# Solar Reuse Assessment

September 2025

## South Point Plant Superfund Site, South Point, Ohio

## Introduction

At the South Point Plant Superfund site, the U.S. Environmental Protection Agency (EPA) partnered with Honeywell International Inc. (Honeywell), a potentially responsible party (PRP), to clean up a 610-acre former chemical manufacturing facility along the Ohio River in South Point, Ohio. Through close coordination with EPA and Honeywell, the Lawrence Economic Development Corporation (LEDC) has successfully redeveloped major portions of the property, which now houses LEDC's offices and commercial and industrial space leased to local businesses.

LEDC is now exploring reuse opportunities for remaining undeveloped areas of the site, including potential energy production. To prepare for discussions with developers, LEDC requested support from EPA's Superfund Redevelopment Program (SRP) to evaluate the site's potential for solar energy.

This report, based on site research, document review, and discussions among SRP, EPA and Honeywell, outlines remedial features, inspection and maintenance requirements, and considerations of suitability and economic feasibility for solar energy development at the site.

## Site Background

The privately-owned 610-acre site is in the village of South Point, Ohio and located on the eastern bank of the Ohio River. The plant on-site was constructed in 1943 by the federal government to produce ammonium nitrate, which was used to produce explosives. Until 1985, several

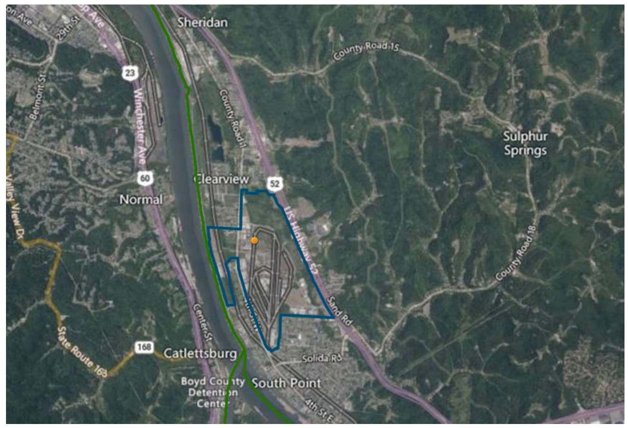


*Figure 1. South Point Plant Superfund Site Boundary and Location*

### EPA Superfund Redevelopment Program Support

EPA's SRP provides reuse planning and technical assistance to communities, stakeholders and EPA site teams. These regional support projects help facilitate redevelopment opportunities, remove barriers to productive reuse, and ensure the future uses of Superfund sites are well aligned with the cleanup and removal/remedial process. These activities are in support of the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as Superfund). EPA's SRP provided technical assistance to EPA Region 5 through its contractor Skeo to develop an energy production assessment for the South Point Plant Superfund site.

companies operated on-site manufacturing compounds such as ammonia, urea, nitrogen fertilizer solution, melamine, formaldehyde and other chemicals. Operators disposed of process wastes and general plant waste in disposal units at the site, including the Northern Fly Ash Pond, the Eastern Disposal Area, Disposal Area D and the Melamine Ponds.

The site was added to the Superfund Program's National Priorities List in September 1984. Soil and groundwater contamination from on-site munitions, fertilizer, coal and ethanol industries affected only small parts of the site; most of the site's acreage was never contaminated. Honeywell completed site cleanup, which included demolition of facilities and excavation and handling of contaminated materials. The site achieved construction completion with the signing of the Preliminary Close-out Report in December 2001.

## Site Remedy Considerations

EPA selected a remedy for long-term cleanup in a 1997 Record of Decision (ROD). EPA's cleanup included digging up and disposing of waste and contaminated soil at a licensed off-site landfill, consolidating remaining waste under a barrier cover to prevent infiltration of rainwater, pumping out contaminated groundwater, discharging treated groundwater to the Ohio River, long-term monitoring, and limits on land use and access to the site. Construction of the remedy finished in 2001.

