitted to change under the PPAs and such changes are not tied explicitly to unforeseen circumstances. Regarding the ability to reduce the facility's capacity, the PPAs restrict such reductions to be up to, but no more than 2 MW AC less than the Proposed Facility Size as per Section 3.4(b). of the PPAs. Regarding the ability to increase the facility's capacity, the PPAs permit such increases under Section 3.3(c), but prevent the Buyers' energy and REC purchasing obligations from increasing by recalculating the Buyer's Percentage Entitlement (defined term in PPA) based on the Actual Facility Size (defined term in PPA based on the as built capacity of the facility as certified by an Independent Engineer).

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CSC-7 If the PPAs expire and are not renewed and the solar facility has not reached the end of its lifespan, will the Petitioner decommission the facility or seek other revenue mechanisms for the power produced by the facility?

Response:

The Petitioner plans for a thirty-year operational life of the solar facility. This presumes there will be an available market for energy and/or RECs or additional contracting opportunity at the end of the existing contract twenty-year term. At the end of either the contracted period or the additional operating period, as determined by the Petitioner, the solar facility will be decommissioned as specified in the Decommissioning Plan (Exhibit L).

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CSC-8 Would the petitioner participate in the ISO-NE Forward Capacity Auction? If yes, which auction(s) and capacity commitment period(s)?

Response:

Yes, the Petitioner plans to participate in the ISO-NE Forward Capacity Auction (FCA). The Petitioner has completed the show of interest and qualification determination processes as part of its participation in the ISO-NE FCA. The Petitioner plans to participate in FCA 13, scheduled for February 2019, for Capacity Commitment Period 2022-2023.

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Proposed Site

CSC-9 Page 6 of the Petition references "in June 2017, the DOA filed a notice in the Town of Enfield Land Records indicating other parcels owned by Jarmoc Farms are part of the Connecticut Farmland Preservation Program" and a map depicting the parcels is provided in Exhibit C.

a) Were the development rights acquired prior to June 2017, but a deed wasn't recorded until June 2017 or were the development rights acquired for these parcels in conjunction with project development consultations with DOA?
b) How many total acres are the other parcels for which the development rights were conveyed to DOA?
c) Do the other parcels contain Prime Farmland Soils?

Response:

The Petitioner has no knowledge regarding the development rights or the status of parcels that are unrelated to the development and operation of the Nutmeg Solar Project.

The information provided in the Petition was intended to demonstrate that the parcels comprising the Project site are not currently part of the Connecticut Farmland Preservation Program.

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CSC-10 Where is the nearest national, state-designated, and/or local historic area from the proposed site? Describe the visibility of the proposed project from the nearby historic area(s).

Response:

The nearest historic resources listed on the National Register of Historic Places are the Hazardville National Register Historic District (Enfield; listed in 1980) and the Somersville National Register Historic District (Somers; listed in 1995). The Hazardville Historic District is located approximately 0.9 miles from the western limit of the Project Site. The Somersville Historic District is located approximately 0.6 miles from the eastern limit of the Project Site.

The Historic Districts will not be directly impacted by the proposed solar facility. The region between the solar facility and both Historic Districts and the historic building consists of undulating topography, residential neighborhoods, and large stands of mature forest. The viewshed from each Historic District also will not be impacted by the proposed Project due to their distance from the Development Area, and because of the hilly and forested nature of the terrain.

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CSC-11 Page 6 of the Petition notes that the western portion of the project site is currently used for tobacco and gourd crops. Page 6 of the Environmental Site Conditions Report notes that about 70 acres is currently cleared and actively managed for agricultural operations. Is it used by the property owner, or is it leased to a third party?

Response:

To the Petitioner's knowledge, the 70 acres is currently farmed by the property owner.

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CSC-12 Page 31 of the Petition notes that approximately 1.27 acres of Statewide Important Farmland Soils and approximately 2.44 acres of Prime Farmland Soils would be disturbed by the proposed project. This is due to the "installation of site roads, equipment pads, and the collector substation." Does this also include post drilling, or would that be a negligible portion of the disturbed areas?

Response:

The amount of soil disturbance from post installation is a negligible portion of the total disturbed area. Mapped farmland soils (Prime Farmland and Statewide Important Farmland Soils) not disturbed for site road, equipment pad or collector substation installation will be maintained as meadow habitat throughout the life of the Project.

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CSC-13 Provide the distance, direction and address of the nearest off-site residence from the solar field perimeter fence.

Response:

The nearest off-site residence from the solar field perimeter fence is located at 59 Broad Brook Road (Map 102; Lot 47). The parcel is owned by Hazardville Property Management Co LLC, 137 Hazard Avenue, Enfield, CT 06082. The southeast property corner is 5.5 feet north of the perimeter fence.

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Energy Production

CSC-14 The proposed project is 19.6 megawatts (MW) alternating current (AC). Provide the MW DC of the proposed project. How many solar modules would be installed? According to the specifications sheet of the proposed solar modules, the wattage of each module ranges from about 345 W DC to 355 W DC. What is the estimated watts DC of a proposed solar module?

Response:

The proposed Project has a 32.14 MW DC capacity based on current solar module power rating assumptions. The Petitioner has not finalized module selection as the Project will leverage NextEra Energy's integrated supply chain module procurement process to cost-effectively procure modules utilizing the latest photovoltaic technology available.

The Petitioner is contemporaneously filing a revised Exhibit F that reflects best available technology (400 W DC modules). Attached hereto as Exhibit CSC-14 and provided as Revised Exhibit F is a specification sheet for the 400 watt module. Approximately 72,520 modules will be installed. The Petitioner has confirmed that the estimated average annual energy production of 37,000 megawatt-hours is based on the 400 W DC module assumption.

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CSC-15 Have electrical loss assumptions been factored in to the output of the facility? What is the output (MW AC) at the point of interconnection?

Response:

Electrical loss assumptions have been factored in to the output of the facility, such that the nameplate rating/output will be 19.6 MW AC at the point of interconnection (POI).

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CSC-16 Explain why a solar panel orientation to the south with an angle at 25 degrees above the horizontal was selected for this facility. Is the project designed to maximize annual energy production or peak load shaving?

Response:

While the Project will provide much of its generation during peak load hours, this facility has been designed to maximize annual energy production. Given the Project's latitude north of the equator, the optimized orientation for the panels is true south. Due to the Project's northern latitude, tilting the panels at 25 degrees above horizontal maximizes the ability to capture year-round solar irradiance even as the sun sits relatively low in the sky during the winter months. The 25-degree tilt also provides structural advantages in shedding snow accumulation as compared to a lower tilt configuration.

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CSC-17 What is the projected capacity factor (expressed as a percentage) for the proposed project?

Response:

The Project's net capacity factor is estimated to be 22.8% in the first year of operations, and an average of 21.3% over the Project's 30-year life.

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CSC-18 What is the efficiency of the photovoltaic module technology of the proposed project?

