FORWARD

The Piedmont Environmental Council (PEC) is a 501(c)3 non-profit organization that was founded in 1972. PEC works with the citizens of our nine-county region (Albemarle, Clarke, Culpeper, Fauquier, Greene, Loudoun, Madison, Orange, and Rappahannock) to conserve land, create high-quality communities, strengthen rural economies, celebrate historic resources, protect air and water quality, build smart transportation networks, promote sustainable energy choices, restore wildlife habitat, and improve people’s access to nature.

Virginia’s Piedmont is an exceptional place. Located at the foot of the Blue Ridge Mountains, the Piedmont is beloved for its scenic beauty, unparalleled in its significance to America’s history, and valuable for its productive family farms, thriving communities, and vibrant economy. Its forests, fields, and wetlands provide clean water for the people of this region as well as those downstream, and they offer bountiful habitat for numerous species of wildlife and native plants. This splendid natural setting, together with its distinctive towns and cities, make the Piedmont a wonderful place to live, work, and visit.

PEC has created this Policy Document to assist localities and their citizens in the proper planning of Utility-Scale Solar (USS) Facilities. Renewable energy will make up a large percentage of energy generation projects in the U.S. for the foreseeable future and are of the utmost importance to the future of our environment; however, in this pursuit, we must ensure that impacts to our cultural, natural, and historic resources are avoided and that proper mitigation is employed in instances where conflicts arise. PEC is well versed in the nature of Utility-Scale Solar (USS) projects and the considerations for siting. We hope to serve our local communities as a resource in determining appropriate size, scale and any potential sites - sites that avoid or minimize impacts from these industrial facilities.

For more information on PEC, please click here to visit our website!

INTRODUCTION

PEC is an advocate for solar energy, especially distributed solar power generation - small scale solar (usually rooftop) primarily designed to meet the immediate demands of the property in which it is located. In comparison, the size and nature of USS Facilities create challenges for any locality to protect important resources and the public health, safety, and welfare of the community. Virginia has thousands of acres of rooftops, parking lots, and landfills devoid of solar panels in areas of moderate to high energy demand, in addition to contaminated and/or underutilized industrial sites. It is PEC’s belief that we should be looking to these developed areas as the low hanging fruit of future solar sites.
The evolution of Commonwealth policy, steadily declining cost of solar panels and the rising demand for green energy has spurred interest in the development of USS Facilities throughout Virginia. These facilities are often sited in rural areas and referred to by many as solar farms. They have many of the same environmental benefits as rooftop solar, including zero emissions and the ability to provide power at times of peak-demand, but they are not agriculture. USS Facilities do not provide the positive outcomes associated with agricultural production; moreover, their only correlation to farms is their tendency to be located on farmlands associated with historical/potential agricultural production. With “small” USS Facilities consuming hundreds of acres, it is difficult at best to protect specific values associated with agricultural lands.

USS Facilities require a vast amount of acreage for energy production -- as much as 7 to 10 acres per megawatt (MW) of rated capacity. Based on size, location, visibility, impacts to agricultural and natural resources, and the potential for additional infrastructure, a locality needs the ability to determine the appropriateness of sites to address impacts.

USS Facilities will play a role in the Commonwealth’s energy mix. But they should not come at the cost of our most productive agricultural and forested areas. Nor should they impact important scenic and historic resources that we rely upon for tourism.

Although Planning District Commissions (PDC), such as the Rappahannock Rapidan Regional Commission (RRRC), have created documents that highlight lands attractive to industry for the siting of USS Facilities; these types of studies generally fall short of identifying important cultural, natural, and historic resources in these areas. This places the burden upon localities to protect and identify important resources that should not be subjected to, or may be in conflict with, USS Facilities. The Comprehensive Plan should act as an additional guideline when discussing proper siting for USS Facilities.

The RRRC relied upon the following natural resource data layers to address “Optimal Areas for Utility-Scale Solar” (Figure 1): floodplains, wetlands, slopes/grade, and prime agricultural land; however, the RRRC did not include additional data layers that would be addressed within a Comprehensive Plan to evaluate appropriate locations for USS Facilities.

