Statement of Justification in Support of Special Use Permit
Willard Solar, LLC
455 Church Street, Willard, NC 28478

Project Narrative

This special use permit application is in support of a proposed Other Electric Power Generation facility (solar farm), Willard Solar, LLC to be located at 455 Church Street, Willard, NC 28478. The site will have access from Church Street. The Other Electric Power Generation facility (solar farm) will contain rows of Photovoltaic (PV) cell panels mounted on posts set in the ground. These rows of panels are referred to as "solar arrays." The solar arrays will be fixed in place facing south in order to receive the maximum amount of sunlight. This configuration contains no moving parts. Solar components will comply with the current edition of the National Electric Code, be UL listed (or equivalent), and designed with an anti-reflective coating. The Willard Solar facility will be a 5MW solar farm and the power generated will be sold to Duke Energy Progress for use by consumers to replace energy produced from non-renewable sources.

While each site is unique, Willard Solar will use standard construction and operation procedures used for our other solar energy facilities in the United States. The construction of the proposed Other Electric Power Generation facility is expected to take approximately 12 to 16 weeks. Willard Solar will be a simple construction that employs the following basic equipment: solar PV panels; inverters; transformers; wires and conductor cables; structural racking system for PV modules; and perimeter fencing. Most sites require minimal grading, and an entire facility can often be installed with minimal soil disturbance. Structural frames, also referred to as racks, are driven into the ground with steel beams on which PV panels are mounted. The inverters and transformers, which receive the power from the solar panels, are mounted on top of concrete pads.

Statements of Justification

Approval Standards

<u>The use is listed among the special uses in the district for which the application is made, or is similar in character to those listed in that district.</u>

The proposed Other Electric Power Generation facility is permitted in Article 5.2.3 of the Pender County Unified Development Ordinance. The proposed Other Electric Power Generation facility will comply with all of the requirements in Article 3.12 of the Unified Development Ordinance, as illustrated in the attached site plan. The proposed Other Electric Power Generation facility will meet all required setbacks. No structure will exceed a height of twenty-five feet (25').

<u>The requested use will not impair the integrity or character of the surrounding or adjoining districts, nor adversely affect the safety, health, morals or welfare of the community or of the immediate neighbors of the property.</u>

The proposed Other Electric Power Generation facility will not endanger the public health or safety of Pender County. The site will generate almost no traffic. Employees will visit the site once a week or even less frequently for routine maintenance of the arrays and the property. The solar panels that comprise the solar arrays are made primarily of glass; they do not contain dangerous materials, nor do they emit dust, noxious fumes or liquids. The active area of the Other Electric Power Generation facility will be enclosed by a six foot (6') high fence and gated for security purposes. Access codes to the gate will be provided to local police, fire and emergency service providers. Vehicular access to the site is adequate for the use proposed and for emergency services. The facility shall meet all requirements of the North Carolina State Building Code.

<u>The proposed use will not constitute a nuisance or hazard.</u>

The proposed Other Electric Power Generation facility will not constitute a nuisance or hazard. Solar farms make good neighbors. They are quiet. The solar arrays have no moving parts. The only sound occurs during daylight hours with the quiet hum of electrical transformers, invertors, and the substation delivering solar power to the power grid. At night, when the sun is not available, there is no energy being created and no sound on the site. Solar farms generate fewer vehicles trips than the average home. Employees visit the site once a week or even less frequently. Solar panels are designed to absorb light, rather than reflect it, which mitigates glare concerns for adjoining properties.

<u>The requested use will be in conformity with the Pender Land Use Plan and other official plans or policies adopted by the Board of County Commissioners.</u>

The proposed Other Electric Power Generation facility will be in conformity with the Pender County Land Use Plan and in harmony with the area in which it will be located. Surrounding properties are being utilized as rural and agricultural. The proposed Other Electric Power Generation facility is a low-impact use consistent with the land use pattern in the area today. Solar farms are quiet, and they do not create noise, dust or odor as traditional farms can. Solar panels are lower in height than a typical home. After construction, they generate fewer trips than one single-family home. Allowing the property to develop as a solar farm will maintain the rural character of the area while providing a sustainable benefit to the community.