Response:

The Project's module efficiency is estimated to be 19.88% based on current module assumptions.

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CSC-19 Would the power output of the solar panels decline as the panels age? If so, estimate the percent per year.

Response:

Yes. The peak power output of the modules is estimated to degrade an average of 0.5% annually after the first year of operations.

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CSC-20 Is the project being designed to accommodate the potential for a future battery storage system? If so, please indicate the anticipated size of the system, where it may be located on the site, and the impact it may have on the PPAs.

Response:

A battery storage system is not contemplated in the Project design.

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CSC-21 Would the impact of soft shading, such as air pollution or hard shading, such as bird droppings or weather events, such as snow or ice accumulation, hail, dust, pollen, etc. reduce the energy production of the proposed project? If so, was this included in the proposed projects capacity factor? Would any of these expose the solar panels to damage?

Response:

The above mentioned factors, if present, would have a minimal effect on the Project's energy production. These minimal effects have been included in the modeling of the Project's estimated energy production and incorporated into the net capacity factor provided in response to CSC-17. Rainfall is anticipated to provide a natural means of removing dirt, dust, pollen, and other particles from module surfaces. Snow and ice accumulation on module surfaces typically melts away quickly once the modules produce an electric current and warm up during the day.

Solar photovoltaic modules are built to withstand constant exposure to natural conditions and are tested for snow, ice, and hail impacts. In the event hail or another object strikes a module surface and damages it, the module will not shatter due to protective tempered glass layered on top of the module's corrosion-resistant plastic ethylene-vinyl acetate (EVA) encapsulation – the resulting shatter-resistance is akin to a car windshield.[1] The Petitioner's operations and maintenance team will evaluate damaged modules and install replacements as needed.

[1] "Health and Safety Impacts of Solar Photovoltaics," N.C. State University, N.C. Clean Energy Technology Center, May 2017, https://content.ces.ncsu.edu/health-and-safety-impacts-of-solar-photovoltaics

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CSC-22 If applicable, what type of methods would be employed to clear the panels of the bird droppings, prey shells, ice accumulation, hail, dust or pollen and at what intervals?

Response:

It is not anticipated that manual module cleaning will be required due to natural cleaning from rainfall and snow/ice melt. In the event cleaning is required, the modules will be sprayed with low-pressure water (if above freezing temperatures) and remaining particles will be removed with a soft-bristled broom. No cleaning solvents or harmful chemicals will be used. *See* the O&M Plan provided in Exhibit H of the Petition for further details on module cleaning procedure.

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CSC-23 Could the project be designed to serve as a microgrid?

Response:

No. Current contractual obligations under the Project's power purchase agreements and terms of the Project's generator interconnection agreement do not contemplate operations as a microgrid. Moreover, microgrid functionality would require the Project to have an energy storage component, which is not included in the Project's design.

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CSC-24 Should one section of the solar array experience electrical problems such that the section shuts down, could other sections of the system still operate and transmit power to the grid?

Response:

Yes. For example, if a fault occurs at one of the Project's inverters causing it to shut down, all of the Project's generation feeding into other inverters will be able to continue normal operations. Likewise, if a fault occurs at the string or combiner box level, the other strings and combiner boxes feeding into the same inverter will not be affected.

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Site Components and Solar Equipment

CSC-25 Provide the following information regarding the Project solar panels:

a) What is the efficiency of the solar panels?
b) Will the panels be mounted in a portrait or landscape fashion?

Response:

a) *See* Response to CSC-18.
b) The modules will be mounted in a portrait fashion.

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CSC-26 Reference Figure 7 – Proposed Conditions. Roughly how many MW AC is the western array, and how many is the eastern array?

Response:

The western array is approximately 6.2 MW AC and the eastern array is approximately 13.4 MW AC.

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CSC-27 Provide the dimensions for the transformer and inverter pads.

Response:

Based on the current design, the electrical equipment pads as shown on the Site Plans in Exhibit G of the Petition, are 12.1 feet x 20 feet.

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CSC-28 Were string inverters considered for this project? If so, what factors led the current design of several large inverters rather than the use of string inverters?

Response:

String inverters were considered, but ultimately not selected because central inverters are more cost-effective for the design of this Project and can be more effectively operated and maintained by the Petitioner.

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CSC-29 What type of solar panel mounts are proposed? What is the design wind speed of the solar panel mount? How are the panels adhered to the mount? What prevents the solar panels from separating from either the racking or the foundation during high winds?

Response:

The current racking system proposed by the Petitioner is the RBI Ground-Mounted NextGen system. A specification for the racking system was provided in Exhibit F of the Petition. The final racking system is subject to change prior to construction.

The racking vendor uses snow loads and wind speeds from the International Building Code (IBC), with Connecticut amendments, to design the racking system for the Project. For this Project, the wind speed rating is 110 miles per hour (mph) and the snow loading is 35/30 pounds per square foot. The IBC considers all factors of safety, and RBI also doubles the pressures on lateral and multiplies them by 1.5 on the compression and uplift.

The panels are securely fastened to the rack using engineered clips and hardware designed to resist all applicable live and dead loads. The racking is fastened together and to the foundation using hardware also designed for all applicable loads.

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CSC-30 Would wiring for the solar panels be attached to the racking? If wiring is external, are there any concerns regarding damages related to weather, vegetation maintenance, animals?

Response:

Yes. The wiring is supported by the horizontal members of the racking. Plastic ties will be used to secure the cables to the racking.

In areas animals can reach, the wiring will be protected by conduit. Weather, vegetation maintenance, or animals are not anticipated to cause damage to the Project.

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CSC-31 Drawing C-042 depicts a 15-foot aisle width between the rows of solar panels. Would the aisle width be consistently 15 feet for the entire project?

Response:

Yes. The Project was designed using consistent spacing between rows (panel edge to panel edge) of 15 feet.

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Interconnection

CSC-32 If the proposed project is approved, does Nutmeg expect that Eversource would file a separate Petition for a Declaratory Ruling with the Council for the roughly 500-foot underground cable and equipment and modifications at the existing Scitico Substation (to accommodate the interconnection)?

Response:

If approved, the Petitioner expects that the equipment and modifications at the Scitico Substation necessary to accommodate the Project's interconnection would be considered as part of any Development and Management Plan ordered by the Council.

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CSC-33 Is the project listed on the October 2018 ISO-NE Regional System Plan Project List? If so, what is the project identification number? How does the projected in-service date compare with the Petitioner's proposed in-service date as noted on page 10 of the Petition?

Response:

Yes. The project identification number is 1764.

The projected in-service date listed (May 2019) does not reflect an extension of key milestone dates, including in-service date, accepted by ISO-NE in September 2018. The extension updated the Project's in-service date to May 1, 2020. The Petitioner is working with ISO-NE and Eversource Energy to further extend the in-service date to the fourth quarter of 2020, as stated in the Petition.