The Cricket Solar Application (Figure 2) is located within an area designated by the RRRC as “Optimal” for USS Facilities (Figure 1); however, the Cricket Solar Facility directly impacts many cultural, natural, and historic resources, including forested land (Figure 3); prime farmland and farmland of statewide importance (Figure 4); and core and study battlefield areas, proposed
historic district, registered historic sites, and the Rapidan River (Figure 2), that were not included in the RRRC analysis (Figure 1).

**Figure 1**: Optimal Areas for Utility-Scale Solar (red arrow points to Cricket Solar Application)
Figure 2: Cricket Solar Application Site Location Map in Culpeper, Virginia.

Figure 3: Cricket Solar Application Forest Cover Map in Culpeper, Virginia.
Figure 4: Prime Agricultural Soils (Prime Farmland and Farmland of Statewide Importance) in Culpeper.

When looking for new sites for USS Facilities, we believe developers and the County should be in general agreement on locations appropriate for these industrial uses - areas that contain marginal farm soils (at best), that are removed from important scenic and historic resources, and sites that provide appropriate visual buffers to neighboring communities - prior to any public hearing on an individual application.

**POLICY PURPOSE**

This Policy Document addresses the following topics: 1) Public Process (Permits); 2) Siting Criteria Policy Document; 3) Tax Revenue; 4) Hydrologic Impacts; 5) Ecological Impacts; 6) Agricultural Land; 7) Grading and Fill; 8) Viewsheds and Natural/Historic Resources; 9) Screening Issues; 10) Noise Implications; 11) Property Values and Study Validity; 12) Decommissioning; 13) Transmission Impacts; and 14) Our Thoughts on the Future of Solar.
1. **PUBLIC PROCESS (PERMITS)**

Utility-Scale Solar (USS) Facilities are industrial facilities and should not be allowed by-right on agriculturally zoned lands. Given their size and nature, they should be:

- Subject to a Conditional or Special Use Permit in agriculturally zoned areas with maximum acreage allowed per project and possibly per the entire County; and/or
- Limited to existing industrial zoned areas.
  - Agricultural land should not be spot zoned to create additional industrial zoned areas for USS Facilities.

Conditional or Special Use Permits on agriculturally zoned properties allow for a public assessment of the impacts and, where warranted, conditions put in place that mitigate those impacts. If severe impacts cannot be mitigated, the proposal should not go forward. As well, limiting the use to existing industrially zoned lands recognizes the nature of these large power generation facilities.

Avoidance of sensitive resources (e.g., cultural, natural, historical, public transportation, and public health, safety, and welfare) can eliminate the likelihood of a severe impact. Like all technologies, solar infrastructure will likely evolve into higher production value potentials, leading to more energy production per acre -- Counties should take this into consideration.

2. **SITING CRITERIA POLICY DOCUMENT**

Counties should consider creating a siting criteria policy documents that, using the values/resources that are important to citizens (often well-defined within Comprehensive Plans), highlight potential impacts, mitigation measures, and conflicts with county resources from USS Facilities. The policy document should clearly delineate impacts to be avoided and those that could potentially be mitigated. It should set clear expectations and standards for the industry and provide the citizens some level of comfort that the county is protecting their health, safety, and welfare in the process. The remainder of this document addresses many of the areas that should be addressed in any policy.

3. **TAX REVENUE**

Localities have vocalized two concerns over local tax revenue associated with USS Facilities: (1) implications of the machine and tool (M&T) tax (§ 58.1-3508.6 and § 58.1-3660); and (2) revenue due to lower land use value tax (LUVT).

**M&T Tax**

The M&T tax offers the following tax exemptions for USS Facilities based on energy production:

- $ \leq 5$ MW: 100% tax exemption
● > 5 MW and < 150 MW: 80% mandatory tax exemption
● ≥ 150 MW: not subject to mandatory 80% tax exemption (local government discretion)

The M&T tax exemption is applicable only to machine and tool property, and not the land itself. Items included in this exemption include machinery and tools, as well as “repair and replacement parts, owned by a business and used directly in producing or generating renewable energy” (§ 58.1-3508.6).