<u>Adequate utilities, access roads, drainage, sanitation, and other necessary facilities have been or are being provided.</u>

Adequate utilities, access roads, drainage, sanitation and other necessary facilities are being provided. The active area of the proposed Other Electric Power Generation facility will be enclosed by a six foot (6') high fence and gated for security purposes. Access codes to the gate will be provided to local police, fire, and emergency service providers. Vehicular access to the site is adequate for the use proposed and for emergency services. There will be no buildings or employees on the property so there is no need for sewage disposal facilities, solid waste, or water on the site.

Adequate measures have been taken or will be taken to provide ingress and egress so designed as to minimize the traffic congestion in the public roads.

The proposed Other Electric Power Generation facility will not adversely impact traffic circulation on or near the site. The site will generate almost no traffic. After construction, the site will generate fewer trips than one single-family home. The solar farm will not be staffed daily, and employees are expected to visit the property weekly or less frequently for maintenance. The site will have access from Church Street.

That the special use shall, in all other respects, conform to the applicable regulations of the district in which it is located.

The proposed Other Electric Power Generation facility shall conform to the applicable regulations of the district in which it is located. The proposed Other Electric Power Generation facility will comply with all of the requirements in Article 3.12 of the Unified Development Ordinance, as illustrated in the attached site plan. The proposed Other Electric Power Generation facility will meet all required setbacks. No structure will exceed a height of twenty-five feet (25').

That the proposed use shall not adversely affect surrounding uses and shall be placed on a lot of sufficient size to satisfy the space requirements of such use.

The proposed Other Electric Power Generation facility will not substantially injure the value of adjoining or abutting property. Solar farms are quiet and have no moving parts. The only sound produced occurs during daylight hours with the quiet hum of electrical transformers and invertors delivering solar power to the grid. At night, when the sun is not available, there is no energy being created and no sound on the site. The solar panels are designed to absorb light, rather than reflect it, which mitigates glare concerns for adjoining properties. The use shall be placed on a lot of sufficient size to satisfy the space requirements, as shown in the attached site plan.

Decommissioning Plan

As required by the Pender County Unified Development Ordinance, Willard Solar, LLC guarantees the Other Electric Power Generation facility shall be removed, at the owner's expense, within one hundred and eighty (180) days of determination by the Planning Department that the facility is no longer being maintained in an operable state of good repair or is no longer supplying solar power.

For these reasons, we respectfully request approval of the proposed Special Use Permit.

Solar Farm Development & Operation

Technical Overview

Solar photovoltaic technology is neither new nor experimental. Although the industry has made gradual improvements over the decades, the materials and technology we use today have changed little in the last 50 years.

"Photovoltaic," commonly abbreviated as PV, is simply the technical term for converting the sun's light into useable electric current.

Solar facilities, often referred to as "solar farms," passively capture naturally occurring sunlight and convert it to clean, renewable energy on a scale large enough to supply electricity for daily living in our homes, businesses and schools. Each solar farm is a collection of thousands of solar panels arranged to gather maximum amounts of sunlight during the day. The panels are linked to inverters and transformers that convert the sunlight into useable electricity, which is then transferred to the existing electrical grid.

Equipment and Construction

Solar facilities are simple constructions that employ the following basic equipment:

- Solar PV panels
- Inverters
- Transformers
- Wires and conductor cables
- Structural racking system for PV modules
- Perimeter fencing

Most sites require minimal grading, and an entire facility can often be installed with minimal soil disturbance. Structural frames (called racks) are driven into the ground with steel beams (called piles), on which PV panels are mounted. The inverters and transformers, which receive the power from the solar panels, are mounted on top of concrete pads.

The electricity-making process starts with sunlight striking the solar panels. The energy from this action is converted into low-voltage DC electricity. This low-voltage DC electricity is fed into the inverters where it is converted into low-voltage AC electricity, which is then fed into the transformers where the electricity is converted into medium-voltage AC electricity. The medium-voltage electricity is connected to the grid through underground cables.

