Minimum Technical Requirements for the Renewable Energy Fund

All Rhode Island Renewable Energy Fund solar photovoltaic (PV) projects must demonstrate compliance with the Minimum Technical Requirements set forth in this document. These requirements are not intended to be all-encompassing, nor are they intended to be a substitute for engineering specifications or for safety requirements. Site-specific conditions and/or local regulations may require additional requirements not contained in this attachment. Commerce RI reserves the right to withhold payment to any project that does not satisfy the Minimum Technical Requirements.

Shading and Estimated Production Requirements

The PV project must be designed so that the estimated annual energy output for the PV project is at least 80% of the default optimal output for a fixed PV project of the same capacity, as estimated by PVWATTS or a similar tool. Optimal parameters for purposes of a PVWATTS estimate are: 1) 0.77 DC to AC derate factor, 2) 42 degree array tilt, and 3)180 degree (True South) azimuth. PVWATTS is available at the following website: http://pvwatts.nrel.gov/.

Shade analysis must demonstrate that the project will output at least 80% of the energy available utilizing the site's optimum conditions, taking into account shading, orientation, and inclination. This can be shown with an average TSRF of at least 80% when measured from the corners of an array using a Solmetric SunEye. If using a Solar Pathfinder the Actual Shaded Solar Radiation must be at least 80%. Solmetric SunEye, Solar Pathfinder, or other Commerce RI-approved shading analyses will be accepted.

Installation Requirements

All installations must follow the most **current edition of the National Electrical Code** with the following changes as noted below. In all cases where manufacturer instructions, third-party guides/handbooks, or other materials contradict the most current edition of any local, state, or federal code, the applicable code shall take precedence over such materials.

- Twist-on wire connectors (wire nuts) shall not be used in any outdoor enclosure unless listed to UL 486D for use in damp/wet locations. Proof of listing will be required during inspection if applicable. (See Article 110.28 for more information)
- Installations of ground- and pole-mounted arrays must have a disconnect switch as described in Article 690.17 exception two, located at the array to isolate all DC current carrying conductors. This is not required where the ground- or pole-mounted array consists entirely of AC modules or microinverters.
- Areas where wiring passes through ceilings, walls, or other areas of the building must be properly restored, booted, and sealed. Thermal insulation in areas where wiring is installed must be returned to “as found or better” condition.
- Commerce RI recommends that photos be taken of the following system components

for all rooftop solar arrays: module frame grounding method, array grounding method, array wire management, interior of any rooftop enclosures, and exterior of any rooftop enclosures. These photos shall be kept on record with the primary installer and made available to Commerce RI upon request.

- An owner's manual of operating and maintenance instructions must be provided to the PV project owner and preferably also posted on or near the PV project. The owner's manual should include manufacturer's specifications, serial numbers, warranty policies, etc.
- Owners must be provided with, at minimum, a basic training orientation that includes maintenance instructions, troubleshooting, meter reading, and electric production reporting instructions.
- Solar PV projects designed to be installed on pitched, non-flat roofs, are required to have an azimuth that is the same as the roof azimuth, in order to be eligible to receive a rebate.

Roof Requirements

PV arrays shall not be installed on any roof that is expected to be replaced within 10 years, or that contains damage that may require repair or early replacement.

Common Installation Violations

- Indoor-rated twist-on wire connectors (wire nuts) shall not be used in outdoor enclosures. Article 110.28 indicates this area can be a damp or wet location, and such installation may violate the listing of the product, see also Article 110.3(B).
- NM-B cable (Romex®) shall not be sleeved in outdoor raceways. Article 300.9 defines the interior of such raceways as a wet location and Article 334.12(B)(4) prohibits this cable to be installed in a wet location.
- Article 300.7(A) requires raceways passing from the interior to the exterior of a building be filled with an approved material to prevent the circulation of warm air to a colder section of the raceway.
- Article 250.24(A)(5) prohibits a grounded (neutral) conductor to be connected to ground at any location downstream of the service disconnecting means. Common violations include this connection in a PV meter enclosure or an AC combiner panelboard.
- Terminal ratings and conductor size/limitations must be followed per Article 110.3(B). Common violations include multiple conductors under a terminal listed for a single conductor, or conductors undersized for the terminals, such as inside a meter enclosure.