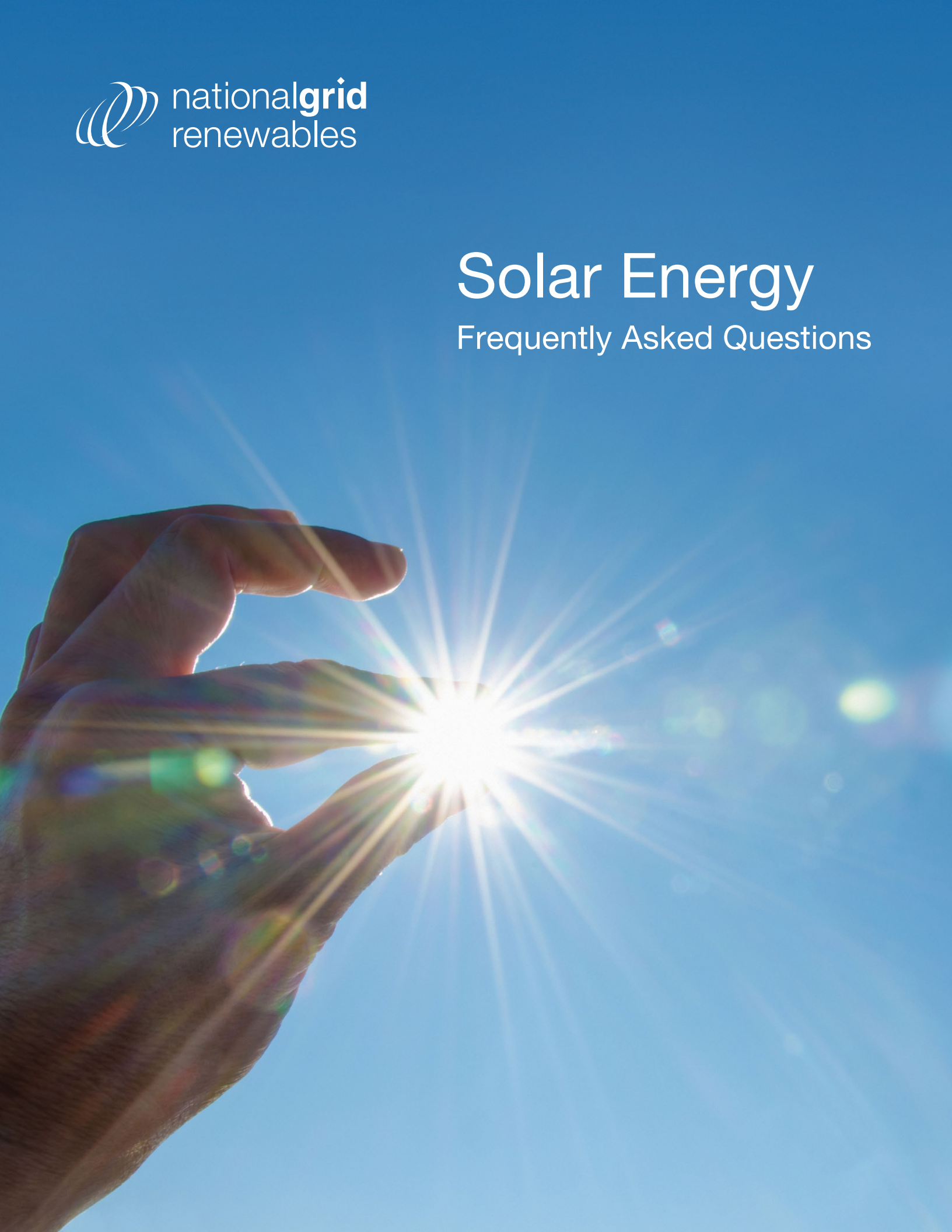
nationalgrid renewables

# Solar Energy

## Frequently Asked Questions



# Who is National Grid Renewables?

National Grid Renewables develops renewable energy projects that power up America's grid and ignite local economic growth. Proudly farmer-founded with deep roots in the soil, we're passionate about empowering landowners with new revenue streams while respecting the interests of surrounding landowners — all while supporting local communities and building out the renewable energy solutions needed to power a sustainable future. We believe that a fair deal is good business. We develop projects that respect the land, respect the community, and respect workers all along the supply chain. And as a unique end-to-end partner — developing, constructing, owning, and operating projects — we're accountable to deliver projects on-time and on-budget to drive collective success for all stakeholders. We're powering progress, together.

