



Creating clean energy communities

September 24, 2018

Public Utility Commission of Oregon
Attn: Filing Center
201 High Street, S.E.
PO Box 1088
Salem, OR 97308-1088

Re: UM 1020 – PGE 2018 Renewable Development Fund (Over \$400,000 and For-Profit Awardees)

On behalf Portland General Electric Company (PGE), Spark Northwest submits the 2018 Renewable Development Fund (RDF) awardees who have been selected for RDF grants, each grant being more than \$400,000 and/or directed to for-profit companies. Spark Northwest is submitting this pursuant to Public Utility Commission of Oregon (Commission) Order Numbers 16-156¹ and 17-455, both filed in Docket Number UM 1020 (Guidelines for Renewable Grants). PGE has already submitted to Staff, via email, awardees of projects with funding less than \$400,000 for Staff review.

PGE has engaged Spark Northwest to evaluate and recommend renewable energy projects for funding from the RDRDF.

Enclosed is the following:

- Attachment A – Summary of Beaverton Public Safety Project;
- Attachment B – Beaverton Public Safety Application documents;
- Attachment C – Summary of DPI Specialty Foods Project; and
- Attachment D – DPI Specialty Foods Application documents.

To satisfy the requirements of Commission Order No. 17-455, PGE provides support for awarding funding to the for-profit entity's projects:

DPI Specialty Foods

For the 2018 RDF application round, PGE received a project from DPI Specialty Foods. This for-profit company has several distribution facilities throughout Oregon and a fleet of refrigerated vehicles that ship perishable goods to stores and other food storage sites. In the last few years, DPI has made concerted efforts to cap their electricity usage and limit their emissions. These conservation initiatives have been successful, resulting in a 31% reduction in usage over two years at their Tualatin warehouse. Further, they have committed to replacing half of their commercial trailers, currently powered by diesel, to electric vehicles at their own cost to deepen their commitment to be a leader in sustainability. The RDF award would go towards partially funding a 1.43 MW solar array on their distribution facility,

¹ See Appendix A, pages 12-13, which provides the revised renewable fund review process.





Spark Northwest

Creating clean energy communities

representing a leap for the company. This array would reduce their consumption by an additional 47%, including the expected additional load of the new electric trucks charging at the loading docks.

From a community and education standpoint, DPI is using this as an opportunity to deepen connections and facilitate learning. Some of the project costs will be used to train and educate non-profit trades group from the local area. This includes, but is not limited to, Constructing Hope, Portland Youth Builders, and Oregon Tradeswomen. The hope is that these organizations will have a chance to gain hands-on knowledge of the solar installation process as well as the basics of electric vehicles. DPI Specialty Foods is also partnering with Forth, Columbia Willamette Clean Cities Coalition, Oregon Environmental Council, and Neighbors for Clean Air to demonstrate their electrified transportation fleet with field trips, presentations, tours and other hands-on learning opportunities.

Should you have any questions or comments regarding this filing, please contact Kalia Savage, PGE's Rates and Regulatory Affairs department, at (503) 464-7432. Please direct all formal correspondence and requests to the following email address pge.opuc.filings@pgn.com

Sincerely,

Jill Eikenhorst
Project Manager
Spark Northwest
206-457-5403

Enclosure

1402 3rd Ave, Suite 901
Seattle, WA 98101

sparknorthwest.org



2018 RDF All Recommended Projects >\$400K OR For-Profits									
Organization Name	Project Name	Organization Type	Non-profit or MUSH (y/n)	Location	Technology	Installation Size (DC kW)	Project Cost	Proposed RDF Award	Estimated Date of Completion
DPI Speciality Foods	DPI Speciality Foods Solar Installation	For-profit	N	Tualatin, OR	Solar PV	1,432.1	\$2,164,980.00	\$346,500.00	Mar-19
City of Beaverton	Beaverton Public Safety Center Solar	Non-profit Municipality	Y	Beaverton, OR	Solar PV	302.0	\$1,074,589.00	\$509,589.00	Feb-20
TOTAL						1,734.1	\$3,239,569.00	\$856,089.00	

RDF Balance 2018	
2018 Beginning Balance	\$4,850,000.00
<\$400K Projects Recommended	\$1,553,433.00
>\$400K OR For-Profit Projects Recomme	\$856,089.00
Remaining RDF Balance	\$2,440,478.00

2018 Projects Recommended	
25 Projects Applied	
5 Deemed Ineligible	
15 Applicants <\$400K	
5 Applicants >\$400K	
1 Updated Budget	
14 Total Projects Recommended	

Beaverton Public Safety Center

Beaverton, OR

Project Summary			
Project Size	302 kW	Estimated Annual Generation	331,800 kWh
Technology	Solar PV	Estimated Generation as % of Site Electricity Use	40%
Capacity Factor	13%	Anticipated On-Line Date	Jan-20
Project Cost Summary			
Total Project Cost	\$1,074,589	RDF Funding Request	\$564,589
Total Project Cost Per Watt	\$3.56/W	Request as a % of Total Project Cost	53%

OVERVIEW SUMMARY STATEMENT

The City of Beaverton provides essential services to about 98,000 residents. It is Oregon's sixth largest city and has a diverse population with 35% identifying as minorities and over 15% living at or below the poverty line. The city intends to construct a new Public Safety Center that will house the Beaverton Police Department and the Emergency Management Program. The proposed solar array will supply renewable electricity to the building and will supplement the back-up diesel generator during power outages. The facility is designed to be battery-ready and the City hopes to participate in PGE's Microgrid Pilot Project and to pursue Path to Net Zero designation from Energy Trust of Oregon.

Location: The solar project will be installed on three distinct roof areas: the flat roof of the main 3-story building, the flat roof of the 1-story portion of the building, and on two parking canopies. The rooftop arrays will not be visible from the street; the parking canopy solar arrays will be visible.

Equipment: The components of the proposed 267 kW solar PV system have not yet been specified but will likely include SilFab solar modules, SolarEdge inverters with optimizers, and IronRidge racking equipment.

Status: Design of the new building is nearly complete and construction is scheduled to begin in September 2018. Construction is scheduled to be complete by March 2020 with the solar installed by January 2020.

Key Strengths:

- Demonstrated commitment to energy efficiency and sustainability with Net Zero and microgrid goals and prior experience with solar PV at other properties.
- The facility provides essential community services including disaster relief services.
- The building is being designed for the proposed project.

Key Weaknesses:

- The applicant is not contributing matching funds beyond the amount required by the State (1.5% of the total building construction budget).
 - A contractor has not yet been selected and the system details have not been finalized.
 - Building construction has not yet begun.
-

PROJECT FEASIBILITY & READINESS

- **Project Team.** The applicant's project team is adequately qualified. The City has prior experience with solar PV on their library and several other facilities. A contractor has not yet been selected, but Imagine Energy has been providing initial design information for planning purposes. Through an RFP, the applicant will consider bids from several contractors including Imagine Energy.
 - **Project Site.** The building structure and electrical system is being designed to accommodate the proposed solar PV project, and the proposed solar array will cover nearly the entire available roof space. Long-span steel girders will be installed above the roof deck to reduce the number of penetrations and to maintain the original roof warranty. There are minimal trees or other obstructions that would cause shade.
 - **Energy Estimate.** Energy production has been estimated using Helioscope software with standard energy loss assumptions. The system has been designed to minimize the impact of shade from HVAC equipment and adjacent rows of solar modules. The average total solar resource fraction is 88% and the estimated net capacity factor is 14%.
 - **Timeline.** The required permit applications will be submitted upon notice of funding. Building construction will start in Fall 2018 and installation of conduit for the solar arrays will begin in March 2019. The expected online date is January 2020.
 - **O&M.** All operations, maintenance, and system performance monitoring will be the responsibility of City staff who will be trained by the solar installation contractor. Associated costs will be included in the building's annual budget. The solar equipment will be included in the building's insurance policy.
-

COMMUNITY BENEFITS & RENEWABLE DEVELOPMENT FUND EXPOSURE

- **Community Benefits.** The project will provide community benefits by reducing operating costs for the City and helping the City to meet resiliency and sustainability goals. The project provides economic benefits by hiring a local installation contractor. The applicant received a letter of support from the Mayor of Beaverton.
 - **Educational Benefits.** The applicant will install an interactive educational kiosk in the lobby of the building, make real-time data available on the City website, and will integrate data from the system into the STEM curriculum at local schools. There will be articles in local newspapers and media blasts about the project. The City's Sustainability Coordinator and Public Relations Department will be responsible for these activities.
 - **RDF Recognition.** The project will provide RDF recognition on the information kiosk, the City website, and in all media about the project. PGE could be included in a ground-breaking celebration in September 2018 and a grand opening in early 2020.
 - **Publicity.** Community members were invited to an open house for the design of the new building, and information about the proposed solar project has been included in local news articles. Feedback to date about the new facility in general has been positive.
-

PROJECT COSTS & FINANCIAL FEASIBILITY

- **Financial Structure.** The City plans to pay for and own the project, and receive associated financial benefits. The applicant is in good financial health and is able to pay for the entire upfront cost of the system until RDF reimbursement is received.
- **Renewable Energy Credits.** The City plans to retain all project RECs.
- **Funding Sources.** The City has approved use of up to \$510,000 for the proposed solar project as required by the State (1.5% of construction budget) but is only proposing to contribute \$472,500 of City funds along with \$37,500 from the Energy Trust of Oregon solar incentives (secured). The applicant is requesting 52.5% of the total project cost from RDF (\$564,589). The project applied for an ODOE RED grant (\$250,000) but was not successful.
- **Additionality.** RDF funding is not necessary for the project to proceed but partial or no funding would result in a scaled-back project. The City is required to spend 1.5% of the construction budget on green technologies, so the building will be installed with some amount of solar.
- **Project Budget.** The proposed budget was based on two bids and is on the higher end of the typical range for this size of project. The budget includes prevailing wage rates, \$55,000 for battery-ready upgrades (4000A main distribution panel), a 10% contingency, and general contractor insurance and mark-ups.