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CSC-34 Would any of the power produced be used on-site (identify use), or would it all be fed into the transmission system? If any of the power would be used on-site, estimate the total on-site load in kilowatts.

Response:

The only intended on-site use of generated power is to meet parasitic load associated with proper operations of the inverters, control systems, switchgear and collector substation. It is estimated that this consumption will not exceed 500 kilowatts. At night when the Project's generation is not available, power backfed from the transmission grid will be used to meet these needs. Since the equipment is not performing (i.e., generating energy) at night, night time load is estimated not to exceed 50 kilowatts.

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CSC-35 Would the 34.5-kV feeders that would connect to the Petitioner's on-site collector substation be underground? If the feeders would be overhead, estimate the pole height and the approximate number of poles required.

Response:

Yes. Nutmeg Solar is proposing to install underground 34.5-kV feeders from the centralized inverters to the low-side of the generator step up transformer in the collector substation.

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CSC-36 Page 7 says the proposed on-site collector substation would be impervious. Would it have a crushed stone base?

Response:

The on-site collector substation is proposed to be built on top of compacted soil topped with crushed stone. Concrete foundations will be installed to support the aboveground substation components.

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Public Safety

CSC-37 Would the solar facility have a protection system to shut the facility down in the event of a fault within the facility or isolate the facility during abnormal grid disturbances or during other power outage events?

Response:

As required by its generator interconnection agreement as well as ISO-NE operating documents and North American Reliability Corporation (NERC) Reliability Standards, the Project will be designed and constructed to include a comprehensive relay protection system. This system includes, but is not limited to: over and under voltage protection, over and under frequency protection, over current protection, and anti-islanding protection. The design and operation of the relay protection system will be coordinated with the interconnecting transmission owner (Eversource Energy) and ISO-NE to ensure safe and reliable operation, including in the event of abnormal grid disturbances or during other power outage events.

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CSC-38 Would the project comply with the National Electrical Code and the National Electrical Safety Code, as applicable?

Response:

Yes. Although the National Electric Code (NEC) is primarily meant for residential and commercial low-voltage applications (i.e., 480 volts and lower), the Project will comply with the NEC and National Electric Safety Code (NESC), as applicable.

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CSC-39 With regard to fencing noted on page 10 of the Petition:

a. Is it correct to say that only the perimeter fence would have the six inch wildlife gap at the bottom and the substation fence and agricultural fence would not?
b. Of the three fence types (perimeter, substation and agricultural), which would have anti-climb measures?

Response:

a. No. As noted on Sheet C-043 of the Permit Drawings in Exhibit G, both the perimeter fence and the agricultural fence are proposed to have a 6" wildlife gap. The substation fence does not feature a wildlife gap.
b. Only the substation fence and gate have anti-climb measures, which will consist of three strands of barbed wire.

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CSC-40 Referencing the Revised Acoustical Analysis under Tab Q of the Petition. The analysis takes into account 12 proposed inverters and the 34.5-kV/115-kV generator step-up transformer at the substation. However, page 8 of the Petition notes that up to 14 inverters would be installed and each would be paired with a medium-voltage transformer. Have the medium-voltage transformers been taken into account in the acoustical study, or would they not materially affect the results? As proposed, would there be 12 inverter/transformer pairs, with a possible maximum of 14? Explain.

Response:

The acoustic analysis performed by Tech Environmental was conducted assuming 12 inverter/transformer pairs. However, based on subsequent design iterations the Petitioner anticipates a maximum of 14 inverters/transformer pairs. Tech Environmental has confirmed that the two possible additional inverters do not materially change anticipated sound levels for nearby residences.

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CSC-41 Would sun reflection off of the panels create a glare effect at any abutting residences? If yes, what measures can be employed to reduce potential glare (ex. Solid fencing, landscaping)?

Response:

No direct or sky-reflected glare is anticipated to affect any abutting residences. Most commercially available PV panels, including ones proposed in this Project, have been designed to minimize glare. In order to limit reflection, solar PV panels are constructed of dark, light-absorbing materials and are finished with an anti-reflective coating. Glare from solar panels is evaluated as part of the Federal Aviation Administration's Technical Guidance for Evaluating Selected Solar Technologies on Airports (the FAA Guide).[2] The FAA Guide estimates that current panel technology and design results in as little as 2% of the incoming sunlight being reflected, depending on the angle of the sun. In comparison, the FAA Solar Guide indicates that snow has a reflectivity of 80%, white concrete has a reflectivity of about 76%, and wood shingles have a reflectivity of 14%.

[2] *See* https://www.faa.gov/airports/environmental/policy_guidance/media/airport-solar-guide-print.pdf

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CSC-42 Tab R of the Petition includes the "Project Extent Corner Locations Figure" and the FAA Determinations of No Hazard letters. How were for the four locations chosen for FAA review purposes?

Response:

The four locations generally reflect the four corners of the Development Area. This data is requested by FAA as part of the Determination of Hazard process.

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CSC-43 Would the proximity of any existing or proposed outbuildings, structures, relocated barns, etc. present a fire safety or other hazard (ex. Lightning strike)? Would the proximity of any existing or proposed outbuildings, structures, etc. present a hazard in relation to the electric generating equipment?

Response:

The Petitioner does not anticipate that existing or proposed outbuildings or structures will present a fire safety or other hazard. Regarding existing outbuildings in the development area, there are currently five barns as indicated on Figure 7 of Exhibit A in the Nutmeg Solar Petition. Three of these barns will be removed, and two will be relocated to the northwest boundary of the project.

All electrical equipment will be designed and constructed in accordance with NEC and the NESC, as applicable, and the Connecticut supplements as they apply to the Project. These provisions will include grounding, access and proximity to any existing, proposed or relocated structures associated with the Project.

Prior to commencing commercial operations, the Petitioner will develop a project-specific Emergency Preparedness Plan which standardizes procedure in the unlikely event of a fire or comparable event.

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CSC-44 With regard to emergency response:

a. In the event of a brush or electrical fire, how would the Petitioner mitigate potential electric hazards that could be encountered by emergency response personnel?
b. Page 20 of the Petition notes that, "All disconnect switches will be cleared marked for use in an emergency." Would first responders have access to the disconnect switches and the ability to shut the entire facility down in an emergency via the disconnect switches? Explain.

Response:

a. Properly installed and maintained solar energy facilities should not result in an increased risk of brush or electrical fire. However, in the unlikely event of a brush fire, a previously coordinated emergency response plan would be implemented.

As the Project is a ground-mounted solar facility, the safety concerns for first responders are different than those encountered on a roof-mounted solar array. On a building roof, it is critical to operate disconnect switches prior to entering the area for fire suppression, as there is the potential for electric contact/arc flash. Ground-mounted solar arrays typically route cables underground, reducing the risk posed to emergency personnel.

Emergency response personnel will have access to disconnect switches throughout the site to isolate an electrical fire, as is detailed further in Part B of this response. The Renewable Operations Control Center will communicate with emergency personnel and remotely shut down electrical equipment as needed.