# Solar Basics

## Photovoltaic solar panels

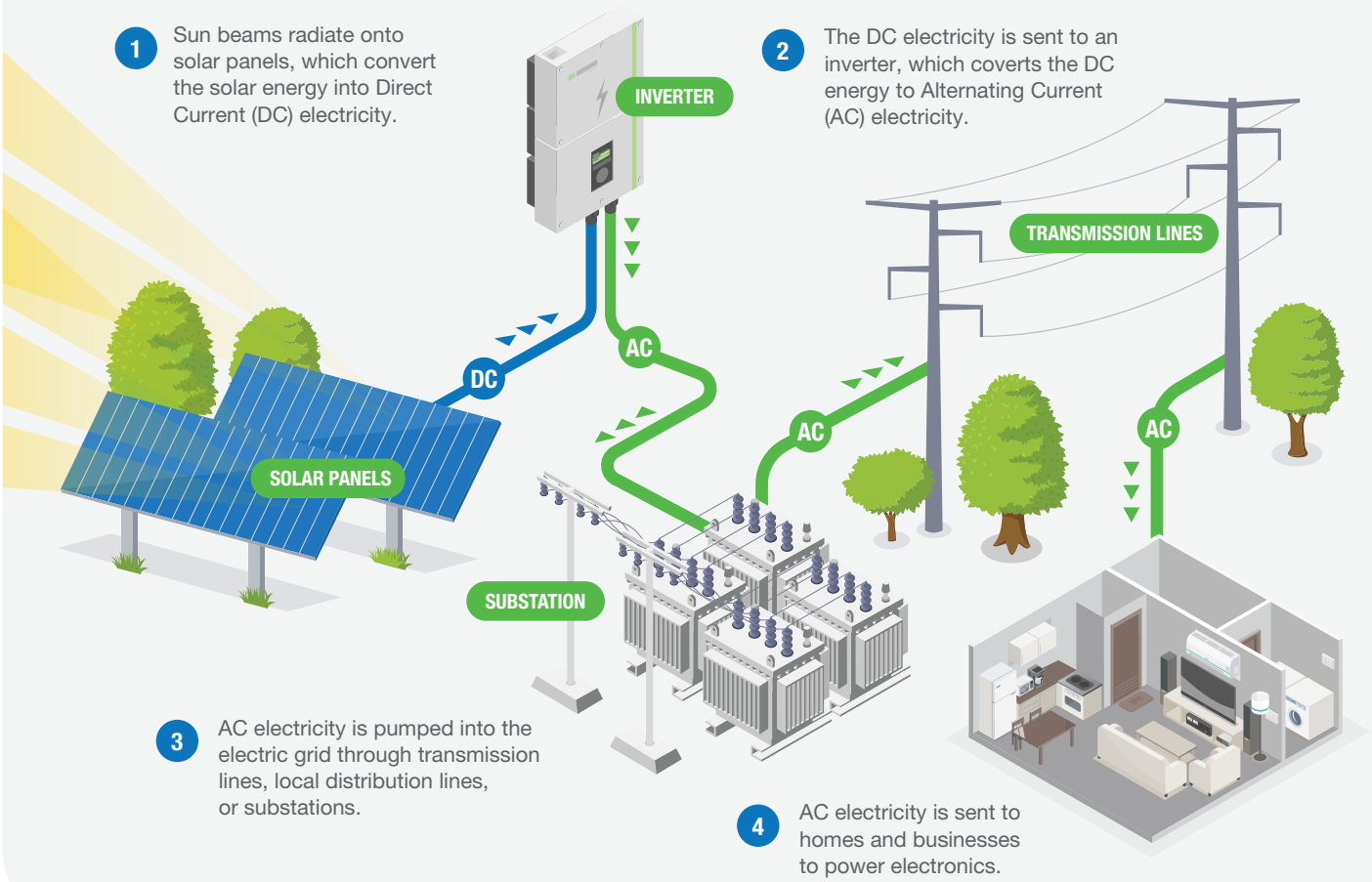
Photovoltaic (PV) solar panels convert sunlight directly into electricity using the photovoltaic effect, where sunlight energizes electrons in silicon cells, generating an electric current. PV panels are designed to absorb as much incoming sunlight as possible. There are different types of panels, including monocrystalline, polycrystalline, and thin film, each varying in efficiency and cost. National Grid Renewables can operate all three types of panels and chooses the panel type based on the cost and efficiency goals of each project.

## Fixed-tilt racking vs. tracking systems

Solar panels are installed on racking systems. National Grid Renewables uses tracking systems instead of fixed-tilt systems for the majority of our solar project sites. We use tracking systems whenever possible because they offer significant advantages over fixed installations by following the sun's path — throughout the day and across different seasons and weather conditions — which increases energy production by 10% to 25%. By generating more energy per panel, tracking systems reduce space requirements.

> One of the greatest advantages of solar energy is that sunlight is infinite and free, and conversion of sunlight to electricity does not generate pollution.

## How Solar Power Works



# Solar Basics *(Continued)*

## Aligning with energy demands

Solar projects produce the most electricity on bright, sunny days — when the energy is likely to be needed most. For example, on hot summer days when the demand for electricity increases to support air conditioners, solar energy projects provide peak electric resources without adding fuel costs. This makes solar an economic choice in a diversified portfolio of electric generation types.

## Solar panel efficiency

The efficiency of an energy generation source is a measure of how much energy can be generated from a given unit of input fuel. The energy efficiency for solar panels has been continuously improving since the 1970s.[1] But one of the greatest advantages of solar energy is that sunlight is infinite and free, and conversion of sunlight to electricity does not generate pollution. This makes the relative efficiency of solar largely unimportant.