Beaverton Public Safety Center EXHIBITS

- Exhibit A - Letter of Support
- Exhibit B - Credentials
- Exhibit C - Site Evaluation
- Exhibit D - Design Drawings
- Exhibit E - Equipment Specifications
- Exhibit F - Site Photos
- Exhibit G - Site Control Agreement
- Exhibit H - Financial Statements
- Exhibit I - Secured Funding Sources
- Exhibit J - Contractor Bids
- Exhibit K - Project Development Timeline
- Exhibit L - Education Plan

Exhibit A

Letter of Support



June 15, 2018

Portland General Electric
121 SW Salmon Street
Portland, OR 97204

Dear Selection Committee,

It is with great pleasure that we submit the following proposal in pursuit of a PGE Renewable Development Fund award for the new Beaverton Public Safety Center's photovoltaic system. In 2016, Beaverton voters passed a \$35 million bond to construct a new Public Safety Center at 12500 SW Allen Boulevard. The building will house the Beaverton Police Department as well as the city's Emergency Operation Center, allowing those departments to move out of a building that is located in a flood plain and is not built to current seismic standards. The new Public Safety Center will be an essential facility designed to remain fully operational after a major earthquake or other disaster, so that emergency services can be provided to the community during a crisis.

High resiliency and environmental goals have been set for the project and a robust photovoltaic system is a key element to achieving those goals. The project is a part of the Energy Trust of Oregon's Path to Net Zero program and seeks to maximize the size of its photovoltaic system to minimize energy use.

The City of Beaverton is proposing to install a 302kW photovoltaic system at a cost of \$985,784, which is proposed to be funded as follows:

\$210,000 – City of Beaverton

\$250,000 – ODOE Renewable Energy Development (RED) Grant [pending]

\$50,000 – Energy Trust of Oregon

\$564,589 – PGE Renewable Development Fund

\$1,074,589 Total Photovoltaic System Cost

If Portland General Electric grants the \$564,589 requested for the project, the City of Beaverton is committed to funding the City's \$210,000 portion of the funding plan, as well as up to an additional \$300,000 required if the city is not successful in securing funding from the Oregon Department of Energy RED grant or the Energy Trust of Oregon.

We are excited by the opportunity to partner with PGE to incorporate a vitally important photovoltaic system into our new Public Safety Center. We thank you for your time and consideration.

Sincerely,

A handwritten signature in blue ink that reads "Denny Doyle". The signature is written in a cursive style with a large initial "D".

Denny Doyle
Mayor

Exhibit B
Credentials

Project Team Credentials

Project Team:

- City of Beaverton, Project Owner
 - Beaverton Police Department, Project Lead
 - Shiels Oblatz Johnsen, Inc., Project Manager/Owner's Representative
 - Imagine Energy, Solar Consultant
 - PAE Engineers, Electrical Engineer
 - FFA Architecture, Project Architect
 - Skanska, CM/GC
-

City of Beaverton

The City of Beaverton is a local government located in Washington County, Oregon, serving 97,590 residents. Among the City's top priorities is safety. Along with the Public Safety Center, the City is in the process of defining our Emergency Master Plan for ongoing disaster preparedness and examining opportunities to expand to a year-round severe weather shelter.

Similar Projects Completed:

- Beaverton City Library, Beaverton, OR
 - Beaverton City Library has strong civic character and has served as a key element in the development of a new urban center for the city of Beaverton. Its location in the center of the city enhances its role as both a community center and information resource center. The building includes a 150-seat auditorium, public meeting rooms, a computer room, and a large children's area.
- Partners for a Sustainable Washington County Community
 - Coalition of 13 organizations working together to support sustainability. PSWCC encourages and promotes sustainability among participating members, both within their organizations and to county residents. PSWCC is a membership-based group that includes public, private and non-profit organizations, and it is staffed by Washington County. The PSWCC Vision follows: We envision a collaborative, innovative Washington County that is well-equipped to support diverse and healthy communities, environments and economies for current and future generations.
- Sustainable Beaverton Strategy
 - The City of Beaverton used federal stimulus funds to improve energy efficiency in buildings and for weatherization loans for Beaverton homes. The City also replaced over 770 traffic signals and street lights with LED technology to further reduce energy consumption.

Beaverton Police Department

The Beaverton Police Department provides a safe city, serving citizens with compassion and respect. We are fully invested in leading our profession with integrity, building and retaining a highly trained, well equipped, progressive, motivated and cohesive team. We strive to be recognized and respected as a leading agency in the law enforcement community.

Similar Projects Completed:

- N/A
-

Shiels Oblatz Johnsen, Inc.

Shiels Oblatz Johnsen, Inc. (SOJ) is a leading project management consultancy based in the Pacific Northwest. Over the last 30 years, our offices in Portland and Seattle have successfully guided numerous public and private development projects from concept through construction. Our reputation as problem solvers for large-scale urban development projects that are challenging, controversial or involve numerous, often competing interests was earned through careful attention to the needs of our clients and the thoughtful integration of every stakeholder involved.

With a portfolio of work encompassing new construction, renovation, and historic preservation, our combined wealth of project management experience is best represented by many of the region's most high profile and award-winning projects with innovative green building features, unique public-private partnerships, a diverse mix of uses and complex funding packages. A hallmark of our practice is creating strategic partnerships on urban, sustainable, transit-oriented developments that revitalize and enhance our downtowns and our neighborhoods.

We take pride in delivering projects on time and on budget, and of the highest quality. Our process promotes collaboration, communication and accountability among all team members. We serve to represent the interests of our clients and provide well informed, practical advice that leads to smart decisions and successful completion. Our commitment to our project partners, and the communities in which we work, runs deep and defines the way we approach every project we undertake.

Similar Projects Completed:

- East County Courthouse, Gresham, OR
 - The East County Courthouse is the successful conclusion of a 25-year effort by Multnomah County to fund and build a new courthouse and fulfill a commitment to provide court services to residents of East Multnomah County. The project includes three courtrooms, administrative and court support staff space, offices for the District Attorney, Multnomah County Sheriff and a new data center for Multnomah County. This highly sustainable project met the Architecture 2030 challenge and achieved LEED Gold

Certification with features such as a green roof, photovoltaic array, and utilization of geothermal wells for process heating and cooling.

- Seattle Justice Center & Seattle City Hall, Seattle, WA
 - A challenging three-phased project involving demolition of a former municipal building, extensive collaboration among multiple stakeholders, and complex design approvals to design and construct a new justice center, city hall and open space plaza on two blocks in downtown Seattle. The Seattle Justice Center is a 14-story building that uniquely integrates Seattle's Municipal Courthouse with a Police Headquarters while clearly defining identities within the same structure. Seattle's City Hall houses offices and chambers for the Mayor, City Council, City Attorney and other City functions. The Justice Center is LEED Silver Certified and City Hall is LEED Gold Certified, the first City Hall in the U.S. to achieve such status.
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Imagine Energy

Imagine Energy was founded in 2003 "to change the way people think about and use energy." Our goal is to bring bleeding-edge technologies to the forefront and apply engineering rigor to every size project. At Imagine Energy, we have a track record of being at the forefront of solar photovoltaic policy development. We helped pioneer S-5! permitting in Portland in 2007, wrote the fire-safety provisions in the 2008 Oregon Specialty Solar Code, and now are pushing for uniform engineering standards for ballasted solar arrays. We have deep relationships with local officials and the engineering rigor to help install your system faster.

Similar Projects Completed:

- McKay Farms, St. Paul, OR
 - The McKay family came over on the Oregon Trail, and is a big part of the agricultural industry in the Willamette Valley. Investing in the future, Mr. McKay purchased in a 350kW solar array to ensure his energy costs stay low for the next generation.
- Dealers Supply Company, Portland, OR
 - A fourth generation family-owned business, Dealer's Supply is *the* place you go for roofing supplies in Portland. To protect their brand new roof on the warehouse, we used an innovative ballasted roof system that has minimal roof penetrations, breaking new ground with City of Portland permitting.
- EcoFlats Net-Zero Building, Portland, OR
 - Building an energy-efficient building is great, but how do you ensure the tenants conserve power over time? We designed and installed this custom feedback system, to show each tenant how much of their weekly "energy budget" they have consumed. The whole building's progress towards a net-zero goal is also tracked, with more water, gas, and power usage tracking behind the scenes.

