pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Clean Water

Chapter 102 Permitting for Solar Panel Farms

Frequently Asked Questions (FAQ)
January 2, 2019

Background

With renewed interest in development of clean, renewable energy in Pennsylvania, the development of solar photovoltaic installations is increasing in the state. This FAQ document was developed to clarify the Department of Environmental Protection's (DEP's) interpretations concerning applicability and implementation of National Pollution Discharge Elimination System (NPDES) permits for stormwater discharges associated with construction activities, including erosion and sediment control (E&S) and post-construction stormwater management (PCSM) for solar panel farms. This document refers to a solar panel farm as a large-scale application of solar panels to generate electricity.

Nothing in this document affects regulatory requirements. The interpretations herein are not an adjudication or a regulation. There is no intent on the part of DEP to give the interpretations in this document that weight or deference. This document provides a framework within which DEP and delegated county conservation districts (CCDs) will exercise administrative discretion in the future. DEP reserves the discretion to deviate from the interpretations in this document if circumstances warrant.

For additional information on solar energy use the following link:

http://www.dep.pa.gov/Citizens/Energy/Renewables/Pages/Solar.aspx

FAQ #1: Is NPDES permit coverage required for the development of a solar panel farm?

If the earth disturbance associated with the construction of a solar panel farm will be at least 1 acre, NPDES permit coverage is required (see 25 Pa. Code § 102.5(a)).

FAQ #2: What earth disturbance is associated with development of a solar panel farm?

Earth disturbance activities necessary to construct solar panel farms will vary depending on the topography, slopes, and soils of the proposed location of the solar panel farm, the layout of the solar arrays, and whether the arrays are fixed panel or dual tracking. In some instances, significant grading, including clearing and grubbing, of the site may be necessary. In other cases, minimal disturbance may be necessary to excavate the site to provide level ground for the installation of

the solar modules. The total earth disturbance of the project would be the cumulative impacts of the earth disturbances associated with the installation of the support/mounting structures for each module, as well as any associated access roads and support building(s).

FAQ #3: What E&S BMPs are necessary for the installation of a solar panel farm?

A person proposing earth disturbance for the development of a solar panel farm must utilize appropriate E&S best management practices (BMPs) applicable to the size and scope of the proposed project. Acceptable E&S BMPs can be found in the *Erosion and Sediment Pollution Control Program Manual*, Department of Environmental Protection, No. 363-213-008. Persons proposing solar panel farms should minimize the extent and duration of the earth disturbance activity, maximize protection of the existing drainage features and vegetation, avoid soil compaction, and utilize any other measures or controls to prevent or minimize the generation of increased stormwater runoff.

FAQ #4: What are the PCSM requirements for a fixed-panel unit?

Many projects use mounting structures where the solar modules are mounted at a fixed inclination calculated to provide the optimum annual output profile. The modules are normally oriented towards the Equator, at a tilt angle slightly less than the latitude of the site. In some cases, depending on local climatic and topographical conditions or electricity pricing regimes, different tilt angles can be used, or the arrays might be offset from the normal East-West axis to favor morning or evening output.

All construction projects need to have some consideration of the impact that their project will have on stormwater runoff. With some solar panel farm projects these impacts will be minimal and may not require a detailed stormwater analysis to be completed. If the following conditions are met, then the project area of a fixed photovoltaic solar panel farm project can be considered pervious cover, a detailed stormwater analysis is not needed, and PCSM BMPs are not necessary:

1. Projects where earth disturbance and grading activities are minimized and where natural vegetative cover is preserved and/or restored. The utilization of low impact construction techniques must be used. Refer to BMP 5.6.1: Minimize Total Disturbed Area – Grading, BMP 5.6.2: Minimize Soil Compaction in Disturbed Areas, and BMP 5.6.3: Re-Vegetate and Re-forest Disturbed Areas, Using Native Species from the *PA Stormwater Best Management Practices Manual*, Department of Environmental Protection, No. 363-0300-002, (December 30, 2006).

2. The vegetative cover must have a minimum uniform 90% perennial vegetative cover with a density capable of resisting accelerated erosion and sedimentation. The 90% standard exceeds the 70% standard as in 25 Pa. Code § 102.22(a)(i), as the vegetation may be typically the primary and only BMP used for solar panel farms.

   (a) A meadow condition is preferable especially for projects located on slopes between 5-10%.
   (b) If areas under the solar panels must be mowed, then the vegetative cover should not be cut to less than 4 inches in height.

(c) Vegetated areas will not be subject to chemical fertilization or herbicide/pesticides application, except for those applications necessary to establish the vegetative cover and in accordance with an approved E&S Plan.

3. The individual photovoltaic panels within an "array" are arranged in a fashion that:

   (a) Allows the passage of runoff between each module, thereby minimizing the creation of concentrated runoff.
   (b) Allows for the growth of vegetation beneath the panel and between "arrays."

4. Ground mounted solar panels that are supported with structures/foundations require little earth disturbance for their installation/construction. Unless evidence is provided to the contrary, it will be assumed that for these ground mounted solar panels themselves (not including access drive, etc.) will disturb 5% of the total project area.

5. Solar panels must be situated on slopes of 10% or less.

6. The lowest vertical clearance of the solar "array" should be 10 feet or less from the surface of the ground but must be of adequate height to promote vegetative growth below the "array." Limiting the height of the solar "array" will minimize the potential for accelerate erosion to occur along the drip line of the solar "array".

