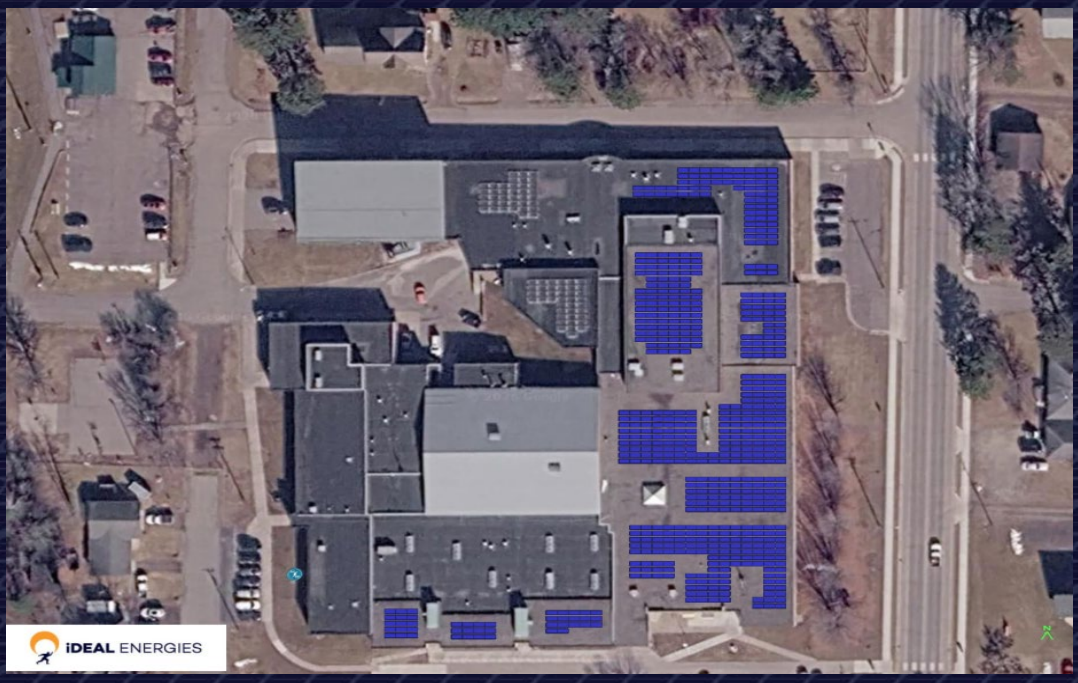
Solar Energy Efficiency Report & Proposal Appendix

Prepared for: **Independent School District No. 698 - Floodwood School District**

Site Name: **Floodwood Elementary**

Project: **347.55 kWDC System - Minnesota Power - Large Power & Lighting - MN Power**

May 13, 2026



iDEAL ENERGIES
Make Money. Save the Planet. ™

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iDEAL's A-Team

iDEAL's Professional Team: iDEAL's team has the requisite capability, academic training, experience and certifications required to undertake the work described in this Proposal. Our Project Manager and Administrative staff will work directly with you to keep you informed, coordinate all project activities and manage all the paperwork on your behalf. Behind the scenes, they will coordinate with our engineering, construction and other teams to assure all the resources are provided to make sure your project is delivered at the highest level of quality possible and that your experience is exceptional.

Chris Psihos PRESIDENT/CEO

Chris founded iDEAL Energies to bring to market innovative solutions for helping companies execute on renewable energy opportunities, in particular solar energy. He has steered iDEAL to become a fully integrated company with the structure necessary to design, install, finance & operate turnkey commercial solar systems, including leasing, electrical, financing & construction. Chris earned a BS in chemical engineering from the University of Wisconsin-Madison. He also earned a Juris Doctorate from the William Mitchell College of Law in St. Paul, Minnesota.

Rich Ragatz SR VP BUSINESS DEVELOPMENT

Rich started working with iDEAL Energies when it was founded in 2010. Thanks to his wide-ranging background in business and real estate, and his sound business acumen, and Rich has helped position iDEAL as the premier commercial solar installer in Minnesota. He has been involved in the real estate business for more than 25 years, including commercial mortgage banking in Chicago, commercial real estate and land appraisal in Portland, and commercial sales and leasing in Minneapolis. Rich earned a BA degree from the University of Wisconsin-Madison (UW) in real estate and marketing. He also earned a master degree from UW Madison in Real Estate Appraisal and Investment Analysis.

David Carbonneau VP OF ENGINEERING & PROCUREMENT

David managed iDEAL's engineering and design teams and procures best in class parts and equipment and partners with vendors to source the finest components for PV solar systems. With his engineering background he provides technical support and troubleshooting during the planning/design/construction stages of the solar arrays. He has extensive experience in both the HVAC and solar industries, as well as his electrical apprenticeship and NABCEP PVIP certification. Dave holds a BS degree in Civil Engineering from the University of Minnesota – Twin Cities.

- NABCEP Certified PV Installation Professional / Certification # PV-110121-013609

Alistair Hall STRUCTURAL ENGINEER

Alistair is iDEAL's on house structural engineer that has reviewed over 500 buildings for solar, analyzing all manners of buildings that encompass over a century's worth of construction techniques. He designs and oversees implementation of structural roof retrofits when necessary and has been influential in developing proprietary software for ballasting and concentrated load analysis. Alistair has experience working in structural forensics as well as practicing general building design with one of Minnesota's top structural engineering firms. While with this firm he gravitated to structural rehabilitation gaining experience with wood, aluminum, masonry, and steel existing structures. Alistair works with iDEAL's subcontractor engineering firms that are hired by iDEAL to facilitate work. Alistair graduated with a BS degree in Civil Engineering with a Structural Emphasis from the Georgia Institute of Technology.

Stephanie Rogalsky LEAD PROJECT ENGINEER

Stephanie is iDEAL's in-house electrical engineer. She oversees the electrical design, including single line drawings, wire and raceway sizing per NEC regulations, and selecting equipment to meet requirements for utility interconnection. She has designed rooftop and ground mount systems ranging from 40kW to 1MW AC. Prior to entering industry, her experience in solar began during college with the University of Minnesota Solar Vehicle Project. Both experiences involve managing the integration of designs from multiple disciplines into a final product to be built. Stephanie works with iDEAL's subcontractor engineering firms that are hired by iDEAL to facilitate work. She earned a BS in Electrical Engineering from the University of Minnesota - Twin Cities.

Wendy Vorasane BUSINESS OPERATIONS MANAGER

Wendy is a Business Operations Manager who manages client relations and interconnection applications. Wendy manages all communications and paperwork with the Utility on our Customer's behalf. She comes with 20+ years of customer service experience. For 400+ projects, she excels in organizing and maintaining complex customer relationships, and the handling of all the details of solar system installations, allowing customer stakeholders to comfortably focus on their operations.

Elizabeth Psihos COO

Elizabeth is responsible for the mobilization and construction of all iDEAL solar projects, including materials planning, site logistics, contractor utilization, regulatory compliance, customer communication, installation, commissioning and clean up. Elizabeth has 10 years of experience with commercial solar spanning sales, finance, state regulation, utility coordination and construction, as well as decades of executive and project management experience. She has a BS degree in Computer Science from St. Thomas University.

Russell Goetze VP OF ELECTRICAL OPERATIONS

Russell is a master electrician that oversees all electrical operations for iDEAL Energies' in-house electrical company, Green^2 Electric. He manages a bright team of journeymen and apprentice electricians, keeping them informed & supported with the right tools and resources to efficiently build productive PV solar systems. He oversees the daily construction activities at all work sites and is responsible for the overall progress of projects as well as the scheduling of workers and the delivery of equipment and materials. His strong leadership is built from 20+ years as an electrician in areas of residential, agricultural, commercial, industrial, institutional and governmental. Russell went to Anoka Hennepin Technical College for his Construction Electrician courses. He passed his journeyman's license in 2004 and obtained his master's license in 2006.

Jim Ciolkosz VP OF OPERATIONS & MAINTENANCE

Jim is responsible for all O & M for iDEAL Energies – which includes, but is not limited to, managing multiple solar monitoring platforms, troubleshooting of all array production issues, collecting all reporting data, Initial Internet Set-up for all systems, all customer interactions with maintenance programs, witness test verification during start up, maintaining the RMA system for warranty items, drone analysis for all arrays, other duties as needed. Previously, Jim worked in the Hazardous Waste Industry for 30+ years, held multiple local and regional management and operational positions. He has managed multiple facilities in all aspects of Finance, Regulatory Compliance, Operations, Logistics, and workforce responsibilities. Jim earned a BA in Biology from the University of Minnesota.

iDEAL Energies Warranty

Engineering and Design Services Warranty Seller warrants that it will perform the engineering and design services in a professional and workmanlike manner using the degree of care, skill, prudence, judgment and diligence that a reasonable, qualified and competent provider of similar services would exercise. Except as otherwise provided herein, for a period beginning on the Substantial Completion Date and ending five years later (the "Warranty Period"), if it is shown that there was an error in such engineering and design services as a result of Seller's failure to meet those standards, and if Customer properly notifies Seller within the Warranty Period, Seller will, at its own expense and at no cost to Customer, re-perform such services to remedy such error within a reasonable timeframe.

Installation Services Warranty Seller warrants that it will perform the installation services in a professional and workmanlike manner using the degree of care, skill, prudence, judgment and diligence that a reasonable, qualified and competent provider of similar services would exercise. Except as otherwise provided herein, if during the Warranty Period it is shown that there was an error in such installation services as a result of Seller's failure to meet those standards, and if Customer properly notifies Seller within the Warranty Period, Seller will, at its own expense and at no cost to Customer, re-perform such services to remedy such error within a reasonable timeframe.

Limited System Components Warranty Seller warrants that the System Components will be new and not physically damaged by Seller at the time of Substantial Completion. If Customer notifies Seller within the Warranty Period that any System Components were not new or were, at that time, physically damaged by Seller at the time of Substantial Completion, Seller will replace such System Components within a reasonable timeframe with System Components that are new and undamaged.

Roof Warranty Except as otherwise provided herein, if during the Warranty Period it is shown that the roof leaks solely as a result of Seller's installation of the Energy System, and if Customer properly notifies Seller within the Warranty Period, Seller will, at its own expense and at no cost to Customer, promptly repair the roof so that it does not leak; provided that such leaking is not due to normal wear and tear.

Limitation on Warranties The above warranties do NOT cover damage, malfunctions or services failures to the extent caused by:

1. Failure to follow any applicable operations or maintenance manual or any other maintenance instructions provided by Seller or the manufacturer of the System Components, or failure to properly maintain or operate the Energy System;
2. Repair, modification, maintenance, movement or relocation of the Energy System or the System Components by someone other than a service technician approved by Seller or the manufacturer of the System Components;
3. Attachment or connection to the Energy System of any equipment not supplied by Seller, or the use of the Energy System for a purpose for which the Project was not intended;
4. Abuse, misuse or acts of Customer or any third person (other than Seller or its employees or agents), including intentional damage, theft or vandalism; or
5. Damage or deteriorated performance of the Energy System or Site caused by electrical surges, building settling, building component failure, work done on the building or adjacent structures, use of machinery or vehicle in the area, winds in excess of the system design rating, lightning, fire, flood, extreme weather conditions, pests, tornadoes, hurricanes, hail, storms, explosions, earthquakes, ground subsidence, falling debris, force majeure (as described in Section 16.g of the Purchase Agreement), accidental breakages (not caused by Seller or its employees or agents), normal wear and tear, and other events or accidents outside the reasonable control of Seller.

Solar Array Operations & Maintenance

iDEAL Energies' O&M Services

A commercial rooftop solar array is a long-term investment designed to deliver reliable energy and financial savings for decades. To ensure maximum performance and protect system value, proactive operations and maintenance (O&M) are essential. O&M programs safeguard against production loss, extend equipment life, and confirm that all system components operate within manufacturer specifications.

iDEAL's installation team delivers solar arrays that are optimized for performance. Before your solar array is started up, Ideal runs the solar array through multiple inspections to make sure it operates correctly form the beginning. After initial start-up and fine tuning to ensure your solar array is tuned for reliable performance, an operations and maintenance program is the next step.

iDEAL Energies provides structured O&M programs that combine industry best practices with our in-house expertise, giving customers confidence and predictable system performance. With over 400 solar arrays currently under management, our team has the experience and proven track record to keep your system performing at its best.

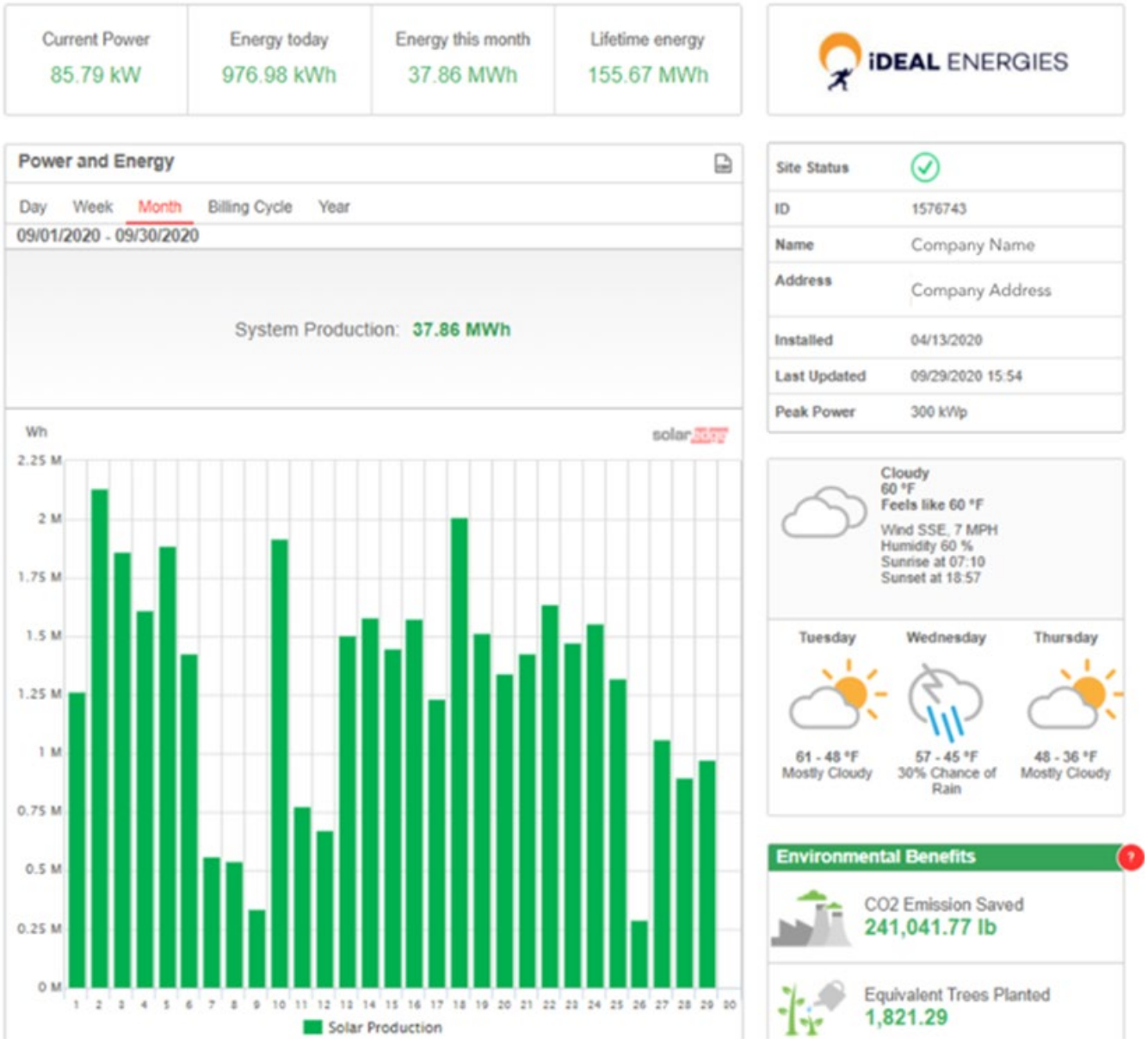
This proposal includes a five-year O&M program, which works in tandem with iDEAL's five-year warranty. Together, these provide comprehensive coverage for the first years of operation and set a strong foundation for decades of reliable production. As the initial term approaches expiration, we will work with you to review performance and to discuss options for extending O&M coverage to support the system throughout its lifetime.