### Remedy Features

The remedy selected in the 1997 ROD called for the following:

- Institutional controls for soil and groundwater.
- Containment of groundwater through pumping and discharging to the Ohio River.
- Groundwater monitoring.
- Excavation of wastes from Disposal Area D.
- Excavation of arsenic-contaminated soils from the Mid-Plant Area.
- Excavation of the coke-oven gas line drip pots and contaminated soils.
- Consolidated wastes within the Eastern Disposal Area.
- Construction of an on-site landfill with barrier cover in the Eastern Disposal Area for wastes from Disposal Area D and arsenic-contaminated soils from the Mid-Plant Area with concentrations less than 400 milligrams per kilogram (mg/kg).
- Off-site disposal of the coke-oven gas line drip pots, contaminated soils associated with the drip pots and arsenic-contaminated soils from the Mid-Plant Area with concentrations greater than 400 mg/kg.

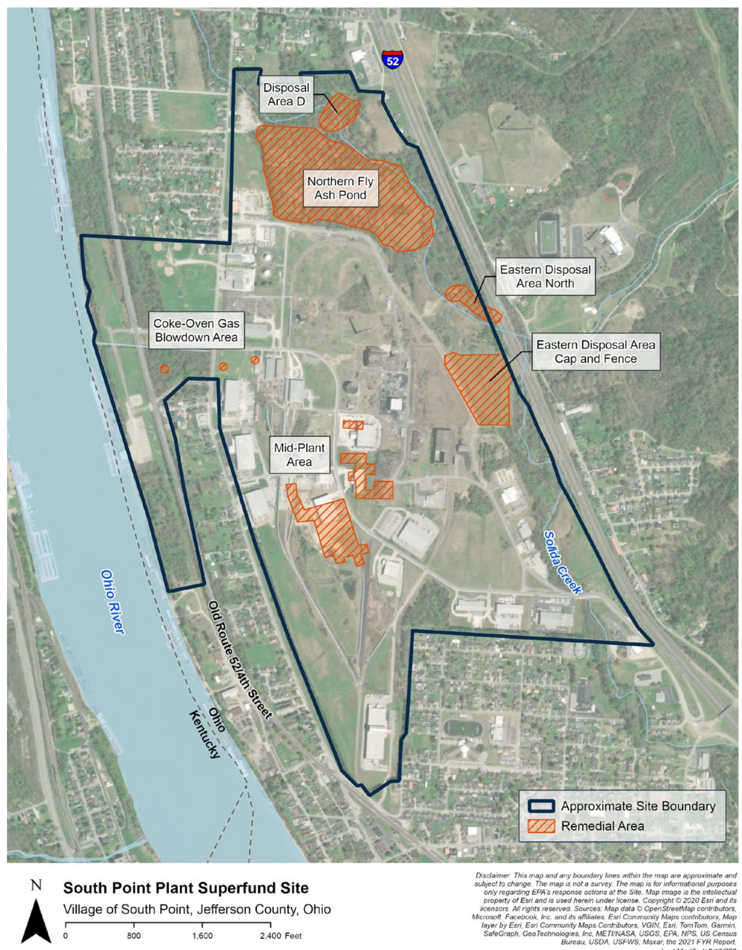


*Figure 2. Site Features*

Erosion control measures were installed at the Landfill, Disposal Area D, along the banks of Solida Creek and along the Northern Fly Ash Pond dike. Solida Creek was relocated to the east and north, away from the dike of the Northern Fly

Ash Pond. The relocated stream bank of Solida Creek was lined with rock riprap. These activities were part of the soils remedy completed in December 2001.

## Institutional Controls and Environmental Covenants

The 1997 ROD requires institutional controls for soil and groundwater. The following institutional controls and environmental covenants are instituted or planned:

- Disposal Area Landfill and Northern Fly Ash Pond-capped area – Prohibit disturbance of the cap over the landfill or disturbance of any other component of the remedy.
    - Deed Restriction/Restrictive Covenant, March 24, 1999, Lawrence County Recorder's Office.
    - Environmental covenants planned.
- Groundwater – Use of groundwater from the site for any purpose is prohibited.
    - Deed Restriction/Restrictive Covenant, March 24, 1999, Lawrence County Recorder's Office.
    - Environmental covenants planned.
- Surface water – Use of surface water from the site for any purpose is prohibited.
    - Deed Restriction/Restrictive Covenant, March 24, 1999, Lawrence County Recorder's Office.
    - Environmental covenants planned.
- Site must be restricted to commercial/industrial use only.
    - Deed Restriction/Restrictive Covenant, March 24, 1999, Lawrence County Recorder's Office.