In order to prevent the spread of unlikely fires, the Project also incorporates the following:

1. During construction clearing activities, woody debris and woody vegetation will be chipped or removed from the site;
2. Lack of a combustible fuel source at inverters, combiner boxes, and other major electrical equipment;
3. Routing of the majority of electrical wiring underground, both reducing risk of fire spreading and potential for electrical contact or arc flash hazards for emergency personnel;

4. Inverter skids and the site substation will be located on a gravel base that will impede vegetation growth;
5. A vegetation management plan aimed to promote low growing vegetation and discourage woody vegetation within and around the Project fence line will reduce the potential for fuel and spread in the unlikely event of a fire. Refer to the O&M Plan provided in Exhibit H of the Petition for vegetation maintenances practices.

b. The Petitioner will provide training to local first responders so that site access and emergency response procedures are well understood. The Petitioner has initiated coordination with the Hazardville Fire District, which strongly supports the Project and provided a letter of support to the Council highlighting "*the company's [NextEra Energy Resources] commitment to safety, and to working with the communities that host its projects.*"

First responders will have access to the Project via a Knox Box Rapid Access System. Disconnect switches will be installed at ground level and be operable by anyone with access to the facility. These disconnect switches will isolate a single combiner box worth of direct current power. First responders will not have the ability to shut down the entire facility, which is consistent with industry best practices. The ability to isolate the entire facility will be controlled remotely by the Renewable Operations Control Center, as well as the site's comprehensive relay protection system designed to automatically trip equipment off line under abnormal or malfunctioning electrical conditions.

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Environmental

CSC-45 Using the EPA Greenhouse Gas Equivalencies Calculator, please provide an EPA Greenhouse Gas Equivalency Analysis for the proposed project. https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

Response:

See Exhibit CSC-45.

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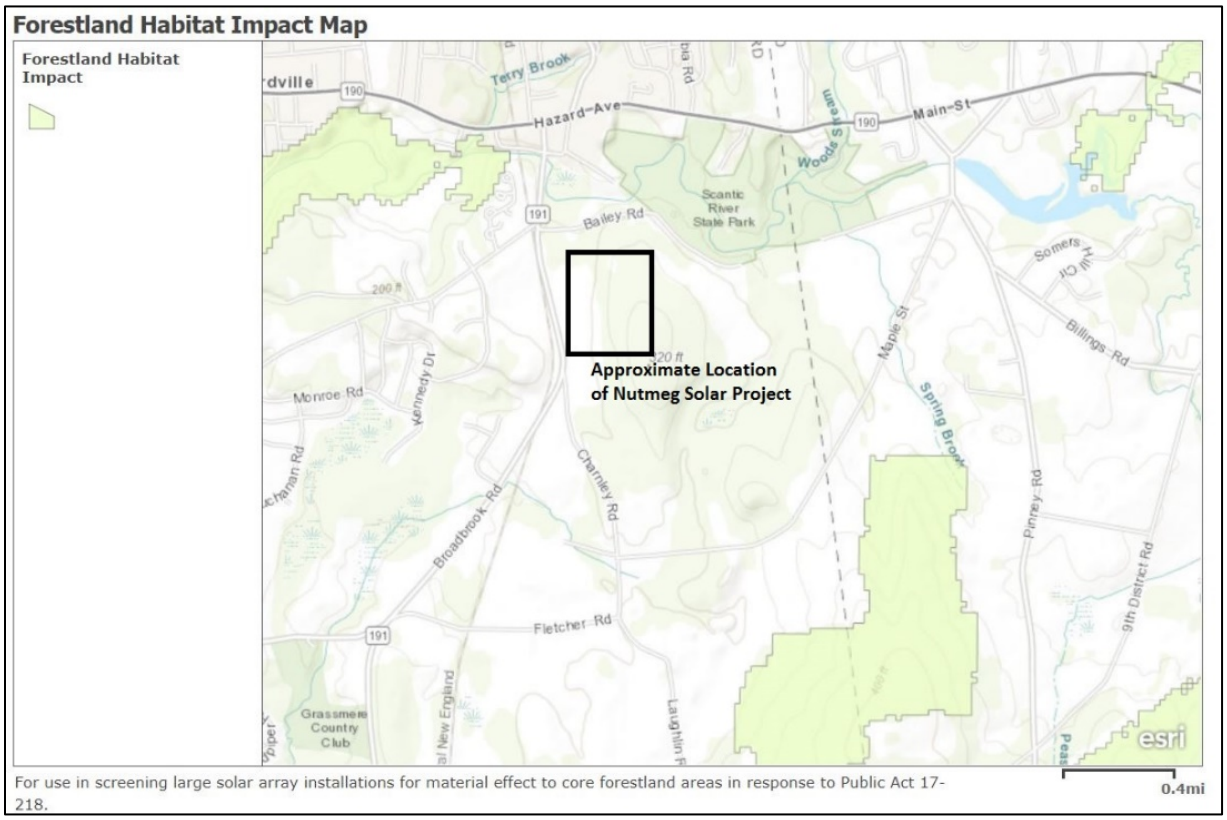
CSC-46 Under Connecticut General Statutes §16-50k, "Core forest" means unfragmented forest land that is three hundred feet or greater from the boundary between forest land and non-forest land, as determined by the Commissioner of Energy and Environmental Protection." Would any tree clearing occur within core forest? If so, how many acres? How would tree clearing affect the acreage of core forest and core forest edge? Provide an aerial photograph that depicts pre- and post-construction acreage of core and edge forest.

Response:

Because the Project was selected by DEEP in a solicitation before July 1, 2017, the Project is expressly exempt from the requirements set forth in Public Act 17-218, including the requirements of Connecticut General Statutes § 16-50k(a) regarding impacts on core forest. Nevertheless, the Project area is not currently mapped as core forest by DEEP, as shown below.



Source: https://www.arcgis.com/home/item.html?id=f9175844f49b4385a6096bcd200ad931

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CSC-47 Tab I of the Petition contains the Photo Rendering Locations map and associated photo-simulations. Has the Petitioner considered vegetative screening in the vicinity of Photo Rendering Location No. 2, known as "West of Broad Brook Road looking northeast?"

Response:

The Petitioner evaluated potential visual impacts of the Project on abutting residences. The Project includes visual screening through vegetation and relocated tobacco barns to ensure limited visual impacts. In the vicinity of Photo Rendering Location No. 2, there are no direct abutters facing the Project.

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CSC-48 Neglecting any equipment inside the proposed on-site collector substation, would the tallest equipment at the site be the medium voltage transformers of 7 to 8 feet high, as noted on page 8 of the Petition?

Response:

The solar modules and the medium voltage transformer/ inverter units will be approximately the same height and neither are anticipated to exceed 10 feet.

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CSC-49 Within the proposed on-site collector substation, would the tallest structure be a terminal structure or transition structure? If yes, provide an estimate of its height.