PAE Engineers

PAE has been a leader in sustainable engineering design for nearly 50 years. Along the way, we've gotten pretty good at identifying the trends in sustainability, project delivery, and building-performance analysis that are driving our industry forward—and helping to restore the planet.

PAE provides mechanical, plumbing, electrical, and technology consulting and engineering-design services for projects ranging from greenfield buildings to retrofits to historic renovations. We also offer related services such as commissioning, comfort analysis, envelope optimization, carbon-footprint and water-cycle analysis, and energy modeling. In everything we do, we prioritize quality and work responsibly—keeping a close eye on cost and sustainability.

Similar Projects Completed:

- Bullitt Center, Seattle, WA
 - The Bullitt Center is the world's largest commercial Living Building, achieving net positive energy, net zero water and net zero wastewater each year. A 242kW photovoltaic array produced 60% more energy than the building used in 2014. This is a Net Zero Energy Building.
- Education Center, Oregon Zoo, Portland, OR
 - Windows into mechanical rooms let visitors see the rainwater harvesting system and screens on the wall show off exactly how much solar energy is gathered on any given day. The project includes a rooftop photovoltaic array and is pursuing Net Zero Energy.
- Rocky Mountain Institute Innovation Center, Basalt, CO
 - This Net-Zero Energy building is in one of the coldest climates in the lower 48 states. An envelope tuned for passive operation allows the building to operate without cooling systems and very little heating to maintain comfort. An 83 kW rooftop PV array and off-site community PV plant will power 90-100% of the building. This is a Beyond Net Zero Energy Building.

FFA Architecture

FFA Architecture and Interiors is a full-service design firm providing award-winning expertise in architecture, planning, and interior design. Since 1956, our practice has been focused on developing architecture that is timeless, beautiful, and sustainable. FFA is proud of this tradition and its legacy of thoughtful, contextual projects throughout the Pacific Northwest region.

We understand that architecture is fundamentally for people. It is a quiet backdrop in our lives that when done with care, has the power to enrich and inspire. Because of this, we work to craft buildings and spaces designed around the people who use them.

Sustainability is central to FFA's work and culture. It is considered the basis of good design rather than supplementary to our process. FFA is committed to thoughtful stewardship of our natural and built environments through a careful consideration of balancing environmental, cultural and economic

resources today so they may persist for future generations. Please see this link for more information about our sustainability practices.

Similar Projects Completed:

- PGE Maintenance Garage, Portland, OR
 - This new 10,000 square foot maintenance garage includes 5 maintenance bays, 1 vehicle wash bay, office, breakroom, locker area, storage and warehouse space. A 20 kW PV array is estimated to produce 22,000 kWh per year. Other sustainable features include LED lighting and 4 electrical vehicle charging stations.
- PGE Service Center Rehabilitation, Portland, OR
 - This 1950s-era building was completely re-imagined as a 21st-century creative workplace with LEED BD+C Gold certification. FFA Architecture and Interiors worked closely with the client to design the renovation of their office as a clear demonstration of their strong commitment as a leader in smarter, cleaner, renewable energy usage.
- Lebanon Justice Center, Lebanon, OR
 - FFA designed the new Justice Center for the City of Lebanon, which includes a police facility, information technology department, municipal court and 12-person jail. FFA worked closely with the clients and the community to design the new 30,000 square foot Justice Center in the center of town.
- Library! At Cole and Ustick, Boise, ID
 - FFA worked in close collaboration with the City of Boise and provided presentations to several public forums as part of the process to achieve a design that met all of the goals the community envisioned. Located on what was a neglected retail strip, the new facility serves as a catalyst for revitalizing the surrounding area. The library serves as a community living room, offering a warm and inviting venue for cultural and educational events year-long. The building includes a PV array and received LEED Gold Certification.

Skanska

With shared values of honesty, trust and respect, Skanska honors a long-standing commitment to our country, local communities and the people who serve them. We observe a strong code of conduct, engage veteran-owned businesses and collaborate with government clients in an effort to build for a better society.

We understand the unique needs, uses and expectations for government projects. With years of experience fulfilling local, state and federal contracts, our teams leverage proven solutions, such as Building Information Modeling (BIM), to deliver compliant results.

Our clients benefit from Skanska's 450+ LEED-accredited professionals, 200+ certified projects and millions of hours in the field. Our buildings aren't just built with minimal impact to the environment. They perform efficiently and maximize ROI. Smart business is good business.

Similar Projects Completed:

- Portland Fire & Rescue Station 21, Portland, OR
 - Skanska provided preconstruction and construction management services for the City of Portland on the 75,000-SF Portland Fire and Rescue Station. The station meets the needs of rescuers and accommodates equipment for essential emergency response services, including water rescue. Sustainable features include site location, daylighting and controls, state-of-the-art HVAC systems, eco-roof and sustainable material selections.
- Jefferson County New Courthouse, Madras, OR
 - Skanska provided construction management services for Jefferson County on a new 35,000-SF two-story courthouse. The courthouse includes holding space, judge's chambers and jury rooms with secure entrances. The facility also features three courtrooms and a long-term plan to add a fourth with minimal impact to the existing site. Public spaces include areas for payment of fines, such as traffic tickets. The scope also includes a 34-KW solar array on the roof and uses a VRF mechanical system to increase the building's efficiency.
- Stone34, Seattle, WA
 - This \$36 million, 129,000-SF, mixed-use, five-story building is located at the corner of Stone Way and North 34th Street at the intersection of the Fremont and Wallingford neighborhoods, just off Seattle's favorite foot-powered express lane, the Burke Gilman Trail. A true innovator, Stone34 embraced cutting-edge sustainable technologies to achieve 75 percent energy and water savings compared to typical office buildings. The building is LEED Platinum certified and was the first designed to meet the requirements of the City of Seattle's Deep Green Pilot Program.

Exhibit C

Site Evaluation



Solar Feasibility Analysis Beaverton Public Safety Center

Prepared For:

Eric Oathes
Beaverton Police Captain
Beaverton, OR 97076
503.536.2260

Prepared By:

Zach Parrott
Solar Designer
Imagine Energy
541.517.8091

June 15, 2018



EXECUTIVE SUMMARY

Attached is a solar resource analysis of the Beaverton Public Safety Center. The analysis has been conducted after reviewing architectural plans, engineering documents, and discussing the installation with the key project team. The type and use, roof structure, and electrical systems were all analyzed and have found to be well suited for the proposed solar arrays. The owner has already enlisted the help of PAE Engineers for early assistance in integrating solar, and much of the large considerations have already been implemented into the design of building systems. This report touches on these considerations and discusses the current market rates for solar at this scale, along with the available financial incentives and tools to make this prominent feature of the design become possible. Additional engineering will be required to check the weight, spans, and attachments of the solar to the roof of the public safety building but we foresee no challenges with this moving forward. Since this will be a Risk Category IV building the installation method will be limited to a traditional single row tilt-up on top of a steel supporting structure. The recommendation of a 302 kw array is expected to cost \$1.01M for all expenses with 79%% of the system cost back in combined incentives and requested grants. Using these numbers the breakeven is around the 9 year mark, although 75% of the system cost will have been recovered by the end of year 1.



BUILDING OVERVIEW AND USE

The new Public Safety Center will be constructed at the existing site of the Beaverton Activities Center, on the corner of SW Hall Blvd and Allen Blvd. The three story, 72,697 sf building will become a new police and emergency management building built to critical-facility standards to ensure that emergency response functions remain intact in case of emergency or natural disaster situations.

The three stories will be constructed with a combination of brick walls and metal panel wall assemblies. The roof is a flat roof with a structure utilizing steel girders and CLT decking, and a built-up bitumen roofing material.

ROOF AREAS TO CONSIDER

The first and third level roofs are available for solar installations on the building itself. Two carports in the parking lot to the south of the building are also being built to support solar arrays, which will add considerably to the overall system size. In compliance with local building codes and the Oregon Solar Specialty Code, a minimum three foot walkway will be maintained around the solar arrays and in from the perimeter parapet of the building. Any arrays greater than 150' in length will require additional 3' pathways to bisect them.

Solar Roof Area

The total roof square footage available is 32,046 and 7,153 for the parking lot canopies, for a combined total of 39,199. For the proposed solar installation we are attempting to use as much as possible. Maintaining pathway requirements and avoiding as much shading as possible allows 12,432 square feet of solar on the 1st and third level roofs, or about 6.3 watts/square foot of the structure. The carport shade structures will not have the same pathway requirements and will be able to be nearly 100% utilized for space. The below simulation shows the entire proposed array and the shading from the building and mechanical equipment.