LUVT
The following recurring question has been raised by multiple localities: If a USS Facility is located within an agriculturally zoned area, can the County tax the USS Facility as a higher use (i.e. industrial)? The answer to that question is yes.

Localities can capture the industrial use associated with USS projects in their assessment of the facilities. The Commissioner of Revenue for each locality is responsible for the assessment of a property’s actual use, regardless of how the property is zoned. Therefore, USS Facilities (industrial-related use) that are located within agriculturally zoned areas will be taxed for their industrial use, including roll-back taxes.

The following excerpts from the taxation section of the Code of Virginia are useful when understanding the taxes associated with LUVT and USS Facilities:

- § 58.1-3230
  ○ Prior, discontinued use of property shall not be considered in determining its current use. Real property that has been designated as devoted to agricultural use shall not lose such designation solely because a portion of the property is being used for a different purpose pursuant to a special use permit or otherwise allowed by zoning, provided that the property, excluding such portion, otherwise meets all the requirements for such designation. The portion of the property being used for a different purpose pursuant to a special use permit or otherwise allowed by zoning shall be deemed a separate piece of property from the remaining property for purposes of assessment.

- § 58.1-3237
  ○ When real estate qualifies for assessment and taxation on the basis of use under an ordinance adopted pursuant to this article, and the use by which it qualified changes to a non qualifying use, or, except as provided by ordinance enacted pursuant to subsection G, the zoning of the real estate is changed to a more intensive use at the request of the owner or his agent, it shall be subject to additional taxes, hereinafter referred to as roll-back taxes. Such additional taxes
shall only be assessed against that portion of such real estate which no longer qualifies for assessment and taxation on the basis of use or zoning.

○ Liability to the roll-back taxes shall attach when a change in use occurs, or, except as provided by ordinance enacted pursuant to subsection G, a change in zoning of the real estate to a more intensive use at the request of the owner or his agent occurs.

4. HYDROLOGIC IMPACTS
Technically sound stormwater engineering practices are necessary to control runoff and pollution. Runoff and pollution are unavoidable impacts associated with impervious surfaces. Mass grading, coupled with the removal of agricultural and forested land, will result in detrimental stormwater runoff and pollution, if not properly handled. Figure 5 below depicts erosion issues during construction of a solar facility.

USS Facilities should have to submit an Erosion and Sediment Control Plan (ESCP), and include the following information:

● Extent of grading and appropriate grading phases;
● Runoff coefficients (soil type, cover type, slope);
● Management of runoff and pollution both during and subsequent to construction/grading activities and throughout the lifetime of the Project;
● Ground cover plantings that should utilize native species ranging from 1 to 3 ft in height; and
● Address the impervious nature of solar panels and the creation of “drip-line erosion” (Figure 6).

Figure 5: Erosion during solar construction titled as “Turbid runoff from a solar project during construction”.

Photo Credit: Environmental Science and Engineering Magazine
5. ECOLOGICAL IMPACTS

Silicon covered solar panels are the general industry standard, and appear to be environmentally friendly. Community members have raised the issue of toxics related to solar panel constituents. We agree that USS Facilities should not use, consider, or anticipates using panels that contain harmful substances that display toxicity characteristics. Concerns related to the use of heavy metals (cadmium) or GenX coating materials have been cited by the general public.

- Cadmium is a heavy metal that can pose potential impacts to soil and groundwater health. Some have expressed concern about contamination from the use of cadmium telluride (CdTe) contained in panels, especially if damage were to occur to the solar panels via natural disaster or during decommissioning. While PEC shares the general concern related to toxics, most of the studies related to CdTe have found there is little evidence that cadmium contamination would occur during the normal use of these panels. However, there is some evidence to suggest a release is possible if not properly disposed. PEC would recommend proper disposal or recycling of these panel types to ensure no contamination occurs. Figure 7 below displays the general layers of cadmium telluride solar arrays.