O&M Services Description

- Continuous monitoring of equipment using web-based monitoring equipment to identify and troubleshoot equipment and performance issues.
- Weekly performance monitoring via the online monitoring system to validate inverter and panel output against benchmarks.
- Semi-annual site audits that include:
    1. Inspecting panels, inverters, and racking for physical damage.
    2. Cleaning debris on or under the array.
    3. Ensuring all labels are intact.
    4. Checking for loose hanging wires and making repairs as needed.
    5. Inspecting and tightening electrical connections.
    6. Checking enclosures for corrosion and repairing where necessary.
- Management of all system component warranty claims on behalf of the customer.
- Replacement services for covered components under manufacturer warranties, including panels, optimizers, and inverters, with published rates for labor and recycling where applicable.

System Monitoring

iDEAL Energies ensures optimal performance with live-time system monitoring to quickly detect faults and maintain system efficiency for long-term success. Online monitoring is provided by the inverter manufacturer at no cost.



Equipment Summary

Item	Type	Warranty
Panel	173 Silfab SIL-580XM+ - DCB (Dom Con)	30-year linear power warranty and a 25-year product warranty
	419 Phono PS590M8GFH-24/TNH	30-year linear performance warranty and a 15-year product warranty
Inverter	1 SolarEdge SE100k 480V3Ph Inverter (Dom Con)	12-year standard warranty, extendable to 20 years
	2 SolarEdge SE80k 480V3Ph Inverter (Dom Con)	12-year standard warranty, extendable to 20 years
Optimizer	592 SolarEdge C651U Power Optimizer (Dom Con)	25-Year Product Warranty
Racking	Panel Claw (CFR+) (Dom Con)	25-Year Product Warranty
	Aerocompact S Base	25 Year Product Warranty

At iDEAL Energies, we believe that long-term solar performance begins with selecting the right equipment. We exclusively source products from Tier 1 manufacturers with proven records of reliability, durability, and financial strength. Every component we install including panels, inverters, racking systems, and monitoring platform are selected to meet the highest standards of safety, performance, and warranty protection.

Our team continuously evaluates the solar technology landscape to ensure that the systems we design, and install are built with the most advanced and field-tested equipment available. iDEAL has deployed systems using components from industry leaders such as Jinko, QCell, SolarEdge, SMA, Unirac and PanelClaw brands that are recognized globally for innovation, quality control, and long-term product reliability. This commitment to quality means:

- Better long-term energy production
- Fewer warranty claims and maintenance issues
- Higher ROI and energy savings for our customers
- Confidence that your system will perform as expected for decades

Each project is engineered to site-specific requirements, and equipment is selected to optimize performance based on roof structure, electrical infrastructure, and environmental conditions. Whether it's high-efficiency bifacial panels, optimizers that enhance safety and output, or racking systems with minimal ballast and roof protection in mind, iDEAL delivers systems that are built to last.

Equipment Specifications

Panel

Silfab SIL-580XM+ - DCB (Dom Con)

Silfab Solar is a leading North American solar panel manufacturer known for its premium-quality, high-efficiency modules and commitment to domestic production. As of 2025, Silfab has manufactured and delivered over 10 million solar panels, with a strong focus on the U.S. and Canadian markets. Silfab panels used by iDEAL are proudly made in state-of-the-art facilities in Washington and Toronto, ensuring full compliance with U.S. import regulations and eligibility for domestic content incentives under the Inflation Reduction Act (IRA).

Silfab has earned industry recognition for both performance and reliability. Its modules have consistently achieved Top Performer status in the PVEL PV Module Reliability Scorecard, a testament to their durability in harsh environmental conditions and long-term energy output. Silfab's commitment to quality is backed by rigorous in-house testing and a 25-year product and 30-year performance warranty.

As a Tier 1-equivalent manufacturer known for its strong financial stability and vertically integrated operations, Silfab is a trusted supplier for residential, commercial, and utility-scale projects. The company's ongoing investment in next-generation cell technologies, including back-contact and N-type designs, places it among the industry leaders in innovation, performance, and low degradation rates.

- **MODEL:** Silfab SIL-580XM+ - DCB
- 30-year linear power warranty and a 25-year product warranty
- High efficiency 22.4% N-Type Silicon Bifacial cells
- 144 of the highest efficiency, premium quality N-Type Silicon half cells result in a maximum power density.
- Positive nameplate tolerance of 0, + 10%
- 3.2mm fully tempered front glass
- Thick and Tough: smaller module format that is structurally stiffer, experiences lower wind force, better withstands point impacts and localize failure risk.
- First-year maximum degradation: 2%. Annual degradation thereafter: 0.3% per year, guaranteeing a minimum of 89.3% power retention after 30 years.

Phono PS590M8GFH-24/TNH

Phono Solar is a globally recognized solar panel manufacturer offering high-efficiency photovoltaic modules for commercial and utility-scale applications. The Phono Draco Module Series used by iDEAL features advanced N-type monocrystalline technology with 144-cell, 16-busbar construction, delivering module ratings from 580W to 600W with efficiencies up to 23.23%. The modules are designed for strong real-world energy production, including improved weak-light performance, competitive high-temperature performance, and bifacial technology that can provide up to 30% additional power yield depending on site conditions and rear-side irradiance.

Phono's Draco Series is backed by a 15-year product warranty and a 30-year linear performance warranty. The modules are warranted with first-year degradation of less than 1.0% and annual degradation of only 0.40%, maintaining 87.4% guaranteed power output at year 30. This long-term performance profile supports stable production expectations and dependable project economics for commercial solar customers.

The modules are engineered for demanding rooftop and ground-mount applications, with dual-glass construction, strong anti-PID characteristics, and broad environmental suitability, including high-humidity, windy, dusty, snowfield, vertical-installation, and BIPV applications. The product also carries key certifications and standards, including IEC 61215, IEC 61730, UL 61730, ISO 9001 quality management, ISO 14001 environmental management, and ISO 45001 occupational health and safety management.

From a structural and durability standpoint, the Draco modules are rated for up to 5,400 Pa front-side static loading, 2,400 Pa rear-side static loading, hail impact up to 25 mm at 80 km/h, and operation from -40°C to +85°C. The modules use 2.0 mm / 2.0 mm heat-strengthened glass, an anodized aluminum alloy frame, IP68-rated junction box, and original Stäubli MC4 connectors, reflecting a robust design suitable for long-term commercial rooftop performance.

- **MODEL:** Phono Draco Series - PS590M8GFH-24/TNH
- 30-year linear performance warranty and a 15-year product warranty
- High efficiency 22.84% N-Type Silicon Bifacial cells
- Bifacial N-Type with lower degradation and up to 30% additional power yield from bifacial technology
- Positive nameplate tolerance of 0, + 3%
- 2.0mm heat strengthened glass on glass construction for increased structural rigidity
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- First-year degradation guaranteed not to exceed 1%. Annual degradation from year two onwards guaranteed not to exceed 0.4% per year. Ensured minimum power output at 30 years is at least 87.4%.

Inverter

SolarEdge SE100k 480V3Ph Inverter (Dom Con)

SolarEdge is a global leader in smart energy solutions, best known for its DC-optimized inverter architecture, which increases the total energy yield of a solar array by enabling each panel to perform at its maximum potential. Unlike traditional systems where the lowest-performing panel can limit the output of the entire string, SolarEdge uses module-level power optimizers that mitigate losses from shading, soiling, or mismatch—resulting in more kilowatt-hours generated per installed watt. More energy means greater utility bill savings over the life of the system, directly improving project economics and accelerating ROI. Backed by a strong financial position as a publicly traded company (NASDAQ: SEDG) and proven performance across global markets, SolarEdge offers reliable, bankable technology that helps businesses reduce operating expenses and take control of long-term energy costs.

- **MODEL:** SE100k
- 100kW / 480V / 3 Ph
-
- SolarEdge produces up to 5–10% more energy than traditional string inverter systems through module-level optimization.
- System includes cloud-based dashboard with real-time monitoring at the panel level—ideal for tracking performance, energy cost reduction, and internal reporting.
- Integrated safety features (e.g., rapid shutdown, arc fault protection) reduce risk and meet NEC code requirements.
- Future-ready platform integrates with battery storage, EV charging, and load control, supporting your broader sustainability or ESG strategy.
- 12-year standard warranty, extendable to 20 years

SolarEdge SE80k 480V3Ph Inverter (Dom Con)

SolarEdge is a global leader in smart energy solutions, best known for its DC-optimized inverter architecture, which increases the total energy yield of a solar array by enabling each panel to perform at its maximum potential. Unlike traditional systems where the lowest-performing panel can limit the output of the entire string, SolarEdge uses module-level power optimizers that mitigate losses from shading, soiling, or mismatch—resulting in more kilowatt-hours generated per installed watt. More energy means greater utility bill savings over the life of the system, directly improving project economics and accelerating ROI. Backed by a strong financial position as a publicly traded company (NASDAQ: SEDG) and proven performance across global markets, SolarEdge offers reliable, bankable technology that helps businesses reduce operating expenses and take control of long-term energy costs.

- **MODEL:** SE80k
- 80kW / 480V / 3 Ph
-
- SolarEdge produces up to 5–10% more energy than traditional string inverter systems through module-level optimization.
- System includes cloud-based dashboard with real-time monitoring at the panel level—ideal for tracking performance, energy cost reduction, and internal reporting.
- Integrated safety features (e.g., rapid shutdown, arc fault protection) reduce risk and meet NEC code requirements.
- Future-ready platform integrates with battery storage, EV charging, and load control, supporting your broader sustainability or ESG strategy.

- 12-year standard warranty, extendable to 20 years

Optimizer

SolarEdge C651U Power Optimizer (Dom Con)

SolarEdge is a global leader in smart energy technology, known for pioneering the DC-optimized inverter system that transforms how solar power is harvested and managed at the module level. Founded in 2006 and publicly traded on the NASDAQ (SEDG), the company is financially stable with a strong global presence and a proven track record across residential, commercial, and utility-scale markets. SolarEdge's technology pairs high-efficiency inverters with proprietary power optimizers, enabling superior energy output, real-time panel-level monitoring, and enhanced safety through built-in rapid shutdown features. Their systems are future-ready—compatible with batteries, EV chargers, and smart energy devices—making them an ideal choice for customers seeking long-term value, innovation, and reliability from a bankable partner.

- **MODEL:** C651U
- Each panel performs independently, recovering energy typically lost to shading, dirt, or mismatch.
- Real-time visibility into performance of each individual module for faster diagnostics and better asset management.
- Optimizers isolate underperforming panels, minimizing production loss and reducing service calls.
- 25-Year Product Warranty
- This optimizer is a one-to-one device, meaning it is designed to operate with a single module per optimizer.

Racking

Panel Claw (CFR+) (Dom Con)

PanelClaw is the #1 flat roof racking provider in North America. Their racking has been deployed on over 13,000 projects totaling nearly 3GW in more than 35 countries around the world. They focus exclusively on flat roof systems. With their 15 plus years of experience, they are transforming the way commercial rooftop PV is done.

PanelClaw believes that buildings are the energy hubs of the future, and PanelClaw's purpose is to accelerate their transition to renewable energy. They provide racking, services, and digital solutions to accelerate the transition to solar energy.

With headquarters in North America and Europe, PanelClaw is the largest provider of PV racking solutions and services for buildings. Their unmatched track record of reliability provides peace of mind for their customers worldwide. Their commitment to cutting-edge engineering has yielded best-in-class racking solutions for over 15 years, and their dedication to world-class service drives partnership and trust.

- **MODEL:** Panel Claw CFR
- 10 Degree Tilt
-
- Compatible with membrane, tar and gravel, ballasted, BUR, concrete and asphalt roofs.
- Smart design features like wind deflectors and optimized ballast allow it to handle high winds with less weight.
- 25-Year Product Warranty
- Fully UL2703 code-compliant

Aerocompact S Base

AEROCOMPACT is a leading global provider of flat roof racking solutions, with its S-Base system engineered to simplify and accelerate commercial rooftop solar installations. Designed with a revolutionary quick-click assembly, S-Base has been deployed across a wide range of projects, delivering fast installation, reduced labor costs, and reliable performance in diverse environments. With a strong focus on flat roof applications, AEROCOMPACT continues to redefine efficiency and scalability in rooftop PV design.

AEROCOMPACT believes in making solar deployment smarter, faster, and more cost-effective. The S-Base system combines lightweight, nested base plates with integrated ballast and wind deflection to minimize point loads and material use while maintaining structural integrity. Its innovative design enables single-person installation and supports high wind and snow loads, ensuring dependable performance across North America and beyond.

- **MODEL:** Aerocompact S-Base 10 Degree Tilt Compatible with all flat roofs incldluing membrane, tar and gravel, ballasted, BUR, concrete and asphalt roofs. 25-Year Product Warranty

any demand charge savings from PV. In contrast, the school's original load peaks in the afternoon when the PV system would be near peak output. In this case, the school would be able to capture substantial demand charge savings from the installation of PV.

In general, buildings whose electricity demand is highest during the day—often schools and office buildings—have the greatest likelihood of seeing demand charge savings from PV. Buildings with evening peak demand, such as hotels and midrise apartments, often see little to no demand charge savings. In addition, there are diminishing returns on demand charge savings from PV—a sufficiently large system can reduce midday electricity demand to the point where peak demand occurs during the evening, when PV cannot capture any additional savings.

How can I estimate potential demand charge savings from a PV system?

It is impossible to predict with absolute certainty how much a PV system will influence a building's demand charges, but it is possible to estimate the range of potential savings. With hourly electricity consumption data and weather data that correspond to the same date range and location, you can use NREL's *System Advisor Model* to evaluate potential savings.[2]

Even without this hourly data, you can estimate a potential range of demand charge savings using the following procedure and look-up graphs in Figure 2. These graphs characterize the relationship between PV and a reduction in peak demand based on simulations of 16 representative commercial buildings in 16 different climate zones using 17 years' worth of historical weather data.[3]

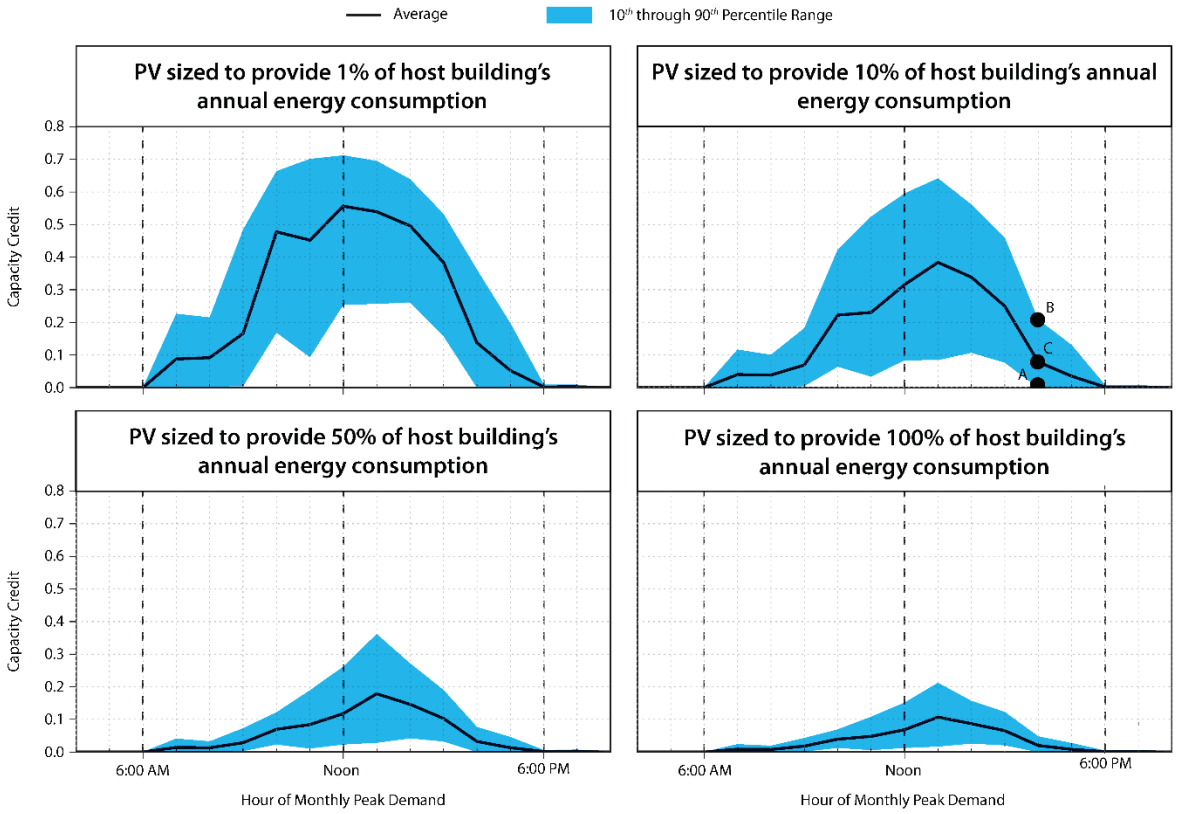

Figure 2. Look-up figures for PV capacity credits for four PV sizes

[2] See *https://sam.nrel.gov*.