## Can solar panels generate energy on a cloudy day?

It's a common misconception that solar panels don't produce electricity if it's cloudy. Substantial sunlight still shines through on even the cloudiest days (otherwise it would be as dark as night), meaning that solar panels will generate some electricity.

## Can solar panels still generate energy in the winter?

Yes. Our solar projects are designed to deliver optimal energy production through all four seasons, utilizing techniques and technologies to accommodate winter climates:

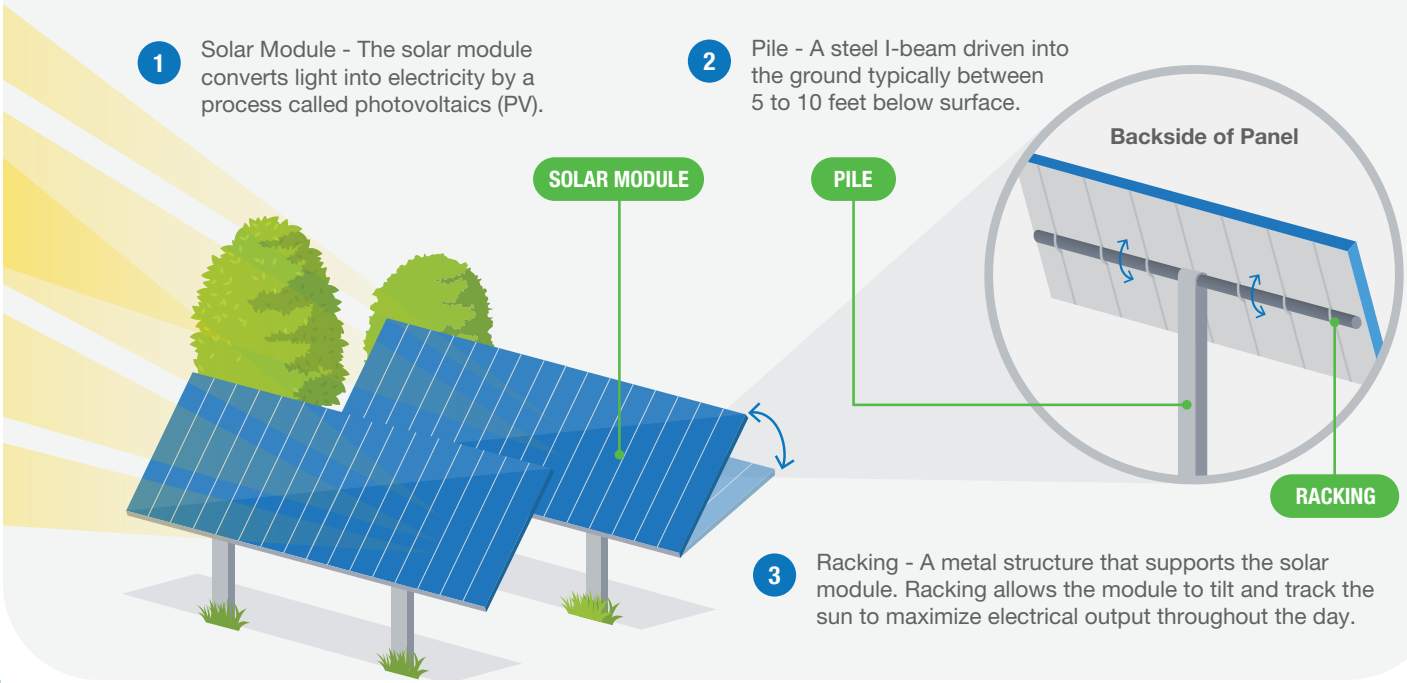
- **Avoiding snow accumulation:** Most solar projects are installed with tracking systems, allowing them to use maximum tilt to dump off excess snow. When fixed-tilt solar projects are installed in areas that receive significant snowfall, they are installed at an angle that maximizes solar energy production while causing heavy snow to slide off the panels, preventing the snow from blocking production.
- **Bifacial solar panels:** New bifacial solar panels optimize energy production even when snow is present, collecting light reflected from the ground to the backside of the panels. Their advanced design allows for reliable energy production in the most extreme environments, while maintaining that performance over its lifespan.

## What is the lifespan of solar panels?

Solar equipment has a life span that extends for decades — sometimes up to 30 years. At the end of the life of the project, solar equipment can be removed, recycled, and salvaged for additional value. Solar projects also allow for flexibility in regard to land use after its removal — including returning land to its original agricultural use.

## Solar Panel Components

1. Solar Module - The solar module converts light into electricity by a process called photovoltaics (PV).
2. Pile - A steel I-beam driven into the ground typically between 5 to 10 feet below surface.
3. Racking - A metal structure that supports the solar module. Racking allows the module to tilt and track the sun to maximize electrical output throughout the day.