A gate was installed to restrict access to the Northern Fly Ash Pond, which is covered with vegetation. Institutional controls are being updated to conform to current state law pursuant to the Ohio Uniform Environmental Covenants Act. The PRP, Honeywell, does not believe the updates are necessary or required, but has prepared an updated draft of the environmental covenants. Property owners and tenants think that the existing deed restrictions are sufficient. EPA, Ohio Environmental Protection Agency (OEPA) and Honeywell will continue to work with property owners and tenants to implement environmental covenants.

## Operation Monitoring and Maintenance Requirements

The 2019 Operation Monitoring & Maintenance (OM&M) Manual for the site is intended to assess the flow and quality of groundwater until remedial goals for groundwater are met. Among other tasks, OM&M includes:

- Quarterly inspections of the site.
- Semiannual groundwater sampling and inspection of monitoring wells.
- Mowing of the cap area.
- A review of existing institutional controls.
- Annual reporting.

# Solar Suitability

## Analysis to Identify Solar Footprints

The following section summarizes the solar suitability analysis, including potential for ground-mounted, utility or community-scale solar power generation at areas of the site that would not otherwise be suitable for development.

Based on discussions with project partners, including EPA, LEDC and Honeywell, it is anticipated that solar development would be sited on the Northern Fly Ash Pond and Eastern Disposal Areas of the site. These areas of the site have gentle slopes with southern exposure and stable soils, are compatible with the remedy, and have proximity to transmission lines.

Solar footprints are shown in Figure 3, the Northern Fly Ash Pond (A) and the Eastern Disposal Area Cap (B).

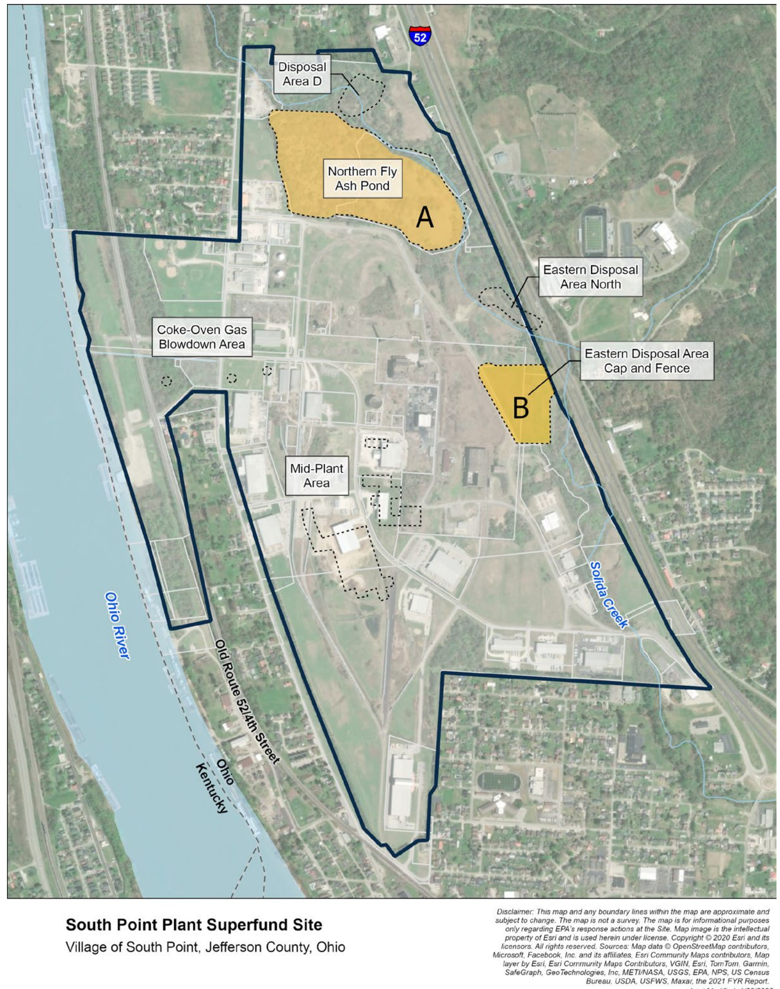


*Figure 3. Solar Footprints*

## Solar Capacity Estimates

The approximate area available for each solar footprint is illustrated in Figure 3. The calculations presented in this report demonstrate a conservative estimate of the production capacity for each area.