- Increasing research on GenX coatings by the EPA, such as the health effects related to Per- and Polyfluoroalkyl Substances (PFAS)\(^1\),\(^2\), raises environmental health concerns.

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2. [https://www.epa.gov/pfas/basic-information-pfas](https://www.epa.gov/pfas/basic-information-pfas)

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Counties should require panel types/materials to be specified in the application and have a condition excluding harmful substances, such as heavy metals and GenX materials, from being used at USS Facilities.

Figure 7: Layers of Cadmium Telluride Photovoltaic Solar Cells.

6. AGRICULTURAL LAND
USS Facilities should not be allowed on land that contains Prime Agricultural Soils (federally designated); and Soils of Statewide Importance should be avoided to the maximum extent possible. Proposals should not negatively impact the future use of a site as agriculture. Processes associated with the development, use, and decommissioning of USS Facilities could limit the future agricultural use of land, forgoing future use as productive cropland. All efforts should be made to return the land to its prior state, including its viability for different types of equal or higher use agriculture. Pasture land is not equivalent to productive cropland.

Proposals that retain some agricultural use or those that increase its value as habitat should receive greater support than those that do not. An example would be a design that allows for continued grazing, hay, and/or crop growing within the area of impact. This is difficult as many grazing animals are not compatible with USS Facilities. Designs that would allow for easy harvesting of crops to be planted in conjunction with panels are not common in projects of this scale. But if discussed with the applicant early, the project may be able to be designed to allow for the equipment or fencing necessary for crops and/or livestock (sheep primarily) in a limited fashion.
Another example of continued agriculture is the inclusion of beehives and beekeeping in conjunction with USS Facilities (Figure 8). Bees will provide pollination to buffers, screening, and neighboring farms while producing honey that can be sold by the landowners. As well, some communities are requiring the establishment of native meadows as a way to increase habitat and decrease the use of herbicides or mechanical clearing on the site.

7. **GRADING AND FILL**
Grading and fill should be avoided. Structural components can be included on ground-mounted systems, to avoid civil engineering (i.e., grading). Figure 9 below depicts solar arrays on sloped terrain, where grading and fill were avoided by utilizing structural components.

If any grading is required, it should not result in the loss of agricultural soils (topsoil) and should be completed in phases to reduce erosion and sediment from the site. In cases where grading is required, topsoil should be removed from the area prior to grading. That soil should be stored on site and replaced after the grading is completed. Compression mats (Figure 10) should be
employed to avoid compaction of soils from heavy equipment. Any existing natural vegetated buffers should be used to further reduce runoff from the site.

Solar panels are impervious surfaces, as they create drip line erosion. Additional impervious surfaces (e.g. roads, structures) should be minimized/avoided.

**Figure 9:** Ground-mounted solar arrays located on a hill, avoiding grading and fill.
8. **VIEWSHEDS AND NATURAL/HISTORIC RESOURCES**

The pursuit of historic resource protection and tourism associated with historic and scenic assets should be taken into consideration when evaluating viewshed implications. Impacts to scenic and historic resources and gateways to communities should be considered and addressed in any development of siting criteria. Counties should consider distance requirements from known resources (battlefields, register properties, historic districts, etc.) and require a site specific analysis of viewshed impacts, such as Figure 11 below. Impacted viewsheds will devalue historic and scenic resources and will deter tourists from visiting these areas.

For example, if a tour guide, while giving a tour of a battlefield, pointed to a large area of solar panels and said “the Northern Army cavalry was positioned upon the hill in the area of those solar panels”, the value of the history associated with the viewshed would be lost in the tourists inability to view the natural landscape associated with this hypothetical medical hospital.
Replacing forested land, especially hardwoods and those classified by the Department of Forestry (DOF) as being high in “forest conservation value”, with solar panels does not make sense. Although solar power provides environmental benefit in their ability to reduce emissions, we should not seek to reduce that value by eliminating other important environmental services of our forests including their contribution as “carbon sinks” and enhanced water quality. Forests and agricultural lands can serve as “carbon sinks”, due to their natural ability to absorb atmospheric carbon dioxide via “carbon sequestration”\(^3\). Counties should not approve renewable energy projects that result in the loss of resources that naturally regulate carbon emissions -- forests and agricultural lands.