# Solar is a Good Neighbor

## Will a solar project be disruptive to the surrounding area?

Solar projects are a domestic supply of energy, making your local grid more resilient to power America's future. They are low to the ground (approximately 8-12 feet above grade), are pollutant free, virtually noiseless, and do not create odors.

## Will construction of a solar project bring harmful pollutants?

Solar projects provide pollutant-free electricity. Solar projects do not generate air or water emissions, nor do they produce hazardous waste, deplete natural resources, cause environmental damage through resource extraction and transportation, or require significant amounts of water during operation. Further, several specific elements of the design and operation of a solar project focus on preventing environmental impacts:

- **Designed to prevent leakage:** Solar panels use inert materials and are designed to withstand the weather elements. According to the Department of Energy, PV panels use a strong encapsulant that keeps all chemicals sealed within the panel structure to prevent leaching in the case of cracking or damage. For example, cadmium telluride (CdTe) photovoltaic (PV) cells are sealed between two sheets of glass to protect the semiconductor materials from the outside environment; and silicon modules are typically sealed with a front sheet of glass with a polymer encapsulant and back sheet.
- **Monitoring for wear & damage:** Panels are regularly inspected; if a panel breaks, it is safely replaced and properly disposed of or recycled. The panel glass is designed to crack like a windshield rather than shatter, keeping materials contained within the panel.
- **Avoiding PFAS contamination:** Most PV solar panels do not contain per- and polyfluoroalkyl substances (PFAS) or compounds that use PFAS in the manufacturing process. Evidence shows that the risk of PFAS contamination from living near a solar farm is much lower than exposure to things like construction and certain materials used in weather-resistant outdoor furniture.[2]
- **Protecting groundwater:** There have been no reported incidences of solar projects negatively affecting groundwater.[3]

## Will construction of a solar project harm agricultural land value?

After a solar project is constructed, areas that do not contain permanent project facilities will be revegetated with a low growing seed mix developed specifically for each site. This ensures establishment, creates a stable habitat, and promotes biodiversity.

# Solar is a Good Neighbor *(Continued)*

## Will a solar project impact surrounding property values?

Numerous studies demonstrate that properties adjacent to solar projects do not see negative property value impacts, nor does having a solar project as a neighbor negatively impact the ability to sell agricultural or residential properties. For example, studies that reviewed the sales of properties adjacent to solar farms in Minnesota, Illinois, and Indiana found little to no measurable and consistent difference in value from sales of properties that were not adjacent to solar farms and control properties.[4] Another large study looking at transactions of homes (in MA and RI) next to solar installations found that "solar developments in rural areas have statistically insignificant effects on home prices," and the effect was found to be "effectively zero."[5]

## Are solar projects noisy?

According to the National Renewable Energy Laboratory:

*"The noisiest components in a solar farm are the inverters, which generate a low buzzing sound as they convert electricity from the direct current (DC) generated by PV modules to alternating current (AC) used by the electric grid. Tracking equipment allowing PV modules to face the sun over the course of the day can also generate a low level of noise. However, the noise generated by solar farms is generally not audible above ambient noise outside of the facility fence."*[6]

- **Inverters are far from property boundaries:** The location of central inverters in the middle of a solar project for electrical efficiency means that they are generally located away from property boundaries.
- **Inverters do not produce noise at night:** Additionally, inverters only make noise while the solar panels are generating, so they do not produce noise at night.

Want to learn more about studies on the noise levels of solar projects? Scan this QR code.

## Do solar projects create harmful glare?

Solar panels are designed to prevent or minimize glare to capture the maximum amount of incoming solar energy. The glass surface of modern solar panels includes an anti-reflective coating, similar to that used on optical equipment (camera lenses), as well as texturing to minimize any loss of incoming light. Studies have shown that PV solar panels reflect as little as 2% of incoming light, which means that PV solar panels are less reflective than water or window glass.[7]

- **Advancing past previous glare concerns:** In the past, solar panel glare had primarily been a concern only for the aviation industry. Today, however, there are numerous solar panel installations near U.S. airports, and there has never been a documented case of an accident due to solar panel glare. All solar projects require Federal Aviation Administration (FAA) approval, and projects within a defined FAA-defined proximity to an airport also require a glare study to demonstrate that the project will not present safety risks.
- **Working with the FAA**: By working with expert construction and technology partners, National Grid Renewables can model facility locations and solar panel arrays with no reflective glare issues or safety concerns. National Grid Renewables develops each solar site with the approved FAA and Sandia Labs solar glare hazard analysis tool, which identifies and mitigates solar glint and glare.

## Do solar panels create heat islands?

"Heat island" is not typically associated with solar facilities. Rather, the U.S. Environmental Protection Agency (EPA) defines "heat islands" as "urbanized areas that experience higher temperatures than outlying areas."[8] Heat islands result when vegetated areas are converted to impervious surfaces (typically in large cities), causing an increase in ambient air temperatures.

## Is there danger from stray voltage?

Induced (stray) voltage issues are generally caused by improperly grounded or isolated electrical circuits found in older buildings, factories, or barns. Solar facilities that are built correctly will not produce stray voltage.