Based on the available acreage of each footprint, the Northern Fly Ash Pond area has the capacity to generate an estimated 14,109 kilowatts (kW) and the Eastern Disposal Area has the capacity to generate 3,652 kW (Table 1).

| Solar footprint | Area | Size (acres) | Estimated capacity (kW)* |
|---|---|---|---|
| A | Northern Fly Ash Pond | 40 | 14,109 |
| B | Eastern Disposal Area | 10 | 3,652 |
| *Conservative estimate based on land requirements of 2.8 acres/Megawatt or 0.35 Megawatt/acre. | | | |

Table 1. Estimated Capacity of Solar Footprints

## Remedy Compatibility

Siting and installation of solar photovoltaic (PV) arrays need to protect the integrity of remedy features at the site, consistent with institutional control requirements for the site. Remedy status and compatibility considerations for Areas A and B are outlined below.

Area A. Northern Fly Ash Pond

- As part of the 2001 soils remedy, erosion control measures were installed along the Northern Fly Ash Pond dike. Solida Creek was relocated to the east and north, away from the dike of the Northern Fly Ash Pond. Fly ash waste materials are consolidated under soil cover.
- The area is vegetated, and a 2021 Five-Year Review found no evidence of erosion, slope instability or other irregularities.
- Institutional controls prohibit disturbance of the cap and use of surface or groundwater.
- In August 2016, a gate was installed to prevent access to the area.

Area B. Eastern Disposal Area

This includes avoiding penetration of the Eastern Disposal Area landfill cap's geomembrane liner or the barrier protection layer. Installations must not interfere with the groundwater extraction and treatment systems or violate groundwater use restrictions.

The landfill cap at the Eastern Disposal Area requires the following components:

- A fence surrounding the area to protect it from disturbance.
- A 30-inch vegetated top layer consisting of 24-inches of protective cover soil and six inches of topsoil.
- A drainage layer to collect water and remove it from the cap.
- A 40-mil textured flexible membrane liner.
- A secondary barrier consisting of an 18-inch-thick clay layer.
- A prepared cap subgrade of 12 inches.

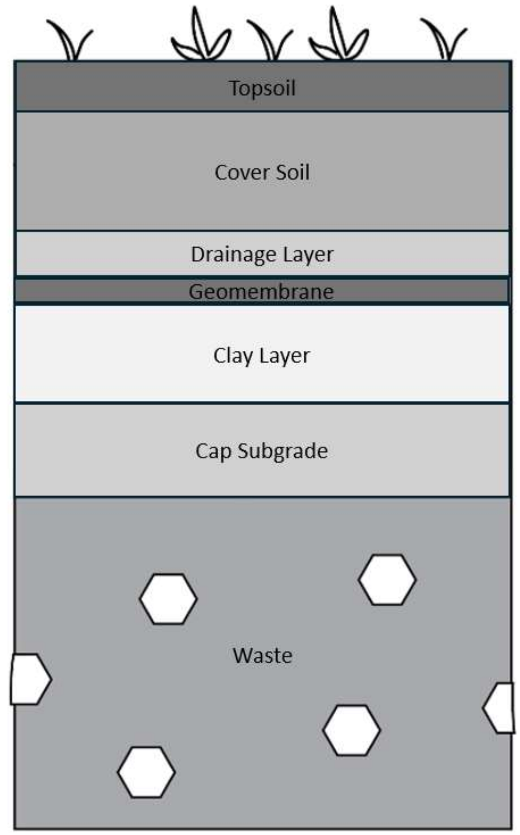

*Figure 4. Landfill Cap Diagram*

Solar siting requires slope considerations for installation. This analysis assumes that only the landfill's top decks, which are minimally graded, will be used for the solar footprint. Other landfill cap system components could include the subsurface and perimeter drainage systems, a hydraulic barrier wall for groundwater and a passive venting system.

