FIREFLY FIELDS
ENERGY CENTER

FREQUENTLY ASKED QUESTIONS ON GROUND-MOUNTED

SOLAR PHOTOVOLTAIC SYSTEMS

Ag Land Use

How much farmland is utilized by a solar project?

Only a portion of farmland is suitable for solar energy generation. Supplying the entire U.S. with 100% PV solar energy would require about 0.6% of America's total land area.

When a project is decommissioned, the land is returned to its original state, and farmers have the opportunity to go back to farming the land if they choose.[2]

How can solar power facilities enhance rural ecosystems?

There are many important components to preserving and enhancing a healthy environment for farming, and a solar facility may support a rural community over generations through: improved soil health, reduced nutrient runoff, enhanced stormwater management, soil formation and retention, reduced pesticide use; reduced water use, and by preserving future farm opportunities.[3]

Why build solar projects on farmland?

Most farmland is flat, cleared, is typically located in proximity to transmission lines and substations, and offers stable, consistent, long-term revenue for landowners willing to lease some or all of their property for solar development. The parcels leased are often parts of farmland that have degraded over time from intensive agricultural practices.

Siting solar on these lands allows soil to "rest" while providing payments to landowners. And, by leasing portions of their land to solar developers, many farmers have the financial stability to continue farming their unleased parcels, and upon project decommission, the land can be returned to its previous use.

Further, with the introduction of agrivoltaics, the co-location of solar PV and agriculture can provide agricultural enterprises with diversified revenue sources and ecological benefits while reducing land use competition and siting restrictions.[4]

Ambient Temperature

Does the presence of ground-mounted solar arrays cause higher ambient temperatures in the surrounding neighborhood (i.e., the "heat island" effect)?

There is no evidence of higher ambient temperatures in neighborhoods surrounding a solar project. Peer-reviewed studies indicate that there is a very limited temperature increase (up to 5 degrees F within approximately five meters above the solar array and up to 1 degree F within approximately 300 meters of the solar array), but this minimal increase does not extend to surrounding neighbors.[5]

Cleaning Protocol

What is the best way to clean solar panel arrays?

Panels are typically only cleaned a few times a year based on soiling levels, though areas that receive regular rainfall can significantly reduce the need for deliberate cleaning of the panel. Should a lack of rain or extreme dust conditions warrant cleaning, a water truck is typically used to wash dirt and natural buildup from the panels. However, in the right situation, an arrangement with a participating landowner may be made to use their water supply.

Cost of Power

Will a solar project in my community lower my utility bills?

A benefit of solar power is that it provides a long-term hedge against increasing prices. Solar power does not consume any fuel and allows utilities to purchase energy at stable long-term rates, which may help reduce future electricity price increases. Customers will save money in the long term, and once built, this solar project will be an important contributor to the county's tax base. This will provide more money for schools and essential government services.

End-of-Life Decommissioning / Recycling

How are solar panels managed after they are no longer in use? Can they be recycled, and do hazardous waste disposal requirements apply?

The average life of solar PV panels can be 20-30 years or longer after initial installation. At the time of decommissioning, panels may be reused, recycled, or disposed of. There are a few different types of solar panels used in ground-mounted PV Systems. Solar module manufacturers typically provide a list of materials used in their product, which may be used to determine the proper disposal requirements at the time of decommissioning.[5]

What happens during the decommissioning phase?

Upon completion of the economic life of a project, or potentially permit expiration, if the project owner determines not to apply for a new permit, the decision to decommission the facility can be made. Decommissioning refers to removal of equipment (panels, racking, wires, and inverters and transformers) as well as other operational structures (foundations and fencing) and restoration of the site. Depending on specific project decommission agreements, during this process, the site may be revegetated to help with erosion and dust control, and access roads may be removed. Unlike some other forms of development, a decommissioned solar site can be repurposed for other uses, such as agriculture production.[6]

Efficiency

Where does the power go?

Think of solar energy just like the other crops that are currently harvested in your community, perhaps corn, wheat, or dairy. While some of those resources stay local, many are shipped outside your community but provide valuable income and jobs locally. Solar energy is no different. While it is impossible to know where exactly the electrons flow once they enter the electrical grid, the benefits of producing that energy, such as tax revenues, stay local.

Do solar panels still work on a cloudy day?

Before constructing any solar project, we evaluate historical meteorological data to determine the facility's expected output. Photovoltaic panels can use direct or indirect sunlight to generate power, though they are most effective in direct sunlight.

Solar panels will still work even when the light is reflected or partially blocked by clouds.[7]

How do solar panels perform in extremely high heat?

Solar panels are designed to perform in extreme heat or cold. There are many reputable solar panel / manufacturers, but all produce panels with similar operational requirements. For bifacial solar panels, -40 degrees to 185 degrees Fahrenheit module temperature is acceptable.