All National Grid Renewables solar facilities are built to electric code and are thoroughly reviewed for any possible electrical impacts on the surrounding community. Stray voltage is addressed when siting and designing a project. Soil studies are conducted to determine the corrosive nature and thermal capacity of the earth. This helps ensure that all grounding equipment and buried cables are designed correctly, and no stray issues arise from corroded grounding equipment.

## What are electromagnetic fields (EMFs)?

The term electromagnetic field (EMF) refers to electric and magnetic fields that arise from the flow of electricity around any electrical device. The consensus is that EMFs pose no health risk to humans.[9]

Want to learn more about EMFs and solar projects? Scan the QR code.

# Why is Solar Critical to the Modern Energy Grid?

Solar energy helps diversify our energy sources and keeps our grid strong so we can keep the lights on in homes, businesses, and critical facilities like schools and hospitals. We want to invest in our grid now, to provide stability for future generations of Americans. As technological advancements continue and costs further decrease, solar power is a cornerstone of the transition towards cleaner and more resilient energy systems, providing diversified energy resources for the grid.

- **Cost competitiveness and affordability:** Solar energy has seen significant reductions in installation costs that position solar power as one of the most cost-effective energy sources available across many regions of the United States today.[10] Building a new solar facility in the U.S. is economically competitive with other sources of energy generation. This is primarily due to the low marginal operating costs of solar.
- **Peaking resource and grid support:** Solar energy complements other forms of energy, filling in gaps and making our grid stronger overall. For instance, during hot summer days when air conditioning usage peaks, solar projects operate at maximum capacity, effectively meeting heightened electricity demands. This capability enhances grid stability by providing reliable electricity precisely when it is most needed.
- **Integration into the energy mix:** Solar energy plays a pivotal role in the overall energy mix, particularly as states and utilities prioritize Integrated Resource Plans (IRPs). IRPs assess the optimal strategies for reliably and affordably supplying electricity to consumers. With the cost-effectiveness and reliability of solar energy improving, more IRPs are incorporating solar power to diversify energy resources and achieve energy goals efficiently.
- **Reliability and resilience:** Solar power generation relies solely on sunlight, which is a free, stable, and predictable energy source that mitigates the risks associated with fuel price spikes or shortages. This stability enhances domestic energy security and resilience within the utility's generation portfolio.
- **Offsetting greenhouse gas emissions:** Large-scale solar projects can significantly reduce greenhouse gas emissions, contributing to climate change mitigation efforts.

Want to learn more about the value of solar? Scan the QR code.

# Driving Economic Value for Landowners & Communities

## Why are solar projects increasingly popular with farmers and landowners?

Solar projects give landowners a modern land-use diversification strategy, delivering steady income that's not subject to volatility in weather, commodity prices, or input costs. Solar energy projects offer local farmers predictability and stability as they look toward the future of their farming operations. Predictable farming income benefits local communities by helping family farms remain in production — which means more support to local businesses, a more stable local agriculture economy, and stronger rural communities. Solar energy projects are like a cash crop that can help prop up farmers during periods of low prices.

## How do solar projects generate economic value for communities?

- **Local tax revenue:** Solar energy projects generate economic growth throughout the project's host communities, including significant new tax revenue for municipalities and counties.
- **Creating jobs:** Solar projects require a significant workforce during the construction phase as well as a smaller number of ongoing roles in project operations. Operational jobs are well-paying with good benefits, providing new opportunities for future generations to stay in the rural communities where they grew up.
- **Stimulus to local economies:** Solar energy projects also provide an influx of local spending in host communities. Construction workers spend money at local restaurants, gas stations, grocery stores, hotels, and other small businesses, creating a boost in income for small business owners and the local economy.
- **Charitable community fund:** Being farmer-founded, National Grid Renewables stays true to our roots by prioritizing the needs of the communities where we work. We pledge charitable funds to directly support the community for every project we own and operate over 50 megawatts.

## Value at every stage

### Development

Throughout development, employees, land agents, construction companies, power purchasers, and other solar industry professionals visit the local area, which puts money back into the community's pocket via spending at restaurants, gas stations, hotels, and retail shops.

### Construction

During the construction phase, solar project communities experience another boom in local spending categories. Solar projects cause an influx of new construction jobs in the local area, which means even more revenue for local shops, restaurants, and hotels.

### Operation

Once a solar project is operational, it contributes to the local tax base, which can include increased income for local school districts, fire and police departments, counties, and townships. The local community also benefits from a project charitable fund, which makes donations to local non-profits.