[3] The procedure and figures given here were derived from Darghouth et al. (2017a). For a deeper dive into the interaction of PV and demand charges, see Darghouth et al. (2017a) and its equivalent for the residential sector, Darghouth et al. (2017b).

[4] See *http://pvwatts.nrel.gov/*.

How to Estimate Demand Charge Savings from PV on Commercial Buildings

What are demand charges?

Demand charges are typically part of a commercial electricity customer's electric bill. These charges are designed to recuperate costs associated with the infrastructure needed to generate and distribute power to the customer, such as power plants and transmission lines. To put this in context, a typical commercial electricity tariff has three components:

- Demand charge: A charge for the maximum rate at which you consumed electricity during the month, measured in kilowatts (kW).
- Customer charge: A fixed dollar amount per month charge. These are designed to capture administrative and miscellaneous costs that do not vary significantly by usage levels.
- Energy charge: A charge for the total amount of electricity that you consumed during the month, typically measured in kilowatt-hours (kWh). This charge is designed to recuperate costs such as fuel and operating and maintenance costs, which are strongly correlated with energy consumption.

As an example, let us consider a hypothetical office building for the month of April. Imagine that the building consumed power at a constant rate of 100 kW, but it also had a 50 kW air conditioning unit turned on for a single hour during the month. Because April has 720 hours, the total energy consumption of the office is 100 kW × 720 hours + 50 kW × 1 hour = 72,050 kWh. The building's demand peaked when the air conditioner was running; however, the 50 kW on top of the 100 kW of miscellaneous loads leads to a total peak demand of 150 kW.

Utilities' total revenue from the sale of electricity to the entire commercial sector in the United States is composed of approximately 3% from customer charges, 25% from demand charges, and 72% from energy charges.[1] Those magnitudes vary moderately by region and significantly by customer. Demand charges that exceed 50% of a customer's monthly electric bill are common.

Can an onsite photovoltaic system reduce demand charges?

A solar photovoltaic (PV) system can reduce demand charges if the solar generation occurs at the same time as the host building's peak demand. Figure 1 shows the impact of PV on demand charges is shown for a simulated hotel and school. As shown in the left panel, the hotel's peak demand occurs in the evening after the sun is down, so a PV system would not reduce the hotel's peak demand and the hotel would not reap

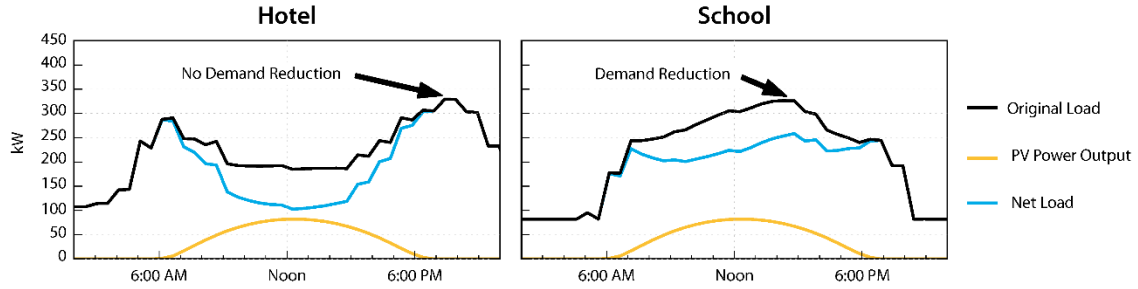

Figure 1. Simulated reduction in peak demand from PV on a hotel and school

[1] Revenue estimates are derived from a curated set of retail electricity tariffs, available in the Utility Rate Database (*http://en.openei.org/wiki/Utility_Rate_Database*), which were quality-checked for this analysis. Bill calculations were performed using approximately 3,000 representative commercial customers that are part of NREL's dGen model (*http://www.nrel.gov/analysis/dgen/*).

The Process for Estimating a Range of Demand Charge Savings

1. Estimate the annual energy production of the PV system you are considering, in kWh per year. If you are working with a developer, they should be able to provide this value for you. Alternatively, you can use NREL's *PVWatts Calculator* to estimate PV production.[4] Lastly, you can roughly estimate annual production by multiplying the size of the system in kilowatts by 1,410 kWh/kW.

2. Use electric bills from the previous year to estimate your building's annual energy consumption.

3. Calculate the PV system's energy production as a percentage of your building's annual energy consumption:

$$\text{PV Production \%} = \frac{\text{Annual PV Production (kWh)}}{\text{Annual Electricity Consumption}} \times 100\%$$

4. Identify which of the panels in Figure 2 is closest to the PV production percentage calculated in step 3. For each month of the year, use the panel to identify the range of capacity credits for the hour that your building's electric demand peaks during that month. If your PV production percentage is sufficiently different from any one of the panels, it would be more accurate to interpolate between the values of two of them.

5. Use the following equation to estimate the demand charge savings for each month. Solve the equation three times – once for the lower 10th percentile capacity credit from step 4, once for the average capacity credit, and once for the upper 90th percentile. Perform this for each month of the year, and add the monthly values to arrive at an estimate of the potential range of demand charge savings.

$$\text{Monthly Demand Charge Savings (\$)} = \text{Monthly Demand Charge Rate (\$/kW)} * \text{PV Size (kW)} * \text{Capacity Credit}$$

How to Use the Process: An Example

Imagine you own a building that reaches its peak demand around 4 p.m. in July and consumed 300,000 kWh of electricity in the preceding year. You are considering a 20-kW PV system, and the demand charge for the month is $10/kW. You can estimate the PV production as 20 kW * 1410 kWh/kW = 28,200 kWh. You can then estimate the PV production percentage as 28,200 kWh / 300,000 kWh = 9.4%. Looking at Figure 2, the upper right panel most closely resembles the fraction of electricity consumption offset by the PV system. The range of capacity credits for the hour that your building peaks are labeled as A, B, and C in Figure 2—zero for the lower end of the range, 0.20 for the higher end, and 0.08 on average. Putting these capacity credits in the equation in step 5 gives a range of potential savings for this month: $0 to $40, with the average building saving $16. Repeat this for each month to get an estimate of the potential range of total annual demand charge savings from PV.

Keep in mind that these are just estimates based on simulations with only a small amount of input from your specific situation. The actual demand charge savings can vary based on daylight hours in your region and the patterns in both energy consumption and PV production. This method of estimation is also based on the simplest type of demand charges based on a building's monthly maximum demand, but other forms of complexity in demand charge design may affect actual savings. These are reasonable first approximations, but more detailed analysis could be beneficial if demand charges play a pivotal role in your decision of whether to invest.

Table 1. Variations in Demand Charge Designs

Demand Charge Style and Description	Influence on PV's Demand Charge Savings
Time-of-use: A window of time is specified (e.g., 5 p.m. to 9 p.m.), and demand charges are calculated using a customer's maximum demand during that window.	Time-of-use windows can significantly affect demand charge savings. Windows that extend outside of daylight hours tend to decrease savings, whereas windows that are entirely within daylight hours tend to increase savings.
Seasonal: Instead of a constant $/kW for each month of the year, values for seasons differ. Often, the summer charges are higher than winter charges.	PV production is typically greatest during summer months; therefore, demand charge savings from PV are often slightly higher for tariffs that have seasonal components that are higher during the summer.
Declining or inclining tiers: Instead of a single $/kW rate, there can be different rates for different tiers of demand. For example, a declining tier might charge $10/kW for the first 500 kW but only $5/kW for any amount beyond that. Declining tiers are more common for commercial customers in the United States.	Declining tiers typically reduce PV savings from demand charges because the PV reduces demand from the top tiers first, which are charged at a lower rate. Inclining tiers typically increase PV savings.
15, 30, or 60 minute 'averaging interval': Demand charge levels are rarely calculated on instantaneous peak demands but instead average demand over a window of time. The most common windows are 15, 30, and 60 minutes.	Temporary dips in PV production (e.g., from a cloud passing overhead) can set a month's demand charge; therefore, demand charge savings from PV are typically greater with longer windows because the longer time averages out the dip in production.
Ratchets: Some tariffs set demand charges as either the current month's highest demand level or a fraction of some historical maximum. For example, a tariff may say that the demand charge is $10/kW of "billing demand," where "billing demand" is either the current month's maximum demand or 70% of the customer's maximum demand during the summer months, whichever is higher.	Ratchets can have a wide range of impacts on demand charge savings.

Demand Charge Design Variations

Demand charges can vary by time of day, by season, or can be based on more complex calculations of the building's demand. The process outlined on the previous page uses the simplest demand charges—ones that are assessed based on a building's monthly maximum demand. Table 1 provides qualitative guidance on estimating demand charge savings from PV under more complicated designs.

If you are unfamiliar with what type of demand charge design applies to your building, you can use a recent electric bill to look up your tariff (e.g., "General Service 2") and then look up the description of this tariff on your utility's website. Note that some tariffs have more than one demand charge element (e.g., a flat component as well as a time-of-use component). The savings from these different elements can be evaluated separately and added together.

References and Further Reading

Bird, Lori, Pieter Gagnon, and Jenny Heeter. 2016. *Expanding Midscale Solar: Examining the Economic Potential, Barriers, and Opportunities at Offices, Hotels, Warehouses, and Universities*. NREL/TP-6A20-65938. Golden, CO: National Renewable Energy Laboratory. *http://www.nrel.gov/docs/fy16osti/65938.pdf*.

Darghouth, Naïm R., Galen L. Barbose, Andrew D. Mills, Ryan H. Wiser, Pieter Gagnon, and Lori Bird. 2017a. *Exploring Demand Charge Savings from Commercial Solar*. Berkeley, CA: Lawrence Berkeley National Laboratory. *https://emp.lbl.gov/sites/default/files/comdemandcharge-briefing.pdf*.

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NREL. 2017. "NREL Screens Universities for Solar and Battery Storage Potential." NREL/FS-7A40-67555. *http://www.nrel.gov/docs/fy17osti/67555.pdf*.

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Solar for Schools Grant Contract

EXHIBIT A

STATE OF MINNESOTA
GRANT CONTRACT AGREEMENT
Swift Contract Number: Click or tap here to enter text.

This Grant Contract Agreement is between the State of Minnesota, acting through its Department of Commerce ("State") and Give the full name of the grantee including its address ("Grantee").

Recitals

Under Minnesota Statutes § 216C.02, subd. 1 the State is empowered to enter into this Grant Contract Agreement. The State is in need of assistance in the promotion of installation of solar energy systems on Minnesota schools, while using the opportunity to integrate renewable energy use into school curriculum according to Minn Stat 216C.375. The Grantee represents that it is duly qualified and agrees to perform all services described in this Grant Contract Agreement to the satisfaction of the State.

Grant Contract Agreement

1 Term of Grant Contract Agreement

1.1 Effective Date. Spell out full date (e.g., July 1, 2023), or the date the State obtains all required signatures, whichever is later.

Per Minnesota Statutes § 16B.98, Subd. 5, the Grantee must not begin work until this Grant Contract Agreement is fully executed and the State's Authorized Representative has notified the Grantee that work may commence.

Per Minnesota Statutes § 16B.98 Subd. 7, no payments will be made to the Grantee until this Grant Contract Agreement is fully executed.

1.2 Expiration Date. Spell out full date (e.g., June 30, 2025), or until all obligations have been satisfactorily fulfilled, whichever occurs first.

1.3 Survival of Terms. The following clauses survive the expiration or cancellation of this Grant Contract Agreement: Liability; State Audits; Government Data Practices and Intellectual Property; Publicity and Endorsement; Governing Law, Jurisdiction, and Venue; and Data Disclosure.

2 Specifications, Duties, and Scope of Work

The parties will perform the services outlined in Exhibit A: Specifications, Duties, and Scope of Work.

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USE FOR PROJECT WITH A GUARANTEED ENERGY SAVINGS CONTRACT

EXHIBIT A

3 Time

The Grantee must comply with all the time requirements described in this Grant Contract Agreement. In the performance of this Grant Contract Agreement, time is of the essence and failure to meet a deadline date may be a basis for a determination by the State's Authorized Representative that the Grantee has not complied with the terms of the Grant Contract Agreement. The Grantee is required to perform all the duties cited within clause two "Specifications, Duties, and Scope of Work" within the grant period. The State is not obligated to extend the grant period.

4 Consideration and Terms of Payment

The consideration for all services performed by the Grantee pursuant to this Grant Contract Agreement shall be paid by the State as follows:

4.1 Compensation. The total obligation of the State under this Grant Contract Agreement, including all compensation and reimbursements, is not to exceed $ Total Compensation and Travel Reimbursement, which shall be paid in accordance with the terms outlined in Exhibit B: Payment Schedule, which is attached and incorporated into this Grant Contract Agreement.

4.2 Administrative Costs. Grantee administrative costs must be necessary and reasonable.

4.3 Travel Expenses. Reimbursement for travel and subsistence expenses actually and necessarily incurred by the Grantee because of this Grant Contract Agreement will not exceed $0.00. The Grantee will not be reimbursed for travel and subsistence expenses incurred outside Minnesota unless it has received the State's prior written approval for out of state travel. Minnesota will be considered the home state for determining whether travel is out of state.

The Grantee will be reimbursed for travel and subsistence expenses in the same manner and in no greater amount than provided in the current Commissioner's Plan promulgated by the Commissioner of Minnesota Management and Budget.

4.5 Invoices. Payments shall be made by the State after the Grantee's presentation of invoices for services satisfactorily performed and the written acceptance of such services by the State's Authorized Representative. Invoices shall be submitted timely, with additional details as requested by the State, and according to the following schedule: Exhibit B: Budget and Payment Schedule.

4.5.1 Retainage. No more than 95 percent of the amount due under this grant contract may be paid until the final product of this grant contract has been reviewed by the State's Authorized Representative. The balance due will be paid when the State's Authorized Representative determines that the Grantee has satisfactorily fulfilled all the terms of this grant contract.

4.6 Budget Categories. Upon notice to and written approval by the State's Authorized Representative, the Grantee's budget for any one category in Exhibit B may be increased by up to 10% of the amount shown in Exhibit B for that category, with the amount of the increase moved from one or more other categories in

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EXHIBIT A

6. Contracting and Bidding Requirements

6.1 For projects that include entering a Guaranteed Energy Savings contract, as defined in Minn. Stat. § 471.345, Subd. 13, or Minn. Stat. § 123B.65, Grantees must follow the law.

6.2 For projects that include construction work, prevailing wage rules apply per Minn. Stat. §§ 177.41 through 177.44. These rules require that the wages of laborers and workers should be comparable to wages paid for similar work in the community as a whole.

6.3 The Grantee and any subrecipients must not contract with vendors who are suspended or debarred by the State of Minnesota or the federal government: Suspended and Debarred Vendors, Minnesota Office of State Procurement.

6.4 The Grantee must maintain written standards of conduct covering conflicts of interest and governing the actions of its employees engaged in the selection, award and administration of contracts.