Counties should seek “Win, Win” opportunities, such as USS Facilities that create positive, renewable energy (“Win”) while avoiding cultural, natural, and historical resources (“Win”).

Counties should avoid “Win, Loss” applications, such as USS Facilities that create positive, renewable energy (“Win”) yet destroy carbon sinks (“Loss”) or important cultural and historic resources.

\(^3\) https://www.americanforests.org/blog/forests-carbon-sinks/
9. SCREENING ISSUES
Screening practices should be designed to hide any USS Facility and its appurtenant features (e.g., fences, solar panels, switchyard) to the maximum extent possible. Fences should be designed to blend in with surrounding screening and natural views. The size, nature, and mixture of vegetative species used to screen the USS Facility should seek to fully mitigate its viewshed implications; however, given the potential size and location of USS Facilities, this may be impossible.

General screening practices should be designed to:

- Protect property values by providing maximum benefits to adjoining landowners and viewsheds. Figure 12 displays poor screening qualities associated with a single row of evergreen trees;
- Provide maximum benefit to wildlife via creation of reliable habitat. Figure 13 displays the co-location of solar arrays and agricultural land that would provide habitat and assist with erosion control;
- Project water quality;
- Screening should consist of a mixture of native deciduous, evergreen trees, and shrubs.
- Established hardwoods should be left in place and utilized as natural screening;
- Pollinator friendly species would be of the highest recommendation, in order to add ecological benefits with the creation of new wildlife habitat;
- Deciduous and evergreen trees should have a minimum vertical planting height to immediately screen fence lines and solar panels; and
- Tree species that drop their lower limbs or open up as they mature should be avoided (white pine, etc.).

Permitting a landowner to waive proper screening practices indicates that said screening only affects the landowner. Lack of proper screening could cause negative, long-term viewshed implications for road travelers and future properties adjoining or in proximity to a USS Facility. Maximum attention must be paid to buffers and screening.
10. NOISE IMPLICATIONS

Noise associated with both construction and general operation should be defined. Construction noises will likely be out of attainment, in regards to those counties that have noise ordinances for agricultural and residential zoned areas. Counties should request that applicants explore alternative installation measures that reduce noise for neighboring communities and livestock. Pile-driving techniques can continue for months on end, and pose serious implications to the public health, safety, and welfare, including both humans and animals (especially livestock). Figure 14 displays pile-driving installation at a USS Facility in Powhatan, Virginia.

Figure 12: Poor screening associated with USS Facility.

Figure 13: Proper screening and agricultural co-location associated with USS Facility.
Comprehensive evaluations of the noise associated with general site operations (e.g., inverters, transformers, panels) should be conducted. Counties should request project noise levels be disclosed at all relevant property lines, associated with both the construction period and general operations.

Figure 14: Pile-driving installation of ground-mounted structures at Scott II Amazon Solar Farm US 5 East in Powhatan, VA.

For example, “the effects of noise on various production parameters of cattle may also vary depending on whether the animals are exposed to noise on continuous or on an intermittent basis. In the latter case, animals are more severely affected as they do not have the chance to adapt to the noise.”

11. PROPERTY VALUES AND STUDY VALIDITY
Property values will be affected. While anecdotal information should not be used in the findings related to any decision, answering the simple question of *Would you want to live next to one?* is a clear indicator that the value of adjacent properties will be impacted, at least for agricultural or residential purposes.

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Many localities are wrestling with the question of *To what degree will a facility impact an adjacent property’s value?*. While no agreed-upon figure has been established, some localities are seeking independent assessments after hearing questionable claims from the industry that impacts are nonexistent or negligible. The nonexistent and negligible claims are largely based on the fact that, due to the young age of USS Facilities in the United States, comparative pricing (i.e. sales price pre-solar vs. post solar) is not sufficient to determine the financial impacts that USS Facilities have on housing values.