Figure 2.1 - Solar Layout and Shading

SOLAR RESOURCE

Both 10° and 5° module tilts were considered for this installation, and it was found that a 5° module allows for closer row spacing and an overall larger system size with little impact to production. Figures 3.1 and 3.2 show the differences in the Tilt and Orientation Factor (TOF). From an optimal tilt and orientation of 30° and 190°, respectively, the 5° tilt was found to have a TOF of 91% while the 10° comes in at 93%. The 2% difference in increased resource does not make up for the increased production we will get from a tighter row spacing and larger array. A 5° module tilt allows for a 0.9' spacing between rows, while a 10° tilt requires 1.8' to prevent inter-row shading. On the same footprint this results in a possible 302 kw array for 5° tilt or 265 kw at 10°.

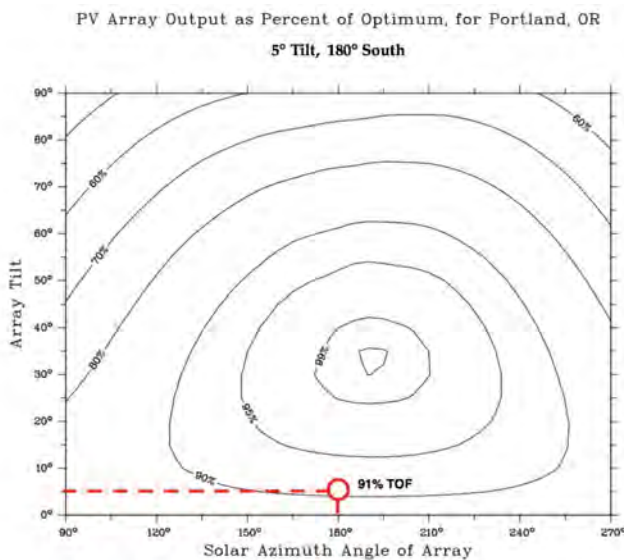


Figure 3.1

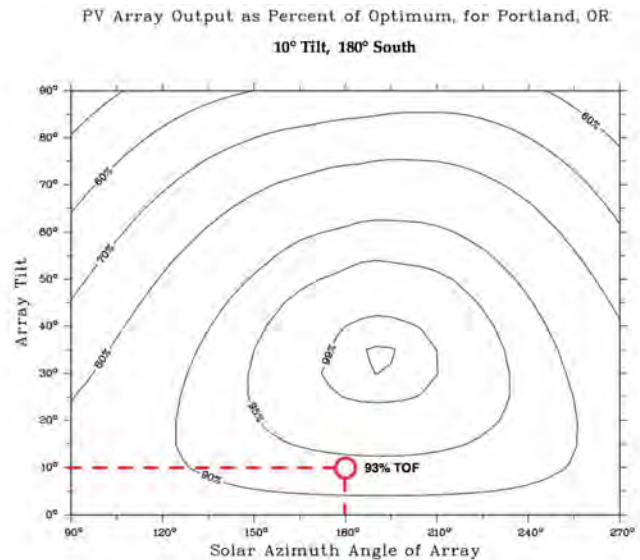


Figure 3.2

Shading on the site is extremely minimal, as shown in the satellite view of the existing site in Figure 3.3. Nearly all shading of the array will occur from the building itself and from mechanical equipment and screening. The combined Total Solar Resource Fraction (TSRF) of the 5° Tilt array is estimated to be 88% using a shade analysis software tool.



Figure 3.3 - Existing building on site

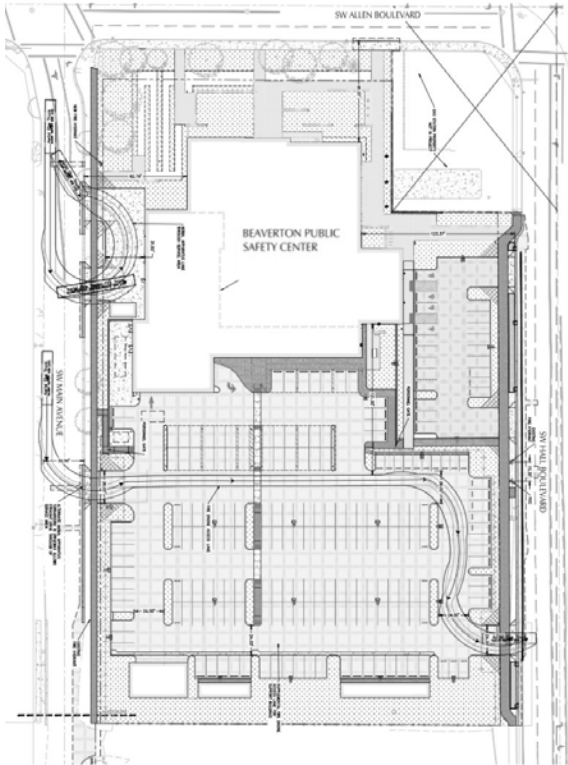


Figure 3.3 - Proposed building on site

STRUCTURAL CONDITION AND ATTACHMENT

The roof structure on the Beaverton Public Safety Center is comprised of steel girders and cross-laminated timber decking, on top of which the insulating foam and bitumen roofing will be installed. The 100% Design Development drawings already call out the allowance for an additional 5 psf load from the solar array, which we expect should be adequate. The weight of solar arrays can vary from 2 psf distributed load to around 5 psf, although individual

point loads will be higher. All structural loads will be checked by a structural engineer to be included in the final permit package.

Single Row Tilt-up

The single row tilt-up system is the most commonly used system where ballasted installations are not used. The modules are placed in east-to-west rows tilted 5° towards south, and are clamped to extruded aluminum rails which are attached to tilt legs and stanchions for positive attachment to the roof structure. The structural engineer will determine the maximum span of the rails, and attachments will be to the structural components or blocking below the roofing material and insulation. Due to the long spans of the roof structure the proposed design consists of an exposed steel girder grid framed above the roof deck to reduce penetration count. The stanchions will be flashed by the roofer to maintain the original roof warranty.

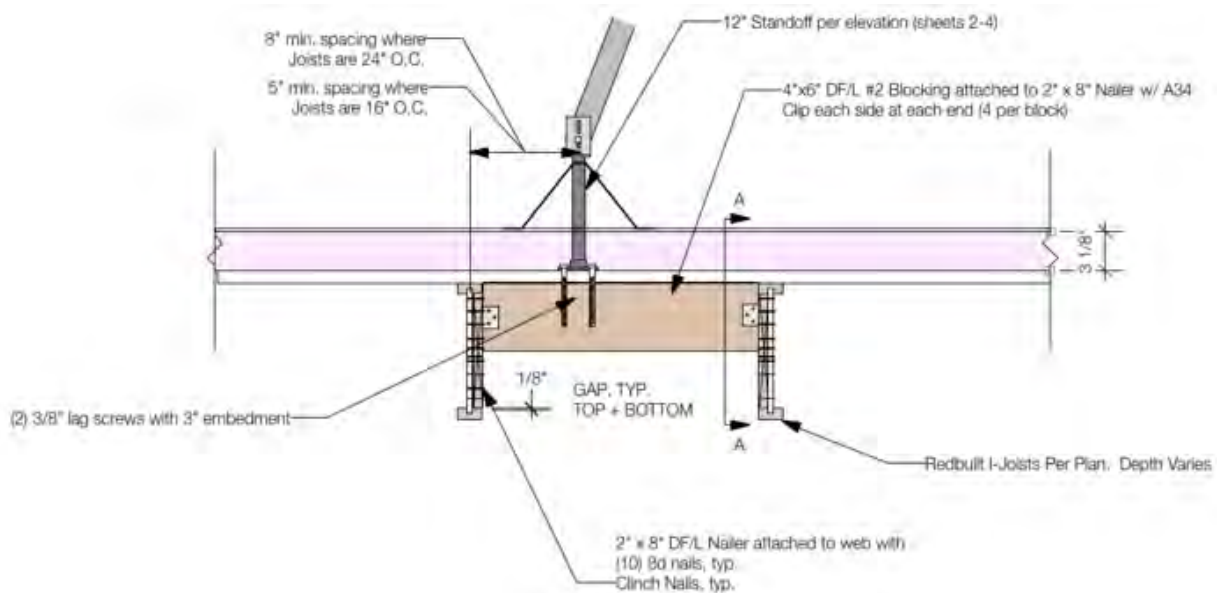


Figure 4.2 - Typical single row tilt-up installation



EQUIPMENT

For the basis of design I am proposing the SolarEdge 66.6K inverter paired with optimizers which will work well with the larger system size and the building's 480v/277v service. The SolarEdge inverter and module-level optimizers will help the array meet the upcoming 2019 NEC requirements for Rapid Shutdown.

72 cell modules in the same footprint are available up to 400w using top of the line panels from LG. They are much more expensive, and to strike a balance of cost effectiveness and maximum system size I am recommending a 350w module from Silfab.