7. Authorized Representatives

7.1 The State's Authorized Representative is **Amanda (Mandi) Schienebeck, Solar for Schools Program Manager, Amanda.Schienebeck@state.mn.us, 651-539-1829,** or their successor, and has the responsibility to monitor the Grantee's performance and the authority to accept the services provided under this Grant Contract Agreement. If the services are satisfactory, the State's Authorized Representative will certify acceptance on each invoice submitted for payment.

7.2 The Grantee's Authorized Representative is Name, title, email address, telephone number, or their successor. If the Grantee's Authorized Representative changes at any time during this Grant Contract Agreement, the Grantee must immediately notify the state.

OPTIONAL - The Grantee's Project Manager is PMfirstname PMlastname, PMtitle, PMphone, or their successor. If the Grantee's Project Manager changes at any time during this grant contract, the Grantee must immediately notify the State.

7.3 The Grantee must clearly post on the Grantee's website the names of, and contact information for, the Grantee's leadership and the employee or other person who directly manages and oversees this Grant Contract Agreement on behalf of the Grantee.

8. Assignment, Amendments, Waiver, and Contract Complete

8.1 **Assignment.** The Grantee may neither assign nor transfer any rights or obligations under this Grant Contract Agreement without the prior consent of the State and a fully executed agreement, executed and approved by the authorized parties or their successors.

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Exhibit B. To move more than 10 percent into a budget category from another budget category or categories will require an amendment to the grant contract.

4.7 Unexpended Funds. The Grantee must promptly return to the State any unexpended funds that have not been accounted for in a financial report to the State.

5 Conditions of Payment

All services provided by the Grantee under this Grant Contract Agreement must be performed to the State's satisfaction, as determined at the sole discretion of the State's Authorized Representative and in accordance with all applicable federal, state, and local laws, ordinances, rules, and regulations. The Grantee will not receive payment for work found by the State to be unsatisfactory or performed in violation of federal, state, or local law.

The value of this grant contract cannot exceed 100% of project costs, as identified in Exhibit B: Budget and Payment Schedule, when combined with funds not contributed by the Grantee, including (a) *secured* incentives (e.g., other grants, utility incentives, fundraised dollars) and (b) the *eligible* solar tax credit value identified and being pursued by the Grantee. The Grantee will notify the State's Authorized Representative, in writing, if the Grantee has secured any additional incentives and of any changes to Grantee's identified solar tax credit value being pursued.

If additional funds result in the value of this grant contract exceeding 100% of project costs, the Grantee will only be eligible for reimbursement up to 100% of project costs when the additional funds are factored into the budget.

If additional funds are received after the State has reimbursed 100% of this grant contract, the amount exceeding 100% will be considered unexpended funds under section 4.7 of this Grant Contract Agreement.

PROJECT IS NOT USING A GUARANTEED ENERGY SAVINGS CONTRACT

6 Contracting and Bidding Requirements

6.1 The Grantee is required to comply with Minnesota Statutes §471.345, Uniform Municipal Contracting Law.

6.2 The Grantee and any subrecipients must comply with prevailing wage rules per Minnesota Statutes §§ 177.41 through 177.50, as applicable.

6.3 The Grantee and any subrecipients must not contract with vendors who are suspended or debarred by the State of Minnesota or the federal government: Suspended and Debarred Vendors, Minnesota Office of State Procurement.

6.4 The Grantee must maintain written standards of conduct covering conflicts of interest and governing the actions of its employees engaged in the selection, award and administration of contracts.

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8.2 Amendments. Any amendment to this Grant Contract Agreement must be in writing and will not be effective until it has been executed and approved by the same parties who executed and approved the original Grant Contract Agreement or their successors.

8.3 Waiver. If the State fails to enforce any provision of this Grant Contract Agreement, that failure does not waive the provision or its right to enforce it.

8.4 Contract Complete. This Grant Contract Agreement contains all negotiations and agreements between the State and the Grantee. No other understanding regarding this Grant Contract Agreement, whether written or oral, may be used to bind either party.

9. Subcontracting and Subcontract Payment

9.1 A subrecipient is a person or entity that has been awarded a portion of the work authorized by this Grant Contract Agreement by Grantee. The Grantee must document any subaward through a formal legal agreement. The Grantee must provide timely notice, in writing, to the State of any subrecipient(s) prior to the subrecipient(s) performing work under this Grant Contract Agreement.

9.2 The Grantee must monitor the activities of the subrecipient(s) to ensure the subaward is used for authorized purposes; is in compliance with the terms and conditions of the subaward, Minnesota Statutes § 16B.97, Subd.4 (a) 1, and other relevant statutes and regulations; and that subaward performance goals are achieved.

9.3 During this Grant Contract Agreement, if a subrecipient is determined to be performing unsatisfactorily by the State's Authorized Representative, the Grantee will receive written notification that the subrecipient can no longer be used for this Grant Contract Agreement.

9.4 No subagreement shall serve to terminate or in any way affect the primary legal responsibility of the Grantee for timely and satisfactory performances of the obligations contemplated by the Grant Contract Agreement.

9.5 The Grantee must pay any subrecipient in accordance with Minnesota Statutes § 16A.1245.

9.6 The Grantee and any subrecipients must not contract with vendors who are suspended or debarred by the State of Minnesota or the federal government.

10. Liability

The Grantee must indemnify, save, and hold the State, its agents, and employees harmless from any claims or causes of action, including attorney's fees incurred by the State, arising from performance of this Grant Contract Agreement by the Grantee or the Grantee's agents or employees. This clause will not be construed to bar any legal remedies the Grantee may have for the State's failure to fulfill its obligations under this Grant Contract Agreement.

11. State Audits

Under Minnesota Statutes § 16B.98, Subd. 8, the Grantee's books, records, documents, and accounting procedures and practices relevant to this Grant Contract Agreement are subject to examination by the Commissioner of Administration, the State granting agency, the State Auditor, the Attorney General, and the Legislative Auditor, as

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to payment, determined on a pro rata basis, for services satisfactorily performed to the extent that dedicated funds are available.

In the event of temporary lack of federal funding or federal appropriation from the grantor, the State may pause its obligations under this Grant Contract Agreement without terminating it. This pause will be for the duration of the lack of funding or appropriation and shall not be considered a termination of the Grant Contract Agreement. The Grantee State will be notified in writing of the temporary pause, and the Grantee's ability to provide services may be temporarily suspended during this period. The State Grantee will provide reasonable notice to the Grantee State of the lack of funding or appropriation and shall notify the Grantee State once funding is restored or appropriated, at which point the provision of services under the Grant Contract Agreement may resume.

The State will not be assessed any penalty if the Grant Contract Agreement is terminated due to insufficient funding. The State must provide the Grantee notice of the lack of funding within a reasonable time of the State's receiving notice.

16. Publicity and Endorsement

16.1 Publicity. Any publicity pertaining to the services resulting from this Grant Contract Agreement shall identify the State as the sponsoring agency. Publicity includes, but is not limited to: websites, social media platforms, notices, informational pamphlets, press releases, research, reports, signs, and similar public notices prepared by or for the Grantee or its employees individually or jointly with others or any subrecipients. All projects primarily funded by state grant appropriations must publicly credit the State, including on the grantee's website, when practicable

16.2 Endorsement. The Grantee must not claim that the State endorses its products or services.

17. Data Disclosure

Under Minnesota Statutes § 270C.65, Subd. 3, and other applicable law, the Grantee consents to disclosure of its social security number, federal employer tax identification number, or Minnesota tax identification number, already provided to the State, to federal and state tax agencies and state personnel involved in the payment of state obligations. These identification numbers may be used in the enforcement of federal and state tax laws which could result in action requiring the Grantee to file state tax returns and pay delinquent state tax liabilities, if any.

Exhibits

The following Exhibits are attached and incorporated into this Grant Contract Agreement. In the event of a conflict between the terms of this Grant Contract Agreement and its Exhibits, or between Exhibits, the order of precedence is first the Grant Contract Agreement, and then in the following order:

Exhibit A: Specifications, Duties, and Scope of Work

Exhibit B: Budget and Payment Schedule

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liabilities, costs, and damages including, but not limited to reasonable attorneys' fees arising out of this grant contract, amendments and supplements thereto, which are attributable to such claims or actions.

If such a claim or action arises, or in Grantee's or the State's opinion is likely to arise, Grantee shall, at the State's discretion, either procure for the State the right or license to continue using the materials at issue or replace or modify the allegedly infringing materials. This remedy shall be in addition to and shall not be exclusive to other remedies provided by law.

13. Workers Compensation

The Grantee certifies that it is in compliance with Minnesota Statutes § 176.181, Subd. 2, pertaining to workers' compensation insurance coverage. The Grantee's employees and agents will not be considered State employees. Any claims that may arise under the Minnesota Workers' Compensation Act on behalf of these employees and any claims made by any third party as a consequence of any act or omission on the part of these employees are in no way the State's obligation or responsibility.

14. Governing Law, Jurisdiction, Venue

Venue for all legal proceedings out of this Grant Contract Agreement, or its breach, must be in the appropriate state or federal court with competent jurisdiction in Ramsey County, Minnesota.

15. Termination

15.1 Termination by the State.

15.1.1 Without Cause. The State may terminate this Grant Contract Agreement without cause, upon 30 days' written notice to the Grantee. Upon termination, the Grantee will be entitled to payment, determined on a pro rata basis, for services satisfactorily performed.

15.1.2 With Cause. The State may immediately terminate this Grant Contract Agreement if the State finds that there has been a failure to comply with the provisions of this Grant Contract Agreement, that reasonable progress has not been made, or that the purposes for which the funds were granted have not been or will not be fulfilled. The State may take action to protect the interests of the State of Minnesota, including the refusal to disburse additional funds and requiring the return of all or part of the funds already disbursed.

15.2 Termination by the Commissioner of Administration. The Commissioner of Administration may immediately and unilaterally terminate this Grant Contract Agreement if further performance under the agreement would not serve agency purposes or performance under the Grant Contract Agreement is not in the best interest of the State.

15.3 Termination for Insufficient Funding. The State may immediately terminate this Grant Contract Agreement if it does not obtain funding from the Minnesota Legislature, or other funding source; or if funding cannot be continued at a level sufficient to allow for the payment of the services addressed within this Grant Contract Agreement. Termination must be by written notice to the Grantee. The State is not obligated to pay for any services that are provided after notice and effective date of termination. However, the Grantee will be entitled

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appropriate, for a minimum of six years from the expiration or termination of this Grant Contract Agreement, receipt and approval of all final reports, or the required period of time to satisfy all State and program retention requirements, whichever is later.

12. Government Data Practices and Intellectual Property Rights

12.1 Government Data Practices. The Grantee and State must comply with the Minnesota Government Data Practices Act, Minnesota Statutes Chapter 13, as it applies to all data provided by the State under this Grant Contract Agreement, and as it applies to all data created, collected, received, stored, used, maintained, or disseminated by the Grantee under this Grant Contract Agreement. The civil remedies of Minnesota Statutes § 13.08 apply to the release of the data referred to in this clause by either the Grantee or the State.

If the Grantee receives a request to release the data referred to in this Clause, the Grantee must immediately notify the State. The State will give the Grantee instructions concerning the release of the data to the requesting party before the data is released. The Grantee's response to the request shall comply with applicable law.

12.2 Intellectual Property Rights. The Grantee shall own all rights, title, and interest in all of the intellectual property rights, including copyrights, patents, trade secrets, trademarks, and service marks in the works and documents. The "works" means all inventions, improvements, discoveries (whether or not patentable), databases, computer programs, reports, notes, studies, photographs, negatives, designs, drawings, specifications, materials, tapes, and disks conceived, reduced to practice, created or originated by the Grantee, its employees, agents, and subcontractors, either individually or jointly with others in the performance of this grant contract. "Works" includes documents. The "documents" are the originals of any databases, computer programs, reports, notes, studies, photographs, negatives, designs, drawings, specifications, materials, tapes, disks, or other materials, whether in tangible or electronic forms, prepared by the Grantee, its employees, agents, or subcontractors, in the performance of this grant contract.

12.3 License to the State. Subject to the terms and conditions of this grant contract, the Grantee hereby grants to the State a perpetual, irrevocable, no-fee right and license to make, have made, reproduce, modify distribute, perform and otherwise use the works and documents for any and all purposes, in all forms and manners that the State, in its sole discretion, deems appropriate. The Grantee shall upon the request of the State, execute all papers and perform all other acts necessary, to document and secure said right and license to the works and documents by the State. At the request of the State, the Grantee shall permit the State to inspect the original documents and provide a copy of any of the document to the State, without cost, for use by the State in any manner the State, in its sole discretion, deems appropriate.

12.4 Obligations. Grantee represents and warrants that materials produced or used under this grant contract do not and will not infringe upon any intellectual property rights of other persons or entities including but not limited to patents, copyrights, trade secrets, trade names, and service marks and names. Grantee shall indemnify and defend the State, at Grantee's expense, from any action or claim brought against the State to the extent that it is based on a claim that all or part of the materials infringe upon the intellectual property rights of another. Grantee shall be responsible for payment of any and all such claims, demands, obligations,

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EXHIBIT A

Grant Contract Agreement Signature Page

State Encumbrance Verification

Individual certifies that funds have been encumbered as required by Minnesota Statutes. §§ 16A.15

Print Name: _____

Signature:_____

Title:_____Date: _____

SWIFT Contract No. _____

Grantee

With delegated authority

Print Name: _____

Signature:_____

Title:_____Date: _____

State Agency

With delegated authority

Print Name: _____

Signature: _____

Title:_____Date: _____

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Solar for Schools RFP Document

Solar for Schools: 2026 Program

Amanda Schienebeck | Solar on Schools Program Administrator

SolarForSchools@state.mn.us

Program Overview

COMMERCE DEPARTMENT

85 7th Place East, Suite 280
St. Paul, Minnesota 55101
mn.gov/commerce/energy
energy.contracts@state.mn.us

MINNESOTA DEPARTMENT OF COMMERCE

REQUEST FOR PROPOSAL

COMM-SFS06-20240701

Minnesota Solar for School Program Application

Step 1: Notice of Intent: School Readiness Assessment*
Date of Issue: Monday, July 1, 2024
Due: Wednesday, July 31, 2024
School Readiness Eligibility Notification: Friday, August 30, 2024

Step 2: Full Grant Application*
Application Open: Upon Notification
Application Due: Friday, November 29, 2024

*Responses to both steps of this RFP must be submitted online using the Department of Commerce's grant interface website ("GIW"). Responders must create an account on the GIW in order to submit an Assessment and the Full Grant Application. Details are in this RFP.

RFP: COMM-SFS06-20240701 Page 1 of 33

[Department of Commerce Active RFPs]

2026 R1 Funding

- Readiness Assessment Open February 02, 2026
- Full Applications due July 03, 2026
- https://mn.gov/commerce/business/rfp.jsp

2026 R2 Funding (Anticipated)

- Readiness Assessment ~July 2026
- Full Applications Due ~December 2026

More Information: mn.gov/solar4schools

Remaining Program Funds

Xcel Electric Service	K-12 Schools	$12,884,232
	MN State Colleges & Universities	$1,117,800
All Other Utilities	K-12 Schools	$4,126,303
	MN State Colleges & Universities	$2,006,889

2024-2025 Incentives

School Type	System Size (kWdc)	Grant Value (% of System Cost)	Outside Xcel Grant Cap ($)	Inside Xcel Grant Cap ($)
Independent & Special School Districts				
ANTC/APU ≤ $5,000	≤ 50	70%	$ 84,000	$ 84,000
	>50 and ≤ 125		$ 175,000	$ 175,000
	> 125 and ≤ 625		$ 500,000	$ 675,000
	> 625 and ≤ 1250		$ 500,000	$ 675,000
ANTC/APU > $5,000 & ≤ $9,250 or Tribal Contract Schools	≤ 50	60%	$ 72,000	$ 72,000
	>50 and ≤ 125		$ 150,000	$ 150,000
	> 125 and ≤ 625		$ 500,000	$ 600,000
	> 625 and ≤ 1250		$ 500,000	$ 675,000
ANTC/APU > $9,250 & ≤ $17,750 or MNSCU	≤ 50	50%	$ 60,000	$ 60,000
	>50 and ≤ 125		$ 125,000	$ 125,000
	> 125 and ≤ 625		$ 500,000	$ 500,000
	> 625 and ≤ 1250		$ 500,000	$ 675,000
ANTC/APU > $17,750 or Cooperative Districts	≤ 50	40%	$ 48,000	$ 48,000
	>50 and ≤ 125		$ 100,000	$ 100,000
	> 125 and ≤ 625		$ 400,000	$ 400,000
	> 625 and ≤ 1250		$ 500,000	$ 600,000

Summary of Incentive Changes

All Discussed in More Detail on Further Slides

Condense the number of grant levels from four levels down to three

Increase the minimum grant from 40% → 70% and the maximum grant from 70% → 90%

"Reverse" the grant from being a **percentage** of project cost, with a not-to-exceed **financial** limit, to being a **financial** dollar amount per watt, with **percentage** cost limitations

Incentive Changes Explained: Pre-Readiness Assessment

Condense the number of grant levels from four levels down to three

Increase the minimum grant from 40% → 70% and the maximum grant from 70% → 90%

School Type or Eligibility Category	Estimated Grant %
ANTC/APU ≤ $5,000	90%
≤ $9,250 ANTC/APU > $5,000 Tribal Contract Schools	*80%*
ANTC/APU > $9,250 Colleges & Universities Cooperative Districts	*70%*

Incentive Changes Explained: Readiness Assessment

"Reverse" the grant from being a **percentage** of project cost, with a not-to-exceed **financial** limit, to being a **financial** dollar amount per watt, with **percentage** cost limitations

Total Maximum Grant ($) = System Size (kWdc) X 1000 X Grant Rate ($/w)

- An Applicant's grant rate is determined by its school type, financial need, and system size (using the incentive table on the next slide)
- The total maximum grant is calculated by multiplying the applicable grant rate by the nameplate capacity of the system, *as identified in the Readiness Assessment*. This represents the maximum value of funds reserved for Applicants whose Readiness Assessment application is approved.