USS Facilities should be considered as industrial use, as they provide industrial-sized energy production, result in industrial-scale consumption of land, and create visual impacts similar to other industrial uses.

12. **DECOMMISSIONING**

USS Facilities are ground mounted systems that include materials aboveground and subsurface. In order to protect the future use of agriculture on the property, all measures should be taken to protect against damages (compaction, removal of topsoil, contamination) of the soils. All traces of the system should be removed at the end of a USS Facility’s useful life. This can be accomplished with a contract condition (landowner) and bonding from the company.

USS Facilities should be returned to its pre-construction condition. For example, the post mounts, cabling, and road networks associated with the site should be removed from the property, along with any remaining infrastructure at the end of the facility’s useful life (aboveground and subsurface elements). Use of concrete and other difficult to remove foundation measures should be minimized to primary structures (e.g., offices, substations, switchyards); and solar array racks should be installed without concrete footings.

At this time, there is little evidence of practical and profitable recycling of solar panels to accommodate the future recycling needs of USS Facilities. Until such time, bonding associated with decommissioning should reflect the full cost of decommissioning plus inflation and, given the lack of an established market, not include any discounts related to the future recycled value of solar panels.

13. **TRANSMISSION IMPACTS**

Localities should make themselves aware of associated transmission and/or substation current locations and future upgrades. If required, the impacts of that infrastructure should be assessed along with the impacts of the facility. Figure 15 depicts the Fiber Optic Network and Electric Transmission Lines in the Northern Piedmont.
14. OUR THOUGHTS ON THE FUTURE OF SOLAR

As previously discussed within the Introduction of this document, Virginia has thousands of acres and sites we would define as *low hanging fruit* that should be used for solar prior to utilizing agricultural lands. These areas include:

- Rooftops
- Parking Lots
- Landfills
- Brownfields and other Contaminated Sites
- Underutilized Industrial Sites
- Airports
- Right of Ways (ROWs)
The vast majority of renewable energy discussed in SB966 is of Utility-scale. According to the legislation, the code now calls for 5,000+ MW of Utility-Scale renewables of which, the vast majority is expected to be met with solar. It is unfortunate that the legislation failed to provide for greater use of distributed generation in the form of Small-Scale agricultural residential and commercial solar via net metering. In order to effectively deploy and rely upon renewable energy, Virginia should consider policies that provide for the greater use of small-scale solar that is not controlled by utilities, including removing current barriers (standby charges, limits on net metering, etc.) to customer and municipally owned generation.

**SOURCES**

In addition to the footnote sources listed throughout this document, PEC found common ground with many of the following sources that could offer additional information for localities considering the adoption of, or changes to, their ordinances. Please note that, while PEC shares many of the same thoughts and ideals presented in these sources, we respectfully disagree with some of the information presented. We have also included hyperlinks to a few of our public submittals that address particular USS Facilities.

**Footnotes (in order of appearance)**

GenX Compounds:

Basic Information on PFAS:
https://www.epa.gov/pfas/basic-information-pfas

Carbon Sinks:
https://www.americanforests.org/blog/forests-carbon-sinks/

Effects of Noise on Cattle Performance:

**Common Ground Sources**

*Industrial Solar Farms: An In-Depth Look How Industrial Solar Farms Impact the Rural Tidewater Counties of the Middle Peninsula and Northern Neck*, The Essex County Conservation Alliance, April 2019

*Utility-Scale Solar Ordinance Recommendations*, Alliance for the Shenandoah Valley, Shenandoah Valley Battlefields Foundation, March 2019
Previous PEC Submittals (included via hyperlink)

_Solar Farms and Criteria for Siting and Permitting_, Letter Submitted to Page County Planning Commission, Piedmont Environmental Council, September 6, 2018

_Utility Scale Solar Application -- Cricket Solar, LLC_, Letter Submitted to Culpeper County Planning Commission, Piedmont Environmental Council, March 6, 2019