IronRidge XR-1000 racking will be used along with Quickmount stanchions. The XR-1000 extruded aluminum rail allows for the longest span between standoffs. This single row tilt-up system will be installed on top of steel or aluminum girders above the roof deck. The carport will see a similar installation using IronRidge racking, but will connect to the standing seam metal roof or structural supports depending on the ultimate design choice.

ELECTRICAL SYSTEM & INTERCONNECTION

The Public Safety Center will be served with 480V/277V 3P power. Typically, inverter AC output is combined in an AC panel board and interconnected via a back-fed breaker on the main distribution panel (MDP). This project is being considered for a future 1 MWh battery backup in addition to a generator. The electrical engineer has already designed the main distribution board to accommodate the PV array. A fused, single handle utility disconnect will be required within 10' of the interconnection. In some cases the solar inverter(s) and AC panel boards are installed in the main electrical room. Consideration for this gear should be factored into the equipment configuration when allocating space in the electrical room.

ENERGY PRODUCTION & CONSUMPTION

Utilizing the roof area and two parking lot solar awnings we are able to fit 302.8 kW on the property. Using the total weighted TSRF of 86% the approximate annual energy production for this array will be 331,800 kWh per year. The anticipated annual energy demand for the building is 824,000 kWh, so this will be offsetting approximately 40% of the entire usage.

This building is being built to critical-facility standards. It will utilize a generator and is pursuing the pilot program to install a 1 MWh micro grid battery system to provide emergency response functions in the event of power outages



and disasters. The 300 kW solar array will play a large role in helping this facility remain operational during such occasions.

MONITORING

Solar production can easily be monitored by data logging systems from the inverter manufacturer. This data can be viewed on any web-enabled device, including monitors in the lobby. This functionality is advantageous as it provides a graphical representation of simultaneous and historic solar production. A strong wifi connection or ethernet cables must be present at the inverter locations on the roof of the building.

COST AND INCENTIVES BREAKDOWN

Incentives typically fall into four categories: Utility rebates (Energy Trust of Oregon), federal tax credits, accelerated depreciation, and grants. For this application we will be focusing on the ETO rebate, a pending grant for \$250k from ODOE, and a requested grant of \$501,367 from the PGE Renewable Development Fund grant. This leaves \$210k from the City of Beaverton for the remainder.

The cost on the proposed system comes to \$1,011,367, and the following chart shows the breakdown of prices and incentives over the 30 year lifespan of the system. The grants clearly make a large impact on the cumulative cash flow, showing a breakeven around year 9.

YR	KWH	SOLAR VALUE	GRANTS	ETO REBATE	CASH FLOW	CUM. CASH FLOW
0				\$50,000	-1,011,367	-961,367
1	306470	\$21,453	\$751,367	-\$10,500	753,352	-208,015
2	305550	\$22,094			23,673	-184,342
3	304634	\$22,755			24,380	-159,962
4	303720	\$23,435			25,109	-134,853
5	302808	\$24,136			25,860	-108,992
6	301900	\$24,858			26,633	-82,359



YR	KWH	SOLAR VALUE	GRANTS	ETO REBATE	CASH FLOW	CUM. CASH FLOW
7	300994	\$25,601			27,430	-54,929
8	300091	\$26,367			28,250	-26,679
9	299191	\$27,155			29,095	2,415
10	298294	\$27,967			29,965	32,380
11	297399	\$28,803			30,861	63,240
12	296506	\$29,664			31,783	95,024
13	295617	\$30,551			32,734	127,757
14	294730	\$31,465			33,712	161,470
15	293846	\$32,406			34,720	196,190
16	292964	\$33,375			35,759	231,949
17	292085	\$34,373			36,828	268,777
18	291209	\$35,400			37,929	306,706
19	290336	\$36,459			39,063	345,769
20	289465	\$37,549			40,231	386,000
21	288596	\$38,672			41,434	427,434
22	287730	\$39,828			42,673	470,107
23	286867	\$41,019			43,949	514,056
24	286007	\$42,246			45,263	559,319
25	285149	\$43,509			46,617	605,936
26	284293	\$44,810			48,010	653,946
27	283440	\$46,150			49,446	703,392
28	282590	\$47,530			50,924	754,317
29	281742	\$48,951			52,447	806,764
30	280897	\$50,414			54,015	860,779

Exhibit D
Design Drawings

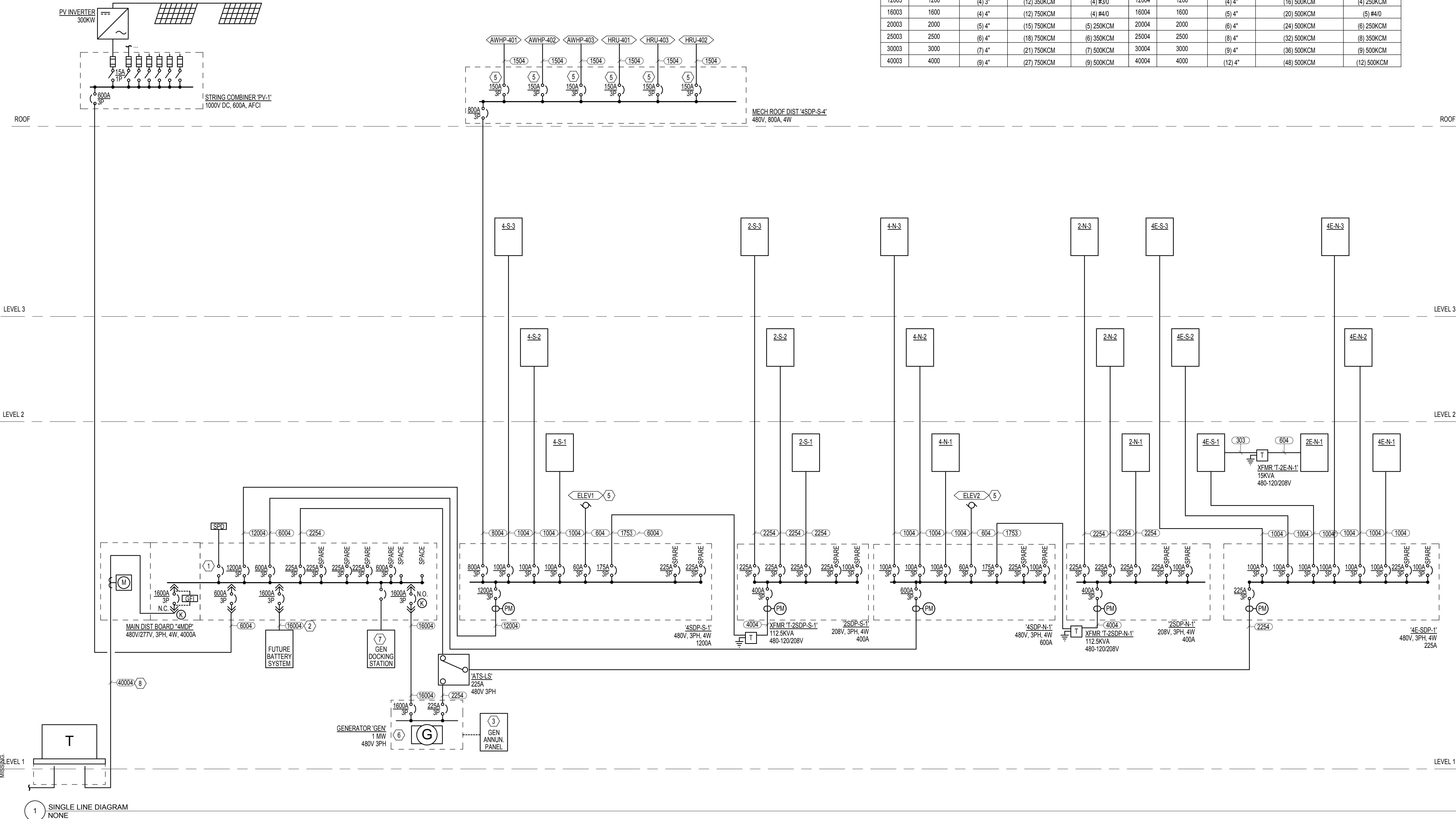
GENERAL NOTES:

A. PROVIDE POWER AND DATA CONNECTION TO EACH POWER METER EQUIPMENT. VERIFY REQUIREMENTS WITH APPROVED METER MANUFACTURER.

NOTES:

1. VERIFY TRIP SIZE WITH SPD MANUFACTURER.
2. PROVIDE CONDUIT ONLY TO FUTURE LOCATION BETWEEN GENERATOR AND UTILITY TRANSFORMER.
3. GENERATOR REMOT ANNUNCIATOR PANEL. MOUNT IN LOBBY. VERIFY LOCATION WITH ARCHITECT.
4. REFER TO GROUNDING SYSTEM DETAIL FOR GROUNDING ELECTRODE CONDUCTOR SIZES.
5. VERIFY ELECTRICAL TRIP RATING WITH SUBMITTED EQUIPMENT PRIOR TO ELECTRICAL EQUIPMENT PURCHASE.
6. PROVIDE GENERATOR CONTROL RELAY.
7. PROVIDE 480/277V, 1800A LOAD BANK/PORTABLE GENERATOR DOCKING STATION CABINET. TRYSTAR OR APPROVED EQUAL.
8. CONDUIT ONLY. PGE TO PROVIDE CONDUCTORS.