Response:

No. The tallest structures located at the on-site collection substation will be two lightning masts. The lightning masts are proposed to be approximately fifty feet in height. The remaining components of the substation are anticipated to be less than thirty feet in height.

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CSC-50 Did the Petitioner conduct a Shade Study Analysis? Would shading present any challenges for the proposed project? If so, how many trees will be removed to mitigate for shading? How were the limits of tree shading determined? Will stumps be left in place in these areas?

Response:

The Petitioner evaluated potential shading during the design of the Project layout. To minimize shading impacts from vegetation, approximately 15.5 acres of vegetation clearing is proposed. Areas of potential shading were determined by evaluating tree heights, topography, and distance of existing vegetation from the solar modules in AutoCAD. In the 15.5 acre area, trees will be cut but not grubbed (i.e., stumps left in place). Additionally, the Petitioner proposes using selective vegetation management in proximity to the vernal pool. The selective vegetation management will minimize shading impacts, while maintaining vegetative cover within the critical terrestrial habitat of the vernal pool.

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CSC-51 What effect would runoff from the drip edge of each row of solar panels have on the site drainage patterns? Would channelization below the drip edge be expected? If not, why not?

Response:

The site has been designed to provide a meadow type of vegetation beneath the drip edge of the solar panels. The velocity and force associated with stormwater from these panels will not be erosive based on the lower edge panel height, which is approximately 24 inches. Once the ground cover vegetation has been established there is no concern over erosion in these areas. During construction, prior to establishment of vegetation, the stormwater control system has been designed to collect runoff from areas not yet stable and direct this runoff to traps or basins for treatment prior to discharge from the site. Additionally, hydroseed with bonded fiber matrix or erosion control blankets will be used on the open ground areas which is intended to reduce the potential for channelization of flows and minimize the potential for erosion.

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CSC-52 Provide the distance from the proposed project to the nearest wetland. Also provide the distance from the proposed project to the nearest watercourse.

Response:

There are no wetlands or streams mapped within the Project site. The proposed limit of work is approximately 545 feet northwest of the nearest wetland as mapped by the U.S. Fish and Wildlife Service's National Wetland Inventory. Aside from the identified vernal pool within the Project site, the nearest watercourse, the Scantic River, is located approximately 866 feet north of the Project as mapped by the US Geological Survey's National Hydrography Dataset.

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CSC-53 Referencing pages 31 and 32 of the Petition, vegetative cutting would be performed within the vernal pool Critical Terrestrial Habitat for vegetation capable of exceeding a 20 to 40-foot canopy height limit. Was this canopy height limit established due to shading concerns?

Response:

Yes. In establishing the canopy height, both shading concerns and maintaining sufficient vegetative cover for the critical terrestrial habitat around the vernal pool were considered.

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CSC-54 What is the host municipality's setback regulation from wetlands?

Response:

The Town of Enfield's Inland Wetlands and Watercourses Regulations (adopted 2011) regulate the following Upland Review Areas:

- 100 feet from wetlands and watercourses
- 200 feet along the Scantic River

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CSC-55 What is the length of the posts and to what depth would the posts be driven (or spun) into the ground to provide structural stability? Are any impacts to groundwater quality anticipated? If so, how would the petitioner manage and/or mitigate these impacts?

Response:

The posts will average 10-16 feet in length and approximately 6 to 9 feet in embedment depth. This depth is informed by pile load testing completed at the Project site in the fall of 2018. The pile load testing consisted of static axial compressive (i.e., push), lateral, and axial uplift (i.e., pull) tests and indicate soil stability load thresholds were achieved at embedment depths of 6 to 9 feet on site.

Due to the composition of the posts, and the limited amount of post material that will be in contact with the ground, no impacts to groundwater quality are anticipated.

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CSC-56 Would glare from the solar panels attract birds (ex. Appear as water) and create a collision hazard?

Response:

No. The solar PV panels will be constructed of dark, light-absorbing materials finished with an anti-reflective coating. *See* Response to CSC-41. Photovoltaic projects in general, and particularly in the eastern United States are not known to attract birds.

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Facility Construction

CSC-57 Would the Petitioner apply for a highway encroachment permit from Connecticut Department of Transportation, as applicable, for any work performed within a state highway right-of-way?

Response:

The Petitioner will seek an Encroachment Permit from the CT Department of Transportation (CT DOT) for construction period access to the Project site from Broad Brook Road, which in the vicinity of the project, is owned by CT DOT. No improvements to Broad Brook Road or new curb cuts are proposed as part of the project.

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CSC-58 Has the Petitioner submitted an application for a General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities from the Department of Energy and Environmental Protection? If yes, on which date was it filed?

Response:

Yes. The Petitioner's application for a DEEP Stormwater General Permit was submitted on November 29, 2018.

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CSC-59 Page 2-7 of the Storm Water Management Report states that, "The berms are designed to infiltrate the 100-year storm event and are equipped with an emergency spillway." Drawings C-025, C-031 and C-036 and others show various emergency spillways. Thus, is it correct to say that a storm event greater than the 100-year event would overflow the berms and end up with water cascading over the berms? If yes, where would the water go, and what could be the potential negative impacts? Are detention basins then needed, or would that be determined upon consultation with DEEP?

Response:

The Site Plans show basins, which are created by the construction of berms. Each basin is equipped with an emergency spillway. The basins, excluding the one collection point along the proposed site road adjacent to the vernal pool depression, has been designed to hold the 100-year storm event. Flow over the spillway is not anticipated except in the event of an emergency.

A severe storm event that exceeds the 100-year storm event standard would overtop the constructed berms through the emergency spillway. The emergency spillways include check dams to further reduce water flow velocity. The water would flow as directed by the spillway downgradient of the berm in a manner as it does under existing conditions. These detention basins have been designed and are proposed to attenuate runoff during the more frequent storm events. During the severe storm events (i.e., less frequent than the 100 year statistical storm event), the site would be expected to discharge stormwater in a manner largely the same as it does under current conditions.

The Project will employ regular on-site monitoring by a qualified third-party inspector as required by the DEEP General Permit. The Petitioner expects to work in close consultation with DEEP in the event of a severe storm event, and is required to conduct more frequent monitoring after storm events.

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CSC-60 With regard to earthwork required to develop the site, provide the following:

a) Will the site be graded? If so, in what areas?

b) What is the desired slope within the solar array areas?

c) Could the solar field areas be installed with minimal alteration to existing slopes?

d) If minimal alteration of slopes are proposed, can existing vegetation be marinated to provide ground cover during construction?

e) Estimate the amounts of cut and fill in cubic yards for the access road(s).

f) Estimate the amounts of cut and fill in cubic yards for solar field grading.

g) If there is excess cut, will this material be removed from the site property or deposited on the site property?