Meeting these conditions will minimize the potential for accelerated erosion (by creating a stable flow condition under and around the solar panels) and provide for an uninterrupted hydrologic cycle (by creating pervious cover under the solar panels).

FAQ #5: What if I cannot meet the conditions outlined above as part of my project for PCSM planning?

If you cannot meet all the conditions listed above to have the project treated as pervious cover, the person proposing the earth disturbance activity will need to complete an analysis of how the proposed solar panel farm project will impact the amount and quality of stormwater runoff from the site, to determine the need for PCSM BMPs. The goal of stormwater management is to replicate the pre-development stormwater runoff condition after the construction project is finished. Post-development runoff conditions will dictate how much of a stormwater analysis must be provided for the project.

FAQ #6: Is there a difference for the PCSM requirements for a tracked-panel unit?

To maximize the intensity of incoming direct radiation, solar panels should be orientated normal to the sun's rays. To achieve this, arrays can be designed using two-axis trackers, capable of tracking the sun in its daily orbit across the sky, and as its elevation changes throughout the year. These arrays need to be spaced out to reduce inter-shading as the sun moves and the array orientations change, so they may need more land area. They also require more complex mechanisms to maintain the array surface at the required angle. This increase land area may result in additional earth disturbance for the project. However, the same PCSM requirements

addressed for fixed panel units as outlined in FAQ #4, Items 1-6 would need to be addressed for tracked panel units as well. If the project area meets all 6 conditions as outlined in FAQ #4, then the project area of a tracked, two-axis photovoltaic solar panel farm would be considered pervious cover and will not require any additional PCSM BMPs.

FAQ #7: What if I proposed the use of gravel rather than vegetative cover under the solar panels?

The use of gravel under the solar panels is permissible; however, the use of gravel would not be considered pervious cover. PCSM is required for the use of the gravel under the solar panels, and the person proposing the project will need to provide a stormwater analysis in accordance with 25 Pa. Code §§ 102.8(g)(2) & 102.8(g)(3).

When calculating the stormwater analysis, projects that are utilizing a minimum of a 6-inch layer of clean, washed and uniformly graded gravel may utilize the void space as storage for stormwater purposes if the project site (e.g., slopes exceeding 10% are not applicable) and the underlying soil conditions allow for it. Sand layers (or another filter media, as approved by DEP) may be introduced into the stormwater design to help address water quality issues.

FAQ #8: What are the PCSM requirements for roadways and support buildings associated with the development of the solar panel farm?

All impervious areas associated with roadways and support buildings will need to follow normal protocols when performing the PCSM stormwater analysis.

FAQ #9: Are there any additional requirements if I need to re-grade the entire area?

Projects that are unable to minimize earth disturbance or grading activities should employ soil/landscape restoration and soil amendments in accordance with the recommendations of the *PA Stormwater BMP Manual*, BMP 6.7.1: Landscape Restoration and BMP 6.7.3: Soil Amendment and Restoration.

FAQ #10: If the width of my solar panels modules will exceed 3 feet are additional BMPs or design considerations necessary?

Yes, if the solar panels are too large, then an adequate vegetative cover may not be able to be established and maintained. Additional BMPs such as infiltration trenches or infiltration berms should be installed downgradient between each row (even if the conditions in FAQ #4 are met). See *PA Stormwater BMP Manual*, BMP 6.4.4: Infiltration Trench and BMP 6.4.10: Infiltration Berm and Retentive Grading for additional guidance.

FAQ #11: If the placement of the support structure/foundations result in these structures occupying more than 5% of the total project area, how is the PCSM stormwater analysis addressed?

Since greater than 5% of the total project area is occupied by the support structure/foundations, the impervious area is increased and the project cannot be treated as pervious cover. You will need to provide an analysis of the impact this will have on the amount and quality of stormwater runoff from the site. Additional drainage conveyances and PCSM BMPs will need to be used to address stormwater issues.

FAQ #12: The slope of my solar panel farm project is greater than 10%, are additional BMPs or design considerations necessary?

Yes, where the slope exceeds 10% additional BMPs such as infiltration trenches or infiltration berms should be installed downgradient between each row. See *PA Stormwater BMP Manual*, BMP 6.4.4: Infiltration Trench and BMP 6.4.10: Infiltration Berm and Retentive Grading for additional guidance.

FAQ #13: The elevation of my solar panels will be greater than 10 feet in height, are additional BMPs and design consideration necessary?

Yes, if the height of the solar panels exceeds 10 feet maximum additional controls are necessary to prevent and minimize accelerated erosion and scour along the drip line or provide some type of energy dissipation controls.

FAQ #14: Can agricultural crops be grown underneath the solar panels?

Yes, "agrivoltaics," the co-development of the same area of land for both solar photovoltaic power and conventional agriculture, may be used provided that:

1. Only shade tolerant crops may be used.

2. Crops must be no tilled in. Moldboard Plowing is not permitted.

3. A written erosion and sediment control plan must be developed for agricultural plowing or tilling activities or a portion of the overall farm conservation plan must identify BMPs used, in accordance with the requirements of Chapter 102.4(a) for the field(s) where the solar panel farm is located.

4. Any cutting or mowing of the agricultural crop is limited to a height of no less than 4 inches minimum.

5. Application of chemical fertilization or herbicides/pesticides is limited to the agronomic needs to the crop(s).

6. Additional BMPs may be used depending on site conditions, slopes and soil types.

7. The height of the solar panels from the ground will likely exceed 10 feet to allow for farm machinery to access the area, if so additional controls to address erosion and scour along the dripline and provide energy dissipation may be necessary.