FEEDER SCHEDULE COPPER: 3 PHASE, 3 WIRE + GROUND					FEEDER SCHEDULE COPPER: 3 PHASE, 4 WIRE + GROUND				
TAG	NOMINAL AMPACITY	CONDUIT SIZE (MIN)	PHASE CONDUCTORS	GROUND CONDUCTOR	TAG	NOMINAL AMPACITY	CONDUIT SIZE (MIN)	PHASE & NEUTRAL CONDUCTORS	GROUND CONDUCTOR
203	20	1/2"	(3) #12	#12	204	20	1/2"	(4) #12	#12
303	30	1/2"	(3) #10	#10	304	30	3/4"	(4) #10	#10
403	40	3/4"	(3) #8	#10	404	40	3/4"	(4) #8	#10
503	50	3/4"	(3) #6	#10	504	50	1"	(4) #6	#10
603	60	3/4"	(3) #6	#10	604	60	1"	(4) #6	#10
703	70	1"	(3) #4	#8	704	70	1 1/4"	(4) #4	#8
803	80	1 1/4"	(3) #3	#8	804	80	1 1/4"	(4) #3	#8
903	90	1 1/4"	(3) #3	#8	904	90	1 1/4"	(4) #3	#8
1003	100	1 1/4"	(3) #2	#8	1004	100	1 1/4"	(4) #2	#8
1103	110	1 1/2"	(3) #1	#6	1104	110	1 1/2"	(4) #1	#6
1253	125	1 1/2"	(3) #1	#6	1254	125	1 1/2"	(4) #1	#6
1503	150	1 1/2"	(3) #1/0	#6	1504	150	2"	(4) #1/0	#6
1753	175	2"	(3) #2/0	#6	1754	175	2"	(4) #2/0	#6
2003	200	2"	(3) #3/0	#6	2004	200	2"	(4) #3/0	#6
2253	225	2"	(3) #4/0	#4	2254	225	2 1/2"	(4) #4/0	#4
2503	250	2"	(3) #4/0	#4	2504	250	2 1/2"	(4) 250KCM	#3
3003	300	2 1/2"	(3) 250KCM	#4	3004	300	3"	(4) 350KCM	#2
3503	350	2 1/2"	(3) 350KCM	#3	3504	350	3 1/2"	(4) 500KCM	#1
4003	400	(2) 2"	(6) #3/0	(2) #3	4004	400	(2) 2"	(8) #3/0	(2) #3
4503	450	(2) 2"	(6) #4/0	(2) #2	4504	450	(2) 2 1/2"	(8) #4/0	(2) #2
5003	500	(2) 2"	(6) #4/0	(2) #2	5004	500	(2) 3"	(8) 250KCM	(2) #1
6003	600	(2) 2 1/2"	(6) 250KCM	(2) #1	6004	600	(2) 3"	(8) 350KCM	(2) #2/0
8003	800	(2) 3"	(6) 500KCM	(2) #1/0	8004	800	(3) 3"	(12) 350KCM	(3) #2/0
10003	1000	(3) 3"	(9) 500KCM	(3) #2/0	10004	1000	(3) 4"	(12) 500KCM	(3) #2/0
12003	1200	(4) 3"	(12) 350KCM	(4) #3/0	12004	1200	(4) 4"	(16) 500KCM	(4) 250KCM
16003	1600	(4) 4"	(12) 750KCM	(4) #4/0	16004	1600	(5) 4"	(20) 500KCM	(5) #4/0
20003	2000	(5) 4"	(15) 750KCM	(5) 250KCM	20004	2000	(6) 4"	(24) 500KCM	(6) 250KCM
25003	2500	(6) 4"	(18) 750KCM	(6) 350KCM	25004	2500	(6) 4"	(32) 500KCM	(8) 350KCM
30003	3000	(7) 4"	(21) 750KCM	(7) 500KCM	30004	3000	(9) 4"	(36) 500KCM	(9) 500KCM
40003	4000	(9) 4"	(27) 750KCM	(9) 500KCM	40004	4000	(12) 4"	(48) 500KCM	(12) 500KCM

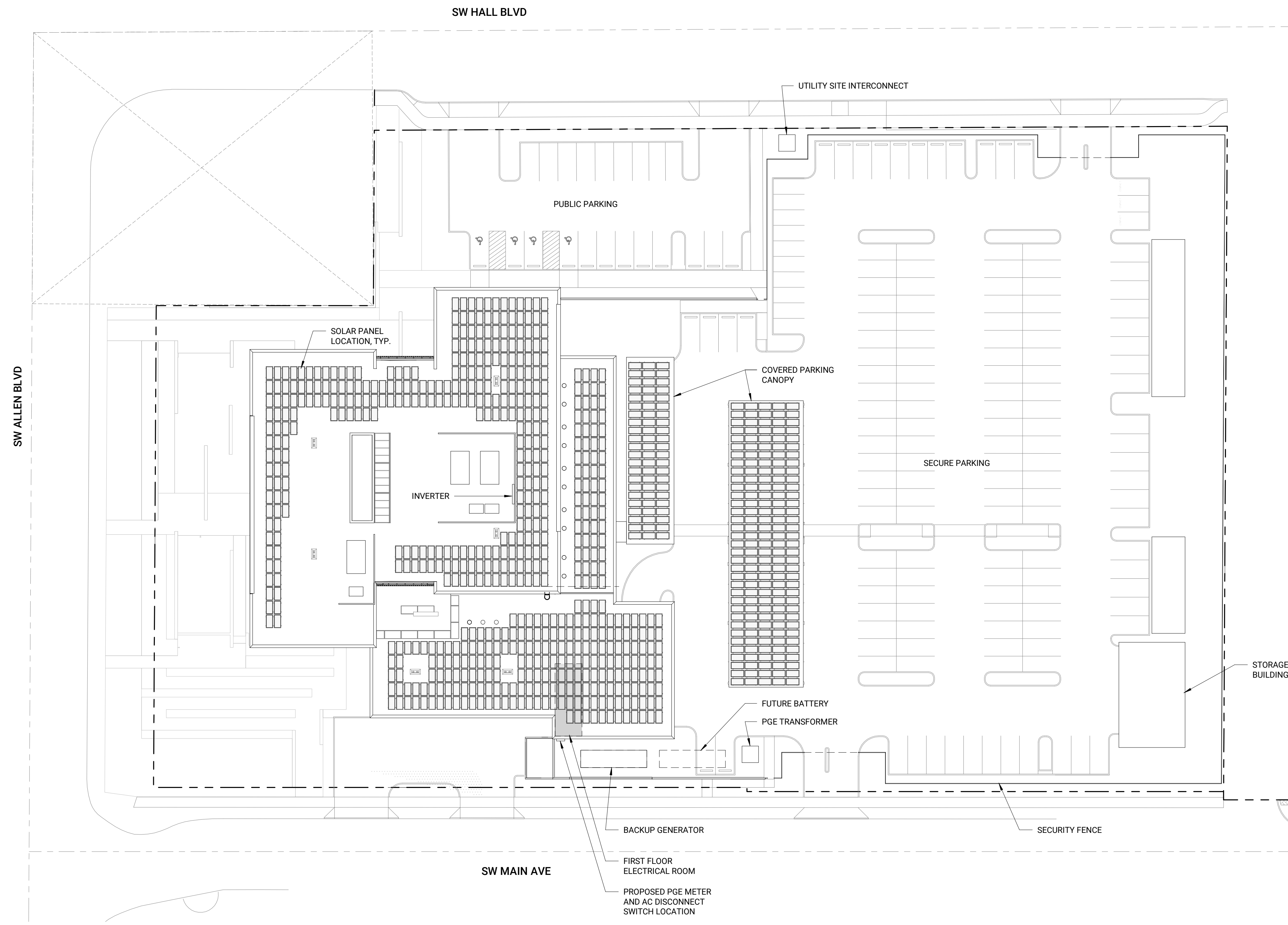


DESCRIPTION	DATE

BEAVERTON PUBLIC SAFETY CENTER
City of Beaverton
Police Department
12500 SW Allen Boulevard
Beaverton, OR 97005