Response:

The topography of the site will not substantially change as a result of the Project. Within the solar array, micro-grading, or the grading of existing undulations, will occur prior to installation of the solar array. While the proposed site roads and stormwater basins require both areas of cut and fill, general site topography will be maintained. Additional responses to CSC-60 regarding earthwork are provided below.

a) The site will be graded around the site roads, collector substation, and to create stormwater basins.

b) The maximum desired slope in the solar array area is less than 20%. Given the relatively gradual slopes throughout the site, significant grading is not proposed in order to accommodate the solar array. In the majority of areas where modules are situated, slopes do not exceed 15% grade. There are several discrete areas where modules are situated on slopes between 15% and 20% grade.

c) No alteration of slopes beyond micro-grading is proposed for installation of the solar arrays. Minimal slope alteration and earthwork is proposed to install site roads and stormwater basins.

d) In the wooded areas proposed to be cleared, and in the portions of the Project site currently used for agriculture, existing vegetation will largely be removed. The site will be revegetated with a native seed mix to promote a meadow habitat.

e) The Project is estimated to require 18,000 cubic yards of cut and 1,900 cubic yards of fill.

f) The Project will not require cut and fill for solar field grading (i.e., grading for installation of solar arrays).

g) The topsoil removed will be redistributed in a broadcast manner on site and stabilized within the limit of work. Refer to the Farmland Soil Mitigation Plan in Exhibit E of the Petition.

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CSC-61 Why is a post-construction road width of 16 feet required for most of the project area (except for the substation location)? What is the minimum road width required for post-construction use?

Response:

The 16-foot road width is proposed for construction period and post-construction site access and circulation to provide sufficient access for construction, operations, and emergency response vehicles. In one portion of the site in the vicinity of the substation, the site road is 20-feet wide around a bend to accommodate the turning radius of substation equipment delivery vehicles.

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CSC-62 Has a comprehensive geotechnical study been completed for the site to determine if site conditions support the overall Project design? If so, summarize the results. If not, has the Petitioner anticipated and designed the Project with assumed subsurface conditions? What are these assumed conditions?

Response:

Yes. The Petitioner commissioned a geotechnical study and analyzed subsurface conditions in fall of 2018 to determine potential constraints, and to provide recommendations to be considered for the design and construction of the Project. The geotechnical study included several bore and test pit locations to determine the existing subsurface physical traits to provide recommendations concerning earthwork, design, and construction. The geotechnical study analysis included:

- Subsurface soil and course fragment conditions
- Soil shear strength and compressibility evaluation
- Seismic site classification per International Building Code (IBC)
- Soil Resistivity

The preliminary results of the geotechnical study indicate that the site consists of deep loamy sand textured soils. The site features isolated layers of silts and clays and varying layers with concentrations of gravel, cobbles, and small boulders. Bedrock was encountered between 12-27 feet, which is below any anticipated Project earthwork and post installation depths. The soil shear strength analysis indicates that soils on site are suitable for the installation of solar arrays and recommends that soils may need to be compacted for the installation of concrete foundations. Research indicated there is low risk for seismic activity in the vicinity of the Project. Soil resistivity test results indicate that native soil on site has low steel corrosivity potential.

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CSC-63 Page 8 of the Petition describes multiple methods to install the posts into the ground, e.g. using a pile driver, drill, vibratory hammer, or spinning ground screws into the ground. Would the choice of methods be determined by the results of a geotechnical study? If a geotechnical study has been performed, provide an update on the methods to install the posts/screws into the ground. In the event that ledge is encountered, what methods would be utilized for installation?

Response:

The choice of post installation methods is informed by the geotechnical study as well as pile load testing results; both of which were performed in the fall of 2018. The preliminary results of the geotechnical study indicate that subsurface soil conditions on the Project site are suitable for a pile driven technique to install the posts; while loose subsurface rock (i.e., cobbles and small boulders) were encountered, bedrock was not present at depths shallower than 12 feet. The pile load testing consisted of static axial compressive (i.e., push), lateral, and axial uplift (i.e., pull) tests and indicate soil stability load thresholds were achieved at embedment depths of 6 to 9 feet on site. No refusals from bedrock were encountered at the pull test locations. Both study results indicate that the conditions on site are suitable to install posts using a pile driver with a hydraulic hammer.

In the event that cobbles, boulders, or bedrock is encountered, the Petitioner will utilize a drill drive technique to drill through rock obstructions. Once post holes are drilled, posts will be driven into the ground to achieve the proper embedment depths that will be determined, engineered, and stamped by the racking supplier.

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CSC-64 Will blasting be required to install any site infrastructure? If not, what methods would be used if bedrock is encountered?

Response:

Based on the preliminary results from the geotechnical study and pile load tests performed, in combination with visual inspections of the site, no blasting is anticipated to be required for construction of the Project. During the pile load tests, no refusals from bedrock were encountered at any of the 21 tested locations.

In the event that bedrock is encountered and post embedment depths are not achieved, the Petitioner will utilize a drill drive technique. Once post holes are drilled, posts will then be driven into the ground to achieve the proper embedment depths that will be determined, engineered, and stamped by the racking supplier.

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CSC-65 What is the anticipated sequence of construction? During what time of year would each sequence ideally occur? Does this account for possible seasonal construction restrictions due to the presence of protected species?

Response:

As detailed in Section 6.15 of the Petition, the construction phasing plan adheres to time of year restrictions for tree roosting bat species, including maternity windows. As such, tree clearing will occur between November 1 to March 31.

The anticipated sequence of construction is as follows:

- Pre-Construction Phase tasks include demarcation of clearing limits, cutting of trees above ground (retain stumps) in frozen conditions, barn relocation and removal, environmental restriction and safety training, and preconstruction meetings. The Petitioner anticipates that the Pre-Construction Phase will occur in winter 2019/2020.
- Phase 1 includes development of internal site roads and the Project's staging area. It is anticipated that Phase 1 will occur in spring 2020.
- Phase 2 includes clearing and grubbing of the Eastern Array. It is anticipated that Phase 2 will occur in spring/ summer of 2020.
- Phase 3 includes installation of solar equipment in the Western Array. It is anticipated that Phase 3 will occur in summer/ fall of 2020.
- Phase 4 includes installation of solar equipment in the Eastern Array. It is anticipated that Phase 4 will occur in summer/ fall 2020.

See Section 3.5 of the Petition and Section 3.2.3 of the Stormwater Report (Exhibit K) for greater detail on Project phasing and construction period stormwater controls.

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CSC-66 Page 10 of the Petition notes that, if the proposed project is approved, the final construction hours would be included in the Development and Management Plan. Does Nutmeg know tentatively what the construction hours and days of the week (e.g. Monday through Friday 8 AM to 5 PM) would be?

Response:

Final construction hours will be included in the Development and Management Plan, however, tentative hours are proposed as:

Monday – Friday:	7 AM – 7 PM
Saturday (as needed):	8 AM – 5 PM

Due to unforeseen circumstances, some night or Sunday construction hours may be required. All construction activities will adhere to § 38-104 of the Town of Enfield Code providing a "daytime hours" exemption from noise level requirements.[3] The Petitioner will notify the Council of any necessary deviation from approved work hours pursuant to Regulations of Connecticut State Agencies § 16-50j-62(b).