Key Considerations

- Restrictions are in place for both Areas A and B that prevent disturbance of soil cover at Northern Fly Ash Pond and engineered cap in the Eastern Disposal Area. Solar array construction needs to avoid penetrating the surface of these areas.
- The Eastern Disposal Area has a multi-layer engineered cap and inspection indicates the soil is stable. The area offers about 10 acres for siting solar arrays.
- The Northern Fly Ash Pond has an undefined cap composition that includes planted soil cover over consolidated fly ash waste. The area offers about 40 acres for siting solar arrays.

## Electric Transmission Infrastructure

The potential solar project footprints are both within 700 feet of a transmission line located to the east of I-52 (Figure 5). Three-phase power is readily available throughout the South Point Plant site's business park adjacent to Areas A and B. Distance to transmission lines is a key consideration for solar development. Solar projects that are closer to transmission lines are less expensive to build than projects sited farther from transmission lines.

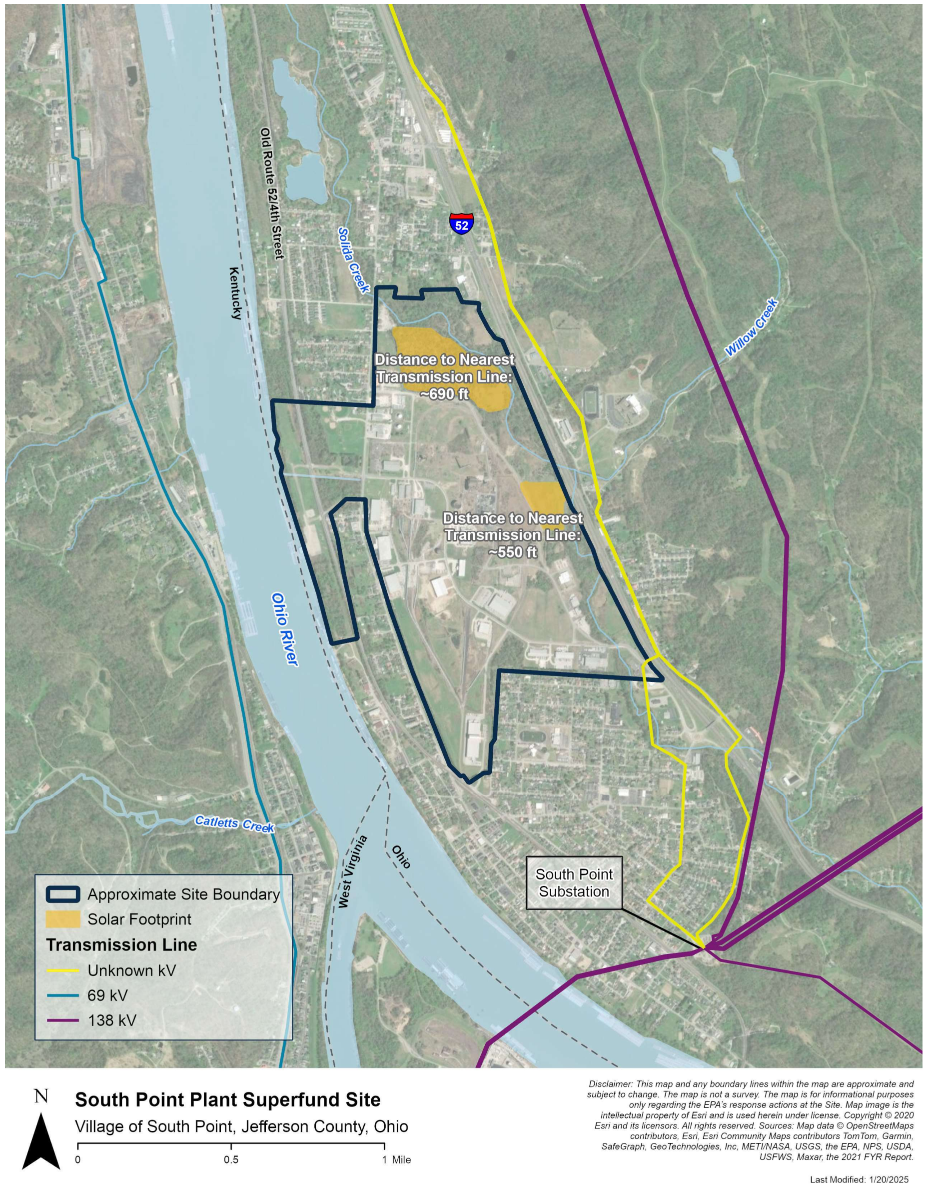


*Figure 5. Transmission Lines*

## Property Ownership

Parts of the site are owned by LEDC and other private companies. Reconstituted Properties, LLC is listed as the owner for Areas A and B.

## Mounting Systems

PV modules are held in place by mounting systems that are either directly anchored into the ground or secured with ballasted concrete blocks sitting on top of the ground surface. Mounting systems should be designed to withstand maximum local wind conditions. Ballasted systems are compatible with multi-layer landfill caps. Construction includes placing a gravel bedding layer on top of the cap surface to create a level, compact surface to support concrete ballast blocks. In some cases, minor excavations into the topsoil layer may be needed to accommodate ballast blocks (Figure 6).[1]

[1] Best Practices for Siting Solar on Landfills. NREL. 2022.