2026 Grant Incentive Rates

School Type or Eligibility Category	System Size (kWdc)	Grant Rate ($/watt)	Not to Exceed (% of Project Cost)
ANTC/APU ≤ $5,000	≤ 50	$ 2.70	90%
	> 50 & ≤ 125	$ 2.34	
	> 125 & ≤ 625	$ 1.98	
	> 625 & ≤ 1250	$ 1.62	
≤ $9,250 ANTC/APU > $5,000 Tribal Contract Schools	≤ 50	$ 2.40	80%
	> 50 & ≤ 125	$ 2.08	
	> 125 & ≤ 625	$ 1.76	
	> 625 & ≤ 1250	$ 1.44	
ANTC/APU> $9,250 Colleges & Universities Cooperative Districts	≤ 50	$ 2.10	70%
	> 50 & ≤ 125	$ 1.82	
	> 125 & ≤ 625	$ 1.54	
	> 625 & ≤ 1250	$ 1.26	

2026 Grant Incentive Rates

SYSTEM SIZE	2024-2025 Cost Basis ($/watt)	2026 Cost Basis ($/watt)
≤ 50	$ 2.40	$ 3.00
> 50 & ≤ 125	$ 2.00	$ 2.60
> 125 & ≤ 625	$ 1.60	$ 2.20
> 625 & ≤ 1250	$ 1.20	$ 1.80

System Size (kWdc)	2026 Grant Cost Basis ($/watt)	90%	80%	70%
≤ 50	$ 3.00	$ 2.70	$ 2.40	$ 2.10
> 50 & ≤ 125	$ 2.60	$ 2.34	$ 2.08	$ 1.82
> 125 & ≤ 625	$ 2.20	$ 1.98	$ 1.76	$ 1.54
> 625 & ≤ 1250	$ 1.80	$ 1.62	$ 1.44	$ 1.26

Incentive Changes Explained: Final Grant

The final grant award will be established after submission of the Full Application and will be calculated using the final system size. It may be additionally reduced or limited due to one or more of the following:

1. System Size Changes
2. System Cost
3. District and University-Wide Grant Caps
4. Additional Funding Sources (Additional Incentives, Tax Credit)
5. Voluntary Grant Reductions
6. Remaining Programmatic Funds
7. Other Factors the Department Deems Necessary

Grant Contract Update – Outside Funds (24m)

Conditions of Payment

All services provided by the Grantee under this Grant Contract Agreement must be performed to the State's satisfaction, as determined at the sole discretion of the State's Authorized Representative and in accordance with all applicable federal, state, and local laws, ordinances, rules, and regulations. The Grantee will not receive payment for work found by the State to be unsatisfactory or performed in violation of federal, state, or local law.

The value of this grant contract cannot exceed 100% of project costs, as identified in Exhibit B: Budget and Payment Schedule, when combined with funds not contributed by the Grantee, including (a) *secured* incentives (e.g., other grants, utility incentives, fundraised dollars) and (b) the *eligible* solar tax credit value identified and being pursued by the Grantee. The Grantee will notify the State's Authorized Representative, in writing, if the Grantee has secured any additional incentives and of any changes to Grantee's identified solar tax credit value being pursued.

If additional funds result in the value of this grant contract exceeding 100% of project costs, the Grantee will only be eligible for reimbursement up to 100% of project costs when the additional funds are factored into the budget.

If additional funds are received after the State has reimbursed 100% of this grant contract, the amount exceeding 100% will be considered unexpended funds under section 4.7 of this Grant Contract Agreement.

Tax Credit Considerations

24-month contract, with 6-month minimum check-ins to allow for Grantees to report additional funds to be added to the budget (e.g., secured incentives, eligible solar tax credit identified to be pursued)

- Due to time limitations of the solar tax credit, Full Grant Applications that have identified intent and budgeted for the solar tax credit will be reviewed on a first-come-first-serve basis in the order in which they were received. All other applications will receive notification no later than Friday, July 31, 2026.

Procurement Requirements – Grant Contract

Municipal Contracting: Projects not entering into a Guaranteed Energy Savings contract (GES) are required to comply with Minn. Stat § 471.345, Uniform Municipal Contracting Law. Applicants and Developers are strongly encouraged to review Minn. Stat § 471.345 to ensure compliance with statutory obligations.

Guaranteed Energy Savings: Projects entering a Guaranteed Energy Savings contract are required to comply with Minn. Stat. § 471.345, Subd. 13 or Minn. Stat. § 123B.65. Applicants and Developers are strongly encouraged to review Minn. Stat. § 471.345, Subd. 13, or Minn. Stat. § 123B.65 to ensure compliance with statutory obligations.

Procurement Requirements – Grant Contract

PROJECT IS NOT USING A GUARANTEED ENERGY SAVINGS CONTRACT

6 Contracting and Bidding Requirements

The Grantee is required to comply with Minnesota Statutes §471.345, Uniform Municipal Contracting Law.

6.1 The Grantee and any subrecipients must comply with prevailing wage rules per Minnesota Statutes §§ 177.41 through 177.50, as applicable.

6.2 The Grantee and any subrecipients must not contract with vendors who are suspended or debarred by the State of Minnesota or the federal government: Suspended and Debarred Vendors, Minnesota Office of State Procurement.

6.3 The Grantee must maintain written standards of conduct covering conflicts of interest and governing the actions of its employees engaged in the selection, award and administration of contracts.

Procurement Requirements – Grant Contract

FOR PROJECTS WITH A GUARANTEED ENERGY SAVINGS CONTRACT

6. Contracting and Bidding Requirements

6.1 For projects that include entering a Guaranteed Energy Savings contract, as defined in Minn. Stat. § 471.345, Subd. 13, or Minn. Stat. § 123B.65, Grantees must follow the law.

6.2 For projects that include construction work, prevailing wage rules apply per Minn. Stat. §§ 177.41 through 177.44. These rules require that the wages of laborers and workers should be comparable to wages paid for similar work in the community as a whole.

6.3 The Grantee and any subrecipients must not contract with vendors who are suspended or debarred by the State of Minnesota or the federal government: Suspended and Debarred Vendors, Minnesota Office of State Procurement.

6.4 The Grantee must maintain written standards of conduct covering conflicts of interest and governing the actions of its employees engaged in the selection, award and administration of contracts.

Procurement – Readiness Assessment

System Procurement Program Process: Describe the current planned procurement process and how it aligns with the school's statutory procurement requirements.

Procurement Commitment: Indicate the level of procurement commitment. Applicants will be required to submit proof of following through on this commitment in the Full Grant Application.

- ❑ No Commitment
- ❑ No RFP Commitment, But Good Faith to Receive 2+ Proposals
- ❑ Public RFP, Formal State Solar Master Contract, or GES Public Solicitation (e.g., Minn. Stat. § 123B.65 Sub.2(b)(1))

Prevailing Wage Commitment:

Procurement – Full Application

Grant Application: As part of the Full Grant Application, Applicants must identify their System ownership and financing model, detail their procurement process, and specify the procurement statute, including all applicable subdivisions that Applicant followed to sufficiently meet all legal procurement obligations.

- Applicants must also provide copies of documents as necessary for the Department to determine that the specified procurement statute and subdivision(s) requirements have been met (where feasible at the time of the application submission).

Procurement Example 1 Full Application Responses - Energy Elementary School

- identified system financing as: direct ownership – no debt
- declared they met procurement obligations under MN Stat. § 471.345 subd. 4a.
- committed to the highest level of voluntary procurement commitment in Readiness Assessment and followed through by issuing a public RFP
- uploaded a copy of the final RFP which they distributed to solicit solar proposals
- uploaded proof of public distribution of the RFP: a copy of the outgoing email including the email recipient list as well as the local newspaper posting
- the district does not need to upload a copy of the contract between the developer and the school district as part of this question – they upload that later in the application.

Procurement Example 1 Full Application Responses - Sunny Secondary School

- identified system financing as: Guaranteed Energy Savings Contract
- declared they met procurement obligations under MN Stat. § 471.345 subd. Subd. 13
- uploaded a copy of the published public notice(s) of the meeting in which the applicant proposed to award the contract
- uploaded a copy of the written guarantee from qualified provider
- committed to the highest level of voluntary procurement commitment in Readiness Assessment and followed through by issuing a GES public solicitation (e.g., Minn. Stat. § 123B.65 Sub.2(b)(1)) and uploaded proof of GES public solicitation in the form of a copy of the published notice of the proposed contract in the school board's official newspaper
- the district does not need to upload a copy of the contract between the developer and the school district as part of this question – they upload that later in the application.
- the district does not upload proof of sufficient bonds as no such bonds have been required nor obtained by time of application submission but acknowledges the statutory obligation in a subsequent application question.

COMMERCE DEPARTMENT

SOLAR FOR SCHOOLS

Questions?

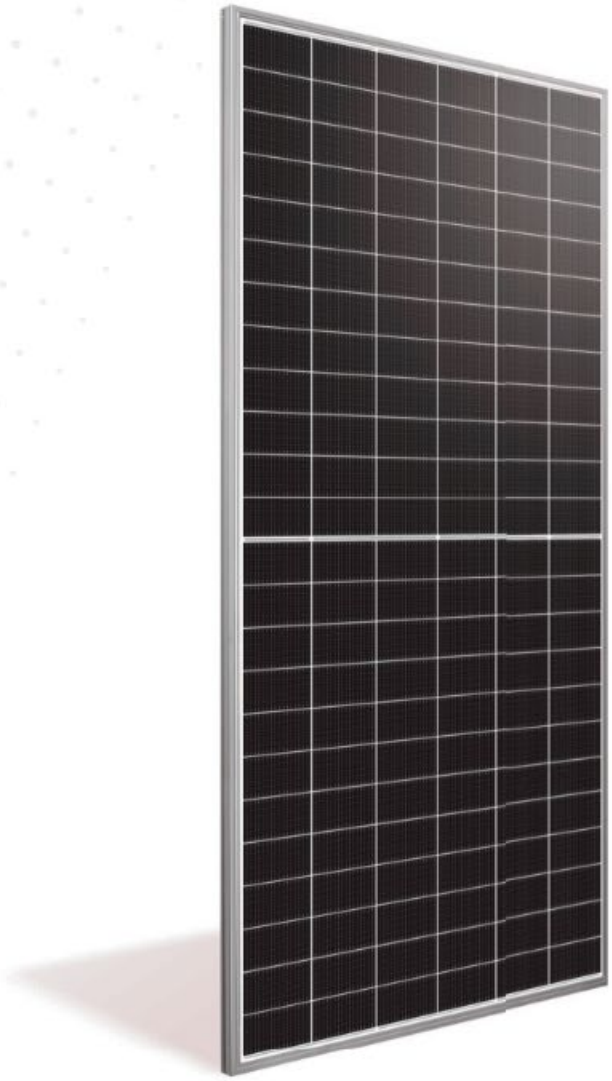
Amanda Schienebeck | Solar on Schools Program Administrator

SolarForSchools@state.mn.us | Amanda.schienebeck@state.mn.us

SILFAB COMMERCIAL NTC

SIL-580 XM+
BIFACIAL

SILFAB SOLAR®



NEXT-GENERATION N-TYPE CELL TECHNOLOGY

Manufactured exclusively in the USA.

- Improved Shade Tolerance
- Improved Low-Light Performance
- Increased Performance in High Temperatures
- Efficient Bifacial Energy Yield
- Enhanced Durability
- Reduced Degradation Rate
- 25-Year Product Warranty/ 30-Year Performance Warranty

TOP PERFORMER 2025 kiwa PV MODULE RELIABILITY SCORECARD

SILFABSOLAR.COM

ELECTRICAL SPECIFICATIONS		580		
Test Conditions		STC	BSTC	NOCT
Module Power (Pmax)	Wp	580	632.8	428.2
Maximum power voltage (Vpmax)	V	44.27	44.27	40.73
Maximum power current (Ipmax)	A	13.10	14.29	10.51
Open circuit voltage (Voc)	V	52.27	52.32	48.08
Short circuit current (Isc)	A	13.85	15.11	11.12
Module efficiency	%	22.4%		
Maximum system voltage (VDC)	V	1500		
Series fuse rating	A	30		
Power Tolerance	Wp	0 to +10		
Bifaciality Factor	%	80 ± 10		

Performance conditions: Measurement tolerance ≤ 3% • Standard Test Conditions (STC): 1000 W/m², AM 1.5, Temperature 25 °C • Nominal Operating Cell Temperature (NOCT): 800 W/m², AM 1.5 • Bifacial Standard Test Conditions (BSTC): 1000 W/m2 + φ × 135 W/m2 , φ = 80 % , AM 1.5 • Electrical characteristics may vary by ±5%.