# Stewardship of Productive Agricultural Land

## How do solar projects impact the land?

Solar projects have been shown to provide several benefits to the land itself:

- **Improved soil quality:** Solar projects themselves provide a much-needed rest for the soil — allowing soil microorganisms and fauna to recover from compaction and pesticide use and improving soil health over time so that it can one day be returned to agricultural use.
- **Increased water efficiency:** A study demonstrated that vegetation at operating solar sites is more water efficient (measured as biomass produced per water unit used).[11] Solar sites planted with native vegetation (which is standard practice for National Grid Renewables) also have less stormwater runoff than row crops.
- **Preserving farmland for future use:** Many states recognize the value of the coexistence of solar energy projects and farmland. For example, the State of Michigan allows commercial solar on land enrolled in the State's farmland preservation program because solar can serve to preserve farmland from being developed for other, more permanent uses.[12]
- **More efficient land use than corn for ethanol generation:** Ethanol production now accounts for nearly 45% of total corn use. Utilizing land for solar projects is a more effective and efficient way to generate energy when compared to growing corn for ethanol production.[13] Moreover, solar projects provide energy directly to the electrical grid, making them a more versatile energy source than ethanol production.

## How is the land's agricultural value maintained?

We approach all solar projects using a low-impact method. After the panels are installed, we plant native and other beneficial vegetation — often supportive to bees and other pollinators. We revegetate our sites with a low-growing seed mix developed specifically for each site to establish vegetation, create a stable habitat, and promote biodiversity.

## What are agrivoltaics?

One of the innovative ways we're partnering with landowners to bring more value is through agrivoltaics. Like it sounds, it's a combination of voltaics (solar farming) and agriculture (traditional farming and land use). A relatively new term, agrivoltaics can take different forms, including growing crops on the edges of a solar farm, growing crops underneath elevated solar panels, animal grazing, and creating or maintaining native, pollinator-friendly habitats. National Grid Renewables began implementing agrivoltaics as part of select solar projects in 2023 and is currently looking for opportunities to expand our agrivoltaics program.

## What is the value of agrivoltaics?

- **Diversifying income streams:** Agrivoltaics gives landowners an opportunity to further evolve and diversify their income streams.
- **Reducing irrigation needs:** According to the U.S. Department of Energy (DOE), it can also bring long-term benefits to the land itself. In dry areas, DOE research shows farming under solar panels can reduce irrigation requirements by decreasing evaporation of water from the soil.[14]
- **Boosting yields:** Preliminary results already suggest agrivoltaics can significantly boost the yields of certain plants in hotter-than-average years. At one site, cherry tomato yields doubled and require less water when grown in the shade of solar panels.[15]

Agrivoltaics can take different forms, including growing crops on the edges of a solar farm, growing crops underneath elevated solar panels, animal grazing, and creating or maintaining native, pollinator-friendly habitats.

Want to learn more about National Grid Renewables' agrivoltaics projects? Scan the QR code.

# Stewardship of Productive Agricultural Land

## How do you protect pollinators?

Many solar sites are paired with pollinator habitat to benefit pollinators at the site. In one study in Minnesota, research found a 4x increase in pollinator insects at one site after implementation of pollinator-friendly plantings.[16]

- **Benefits of pollinators:** Native and/or pollinator-friendly habitats offer a variety of benefits. First, these sites provide habitat for vulnerable species of pollinators. Native plants not only improve the aesthetic value of sites, but their extensive root systems can benefit soil quality, reduce runoff, improve water quality, and sequester carbon. Native vegetation also requires less costs and inputs due to reduced maintenance needs. Lastly, healthy populations of pollinators can support nearby pollinator-supported crops.[17]
- **Pollinators deliver substantial economic value:** Pollinators benefit a large quantity of crops grown in the U.S. — a value of approximately $14.6 billion (about $45 per person in the US). As a result, researchers at the Argonne National Lab and NREL say that "...the agroeconomic implications for the enhanced pollinator service benefits provided by solar-pollinator habitat could be significant." In other words, supporting pollinator habitat at solar sites may have positive economic impacts on nearby agriculture.[18]

## How is wildlife protected around project sites?

National Grid Renewables conducts a field review of wildlife habitat for all its solar projects. We also consult with the U.S. Fish and Wildlife Service (USFWS) and state wildlife agencies to ensure proper protocol for any species-specific surveys and to discuss any required avoidance, best management practices, or mitigation required for construction.

### Birds:

Concentrated solar power (CSP) is different from the photovoltaics that National Grid Renewables installs in ways that can be harmful to birds. Both the glare from the mirrors or lenses it uses to generate heat as well as the intense heat it creates to produce the steam needed to deliver electricity present risks to birds. By contrast, the large-scale photovoltaic projects that National Grid Renewables develops generally do not negatively impact birds in non-desert areas. Because of its low direct risk to birds, as well as its direct and indirect benefits to birds through reductions in carbon pollution, the National Audubon Society (among other wildlife organizations) advocates for increases in installed solar photovoltaic capacity.[19]

### Bats:

Solar installments do not negatively impact bat populations. In fact, the increased biodiversity is a benefit for bats. In some cases, there may be tree clearing required to facilitate project development. In those cases, National Grid Renewables will coordinate with U.S. Fish and Wildlife Service to minimize impacts to species. We also partner with the National Forestry Foundation to support their reforestation efforts to offset tree removal at our project sites.