APPROVED: KPH
DRAWN: ASH
DATE: 05.02.2018
PROJECT NUMBER: 24017

E-701
100% DESIGN DEVELOPMENT



#	DESCRIPTION	DATE

BEAVERTON PUBLIC SAFETY CENTER

CITY OF BEAVERTON POLICE DEPARTMENT

APPROVED:	ITG
DRAWN:	JP
DATE:	06.11.2018
PROJECT NUMBER:	240717

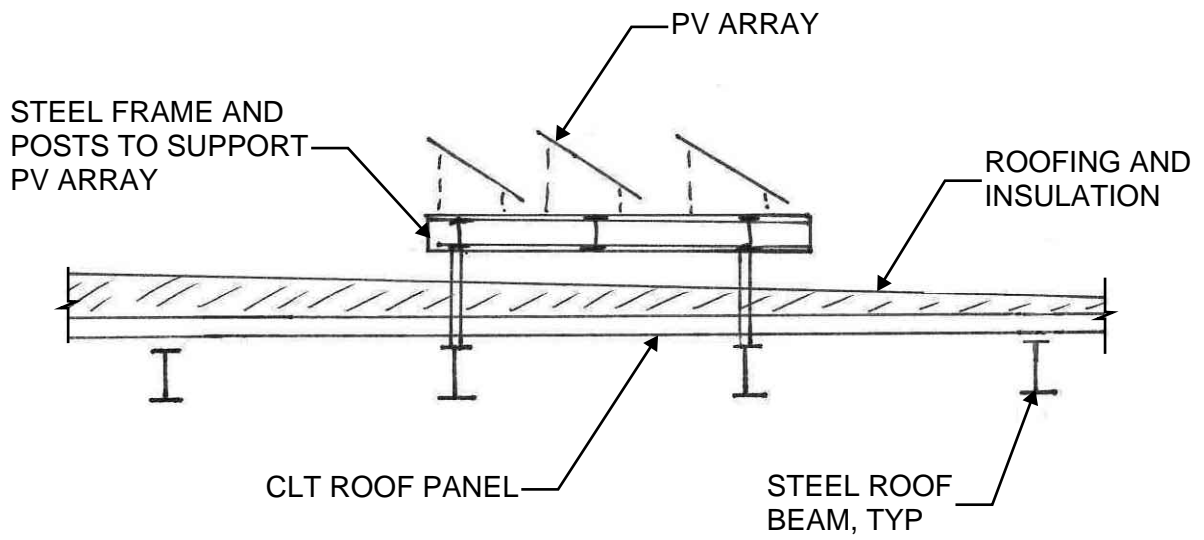
PV SYSTEM DIAGRAM

D-100
 PRELIMINARY

DRAWINGS TO BE PRINTED IN GRAYS. IF 3 DISTINCT SHADES OF GRAY ARE NOT VISIBLE, INFORMATION MAY BE MISSING.



Project:	BPSC	By:	JCC	Sheet No.
Location:	BEAVERTON, OR	Date:	3/29/2018	
Client:	FFA	Revised:		Job No.
Subject:		Date:		21700856



PV ARRAY SUPPORT STRUCTURE

Exhibit E
Equipment Specifications



SolarEdge Commercial Three Phase Inverters for the 277/480V Grid

for North America

SE66.6K-SE100K

INVERTERS



Specifically designed to work with power optimizers

- Easy two-person installation – each unit mounted separately, equipped with cables for simple connection between units
- Balance of System and labor reduced compared to using multiple smaller string inverters
- Independent operation of each unit enables higher uptime and easy serviceability
- No wasted ground area: wall/rail mounted, or horizontally mounted under the modules (10° inclination)
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per 690.11 and 690.12
- Built-in module-level monitoring with Ethernet or cellular GSM
- Fixed voltage inverter for superior efficiency (98.5%) and longer strings
- Integrated DC Safety Switch and optional surge protection & DC fuses (plus & minus)
- Built-in RS485 Surge Protection Device, to better withstand lightning events



SolarEdge Commercial Three Phase Inverters for the 277/480V Grid for North America SE66.6K-SE100K

	SE66.6K	SE100K	
OUTPUT			
Rated AC Power Output	66600	100000	VA
Maximum AC Power Output	66600	100000	VA
AC Output Line	4-wire WYE (L1-L2-L3-N) plus PE		
AC Output Voltage Minimum-Nominal-Maximum ⁽¹⁾ (L-N)	244 - 277 - 305		Vac
AC Output Voltage Minimum-Nominal-Maximum ⁽¹⁾ (L-L)	422.5 - 480 - 529		Vac
AC Frequency Min-Nom-Max ⁽¹⁾	59.3 - 60 - 60.5		Hz
Maximum Con Output Current (per Phase) @277V	80	120	A
GFDI Threshold	1		A
Monitoring, Islanding Prot Con able Power Factor, Country Con able Thresholds	Yes		
INPUT			
Maximum DC Power (Module STC)	90000 / 45000	135000 / 45000	W
Transformer-less, Ungrounded	Yes		
Maximum Input Voltage DC to Gnd	500		Vdc
Maximum Input Voltage DC+ to DC-	1000		Vdc
Nominal Input Voltage DC to Gnd	425		Vdc
Nominal Input Voltage DC+ to DC-	850		Vdc
Maximum Input Current	80	120	Adc
Maximum Input Short Circuit Current	120		Adc
Reverse-Polarity Prot	Yes		
Ground-Fault Isola Det	350kΩ	per Unit	
CEC Weighted E	98.5		%
Nigh Power Consump	< 12		W
ADDITIONAL FEATURES			
Supported Communica Interfaces	RS485, Ethernet, Cellular GSM (op		
Rapid Shutdown	NEC2014 and NEC2017 compliant/ upon AC Grid Disconnect		
RS485 Surge Prot	Built-in		
DC SAFETY SWITCH			
DC Disconnect	1000V / 2 x 40A	1000V / 3 x 40A	
DC Surge Prot	Op Type II, replaceable		
DC Fuses on Plus & Minus	Op 30A		
STANDARD COMPLIANCE⁽²⁾			
Safety	UL1741, UL1741 SA, UL1699B, UL1998, CSA 2.22		
Grid Standards	IEEE 1547, Rule 21, Rule 14 (HI)		
Emissions	FCC part15 class A		
INSTALLATION SPECIFICATIONS			
Number of units	2	3	
AC Output Conduit Size / Max AWG / Max PE AWG	1.5" / 2/0 / 6	2" / 4/0 / 4	
DC Output Conduit Size / Terminal Block AWG Range /	2 x 1.25" / 6-14 / 6 strings		
Number of Strings ⁽³⁾	2 x 1.25" / 6-14 / 9 strings		
Dimensions (H x W x D)	Primary Unit: 37 x 12.5 x 10.5 / 940 x 315 x 260; Secondary Unit: 21 x 12.5 x 10.5 / 540 x 315 x 260		in / mm
Weight	Primary Unit: 105.8 / 48; Secondary Unit 99.2 / 45		lb / kg
Opera Temperature Range	-13 to +140 / -25 to +60 ⁽⁴⁾ (-40°F / -40°C op		°F / °C
Cooling	Fan (user replaceable)		
Noise	< 60		dBA
Prot Ra	NEMA 3R		
Bracket Mounted (Brackets Provided)			

⁽¹⁾ For other regional se please contact SolarEdge support

⁽²⁾ Pending

⁽³⁾ Single input op per unit (up to 3AWG) available

⁽⁴⁾ De-ra from 50°C



LIMITED PRODUCT WARRANTY

This SolarEdge Technologies Ltd. Limited Warranty covers defects in workmanship and materials of the below-listed products for the applicable warranty period set out below:

- **Power optimizers:** 25 years commencing on the earlier of: (i) 4 months from the date the power optimizers are shipped from SolarEdge; and (ii) the installation of the power optimizers, *provided, however*, that for the module embedded power optimizers (CSI and OPJ models), the Warranty Period shall not exceed the maximum of (1) the module product warranty and (2) the module power warranty periods provided by the applicable module manufacturer.
- **Inverters, Safety & Monitoring Interface (SMI), Auto-transformer, GSM Cellular Modem:** 12* years commencing on the earlier of: (i) 4 months from the date the products are shipped from SolarEdge; and (ii) the installation of the products.
- **StorEdge Interface:** 10 years commencing on the earlier of: (i) 4 months from the date the Interfaces are shipped from SolarEdge; and (ii) the installation of the Interfaces.
- **Home Gateway, Control and Communication Gateway, Firefighter Gateway, Wireless Communication Products excluding GSM Cellular Modem, RS485 Expansion Kit, SolarEdge Meter, Smart Monitoring Combiner Box:** 5 years commencing on the earlier of: (i) 4 months from the date the product is shipped from SolarEdge; and (ii) the installation of the product. Warranty duration of wireless communication products is the same whether or not the product is pre-installed in the inverter.

* In some countries the inverter warranty is limited to 7 years. For a list of these countries please access http://www.solaredge.com/warranty_exceptions

The Limited Warranty does not apply to components which are separate from the Products, ancillary equipment and consumables, such as, for example, cables, fuses, wires and connectors, whether supplied by SolarEdge or others. Some components may carry their own manufacturer warranty. See product datasheet for more details. In addition, for all power optimizers with a part number ending in C, the SolarEdge warranty does not apply to the input connector.

The Limited Warranty only applies to the buyer who has purchased the Products from an authorized seller of SolarEdge for use in accordance with their intended purpose. The Limited Warranty may be transferred from buyer to any assignee, and will remain in effect for the time period remaining under the foregoing warranties, *provided* that the Products are not moved outside its original country of installation and any reinstallation is done in accordance with the installation directions and use guidelines accompany the Products (collectively the "Documentation").