Solar Panel Technology

Cypress Creek Renewables uses several solar PV panel technologies: Crystalline Silicon (C-Si) and Thin Film (TF). Each type of technology uses slightly different materials, work identically, and are of similar construction.

Crystalline Silicon modules are produced by sourcing extremely high quality, pure silicon or quartz. The silicon is heated until it melts, after which a crystal is grown from a source ingot. The silicon crystal is sliced into thin wafers, mounted onto a durable backing material, and encapsulated by tempered glass and an aluminum frame. Thin-film solar modules are made by depositing thin film photovoltaic materials into crystalline layers that are bonded to tempered glass, after which the module is encapsulated by the aluminum frame.

Once finished, the solar PV panels function as a solar state inert crystal, most similar to a pane of solid glass. The solar panels are expected to work upwards of 40 years before they are recycled to recover the valuable materials contained inside. There are no chemicals, fluids, or materials that are capable of entering the environment.

Audibility

The facility's inverters and transformers produce a sound when operating during the hours of peak power production, typically between 10am-2pm. At 150 feet, this sound is inaudible above natural ambient noise in rural areas. The sound created by the inverter during peak power production is typically in the low-range of 65 decibels at a distance of 30 feet—the equivalent of the sound created during normal conversation. The rest of the facility's equipment does not produce any audible sound and no sound is produced at night.

Source: Massachusetts Clean Energy Center. (2012). Study of acoustic and EMF levels from solar photovoltaic projects. Boston, MA.

Glare

Solar panels are designed to absorb light from the visible spectrum, not to reflect it, although some upward reflection does occur. To assist light absorption, each PV panel is treated with an anti-reflective coating. Naturally occurring ponds and streams, snow, and even certain kinds of soil and vegetation are similarly reflective. In fact, the sunlight that is reflected away from solar panels produces the same amount of glare as a flat pond or lake.

Additionally, the solar panels are mounted at an angle that allows for the most light to be absorbed throughout the year, which results in the panels facing the sky at shallow angles (typically less than 25 degrees). As a result, what little light is reflected is not visible to ground-level observers.

All solar farms are required to be approved by the FAA as potential glare hazards for aviators. To date, no PV array has been deemed a glare hazard. In fact there are a significant number of PV power plants built next to highways and around airports.

Source: Riley, E. & Olson, S. (2011). A study of the hazardous glare potential to aviators from utility-scale flat-plate photovoltaic systems. ISRN Renewable Energy, 2011. http://dx.doi.org/10.5402/2011/651857

Electro-Magnetic Fields (EMF)

The International Commission on Non-Ionizing Radiation Protection has established 833 milli-Gauss (mG) as the limit for prolonged exposure to electro-magnetic fields. The inverter is the strongest source of magnetic fields in the solar facility with levels varying from 150–500 mG at a distance of one to two feet. As an unmanned facility, prolonged exposure is never an issue. The level of EMFs noticed 1–2 feet away from our equipment pad is similar to standing next to your television. At 150 feet, the inverter's magnetic field levels drop below 0.5 mG or less, often falling to the background level of earth's magnetic field of 0.2 mG.

No other solar PV component emits EMFs that are measureable above the earth's magnetic field. There are no EMFs emitted at night.

Sources: Massachusetts Clean Energy Center. (2012). Study of acoustic and EMF levels from solar photovoltaic projects. Boston, MA.

Long Island Power Authority.

Soil Protection

Minimal ground disturbance only occurs during the short (6 to 12 week) construction period. Heavy equipment and traffic is restricted to perimeter roads, which comprise less than 0.03 percent of the site area during construction. To further protect against erosion, most roads on the site are re-seeded with vegetation after construction unless otherwise required by the soil conditions or indicated by the jurisdiction.

A detailed erosion and sedimentation control plan is developed for every project so that water-borne runoff is prevented from entering the surrounding environment. Control measures typically include straw bales, hay coil logs, run-off channels, silt fencing, and sediment basins. Once constructed, natural vegetative growth is encouraged within the facility to prevent erosion, and the areas where panels are located are not considered impervious.