### *Ballasted Systems*

Ballasted systems are the most common anchoring method for PV systems on landfills. They typically consist of a flat tray or large concrete block placed on the landfill cap, with the array support structure attached. The weight of the ballast material prevents the PV system from shifting due to wind uplift and horizontal sliding. Ballasted systems do not penetrate the landfill cap and can provide good structural support for the PV array. Ballasted systems typically require either shallow excavation in the topsoil layer to establish gravel filled trenching or placement of gravel bedding on top of a vegetated cover. Shading from panels, gravel placement and trenching will likely alter vegetation management practices. Modified vegetated cover management, such as the use of shade tolerant grass species and soil stability inspections at the footings, will likely need to be considered. More detailed engineering studies are warranted to evaluate soil stability, which could include a soil compaction study to ensure surfaces can support weight of ballasted blocks.

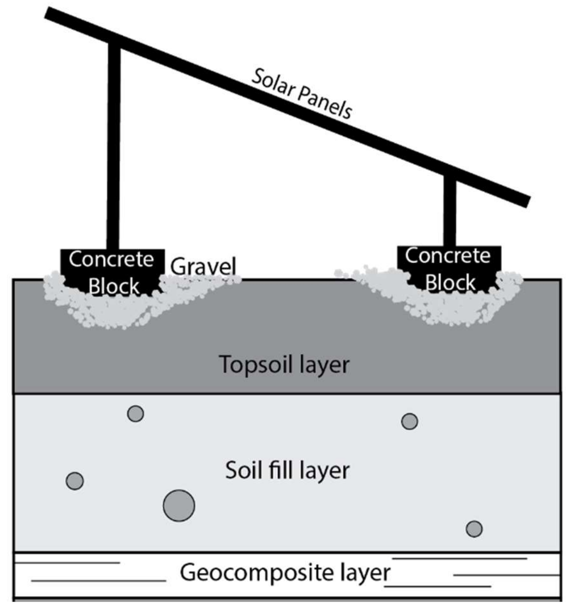


*Figure 6. Solar Panel Mounting System*

*Figure 7. Ballasted solar system. Source: NREL.*

## Stormwater Management

The PV project design should consider the interaction between the PV system components and the existing stormwater management system. The design of the stormwater management system, including the design storm, runoff and stage-storage calculations, should be understood before proceeding with the design of the solar project. The PV system will likely affect the operation of the existing stormwater management system because it will increase the area of impervious surface of the landfill and create changes in rainfall infiltration and runoff patterns. The PV system design should include the necessary alterations to the stormwater management systems affected by the predicted changes in rainfall infiltration and runoff patterns. Design considerations could include the construction of drainage features, resizing detention ponds and upgrading stormwater treatment systems.[2]

[2] Best Practices for Siting Solar on Landfills. NREL. 2022.