MECHANICAL PROPERTIES / COMPONENTS	METRIC	IMPERIAL
Module weight	28.5 kg ± 0.2 kg	62.8 lbs ± 0.4 lbs
Dimensions (H x L x D)	2278 mm x 1133 mm x 35 mm	89.7 in x 44.6 in x 1.4 in
Maximum surface load (wind/snow)*	2400 Pa rear load / 5400 Pa front load	50.1 lb/ft² rear load / 112.8 lb/ft² front load
Hail impact resistance	ø 25 mm at 83 km/h	ø 1 in at 51.6 mph
Cells	144 Half cells - N-Type Silicon solar cell 182 mm x 91 mm	144 Half cells - N-Type Silicon solar cell 7.16 in x 3.58 in
Glass	3.2 mm high transmittance, tempered, anti-reflective coating	0.126 in high transmittance, tempered, anti-reflective coating
Cables and connectors (refer to installation manual)	1350 mm, ø 5.7 mm, EVO2 from Staubli	53.1 in, ø 0.22 in (12 AWG), EVO2 from Staubli
Backsheet	High durability, superior hydrolysis and UV resistance, multi-layer dielectric film, transparent PV backsheet	
Frame	Anodized Aluminum (Silver)	
Junction Box	UL 3730 Certified, IEC 62790 Certified, IP68 rated, 3 diodes	

TEMPERATURE RATINGS	
Temperature Coefficient Isc	0.04 %/°C
Temperature Coefficient Voc	-0.24 %/°C
Temperature Coefficient Pmax	-0.29 %/°C
NOCT (± 2°C)	45 °C
Operating temperature	-40/+85 °C

WARRANTIES	
Module product workmanship warranty	25 years**
Linear power performance guarantee	30 years
	≥ 98% end 1st yr ≥ 94.7% end 12th yr ≥ 90.8% end 25th yr ≥ 89.3% end 30th yr

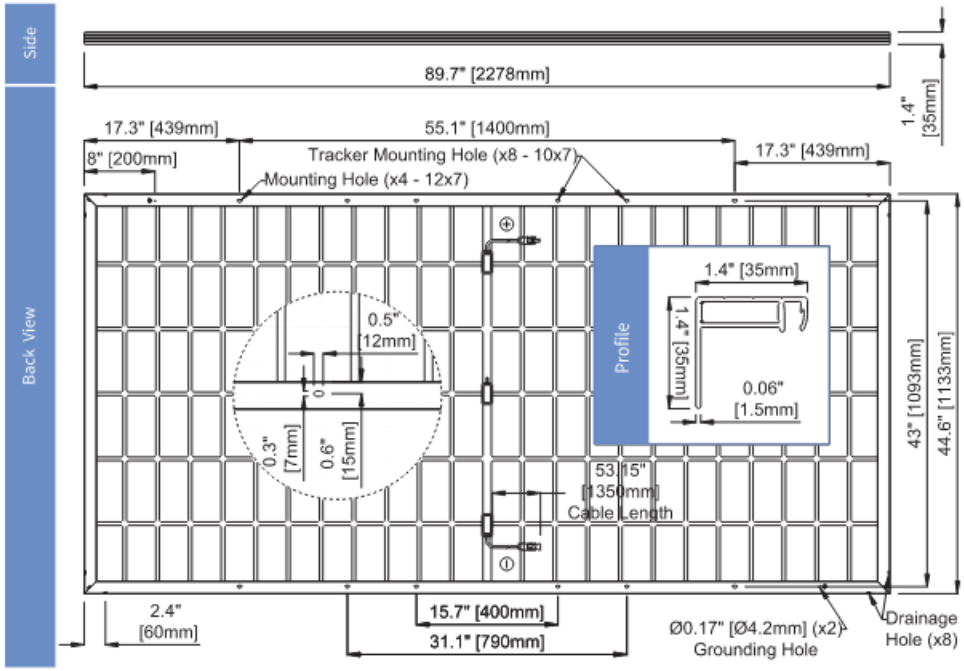
CERTIFICATIONS	
Product	UL 61215, UL 61730, CSA C22.2#61730, IEC 61215, IEC 61730, IEC 61701 (Salt Mist Corrosion), IEC 62716 (Ammonia Corrosion), CEC Listed, UL Fire Rating: Type 1
Factory	ISO9001:2015

SHIPPING SPECS	
Modules Per Pallet:	29
California (Pallets per load)	21
Others (Pallets per load)	22

* ⚠ Warning. Read the Safety and Installation Manual for mounting specifications and before handling, installing and operating modules.

** 12 year extendable to 25 years subject to registration and conditions outlined under "Warranty" at silfabsolar.com.

PAN files generated from 3rd party performance data are available for download at: silfabsolar.com/downloads.



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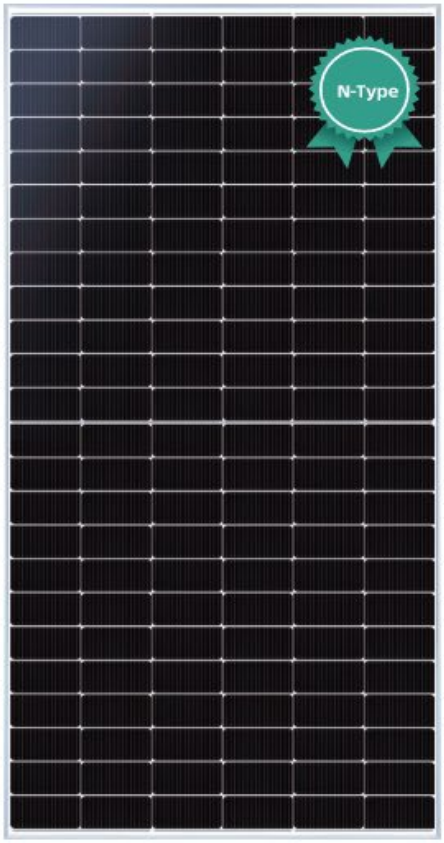
Silfab - SIL-580-XM+-BIFACIAL 20250527



PHONO

580-600w

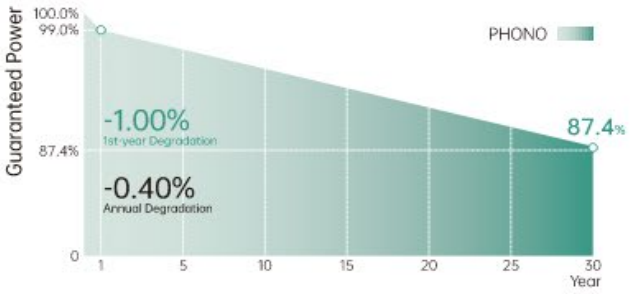
Draco Module Series

N-Type HIGH EFFICIENCY 144-16BB-W-WG

Bloomberg NEW ENERGY FINANCE Tier1 TOP PERFORMER 2025 kiwa PV MODULE RELIABILITY SCORECARD

Extraordinary Product Performance

- Up to 30% additional power yield benefited from bifacial technology and up over 80% cell bifaciality
- Competitive high-temperature performance with ameliorated temperature coefficient
- Better weak illumination response, higher power generation with N-Type technology



15-year Product Warranty

30-year Linear Performance Warranty

Higher Quality Reliability

- N-Type with lower LID and LeTID
- Industry-leading cell processing technology and dual glass contributes to excellent anti-PID characteristic
- First-year degradation is less than 1.0%, with linear degradation of 0.4% per year for 30 years

Wider Application Conditions

- BIPV, vertical installation, snowfield, high-humid area, windy and dusty area
- Safer and easier handling during transportation and installation

MANAGEMENT SYSTEM CERTIFICATES

IEC 61215, IEC 61730, UL 61730

ISO 9001
2015 / Quality management system

ISO 14001
2015 / Standards for environmental management system

ISO 45001
2018 / International standards for occupational health & safety

us.phonosolar.com / usa@phonosolar.com

Electrical Typical Values

Model	PS580M8GFH-24/TNH		PS585M8GFH-24/TNH		PS590M8GFH-24/TNH		PS595M8GFH-24/TNH		PS600M8GFH-24/TNH	
Testing Condition	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Rated Power (Pmpp)	580	444	585	448	590	452	595	456	600	459
Rated Current (Impp)	13.42	10.81	13.48	10.86	13.54	10.91	13.60	10.95	13.66	11.00
Rated Voltage (Vmpp)	43.22	41.09	43.40	41.26	43.58	41.43	43.75	41.59	43.93	41.76
Short Circuit Current (Isc)	14.11	11.36	14.18	11.42	14.25	11.48	14.32	11.53	14.39	11.59
Open Circuit Voltage (Voc)	52.20	49.98	52.44	50.21	52.68	50.44	52.92	50.67	53.05	50.80
Module Efficiency (%)	22.45		22.65		22.84		23.03		23.23	

STC (Standard Testing Conditions): Irradiance 1000W/m², AM 1.5, Cell Temperature 25°C

NOCT (Nominal Operation Cell Temperature): Irradiance 800W/m², Ambient Temperature 20°C , Spectra at AM1.5, Wind at 1m/s

BNPI

Maximum Power (Pmax)	639	644	650	655	661
Optimum Operating Current (Impp)	14.79	14.84	14.92	14.98	15.05
Optimum Operating Voltage (Vmpp)	43.22	43.40	43.58	43.75	43.93
Short Circuit Current (Isc)	15.57	15.62	15.70	15.75	15.85
Open Circuit Voltage (Voc)	52.20	52.44	52.68	52.92	53.05

BNPI:Front Side Irradiation 1000W/m², Back Side Reflection Irradiation 135W/m² , AM 1.5, Ambient Temperature 25°C

Mechanical Characteristics

Cell Type	N Type Monocrystalline
Dimension (L × W × H)	Length: 2278mm (89.69 inch) Width: 1134mm (44.65 inch) Height: 30mm (1.18 inch)
Weight	32.0kg (70.55 lbs)
Glass	2.0mm/2.0mm Heat Strengthened Glass
Frame	Anodized Aluminium Alloy
Cable (Including Connector)	12AWG(UL)/4mm² (IEC), 1350mm or Customized Length
Connector	Original Stäubli MC4
Junction Box	IP 68 Rated

Temperature Ratings

Voltage Temperature Coefficient	-0.25%/°C
Current Temperature Coefficient	+0.04%/°C
Power Temperature Coefficient	-0.29%/°C
Power Tolerance	0~+3%
NOCT	42±2°C
Bifaciality	80±5%

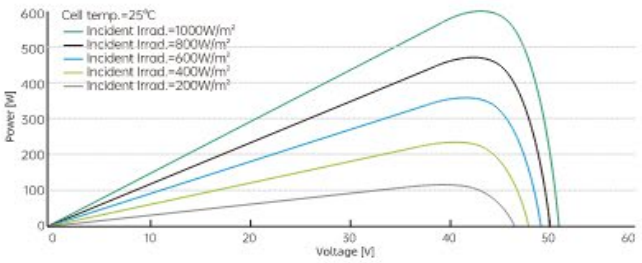
Absolute Maximum Rating

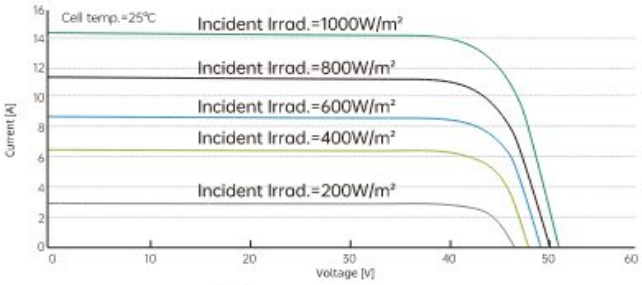
Operating Temperature	From -40 to + 85°C
Hail Diameter @ 80km/h	Up to 25mm
Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Maximum Series Fuse Rating	30A
PV Module Classification	II
Fire Rating (UL 61730)	Type29
Maximum System Voltage	DC 1500V

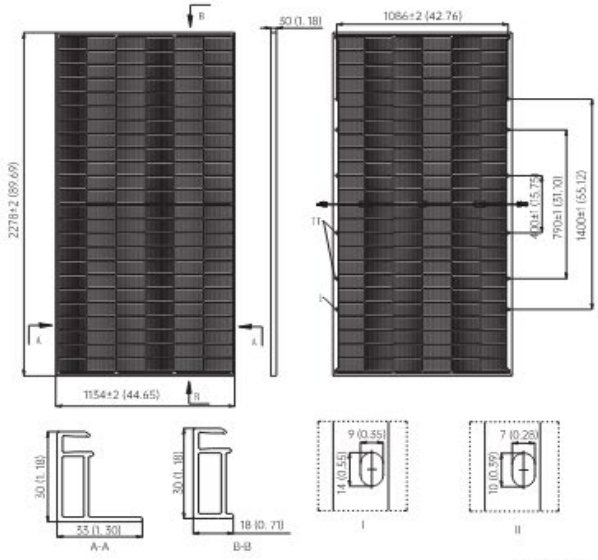
Packaging Configuration

Container	20' GP	40' HQ
Pcs/Container	180	720
Pcs/Pallet	36	36
Pallets/Container	5	20

Electrical Characteristics







Note:mm (inch)

PHONO

Three Phase Inverter with Synergy Technology

USA Domestic Content Eligible

INVERTER

For North America

SE50KUS / SE80KUS / SE100KUS / SE110KUS / SE120KUS

12-20 YEAR WARRANTY

Made in the USA from imported parts

SOLAREDGE'S USA-MANUFACTURED OFFERING FOR C&I ROOFTOPS AND CARPORTS

- Eligible for domestic content*: SolarEdge USA-manufactured inverters, when paired with certain SolarEdge USA-manufactured power optimizers, are intended to be eligible for the enhanced federal income tax credit for domestic content
- Pre-commissioning feature for automated validation of system components and wiring during the site installation process and prior to grid connection
- Easy two-person installation with lightweight, modular design (each inverter consists of two or three Synergy units and one Synergy Manager)
- Independent operation of each Synergy unit enables higher uptime and easy serviceability
- Built-in thermal sensors detect faulty wiring, ensuring enhanced protection and safety
- Built-in arc fault protection and rapid shutdown
- Built-in PID mitigation for maximized system performance
- Monitored** and field-replaceable surge protection devices, to better withstand surges caused by lightning or other events
- Built-in module-level monitoring with Ethernet or cellular communication for full system visibility

* For more details, see Eligibility for Domestic Content on the last page.

** Applicable only for DC and AC SPDs.

solaredge

/ Three Phase Inverter with Synergy Technology

USA Domestic Content Eligible for North America

SE50KUS / SE80KUS / SE100KUS / SE110KUS / SE120KUS

Applicable to inverters with part numbers	SE-DBL-USxxIBNxx	SE-TRI-USxxIBNxx				
Model Number	SE80KUS	SE50KUS	SE100KUS	SE110KUS	SE120KUS	UNITS
OUTPUT						
Total Rated AC Output Capacity	80,000	120,000				W
Rated AC Active Output Power	80,000	50,000	100,000	110,000	120,000	W
Maximum AC Apparent Output Power	80,000	50,000	100,000	120,000	120,000	VA
AC Output Line Connections	3W + PE, 4W + PE					
Supported Grids	WYE: TN-C; TN-S; TN-C-S; TT, IT; Delta: IT					
AC Output Voltage Minimum-Nominal-Maximum[1] (L-N)	244 – 277 – 305	105 – 120 – 132.5	244 – 277 – 305			Vac
AC Output Voltage Minimum-Nominal-Maximum[1] (L-L)	422.5 – 480 – 529	183 – 208 – 229	422.5 – 480 – 529			Vac
AC Frequency Minimum-Nominal-Maximum[1]	59.5 – 60 – 60.5					Hz
Maximum Continuous Output Current (per phase, PF=1)	96.5	139.5	120	144.3		Aac
GFDI Threshold	1					A
Utility Monitoring, Islanding Protection, Configurable Power Factor, Country Configurable Thresholds	Yes					
Total Harmonic Distortion	≤ 3					%
Power Factor Range	±0.85 to 1					
INPUT[2]						
Maximum DC Power (Module STC) Inverter / Synergy Unit	140,000 / 70,000	87,500 / 29,165	175,000 / 58,300	210,000 / 70,000		W
Transformer-less, Ungrounded	Yes					
Maximum Input Voltage DC+ to DC-	1000	600	1000			Vdc
Operating Voltage Range	850 – 1000	370 – 600	850 – 1000			Vdc
Maximum Input Current	2 x 48.25	3 x 46.5	3 x 40	3 x 48.25		Adc
Reverse-Polarity Protection	Yes					
Ground-Fault Isolation Detection	167kΩ sensitivity per Synergy Unit[3]					
CEC Weighted Efficiency	98.5	97	98.5			%
Nighttime Power Consumption	< 8	< 12				W
ADDITIONAL FEATURES						
Supported Communication Interfaces[4]	2 x RS485; Ethernet; Wi-Fi (optional); Cellular (optional)					
Smart Energy Management	Export Limitation					
Inverter Commissioning	With the SetApp mobile application using built-in Wi-Fi access point for local connection					
Arc Fault Protection	Built-in, user configurable (according to UL 1699B)					
Photovoltaic Rapid Shutdown System	NEC 2014 – 2023, built-in, if paired with C651U					
PID Rectifier	Nighttime, built-in					
RS485 Surge Protection (ports 1+2)	Type II, field replaceable, integrated					
AC, DC Surge Protection	Type II, field replaceable, integrated					
DC SAFETY SWITCH						
DC Disconnect	Built-in					
STANDARD COMPLIANCE						
Safety	UL 1699B; UL 1741; UL 1741 SA; UL 1741 SB; UL 1998; CSA C22.2#107.1; Canadian AFCI according to T.I.L. M-07					
Grid Connection Standards	IEEE 1547-2018, Rule 21, Rule 14 (HI)					
Emissions	FCC Part 15 Class A					

(1) For other regional settings please contact SolarEdge support.
(2) For compatibility of inverters and power optimizers, see this technical note.
(3) Where permitted by local regulations.
(4) For specifications of the optional communication options, visit the Communication product page or the Knowledge Center to download the relevant product datasheet.