### Butterflies:

We are participating in a monarch butterfly conservation program at our Bingham project site. National Grid Renewables is an enrolled participant in the Candidate Conservation Agreement with Assurances (CCAA) for the Monarch Butterfly approved by the US Fish and Wildlife Service and administered by the University of Illinois Chicago (UIC). As part of our enrollment, National Grid Renewables maintains set acreage with a minimum number of nectar and/or milkweed plantings for each enrolled project to provide food and habitat for monarch butterflies. National Grid Renewables' participation in the program improves monarch butterfly population-level viability to combat various external negative impacts on their populations.

# Lifecycle of a Solar Project: Development

## How are project sites selected?

When evaluating locations for our solar sites, we consider: the projected size of the facility, land type and quality, localized environmental impacts, the local climate and (if necessary) snow load, the electric service territory ownership, the proximity of the site to nearby existing electrical infrastructure, and permitting and interconnection considerations. Lastly, in addition to these considerations, a highly motivated landowner group, combined with local support, is key to a successful project.

## Maintaining the integrity of drain tiles

Having a functional tile network is important in maximizing a farm's yield, so we take every tile seriously. National Grid Renewables considers both existing and planned tile systems throughout the development and site design process. This meticulous planning ensures that any drain tile disturbed during the construction process is returned to the way it was found prior to construction — meaning less time, less hassle, and no cost for landowners.

To help us minimize impacts to the tile networks, National Grid Renewables collects tile data from various sources:

- Landowner tile maps
- Local tile company data
- Aerial infra-red imagery
- County tile data

## Addressing tile disruption

National Grid Renewables understands that not all drain tiles can be mapped and avoided, so it is company practice in heavily tiled areas to trench underground collector lines instead of plowing. This way, we can see the tile that is damaged and fix it on the spot. Additionally, it is our policy to work with a local tile company throughout the development process. National Grid Renewables will repair any damaged or crushed tile at no cost to the landowner for up to five years after construction is completed.

# Lifecycle of a Solar Project: Construction

## How long does construction of a solar project take?

Construction of larger solar projects (100+ MW) typically takes 15 to 18 months from commencement of construction to commercial operation. Smaller projects (less than 100 MW) take less time — up to six months to reach commercial operation.

## What to expect as a landowner

Throughout our development/pre-construction/design phase, National Grid Renewables and its contractors may need to access your land to perform studies, surveys, or tests. These may include:

- Road surveys
- American Land Title Association (ALTA) and other property surveys
- Environmental studies that may be focused on birds, bats, and other species
- Wetlands delineations and archaeological studies
- Geotechnical testing and soil boring

## The construction process

Every solar project is unique, but the process includes the following:

- **Civil preparation:** Clearing and grubbing the property and installing fencing.
- **Structural work:** Installing steel piers and the racking system on which the modules sit.
- **Equipment installation:** Installing electrical cable, trenching, modules, and inverters.
- **Seeding:** After equipment installation is complete, the property is seeded into a stable low-growing seed mix.
- **Testing and commissioning:** Utility testing to ensure safe and effective delivery of electricity to the grid.

“Our construction teams design their plans to mitigate negative effects on existing crops on the project site and surrounding land.”

## Will construction be disruptive to the surrounding community?

- **Traffic and road use:** The National Grid Renewables construction team works with local road commissioners and county engineers to establish a comprehensive road use and maintenance agreement. This establishes haul routes, current road conditions, and maintenance protocols to mitigate disruptions and minimize the impact on local infrastructure.
- **Emergency response protocols**: National Grid Renewables establishes emergency response protocols for its sites and collaborates with local fire departments and EMS prior to construction and operation. While a small portion of the panel materials are flammable, these components alone cannot support a significant fire. As an extra precaution, fire safety measures are taken prior to, during, and after construction.

## What about potential damage to land during construction?

National Grid Renewables' agreements provide many protections for landowners to ensure that they don't incur costs or risks during development and construction.

- **Crop damage payments:** Our construction teams design their plans to mitigate negative effects on existing crops on the project site and surrounding land. In the event crop damage does occur, we fully compensate landowners for the resulting financial impacts.
- **Drain tile repairs:** For every solar project we develop, we analyze the location of existing drain tile and design project layouts around it. If we are unable to design around drain tile, we take great care when cutting into the tile to minimize impacts. Just like our crop damage clause, National Grid Renewables offers drain tile damage payments, which ensures that drain tile is restored to the same or similar condition as its original state.
- **Storm water runoff:** Sites are designed and permitted utilizing a Storm Water Pollution Prevention Plan utilizing a third-party engineer. We install and maintain Best Management Practices to minimize and prevent any sediment from being discharged from site.

## Will the solar project include battery storage?

Some solar projects may include battery storage to capture the sun's energy at peak times and store it for later use. There are multiple benefits to local communities: Battery storage increases local reliability and resilience of the local grid by having a back-up source of energy; it diversifies electric generator portfolios; and it helps integrate the use of renewable resources. Whether or not a project contains storage will be dependent on the transmission infrastructure and market demands.

“

Battery storage increases local reliability and resilience of the local grid by having a back-up source of energy; it diversifies electric generator portfolios; and it helps integrate the use of renewable resources.