## Economic Feasibility for Solar Production at the Site

To evaluate the potential economic feasibility of solar development at the site's two potential solar footprints identified above, SRP's contracting team developed three models to showcase the different pathways for financing solar energy generation at the site. Each model accounts for the various costs and variables associated with a solar system's installation to calculate the value of the investment. All the models assume that a 4-acre solar footprint has the solar capacity of 1 megawatt (MW) (or 1,000 kW), making the capacity of the site's 50 available acres for solar development equal to 12,500 kW. All the models also assume that the installed cost of a solar system is equal to a conservative estimate of $1.80/watts direct current (Wdc).

### *Land Lease Agreement*

In a land lease agreement, the landowner leases the land to a private developer who designs, builds, finances, owns and operates a solar system hosted at the site. The landowner would receive lease fees based on the acreage used for the project. The potential financial impact is the annual and 20-year revenue that is driven by lease fees. The model below assumes a 20-year time horizon during which base rent is kept at $2,000/acre. It is possible that a higher base rent could be secured at the start of the agreement. A discount rate of 7% was used to calculate the net present value (NPV) of the total lease revenue.

| Acres | System Size (kW) | Annual Base Rent (per acre) | Annual Lease Revenue | Total Lease Revenue (Over 20-Year Timeframe) | NPV of Total Lease Revenue |
|---|---|---|---|---|---|
| 50 | 12,500 | $2,000 | $100,000 | $2,000,000 | $1,122,560 |

Table 2. Estimated Project Payback in the Land Lease Agreement Model

Table 2 shows the estimated annual and 20-year payback of the project under a land lease agreement. At a base rent of $2,000/acre per year, the annual revenue generated by lease fees is $100,000 for all 50 acres. Over the 20-year project timeframe, this base rent will generate a total of $2,000,000 in revenue. The NPV of the total lease revenue is equal to $1,122,560, which indicates that the land lease agreement is a profitable investment.

### *Avoided Cost (Net Metering)*

Another model for financing a solar project at the site is net metering. Under this approach, the landowner or project host installs and maintains a solar energy system at their own cost. The energy produced is sent to the grid and the utility company pays an avoided cost rate (which represents the cost the utility avoids having to incur to produce electricity) to the landowner in return. While the utility, AEP Ohio, does not currently offer net metering to residential solar users, it is possible they may offer utility-scale net metering on a case-by-case basis. This model was created for the scenario in which utility-scale net metering is a viable option for solar at the site.

| Solar Footprint | Size (acres) | Estimated Output (kWh) | Avoided Costs* ($0.03/kWh) | REC Value** ($3.00/MWh) | 60% Tax Rebate | Total Benefit |
|---|---|---|---|---|---|---|
| Area A | 40 | 12,641,280 | $379,238 | $37,923 | $426,643 | $843,805 |
| Area B | 10 | 3,271,680 | $98,150 | $9,815 | $110,419 | $218,384 |
| Total | 50 | 15,912,960 | $477,388 | $47,738 | $537,062 | $1,062,190 |

kWh – kilowatt-hours, MWh – megawatt-hours

*Avoided cost of $0.03/kWh is assumed and would be determined by AEP Ohio.

**Solar renewable energy credits (SRECs) in Ohio are currently valued at approximately $3/MWh, according to EnergySage.

Table 3. Estimated Project Payback in Year 1 of the Avoided Cost (Net Metering) Model

Table 3 shows the estimated project output and payback after one year of solar energy generation under the avoided cost (net metering) model. Totals are shown for potential solar arrays constructed at Northern Fly Ash Pond (Area A) and Eastern Disposal Area (Area B). Solar output estimates were calculated under the assumption that a 1 MW system has a solar output of approximately 1,280 megawatt-hour (MWh) in year 1. The 60% tax rebate is a combination of a

30% federal tax credit from the Inflation Reduction Act, a 10% tax credit from the Energy Community Tax Credit Bonus, a 10% tax credit for Brownfields and a 10% tax credit for low-moderate income status.[3] The total benefit of the project is equivalent to the sum of the avoided costs and the value of the renewable energy credits (RECs), minus the tax rebate.