[3] "Daytime hours" is defined in the Town of Enfield Code as between 7:00 AM and 9:00 PM Monday through Saturday, and between 9:00 AM and 9:00 PM on Sunday.

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Maintenance Questions

CSC-67 Does the proposed capacity factor and annual megawatt-hours of energy output take into account snow accumulation on the solar panels?

Response:

Yes. Both the net capacity factor and annual energy production estimates provided take into account snow accumulation, along with a variety of other sources of potential energy production losses.

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CSC-68 Has any analysis been conducted to determine structural limits of snow accumulation on the solar panels and steel support structures, assuming heavy, wet snow and or ice? Would there be circumstances that would require snow/ice removal to prevent damage to the panels/rack system?

Response:

As noted in the response to CSC-29, the proposed racking design incorporates snow loads from the International Building Code (IBC), with Connecticut amendments, for the Project. For this Project, the snow loading is 35/30 pounds per square foot. Additionally, the fixed-tilt panels are installed at an angle above horizontal to optimize sun to facilitate melting. This angular mounting also allows most snow and ice to slide off the panels onto the ground once the sun rises and begins to warm the panels.

The racking design takes into account heavy snow and ice; there is not any anticipated need for the snow/ice to be removed for structural reasons.

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CSC-69 Page 3 of the Petition details the Array Cleaning Procedure. Would this maintenance activity have any impacts to water quality?

Response:

While manual module cleaning is not anticipated, should it be required, the modules will be cleaned with low-pressure water absent use of cleaning solvents or chemicals that could have a potential negative impact on water quality. *See* response to CSC-22.

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Company:

Nutmeg Solar, LLC

Submission Date:

December 7, 2018

CSC-70 How does the developer intend to promote and maintain grasses or other ground cover beneath the panels and within the solar array rows? Would bare ground areas or patchy growth increase site runoff?

Response:

The Petioner will promote and maintain vegetation within the solar array rows and beneath panels as part of the Stormwater Pollution Control Plan and in accordance with DEEP's 2017 Guidance Document on "Stormwater Management for Solar Farm Construction Projects", 2004 Connecticut Stormwater Quality Manual Stormwater Manual and the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control SESC Guidelines). The growth of native meadow vegetation following construction will be promoted and maintained by mowing twice per year to allow for healthy ground cover and to prevent woody vegetation growth. In addition, semi-annual inspections of site vegetation will occur through the life of the Project to ensure that patchy or bare ground is remediated and reseeded as nessecary to promote healthy ground cover throughout the site.

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

Petition No. 1352

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Nutmeg Solar, LLC

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CSC-71 Would the Petitioner store any replacement modules on-site in the event solar panels are damaged by hail, prey shells or other impact hazards? If so, where? How would damaged panels be detected?

Response:

The Petitioner will store replacement panels at a centralized location to service NEER's portfolio of solar projects in the region. Damaged panels will be detected either by on-site maintenance inspections, or based on remote performance monitoring. In addition, NEER's operations team is piloting use of thermographic scanning in order to identify underperforming/damaged panels or other solar facility equipment.

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CSC-72 Could the solar panels be recycled? If so, how?

Response:

Solar photovoltaic panel recycling technologies have been implemented over the past decade and have been shown to recover over 95 percent of semiconductor material and over 90 percent of the glass in the panel.[4] Solar PV panels typically consist of glass, polymer, aluminum, copper, and semiconductor materials that can be recovered and recycled at the end of their useful life.[5]

The Petitioner will evaluate opportunities for panel recycling prior to decommissioning of the Project.

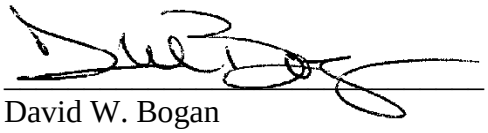
[4] S. Weckend, A. Wade, G. Heath. "End of Life Management: Solar Photovoltaic Panels." International Renewable Energy Agency, June 2016. http://iea-pvps.org/fileadmin/dam/public/report/technical/IRENA_IEAPVPS_End-of-Life_Solar_PV_Panels_2016.pdf?bcsi_scan_fd86d3dd427d821e=0&bcsi_scan_filename=IRENA_IEAPVPS_End-of-Life_Solar_PV_Panels_2016.pdf

[5] "Health and Safety Impacts of Solar Photovoltaics," N.C. State University, N.C. Clean Energy Technology Center, May 2017. https://content.ces.ncsu.edu/health-and-safety-impacts-of-solar-photovoltaics

CERTIFICATION

I hereby certify that on December 7, 2018, the foregoing was delivered by electronic mail and regular mail, postage prepaid, in accordance with § 16-50j-12 of the Regulations of Connecticut State Agencies, to all parties and intervenors of record, as follows:

Maria S. Eldsen, Esq.
Acting Town Attorney
Town of Enfield
820 Enfield Street
Enfield, CT 06082
townattorney@enfield.org



David W. Bogan
Commissioner of the Superior Court

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

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Company: Nutmeg Solar, LLC

Submission Date: December 7, 2018

Exhibit CSC-14

www.jinkosolar.com

Jinko Solar
Building Your Trust in Solar

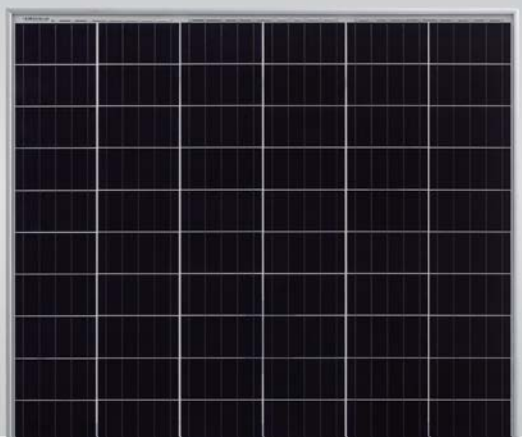
Cheetah HC 72M-V
380-400 Watt

MONO PERC HALF CELL MODULE

Positive power tolerance of 0~+3%

- Half Cell
- Mono PERC 72 Cell

PERC



KEY FEATURES

5 Busbar Solar Cell
5 busbar solar cell adopts new technology to improve the efficiency of modules , offers a better aesthetic appearance, making it perfect for rooftop installation.

High Voltage
UL and IEC 1500V certified; lowers BOS costs and yields better LCOE

High Efficiency
Higher module conversion efficiency (up to 19.88%) benefit from half cell structure (low resistance characteristic).

PID Resistance
Excellent Anti-PID performance guarantee limited power degradation for mass production.

Low-light Performance
Advanced glass and cell surface textured design ensure excellent performance in low-light environment.