Dust and Weed Control

During construction, dust levels are kept to a minimum by limiting heavy equipment and traffic to designated perimeter roads and points of site entry. During dry seasons, roads are regularly kept wet to reduce dust. Wet seasons naturally keep dust levels down.

To minimize the encroachment of weeds following construction native grass is planted across the site. The grounds are watered as needed, and weeds are removed during regular maintenance activities.

Source: National Renewable Energy Laboratory. (2013). Overview of opportunities for co-location of solar energy technologies and vegetation (Report No. DE-AC36-08GO28308). Golden, CO.

Wildlife Protection

In most cases, wildlife is protected by using perimeter fencing and barbed wire to prevent access for large mammals, such as deer. Large animals are kept out of the site because they can interfere with equipment, damage wiring, or injure themselves. In cases when barbed wire is not used, perimeter fence height is increased.

Smaller animals, such as squirrels and birds, are allowed to pass throughout the facility following construction. The environment in the solar facility is often conducive to a wildlife habitat because of its natural vegetation, significant amount of shade and relative lack of human disruption. Wildlife access to electrical equipment is prevented with conduit protection for wires and foam sealing at all equipment entry points.

Source: Turney, D. & Fthenakis, V. (2011). Environmental impacts from the installation and operation of large-scale solar power plants. Renewable and Sustainable Energy Review, 15, 3261-3270.

Decommissioning

Decommissioning and dismantling of the solar PV power plant is not expected to occur until over thirty years after the facility is constructed. The system's equipment, including wires, conductors, and racking, has significant salvage value since it is comprised of useful metals such as copper, aluminum and steel. The PV panels are valuable for their semiconductor materials and rare metals such as silver. The salvage value meets or exceeds the cost of decommissioning. At the end of the facility's lifetime, a solar reclamation firm will collect the modules for recycling, the inverters for refurbishing, and the hardware for salvage. The land is then reseeded with a local seed mix and can be repurposed for agriculture or other uses.

Maintenance

Once constructed, solar farms require very little maintenance. As such, there is no need to build travel infrastructure to accommodate traffic. Electrical engineers will service the inverters and transformers on average once per quarter. Solar PV panels have a very low failure rate (approximately 1 in 10,000 per year), and are easily replaced from inventory stores.

The panels require no on-site water or chemicals to keep clean. Natural weather conditions, such as snow and rain, occur with enough frequency and quantity to naturally keep the panels clean.

Grass is kept under control by mowing and weeds may be spot sprayed if necessary. In some regions, sheep grazing within the facility are used to control vegetation. Sites are maintained approximately 5-9 times per year during the growing season, depending on location.

Source: National Rural Electric Cooperative Association. (2015) Cooperative utility PV manual.

Safety

Solar facilities do not generate more than one to three vehicle visits per quarter on average, making them insignificant traffic generators that do not create safety issues for the surrounding road networks. By contrast, the average American household generates ~6 vehicle trips per day.

Additionally, solar PV power plants are constructed according to all required building and electrical codes and safety measures. Site plans are approved by local authorities, and regularly visited throughout construction as required by local ordinance or state building code. Interconnection agreements are carried out as specified by the local utility. Energized system components, such as inverters, are commissioned by the manufacturers' technicians. Solar facilities employ required lock-out measures and safety warnings. A perimeter security fence prevents trespassing and vandalism.

The regular vegetation control methods prevent buildup of debris that could otherwise pose risk of fire material. As such, solar PV facilities pose no increased risk of fires to the surrounding areas.

Sources: Jeff Court. (2014). Photovoltaic solar safety management for utilities. Incident Prevention Magazine, November 2014.

National Fire Prevention Agency. (2015). National electric code (pp. 690.1-91, 370.1-120, 376.1-120, 408.1-58, 450.1-48, 480, 490.1-74, 705.1-135, 728, 750). Quincy, MA: National Fire Prevention Agency.

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