# Lifecycle of a Solar Project: Operation

## What will the permanent operations team look like?

National Grid Renewables' Operations & Maintenance teams typically consist of up to four full-time employees who work at the project site. Their responsibilities include annual preventive maintenance, basic troubleshooting, warranty management, corrective maintenance, routine equipment inspections, road and grounds maintenance, and plant inspections occurring regularly and as needed.

## Land management

Land management at utility-scale solar sites is a critical aspect of ensuring optimal energy production and site efficiency. With vast arrays of solar panels spanning acres of land, the presence of vegetation can pose significant challenges if left unchecked.

- National Grid Renewables implements strategies to control and mitigate the growth of plants and trees that could obstruct sunlight, shade panels, or interfere with maintenance activities. This often includes regular mowing, trimming, or the application of herbicides to prevent weed growth.
- Beyond maintaining optimal solar exposure, vegetation management plays a crucial role in preserving biodiversity and ecosystem health. Sustainable practices, such as planting native vegetation or creating wildlife habitats within the solar site, can enhance environmental stewardship while supporting local ecosystems.

## Remote operations control center (ROC)

The National Grid Renewables Remote Operations Center (ROC) serves as a centralized hub for monitoring, controlling, and managing the operations of renewable energy assets remotely. The ROC's primary functions include:

- Performance monitoring and optimization through real-time data collection
- Fault and malfunction detection for rapid response and troubleshooting to minimize downtime and maximize energy generation
- Maintenance management and optimization
- Remote control of various aspects of the energy assets to meet grid demands
- Grid integration and power dispatch to meet demand while maintaining grid stability
- Maintaining security and regulatory compliance through robust physical security and cybersecurity measures
- In emergencies, such as extreme weather or grid disruptions, the ROC also plays a crucial role in coordinating response efforts, implementing contingency plans, and restoring operations as quickly as possible

# Lifecycle of a Solar Project: Decommissioning

## Dedicated decommissioning plan

For each project, National Grid Renewables drafts a decommissioning plan outlining how we will comply with all local, state, and federal decommissioning requirements (including financial assurances) to ensure facilities are removed at the end of a project's useful life. National Grid Renewables' decommissioning plans include:

- An estimate for the cost to decommission the entire project (which is borne by National Grid Renewables and our partners — not the landowners or community members)
- A plan detailing how, when, and why a decommissioning process would commence
- A financial security (letter of credit, bond, or cash escrow) to cover the full cost of decommissioning the solar farm, including crop damages from demolition
- The name of the financial institution responsible for managing the funds and the procedure that the responsible government unit will follow to draw on them

The plan will be reviewed and approved by the appropriate government unit before construction can begin.

Furthermore, National Grid Renewables' standard solar lease also obliges us to remove all solar facilities at the end of the project's life or lease term.

> "As the adoption of solar energy continues to grow, investing in efficient recycling infrastructure and practices will be crucial to minimize the environmental footprint of solar power generation.

## What are the steps of decommissioning?

The decommissioning plan describes the steps taken to remove a project after its useful life and provides a basis for establishing a financial surety to protect host landowners, adjacent landowners, and local taxpayers. Decommissioning activities include dismantling and repurposing, salvaging or recycling, disposing of project facilities, and restoring or reclaiming the land to pre-construction conditions when possible, allowing for the site to be returned to its original or another use.

## What can be salvaged from a solar project?

Components that can be salvaged or resold include structural steel (foundation posts, panel racking, transformer cores, met towers, substation components, interconnection facility components), copper (electrical conductor and transformer windings), aluminum (electrical conductor and transforming windings), transformer oil, aggregate materials (access road, substation pad, interconnect pad), and operations and maintenance buildings and land.

## How are solar panels recycled?

As the solar energy industry continues to grow, the need for efficient and sustainable methods of recycling solar panels becomes increasingly important to minimize waste and environmental impact. Solar panel recycling not only helps conserve valuable resources and reduce waste, but it also supports the sustainability of the solar energy industry by promoting circular economy principles. As the adoption of solar energy continues to grow, investing in efficient recycling infrastructure and practices will be crucial to minimize the environmental footprint of solar power generation.

Solar panel recycling involves the process of recovering valuable materials from decommissioned or end-of-life photovoltaic (PV) panels to be reused in the manufacturing of new panels or other products. The recycling process typically begins with the collection and transportation of used solar panels to our specialized recycling facilities partners. Upon arrival, the panels are sorted and inspected to determine the best method of recycling based on their composition and condition.

## Want to learn more?

For additional questions about solar projects or National Grid Renewables, visit any one of our office locations or call us at 952.988.9000.

You can also email your questions and comments to info@nationalgridrenewables.com, or visit our website at nationalgridrenewables.com.

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[16] Large-Scale Solar Siting Resources

[17] The Potential of Agrivoltaics for the U.S. Solar Industry, Farmers, and Communities

[18] If You Build It, Will They Come? Insect Community Responses to Habitat Establishment at Solar Energy Facilities

[19] Birds and Clean Energy



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