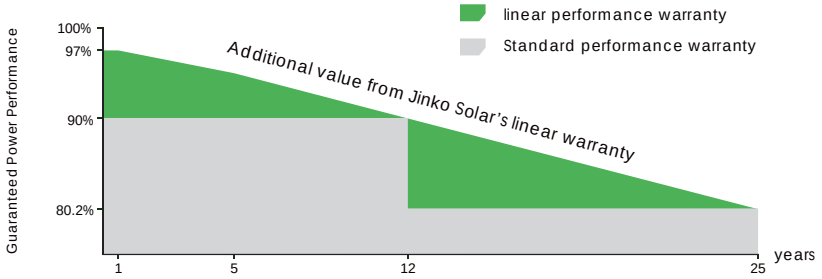
Severe Weather Resilience
Certified to withstand: wind load (2400 Pascal) and snow load (5400 Pascal).

Durability Against Extreme Environmental Conditions
High salt mist and ammonia resistance certified by TUV NORD.

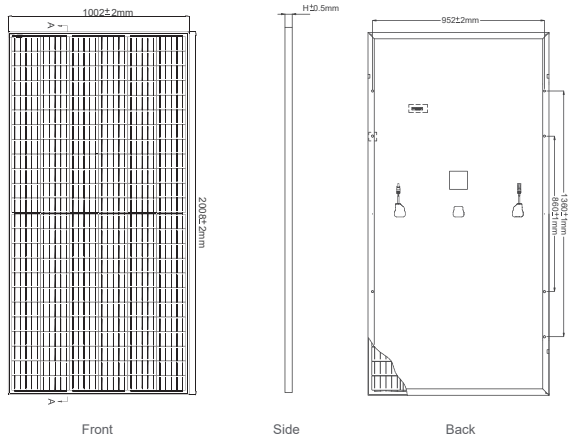
LINEAR PERFORMANCE WARRANTY

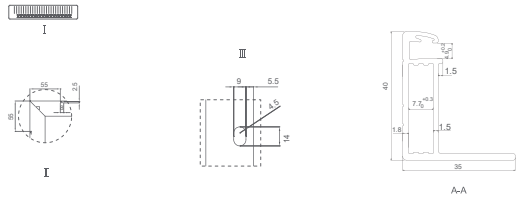
10 Year Product Warranty • 25 Year Linear Power Warranty

- ISO9001:2008, ISO14001:2004, OHSAS18001 certified factory
- IEC61215, IEC61730, UL1703 certified product



Engineering Drawings



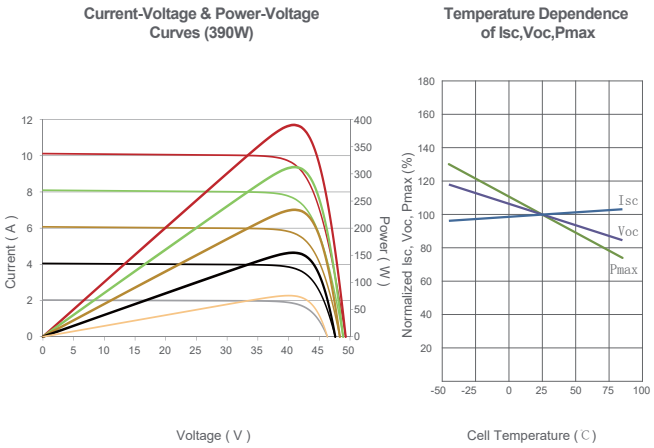


Packaging Configuration

(Two pallets =One stack)

26pcs/pallet , 52pcs/stack, 572pcs/40'HQ Container

Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	Mono PERC 158.75×158.75mm
No.of Half-cells	144 (6×24)
Dimensions	2008×1002×40mm (79.06×39.45×1.57 inch)
Weight	22.5 kg (49.6 lbs)
Front Glass	3.2mm, Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP67 Rated
Output Cables	TÜV 1x4.0mm², Anode 290mm, Cathode 145mm or Customized Length

SPECIFICATIONS

Module Type	JKM380M-72H-V		JKM385M-72H-V		JKM390M-72H-V		JKM395M-72H-V		JKM400M-72H-V	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	380Wp	286Wp	385Wp	290Wp	390Wp	294Wp	395Wp	298Wp	400Wp	302Wp
Maximum Power Voltage (Vmp)	40.5V	38.6V	40.8V	38.8V	41.1V	39.1V	41.4V	39.3V	41.7V	39.6V
Maximum Power Current (Imp)	9.39A	7.42A	9.44A	7.48A	9.49A	7.54A	9.55A	7.60A	9.60A	7.66A
Open-circuit Voltage (Voc)	48.9V	47.5V	49.1V	47.7V	49.3V	48.0V	49.5V	48.2V	49.8V	48.5V
Short-circuit Current (Isc)	9.75A	7.88A	9.92A	7.95A	10.12A	8.02A	10.23A	8.09A	10.36A	8.16A
Module Efficiency STC (%)	18.89%		19.14%		19.38%		19.63%		19.88%	
Operating Temperature (℃)	-40℃~+85℃									
Maximum System Voltage	1500VDC (IEC)									
Maximum Series Fuse Rating	20A									
Power Tolerance	0~+3%									
Temperature Coefficients of Pmax	-0.36%/℃									
Temperature Coefficients of Voc	-0.28%/℃									
Temperature Coefficients of Isc	0.048%/℃									
Nominal Operating Cell Temperature (NOCT)	45±2℃									

STC: Irradiance 1000W/m² Cell Temperature 25°C AM=1.5

NOCT: Irradiance 800W/m² Ambient Temperature 20°C AM=1.5 Wind Speed 1m/s

* Power measurement tolerance: ± 3%

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Exhibit CSC-45

Equivalency Results

How are they calculated?

The sum of the greenhouse gas emissions you entered above is of Carbon Dioxide Equivalent. This is equivalent to:

177,859 Metric Tons ▼

Greenhouse gas emissions from

38,085

Passenger vehicles driven for one year

-or-

435,928,922

Miles driven by an average passenger vehicle

-or-

61,972

Tons of waste recycled instead of landfilled

-or-

8,862

Garbage trucks of waste recycled instead of landfilled

CO_2 emissions from

20,013,390

gallons of gasoline consumed

-or-

194,594,092

Pounds of coal burned

-or-

2,355

tanker trucks' worth of gasoline

-or-

19,205

homes' energy use for one year

-or-

45.1

Wind turbines running for a year

-or-

26,658

homes' electricity use for one year

-or-

971

railcars' worth of coal burned

-or-

5,952,443

Incandescent lamps switched to LEDs

-or-

411,781

barrels of oil consumed

-or-

7,270,824

propane cylinders used for home barbeques

-or-

0.044

coal-fired power plants in one year

Carbon sequestered by

4,609,419

209,492

tree seedlings grown for 10 years

-or-

acres of U.S. forests in one year

-or-

1,451

acres of U.S. forests preserved from conversion to cropland in one year