Three Phase Inverter with Synergy Technology

USA Domestic Content Eligible for North America

SE50KUS / SE80KUS / SE100KUS / SE110KUS / SE120KUS

Applicable to inverters with part numbers		SE-DBL-USxxIBNxx	SE-TRI-USxxIBNxx				
Model Number		SE80KUS	SE50KUS	SE100KUS	SE110KUS	SE120KUS	UNITS
INSTALLATION SPECIFICATIONS							
Number of Synergy Units per Inverter		2	3				
AC Maximum Conduit Size		2 ½"					in
AC Maximum Conductor Size Line / PE		4/0 AWG / 1/0 AWG					
DC Maximum Conduit Size		1 x 3"; 2 x 2"					in
Inverter Unit / Synergy Manager	Multi-input (fuse-less)[5] (SE-xxx-USxxIxxSx)	6 / 3 pairs; 6 – 12 AWG	9 / 3 pairs; 6 – 12 AWG				
	Combined input (fuse-less) (SE-xxx-USxxIxxWx)	N/A	3 pairs / 1 pair, 2 – 4 AWG; copper or aluminum				
Dimensions (H x W x D)		Synergy Unit: 22 x 12.9 x 10.75 / 558 x 328 x 273 Synergy Manager: 14.17 x 22.4 x 11.6 / 360 x 560 x 295					in / mm
Weight		Synergy Unit: 70.4 / 32 Synergy Manager: 39.6 / 18					lb / kg
Operating Temperature Range		-40 to +140 / -40 to +60[6]					°F / °C
Cooling		Fan (user replaceable)					
Noise		< 67					dBA
Protection Rating		NEMA 3R					
Mounting		Brackets provided					

(5) Fusing is not included with the multi-input version of the Synergy Manager.
(6) For power derating information, see the Temperature Derating technical note for North America.

*Eligibility for Domestic Content

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USESUK-USR0INNN**8**, when paired with C651U	Printed Circuit Board Assemblies, Enclosure (17.6%)	Printed Circuit Board Assemblies (DC-DC) and (AC-AC), Enclosure, Production (24.8%)

SolarEdge is a global leader in smart energy technology. By leveraging world-class engineering capabilities and with a relentless focus on innovation, SolarEdge creates smart energy solutions that power our lives and drive future progress.

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Continuing to advance smart energy, SolarEdge addresses a broad range of energy market segments through its PV, storage, EV charging, UPS, and grid services solutions.

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CE

solaredge

Three Phase Inverter with Synergy Technology

USA Domestic Content Eligible

For North America

SE50KUS / SE80KUS / SE100KUS / SE110KUS / SE120KUS

INVERTER

12-20 YEAR WARRANTY

Made in the USA from imported parts

SOLAREDGE'S USA-MANUFACTURED OFFERING FOR C&I ROOFTOPS AND CARPORTS

- Eligible for domestic content*: SolarEdge USA-manufactured inverters, when paired with certain SolarEdge USA-manufactured power optimizers, are intended to be eligible for the enhanced federal income tax credit for domestic content
- Pre-commissioning feature for automated validation of system components and wiring during the site installation process and prior to grid connection
- Easy two-person installation with lightweight, modular design (each inverter consists of two or three Synergy units and one Synergy Manager)
- Independent operation of each Synergy unit enables higher uptime and easy serviceability
- Built-in thermal sensors detect faulty wiring, ensuring enhanced protection and safety
- Built-in arc fault protection and rapid shutdown
- Built-in PID mitigation for maximized system performance
- Monitored** and field-replaceable surge protection devices, to better withstand surges caused by lightning or other events
- Built-in module-level monitoring with Ethernet or cellular communication for full system visibility

* For more details, see Eligibility for Domestic Content on the last page.

** Applicable only for DC and AC SPDs.

solaredge

/ Three Phase Inverter with Synergy Technology

USA Domestic Content Eligible for North America

SE50KUS / SE80KUS / SE100KUS / SE110KUS / SE120KUS

Applicable to inverters with part numbers	SE-DBL-USxxIBNxx	SE-TRI-USxxIBNxx				
Model Number	SE80KUS	SE50KUS	SE100KUS	SE110KUS	SE120KUS	UNITS
OUTPUT						
Total Rated AC Output Capacity	80,000	120,000				W
Rated AC Active Output Power	80,000	50,000	100,000	110,000	120,000	W
Maximum AC Apparent Output Power	80,000	50,000	100,000	120,000	120,000	VA
AC Output Line Connections	3W + PE, 4W + PE					
Supported Grids	WYE: TN-C; TN-S; TN-C-S; TT, IT; Delta: IT					
AC Output Voltage Minimum-Nominal-Maximum[1] (L-N)	244 – 277 – 305	105 – 120 – 132.5	244 – 277 – 305			Vac
AC Output Voltage Minimum-Nominal-Maximum[1] (L-L)	422.5 – 480 – 529	183 – 208 – 229	422.5 – 480 – 529			Vac
AC Frequency Minimum-Nominal-Maximum[1]	59.5 – 60 – 60.5					Hz
Maximum Continuous Output Current (per phase, PF=1)	96.5	139.5	120	144.3		Aac
GFDI Threshold	1					A
Utility Monitoring, Islanding Protection, Configurable Power Factor, Country Configurable Thresholds	Yes					
Total Harmonic Distortion	≤ 3					%
Power Factor Range	±0.85 to 1					
INPUT[2]						
Maximum DC Power (Module STC) Inverter / Synergy Unit	140,000 / 70,000	87,500 / 29,165	175,000 / 58,300	210,000 / 70,000		W
Transformer-less, Ungrounded	Yes					
Maximum Input Voltage DC+ to DC-	1000	600	1000			Vdc
Operating Voltage Range	850 – 1000	370 – 600	850 – 1000			Vdc
Maximum Input Current	2 x 48.25	3 x 46.5	3 x 40	3 x 48.25		Adc
Reverse-Polarity Protection	Yes					
Ground-Fault Isolation Detection	167kΩ sensitivity per Synergy Unit[3]					
CEC Weighted Efficiency	98.5	97	98.5			%
Nighttime Power Consumption	< 8	< 12				W
ADDITIONAL FEATURES						
Supported Communication Interfaces[4]	2 x RS485; Ethernet; Wi-Fi (optional); Cellular (optional)					
Smart Energy Management	Export Limitation					
Inverter Commissioning	With the SetApp mobile application using built-in Wi-Fi access point for local connection					
Arc Fault Protection	Built-in, user configurable (according to UL 1699B)					
Photovoltaic Rapid Shutdown System	NEC 2014 – 2023, built-in, if paired with C651U					
PID Rectifier	Nighttime, built-in					
RS485 Surge Protection (ports 1+2)	Type II, field replaceable, integrated					
AC, DC Surge Protection	Type II, field replaceable, integrated					
DC SAFETY SWITCH						
DC Disconnect	Built-in					
STANDARD COMPLIANCE						
Safety	UL 1699B; UL 1741; UL 1741 SA; UL 1741 SB; UL 1998; CSA C22.2#107.1; Canadian AFCI according to T.I.L. M-07					
Grid Connection Standards	IEEE 1547-2018, Rule 21, Rule 14 (HI)					
Emissions	FCC Part 15 Class A					

(1) For other regional settings please contact SolarEdge support.
(2) For compatibility of inverters and power optimizers, see this technical note.
(3) Where permitted by local regulations.
(4) For specifications of the optional communication options, visit the Communication product page or the Knowledge Center to download the relevant product datasheet.

Three Phase Inverter with Synergy Technology

USA Domestic Content Eligible for North America

SE50KUS / SE80KUS / SE100KUS / SE110KUS / SE120KUS

Applicable to inverters with part numbers		SE-DBL-USxxIBNxx	SE-TRI-USxxIBNxx				
Model Number		SE80KUS	SE50KUS	SE100KUS	SE110KUS	SE120KUS	UNITS
INSTALLATION SPECIFICATIONS							
Number of Synergy Units per Inverter		2	3				
AC Maximum Conduit Size		2 ½"					in
AC Maximum Conductor Size Line / PE		4/0 AWG / 1/0 AWG					
DC Maximum Conduit Size		1 x 3"; 2 x 2"					in
Inverter Unit / Synergy Manager	Multi-input (fuse-less)[5] (SE-xxx-USxxIxxSx)	6 / 3 pairs; 6 – 12 AWG	9 / 3 pairs; 6 – 12 AWG				
	Combined input (fuse-less) (SE-xxx-USxxIxxWx)	N/A	3 pairs / 1 pair, 2 – 4 AWG; copper or aluminum				
Dimensions (H x W x D)		Synergy Unit: 22 x 12.9 x 10.75 / 558 x 328 x 273 Synergy Manager: 14.17 x 22.4 x 11.6 / 360 x 560 x 295					in / mm
Weight		Synergy Unit: 70.4 / 32 Synergy Manager: 39.6 / 18					lb / kg
Operating Temperature Range		-40 to +140 / -40 to +60[6]					°F / °C
Cooling		Fan (user replaceable)					
Noise		< 67					dBA
Protection Rating		NEMA 3R					
Mounting		Brackets provided					

(5) Fusing is not included with the multi-input version of the Synergy Manager.
(6) For power derating information, see the Temperature Derating technical note for North America.

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CE

solaredge

Commercial Power Optimizer

USA Domestic Content Eligible

C651U

POWER OPTIMIZER

Made in the USA
from imported parts

SolarEdge's USA-manufactured offering for C&I projects, for power optimization at the module level

- **Eligible for Domestic Content***
  - SolarEdge USA-manufactured power optimizers, when paired with certain SolarEdge USA-manufactured inverters, are intended to be eligible for the enhanced federal income tax credit for domestic content
- **Higher Energy Yields**
  - Generates maximum power from each PV module
  - High efficiency (99.5%)
  - Supports high power and bifacial PV modules, including G12 modules
- **Enhanced Monitoring and Visibility**
  - Maximum system visibility up to the individual module level
  - Pinpointed fault detection and remote troubleshooting
- **Maximum Protection with Built-in Safety**
  - Designed to automatically reduce high DC voltage to touch-safe levels, upon grid/inverter shutdown, with SafeDC™
  - Includes SolarEdge Sense Connect, designed to prevent arcs by monitoring Power Optimizer connectors for overheating
  - Certified to Photovoltaic Rapid Shutdown, according to NEC 2014 – 2023

* For more information, refer to the last page of this document

solaredge

/ Power Optimizer

USA Domestic Content Eligible for North America

C651U

Power Optimizer Model	C651U	
INPUT		
Rated Input DC Power[1]	650	W
Absolute Maximum Input Voltage (Voc)	80	Vdc
MPPT Operating Range	12.5 – 80	Vdc
Maximum Short Circuit Current (Isc) of Connected PV Module[2]	20	Adc
Maximum Adjusted Short Circuit Current (with Safety Factor)[3]	25	Adc
Maximum Efficiency	99.5	%
Weighted Efficiency	98.8	%
Overvoltage Category	II	
OUTPUT DURING OPERATION		
Maximum Output Power	650	Wdc
Maximum Output Current	24	Adc
Maximum Output Voltage	60	Vdc
SAFETY FEATURES		
SafeDC™	Yes	
Safety Output Voltage per Power Optimizer	0.5 ± 0.075	Vdc
Sense Connect	Yes	
Photovoltaic Rapid Shutdown System	Yes, NEC 2014 – 2023	
STANDARD COMPLIANCE		
EMC	FCC Part 15; IEC 61000-6-2; IEC 61000-6-3	
Safety	IEC62109-1 (class II safety); UL 1741; UL 3741; CSA C22.2#107.1	
Material	UL94 V-0, UV Resistant	
RoHS	Yes	
Fire Safety	VDE-AR-E 2100-712:2013-05	
INSTALLATION SPECIFICATIONS		
Compatible SolarEdge Inverters[4]	Commercial Three Phase Inverters with one of the following part number structures: xSE-SIN-USxxIxxxx SE-DBL-USxxIxxxx SE-TRI-USxxIxxxx	
Maximum Allowed System Voltage	1000	Vdc
Dimensions (W x L x H)	128 x 155 x 52 / 5.03 x 6.10 x 2.05	mm / in
Weight	1080 / 2.38	gr / lb
Input Connector	MC4[5]	
Input Wire Length	(+) 1.4, (-) 1.4 / (+) 4.59, (-) 4.59[6]	m / ft
Output Connector	MC4	
Output Wire Length	(+) 3.0 (-) 0.10 / (+) 9.84, (-) 0.32	m / ft
Operating Temperature Range[7]	-40 to +85 / -40 to +185	°C / °F
Protection Rating	IP68 / NEMA6P	
Relative Humidity	0 – 100	%

(1) Modules with a front side maximum power of up to 715W at STC are allowed. Up to +5% power tolerance is allowed.
(2) When using bifacial modules, consider only the front side Isc at STC (0% back side gain). For details, see here.
(3) Adjusted for ambient temperature, irradiance, bifacial gain, safety factor, and so on, in accordance with NEC and CSA.
(4) For detailed inverter compatibility information, see here.
(5) For other connector types please contact SolarEdge.
(6) The Sense Connect feature is only enabled on the output wire connectors. For details, see here.
(7) For ambient temperatures above +65°C / +149°F, power derating is applied. For details, see here.

RoHS Intertek

/ Power Optimizer

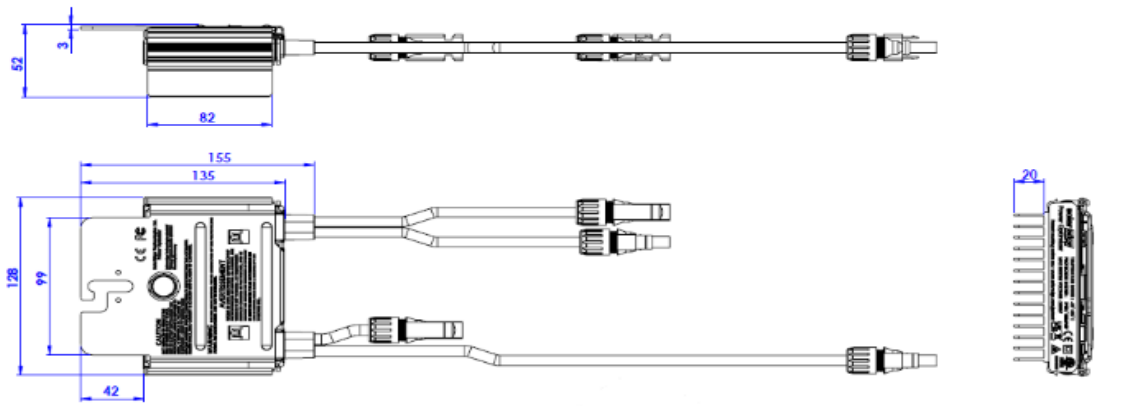
USA Domestic Content Eligible for North America

C651U

PV System Design Using a SolarEdge Inverter[8]		208V Grid SE10K	208V Grid SE17.3K*	277/480V Grid SE30K, SE33.3K*	277/480V Grid SE40K*	
Compatible Power Optimizers		C651U				
Minimum String Length	Power Optimizers	13	13	18	18	
	PV Modules	13	13	18	18	
Maximum String Length	Power Optimizers	57	57	57	57	
	PV Modules	57	57	57	57	
Maximum Continuous Power per String		10,000	9600	20,400	20,400	W
Maximum Allowed Connected Power per String[9]		1 string or more – 15,000	1 string – 11,400 2 strings or more – 15,600	1 string – 22,650 2 strings or more – 30,400	1 string – 22,650 2 strings or more – 30,400	W
Parallel Strings of Different Lengths or Orientations		Yes				
Maximum Difference in Number of Power Optimizers Allowed Between the Shortest and Longest String Connected to the Same Inverter Unit		5 Power Optimizers				

*The same rules apply for Synergy units of equivalent power ratings, that are part of the modular Synergy Technology inverter.
(8) C651U cannot be mixed with any other Power Optimizer models in the same string.
(9) To connect more STC power per string, design your project using SolarEdge Designer