Health / Materials / Water Issues

Can chemicals that might be contained in solar PV threaten public drinking water systems and/or wetland resources?

All solar panels are contained in a solid matrix, are insoluble, and are enclosed. Therefore, releases are not a concern. Rules are in place to ensure that ground-mounted solar arrays are installed in a way that protects public water supplies, wetlands, and other water resource areas.[8]

Are there health risks from the electric and magnetic fields (EMF) from solar panels?

Solar energy produces no emissions, waste, odor, or byproducts. Silicon solar cells were produced commercially in the 1950s, and the first solar power plant was built over 35 years ago in southern California. PV arrays generate EMF in the same extremely low frequency (ELF) range as electrical appliances and wiring found in most homes and buildings.

The extremely low-frequency EMF from PV arrays is the same as the EMF people are exposed to from household electrical appliances, wiring in buildings, and power transmission lines (all at the power frequency of 60 hertz). In comparison, EMF produced by cell phones, radios, and microwaves is at much higher frequencies (30,000 hertz and above).[8]

A person outside of the fenced perimeter of a solar facility is not exposed to significant EMF from the solar facility. In 2005, a task group of scientific experts convened by the World Health Organization (WHO) concluded that there were no substantive health issues related to electric fields at levels generally encountered by members of the public.[9]

Can solar panels be damaged by hail and strong winds?

Solar panels are designed to withstand extreme weather, including hail and thunderstorms. However, just like your car windshield can get damaged, the same can happen to solar panels (though rare). If a solar panel were to become damaged from severe weather or any other reason, it would likely be the glass that has become damaged, and there would be no risk of exposure to the contents. The Savion team has plenty of experience developing solar projects in high-wind zones. Our projects have shown to be virtually undamaged by direct hits from CAT 3 storms in the past. But, even if something were to hit the area and damage the solar panels, the solar project would be well-insured, with plans to make repairs.

Will a solar farm create stormwater runoff and water drainage issues?

In many situations, during the development phase of a solar project, drainage studies and calculations may be conducted by third-party experts. It is typical to find that a solar project area's post-construction condition will create less stormwater runoff than the current pre-construction condition of cultivated land.

Ecological benefits are expected to accrue over time from the temporary but long-term conversion of agricultural land to native plant communities. Native plant species tend to have deeper and more complex root systems, which allow for improved water absorption and retention than in soil on agricultural land. As a result, erosion and stormwater runoff will be reduced.

Are the materials inside a solar panel safe?

Yes. Modern commercial solar panels do not contain sufficient hazardous material to pose a danger to the environment and human health. The primary component in crystalline silicon solar cells is silicon, the second-most common element on earth.[10]

Solar Panel Design / Visual Impacts

How high are the panels off the ground? How tall do the panels stand?

Solar panels sit approximately 4' off the ground, depending on site conditions. Considering a common solar panel size is 36'' x 66'', the approximate total height of the panels at the highest point is typically 7-8' but does not exceed a height of 10'.

How important are reflectivity and potential visual impacts from solar projects, especially near airports?

Solar panels are designed to absorb and convert solar energy into electricity. They reflect only about 2 percent of incoming light, so issues with glare from PV panels are rare. Solar module glass has less reflectivity than water or window glass and reflected light from solar panels will have a significantly lower intensity than the glare from direct sunlight. Many projects throughout the U.S. and the world have been installed near airports with no impact on flight operations. There have been no U.S. aircraft accident cases in which glare caused by a solar energy facility was cited as a factor. Proper siting procedures can ensure panels are placed to minimize any potential glare to surrounding areas.[8]

How does the traffic associated with large solar projects impact nearby residential and agricultural properties?

During construction, there will be increased traffic associated with construction activities. However, after the construction phase is complete, operating solar projects do not attract high volumes of additional traffic.

Why was this area selected for a solar project?

The project area is suitable for utility-scale solar facility development due to its proximity to available transmission capacity and significant energy demand within the electrical grid. The project also provides significant local economic benefits and is a form of development that will maintain the rural character of the area.

How are solar panels designed to adapt in extreme weather?

Solar panels are highly capable of withstanding extreme weather conditions due to their solid state and limited number of moving parts. The best practices, codes, and standards to which utility-scale photovoltaic ground-mounted systems are built include a site-specific assessment of the seismic, wind, and flooding risk that drives decisions on the materials, components, and engineering details of the facility. Solar panels that include tracker systems that allow for changing the positioning of the panels to be more resilient to extreme weather by positioning in such a way that may limit or minimize damage from things such as hail or wind. For example, panels can be angled to reduce exposure to hail and facilitate the removal of snow or the accumulation of ice. Following extreme weather, a solar facility is inspected to assess energy production and identify any instances of broken glass, detached modules or frames, warped modules, or detached electrical cabling. If any damage is detected, the affected modules are disconnected, and corrective repairs are made. Modern commercial solar panels do not contain hazardous materials that pose a danger to the environment and human health.[11]

Property Values

How do ground-mounted solar PV arrays adjacent to residential neighborhoods influence the property values in those neighborhoods?