### *Power Purchase Agreement*

In a power purchase agreement (PPA), a third-party developer owns, installs and maintains a solar energy system on the site. The landowner purchases the electricity generated by the system at a fixed rate with a set annual escalation over the 20-year timeframe. The potential financial impact is the money saved by avoiding paying for electricity at the full retail price. The model below utilizes an annual escalator of 2% for the PPA price to account for rising energy costs and the gradual decrease in the solar system's efficiency. Solar output estimates were calculated under the assumption that a 1 MW system has a solar output of approximately 1,280 MWh in year 1.

| Acres | System Size (kW) | Estimated Output (kWh) | Avoided Electricity Price ($0.07/kWh) | PPA Price* ($0.15/kWh) | REC Value ($3.00/MWh) |
|---|---|---|---|---|---|
| 50 | 12,500 | 16,000,000 | $1,120,000 | $2,400,000 | $48,000 |

*Assumed cost of the PPA is $0.15/kWh, according to an estimate by solar.com.

Table 4. Estimated Project Payback in Year 1 of the Power Purchase Agreement Model

Table 4 shows the estimated project cost, benefit, and output in the first year of solar energy generation under a PPA. The project cost during year 1 (PPA price) is significantly higher than the project benefits (avoided electricity price and REC value). Research during the development of this model determined that retail electricity rates in the region are considerably lower than the average PPA price. As seen in Table 5, these findings indicate that a PPA at the South Point Plant site is not a profitable option for solar over the 20-year timeframe.

| Total Cost | Total Benefit | Total REC Compensation | Net Total Benefit | NPV of Net Total Benefit |
|---|---|---|---|---|
| ($55,442,188) | $27,641,608 | $915,739 | ($27,800,580) | ($15,470,939) |

Red indicates negative values.

Table 5. Estimated Project Payback Over 20-Year Timeframe of the Power Purchase Agreement Model

In summary, while direct ownership or power purchase agreement financing are options, under Ohio AEP's current utility rates ($0.07/kW for commercial customers) a solar project would be unlikely to help reduce or offset electricity costs for LEDC or the business park tenants.

[3] Rebate and tax credit information is current as of the date of this report's publishing.

## Key Considerations and Summary

This project evaluated two potential areas at the site for solar renewable energy generation. Solar generation at the site could drive energy savings, create jobs and provide benefit for the surrounding community. Ballasted solar arrays could be built on the Northern Fly Ash Pond and Eastern Disposal Area Cap and designed to be compatible with the site's remedy features and institutional controls. The preliminary estimated costs and for project design, installation and ongoing OM&M and financing models can serve as a starting point for evaluating the project's feasibility.

### Contact Information


**South Point Plant Site Profile:**
www.epa.gov/superfund/southpoint-plant

**EPA Region 5:**
Nabil Fayoumi, Remedial Project Manager
fayoumi.nabil@epa.gov I (312) 886-6840

**EPA Superfund Redevelopment Program**:
Jamie Stoik, Superfund Redevelopment Coordinator
stoik.jamie@epa.gov | (312) 886-6069


### Potential Next Steps

The site would benefit from a more in-depth solar assessment. Additional solar reuse assessment recommendations are outlined below.

- Engineering analysis to refine the solar PV project siting is warranted and would likely include analysis of structural stability and potential for settlement, additional stormwater runoff volumes, wind shear and loading impacts, specific solar array layout and vegetation management modifications.
- LEDC would likely benefit most from leasing land and entering into a lease agreement with a solar developer.
- While Direct Ownership or Power Purchase Agreement financing are options, under Ohio AEP's current utility rates ($0.07/kW for commercial customers) a solar project would be unlikely to help reduce or offset electricity costs for LEDC or the business park tenants. If utility rates increase or solar program offerings change, consider re-evaluating avoided cost and PPA models.
- LEDC and business park owners could potentially benefit from a community solar financing approach. While not authorized in Ohio at this time, such an approach could help to offset a community's or group of tenants' power costs through partial ownership in a solar project.

This report concludes the current regional support project sponsored by EPA's Superfund Redevelopment Program. For additional information, please see the EPA contacts listed.