C651U Mechanical Drawing



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RoHS Intertek

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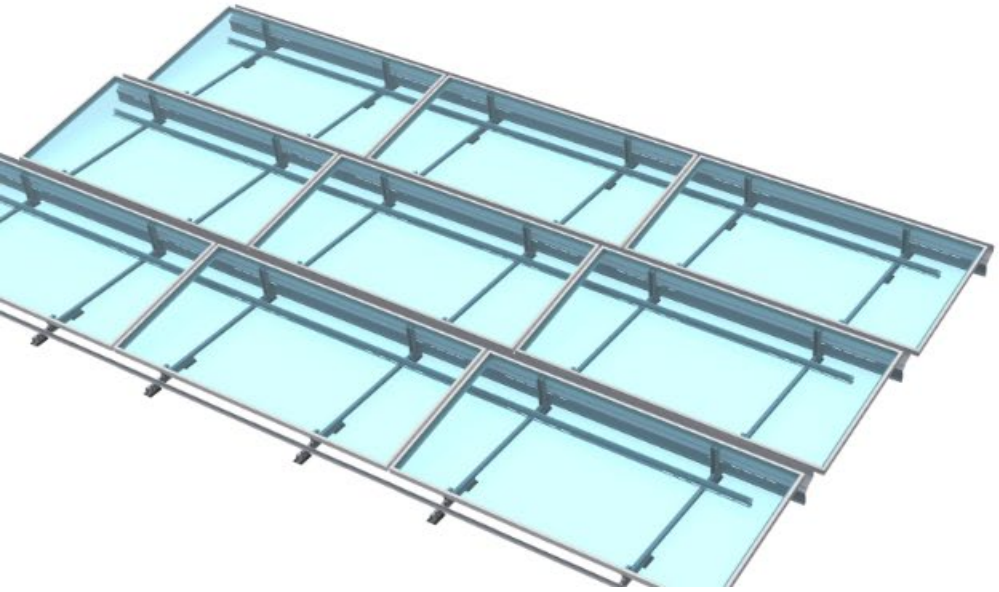
AN ENSTALL COMPANY

clawFR plus™

10 DEGREE

FLAT ROOF RACKING SPECIALISTS

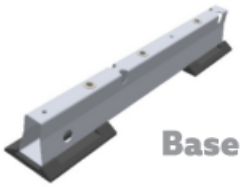
PanelClaw is the only major racking provider in North America focused exclusively on flat roofs. This specialization provides a competitive advantage for our partners. No one knows more about flat roof racking than PanelClaw; no one delivers a more thoroughly tested and reliable platform; and no one matches our level of service. Our mission is to accelerate the deployment of flat roof PV by continually lowering its life-cycle cost while maintaining the highest levels of reliability. The clawFRplus platform is the result of a 15+ year commitment to flat roof.



ENGINEERED FOR SPEED

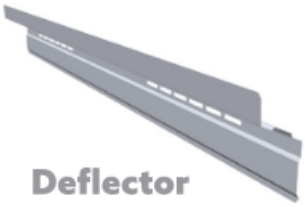
- Single M6 bolt hardware kit
- No-tool module attachment
- 11″ plus access ways between modules
- 90 degree single-module tilt-up
- Flexible order of operations installation process allows for optimized coordination of building trades on the roof
- Integrated roof protection pads
- One ground lug required per array

SYSTEM COMPONENTS



Base

Rail



Deflector

Module Connector

Cam Bracket w/ Cam Claw

M6 Bolt

UNIVERSAL TOOL-LESS MODULE CONNECTIONS

clawFRplus improves on the industry leading **clawFR** platform. Upgraded high and low side module connections increase system performance and eliminate module adaptor accessories while maintaining **clawFR**'s easy to install architecture.

SAFETY & RELIABILITY

clawFRplusTM has undergone a comprehensive suite of reliability and performance tests that exceed US code requirements. Our wind tunnel test program and in-house Intertek® certified satellite test laboratory, supported by third-party peer reviews, collectively form the most comprehensive and robust testing framework in the industry.

PRODUCT DETAILS

APPLICATIONS
< 5° slope flat roofs (up to 7° possible w/engineering review)

ROOF TYPE COMPATIBILITY
Membrane, tar and gravel, ballasted, BUR, concrete, asphalt (not compatible with metal roofs)

3 ROW SPACING OPTIONS
11" | 14" | 17"

PLATFORM LOAD
~ 2.0 - ~ 12.0 psf

MODULE ORIENTATION
Landscape

MODULE ATTACHMENT
Airy point flange mounted

BASIC WIND SPEED
Up to 190 mph ASCE 7-16 (>190 mph by approval)

WIND EXPOSURE CATEGORY
B and C (D with review)

USGS SEISMIC CATEGORIES
A, B, C, D (others require engineering review)

WARRANTY AND CERTIFICATIONS
25 year warranty
ANSI/UL 2703-2015 Listed System Fire Rating
Class A with Module Types 1, 2, 16, 19, 22, 25, 29, 30 and 38

clawFRplus™
10 DEGREE

O&M FEATURES

- Optimizers mount on the Module Connector Tilt Arm, under the module and near the gap between two modules
- ZAM® coating with 3x better corrosion resistance than G90
- Mechanical roof attachments, when needed, are placed in the module row gaps for easy O&M inspection

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v1.0

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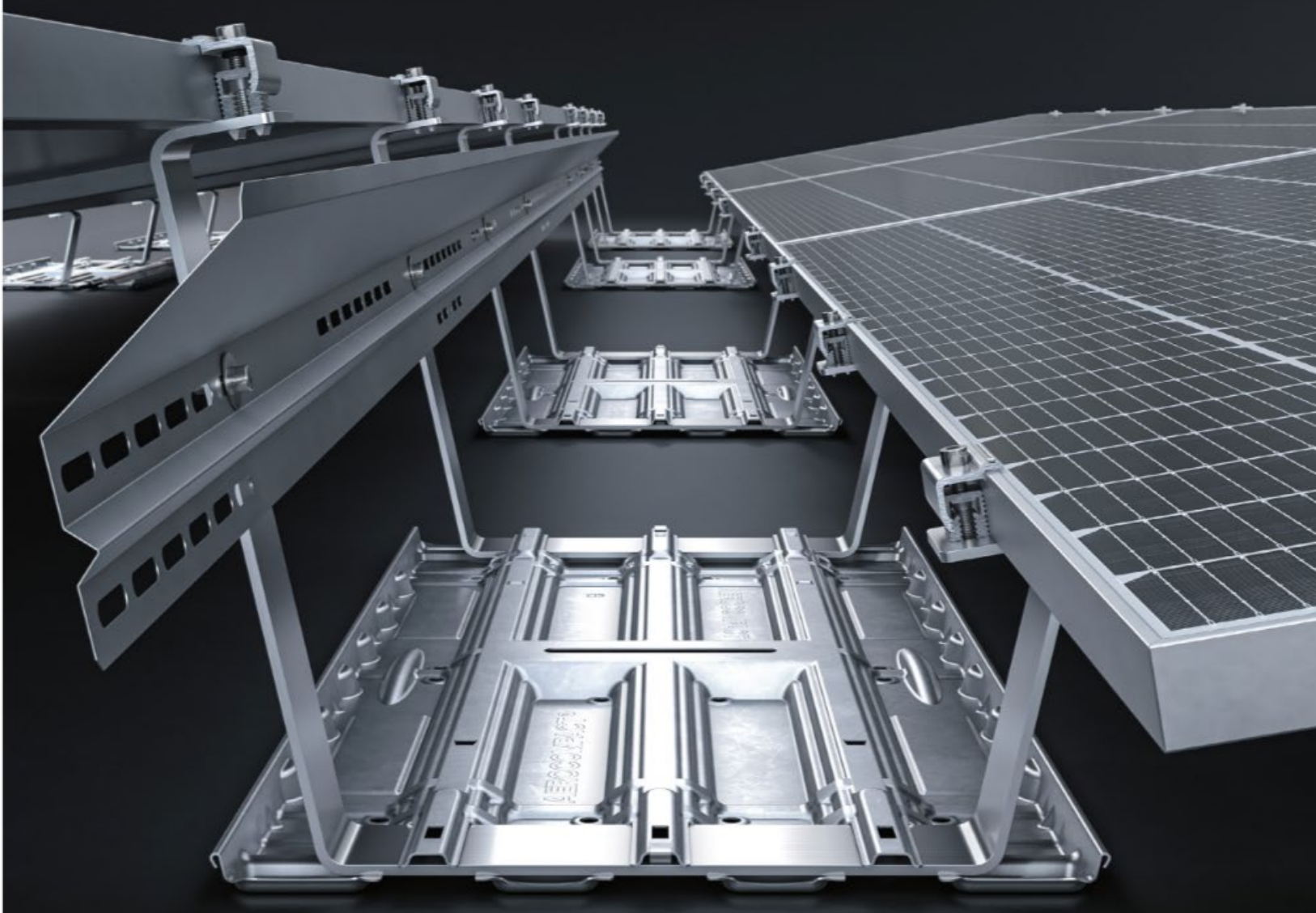
AEROCOMPACT®



S_BASE

COMPACT**FLAT**

THE R_EVOLUTIONARY QUICK-CLICK MOUNTING SYSTEM
FOR YOUR FLAT ROOF SOLAR PROJECT.

AEROCOMPACT®

TECHNICAL DATA

DESCRIPTION	Fast assembly flat roof click together system with fewer components and super strength to support your PV system in high wind and snow environments. Compact nested plates are lightweight to save on storage, labor, and transportation costs. Integrated ballast platform with wind deflectors reduce point loading and ballast quantity.
AREA OF APPLICATION	Membrane, bitumen, gravel, concrete. Slip sheets may be required by roof system manufacturer or AHJ on a project basis.
MODULE DIMENSIONS	37 - 51 in x 61 - 98 in 940 - 1.300 mm x 1.550 - 2.500 mm
MODULE TILT	South-Facing 5° and 10°
CLAMP POSITION	Clamping position 370 mm from module edge. Clamping position 14.6 in from module edge.
SYSTEM HEIGHT FROM ROOF	6.7 in 170 mm
ROOF SETBACK	Determined by local fire code and/or AHJ.
MAX. BUILDING HEIGHT	328 ft (adaptation to higher buildings on request) 100 m (adaptation to higher buildings on request)
MAX. ROOF SLOPE	Fully ballasted up to 5°, if more than 5° anchors are required.
MAX. ARRAY SIZE	No system limitation
MAX. WIND LOAD	Up to 35 psf * Up to 1,7 kN/m² *
MAX. SNOW LOAD	Up to 73 psf * Up to 3,5 kN/m² *
CODE STANDARDS	Wind tunnel tested by I.F.I. (Institut für Industrieaerodynamik GmbH) to ASCE 7-10, ASCE 7-16 and ASCE 7-22 standards. UL 2703 compliant.
BUILDING REQUIREMENTS	Structural feasibility provided by others to ensure calculated racking design can be supported. General terms and warranty conditions apply based on the information provided to AEROCOMPACT. Including PV modules selected by others.
COMPONENTS	Module clamps with grounding pins, universal base plate, front foot, back foot, connectors, wind deflectors, ballast blocks (provided by the customer); optional: roof anchor, earthing and lightning protection clamp, optimizer mount.
MATERIALS	Load-bearing connecting parts and module clamps made from aluminum, screws made from A2–70 stainless steel, wind deflectors made from steel with protective coating against corrosion, building protection mat made from EPDM.

* The loads (design loads) include an industry-standard 1.5-fold safety factor.

PB_COMPACFLAT S_BASE_US_V1_09-2024

INTELLIGENT SOLAR RACKING

AEROCOMPACT.COM

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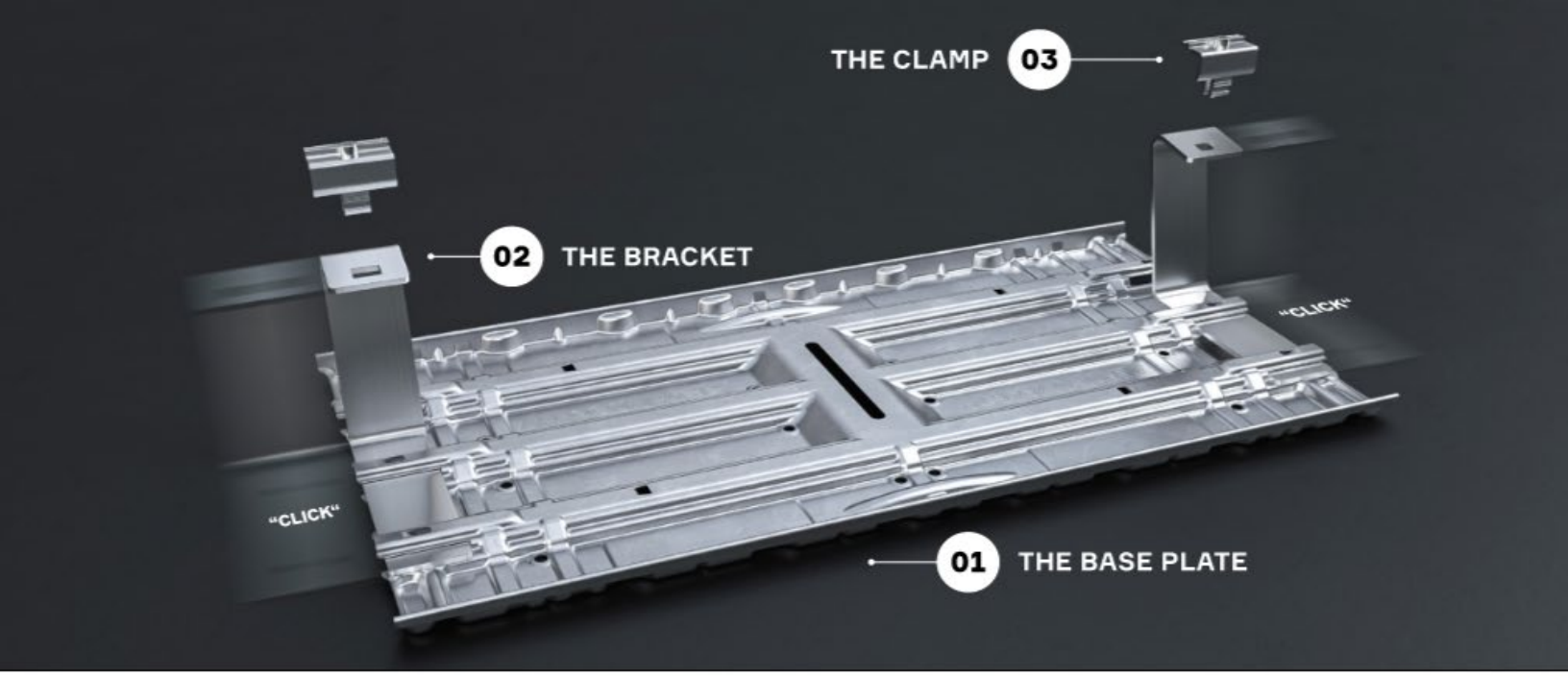
Matthews, NC 28105, USA
+1 800 578 0474
office.us@aerocompact.com



SIMPLE AND EASY. IT'S ALL ABOUT THE BASE, JUST CLICK IT IN PLACE!

SUPER FAST ASSEMBLY – NO PLASTIC PARTS!

01 THE BASE PLATE

The newly developed, patent pending base plate deliveres in easy to transport nested stacks that are light and strong to hold ample ballast or support anchored connection points.

02 THE BRACKET

Click it in place with S_BASE. The 100% aluminum brackets boast superior corrosion resistance, durability and thermal expansion flexibility.

03 THE CLAMP

Click in and tighten down to your PV module frame using one tool for the entire S_BASE structure.

ADDITIONAL Bonding clip

Scan the QR-code for detailed technical data and the complete list of accessories.

ADDITIONAL Cable management

THE S_BASE FEATURES

+ LOW POINT LOADS DUE TO WIDE FOOTPRINT
+ SIMPLE ASSEMBLY AND INTEGRATED BONDING
+ NATURALLY FLEXIBLE FOR THERMAL EXPANSION/CONTRACTION
+ SINGLE OR DOUBLE BASE PLATE ANCHORING
+ STABLE LONG SIDE PV CLAMPING
+ REDUCED BALLAST LOAD/DEMAND WITH WIND DEFLECTORS