In examining property values in states across the U.S., recent studies show that living near a solar project does not deter the sales of agricultural or residential land sales. According to the Solar Energy Industries Association (SEIA), large-scale solar arrays often have no measurable impact on the value of adjacent properties. This is likely due to the fact that solar farms are quiet, odorless, and do not add traffic or burden local infrastructure, unlike more intensive types of development.[12]

Public Safety

What action is taken to protect the public from areas where solar arrays are installed?

Large-scale ground-mounted arrays are enclosed by fencing. This prevents children and the general public from coming into contact with the installations, thus preventing unsafe conditions. The National Electric Code requires that conductors, a part of solar PV arrays, are installed so they are not readily accessible. In addition, warning signs and occasional alarm systems are installed to deter unauthorized individuals from entering the solar array area.[8]

What happens during project construction?

Construction of a solar facility can take up to one year or more in total for large utility-scale projects. The basic types of activities that will take place include site preparation, construction, revegetation, and operations. Once solar projects are built, there is little traffic in and out of the site.[13]

Sound

How much sound do solar projects make?

Solar panels do not emit sound when they convert sunlight into electricity. Rather, sources of sound at solar facilities are associated with converting solar panels electrical output from DC to AC and adjusting the voltage such that it can be transmitted to the electrical grid. This is done via inverters and transformers, which may have fans and cooling systems to ensure proper function when operating at full load during the heat of the day. Sound emitted from inverters can be calculated using software during project design and can be minimized with proper planning and siting.[13]

[1] David G. Loomis, Ph.D. Economic Impact and Land Use Analysis of Mark Center Solar. Bloomington, IL: Strategic Economic Research, December 2020, page 22.

[2] The Regional Per-Capita Solar Electric Footprint for the United States, Technical Report NREL/TP-670-42463, prepared by The National Renewable Energy Laboratory (Golden, CO, 2007), page 20.

[3] American Clean Power, "How Solar Power Enhances Rural Ecosystems," CleanPower.org, February 2023, https://cleanpower.org/wp-content/uploads/gateway/2023/03/ACP_Solar_and_Farmland.pdf

[4] American Clean Power, "Solar Energy & Farmland FAQ," CleanPower.org, February 2024, https://cleanpower.org/resources/solar-energy-farmland-faq/

[5] Analysis of the Potential for a Heat Island Effect in Large Solar Farms. Department of Earth and Environmental Engineering. Columbia University, 2013.nt.

[6] Massachusetts Department of Energy Resources. Clean Energy Results Questions & Answers Ground-Mounted Solar Photovoltaic Systems. Massachusetts Department of Environmental Protection. Massachusetts Clean Energy Center, June 2015, page 7.

[7] American Clean Power, "What Happens When a Solar Facility is Decommissioned?," CleanPower.org, December, 2021, https://cleanpower.org/resources/what-happens-when-a-solar-facility-isdecommissioned/

[8] Solar Energy Industries Association, "What happens to solar panels when it's cloudy or raining?," SEIA.org, 2023, https://www.seia.org/initiatives/what-happens-solar-panels-when-its-cloudy-or-raining

[9] Clean Energy Results Questions & Answers Ground-Mounted Solar Photovoltaic Systems, prepared by Massachusetts Department of Energy Resources, Massachusetts Department of Environmental Protection, and Massachusetts Clean Energy Center (June 2015, page 20).

[10] NC State University. Health and Safety Impacts of Solar Photovoltaics. NC Clean Energy Technology Center, May 2017, page 12.

[11] American Clean Power, "Solar Panels and Your Community," CleanPower.org, August 30, 2022, https://cleanpower.org/wpcontent/uploads/gateway/2022/08/ACP_FactSheet_SolarCommunity_220830.pdf

[12] American Clean Power, "Designing and Adapting for Extreme Weather," CleanPower.org, August 2024, https://cleanpower.org/wp- content/uploads/gateway/2024/08/ExtremeWeather_FactSheet_240909.pdf

[13] Solar Energy Industries Association, "Solar and Property Value," SEIA.org, July 2019, https://www.seia.org/research-resources/solar-property-value

[14] American Clean Power, "Solar as a Neighbor: Living Near a Solar Project," CleanPower.org, July 2024, https://cleanpower.org/resources/solar-as-a-neighbor-living-near-a-solar-project/