If, during the applicable Warranty Period, buyer discovers any defect in workmanship and materials and seeks to activate the Limited Warranty, then buyer shall, promptly after such discovery, report the defect to SolarEdge by sending an email to support@solaredge.com with the following information: (i) a short description of the defect, (ii) the Product's serial number, and (iii) a scanned copy of the purchase receipt or warranty certificate of the applicable Product.

Upon buyer's notification, SolarEdge shall determine whether the reported defect is eligible for coverage under the Limited Warranty. The Product's serial number must be legible and properly attached to the Product in order to be eligible for Warranty coverage. If SolarEdge determines that the reported defect is not eligible for coverage under the Limited Warranty, SolarEdge will notify buyer accordingly and will explain the reason why such coverage is not available. If SolarEdge determines that the reported defect is eligible for coverage under the Limited Warranty, SolarEdge will notify buyer accordingly, and SolarEdge may, in its sole discretion, take any of the following actions:

- repair the Product at SolarEdge's facilities or on-site; or
- issue a credit note for the defective Product in an amount up to its actual value at the time buyer notifies SolarEdge of the defect, as determined by SolarEdge, for use toward the purchase of a new Product; or
- provide Buyer with replacement units for the Product.

SolarEdge will determine whether the Product should be returned to SolarEdge and, if SolarEdge so determined, the Return Merchandise Authorization ("RMA") Procedure (set out below) will be invoked. Where replacement Products are sent, SolarEdge generally sends such products within 48 hours. SolarEdge may use new, used or refurbished parts that are at least functionally equivalent to the original part when making warranty repairs. The repaired Product or replacement parts or Product, as applicable, shall continue to be covered under the Limited Warranty for the remainder of the then-current Warranty Period for the Product.

Where the RMA Procedure is invoked by SolarEdge, SolarEdge will instruct buyer how to package and ship the Product or part(s) to the designated location. SolarEdge will bear the cost of such shipment, upon receipt of the Product or part(s), SolarEdge will, at its expense and sole discretion, either repair or replace the Product or part(s).

SolarEdge will deliver the repaired or replaced Product or part(s) to buyer at buyer's designated location in countries where SolarEdge has an office and/or there is a significant PV market. For the specific list of countries to which such service is provided, please access http://www.solaredge.com/articles/shipping_cost_coverage_warranty. SolarEdge will bear the cost of such shipment, including shipping and customs (where applicable) and buyer shall bear any applicable value added tax. SolarEdge may elect to ship replacement Product and/or part(s) prior to receipt of the Product and/or part(s) to be returned to SolarEdge as per the above.

Where SolarEdge decides to repair the Product or part(s), warranty coverage includes labor and material costs necessarily incurred to correct the Product defect; and where SolarEdge decides to replace the Product or part(s) to which the Limited Warranty applies, warranty coverage includes the cost of the replacement of the Product or part(s). In addition, SolarEdge shall bear shipping costs in respect to the foregoing, as set out above. All other costs, including, without limitation, travel and boarding costs of SolarEdge service personnel that are incurred for repairs of Products on-site, as well as costs related to buyer's employees and contractors repair or replacement activities, are not covered by the Limited Warranty and, unless otherwise agreed in writing in advance by SolarEdge, shall be borne by the buyer.

Warranty Exclusions: This Limited Warranty will not apply if (a) buyer is in default under the General Terms and Conditions of other Agreement governing the purchase of the Product, or (b) the Product or any part thereof is:

- damaged as a result of misuse, abuse, accident, negligence or failure to maintain the Product;
- damaged as a result of modifications, alterations or attachments thereto which were not pre-authorized in writing by SolarEdge;
- damaged due to the failure to observe the applicable safety regulations governing the proper use of the Product;
- installed or operated not in strict conformance with the Documentation, including without limitation, not ensuring sufficient ventilation for the Product as described in SolarEdge installation guide;
- opened, modified or disassembled in any way without SolarEdge's prior written consent;
- used in combination with equipment, items or materials not permitted by the Documentation or in violation of local codes and standards;
- damaged or rendered non-functional as a result of power surges, lightning, fire, flood, pest damage, accident, action of third parties, or other events beyond SolarEdge's reasonable control or not arising from normal operating conditions; or
- damaged during or in connection with shipping or transport to or from buyer where buyer arranges such shipping or transport.

This Limited Warranty does not cover cosmetic or superficial defects, dents, marks or scratches, which do not influence the proper functioning of the Product.

THE LIMITED WARRANTIES SET OUT HEREIN ARE IN LIEU OF ANY OTHER WARRANTIES WITH RESPECT TO THE PRODUCTS PURCHASED BY BUYER FROM SOLAREEDGE, WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL (INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), ALL OF WHICH ARE EXPRESSLY EXCLUDED TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW.

Claims by buyer that go beyond the warranty terms set out herein, including claims for compensation or damages, are not covered by the Limited Warranty, insofar as SolarEdge is not subject to statutory liability. In such cases, please contact the company that sold you the Product. Eventual claims in accordance with the law on product liability remain unaffected.

Coverage under the Limited Warranty is subject to buyer complying with the foregoing notification requirements and cooperating with SolarEdge's directions. SolarEdge's sole obligation and buyer's exclusive remedy for any defect warranted hereunder is limited to those actions expressly stated above. Such actions are final and do not grant any further rights, in particular with respect to any claims for compensation.

Unless otherwise specified in an executed Agreement with SolarEdge, the Limited Warranty and related provisions set out herein are subject to SolarEdge's General Terms and Conditions, including, without limitation, the provisions thereof, which relate to disclaimer of warranties, limitation of liability and governing law and jurisdiction.

Revised: June 2016



SLG-M Monocrystalline



350 Wp 72 Cell

Monocrystalline PV Module

100% MAXIMUM POWER DENSITY

Silfab's SLG-M 350 ultra-high-efficiency modules are optimized for Commercial projects where maximum power density is preferred.

100% NORTH AMERICAN QUALITY MATTERS

Silfab's fully-automated manufacturing facility ensures precision engineering is applied at every stage. Superior reliability and performance combine to produce one of the highest quality modules with the lowest defect rate in the industry.

NORTH AMERICAN CUSTOMIZED SERVICE

Silfab's 100% North American based team leverages just-in-time manufacturing to deliver unparalleled service, on-time delivery and flexible project solutions.



ENSURES MAXIMUM EFFICIENCY

72 of the highest efficiency, premium quality monocrystalline cells result in a maximum power rating of 350Wp.

ADVANCED PERFORMANCE WARRANTY

25-year linear power performance guarantee to 82%

ENHANCED PRODUCT WARRANTY

12-year product/workmanship warranty

BUILT BY INDUSTRY EXPERTS

With over 35 years of industry experience, Silfab's technical team are pioneers in PV technology and are dedicated to an innovative approach that provides superior manufacturing processes including: infra-red cell sorting, glass washing, automated soldering and meticulous cell alignment.

POSITIVE TOLERANCE

(-0/+5W) All positive module sorting ensures maximum performance

44 PPM DEFECT RATE*

Total automation ensures strict quality control during each step of the process at our certified ISO manufacturing facility. *As of December 31, 2016

LIGHT AND DURABLE

Over-engineered to weather low load bearing structures up to 5400 Pa. Light-weight frame exclusively designed with wide-ranging racking compatibility and durability.

PID RESISTANT

Proven in accordance to IEC 62804-1

AVAILABLE IN

Silver



Electrical Specifications		SILFAB SLG Monocrystalline	
Test Conditions		STC	NOCT
Module Power (Pmax)	Wp	350	264
Maximum power voltage (Vpmax)	V	38.9	35.0
Maximum power current (Ipmax)	A	9.02	7.58
Open circuit voltage (Voc)	V	47.5	43.9
Short circuit current (Isc)	A	9.61	7.88
Module efficiency	%	17.9	16.9
Maximum system voltage (VDC)	V		1000
Series fuse rating	A		15
Power Tolerance	Wp		-0/+5

Measurement conditions: STC 1000 W/m² • AM 1.5 • Temperature 25 °C • NOCT 800 W/m² • AM 1.5 • Measurement uncertainty ≤ 3%
 • Sun simulator calibration reference modules from Fraunhofer Institute. Electrical characteristics may vary by ±5% and power by -0/+5W.

Temperature Ratings		SILFAB SLG Monocrystalline	
Temperature Coefficient Isc	%/K		0.03
Temperature Coefficient Voc	%/K		-0.30
Temperature Coefficient Pmax	%/K		-0.38
NOCT (± 2°C)	°C		45
Operating temperature	°C		-40/+85

Mechanical Properties and Components		SILFAB SLG Monocrystalline	
Module weight (± 1 kg)	kg		23
Dimensions (H x L x D; ± 1 mm)	mm		1970 x 990 x 38
Maximum surface load (wind/snow)*	N/m ²		5400
Hail impact resistance			Ø 25 mm at 83 km/h
Cells			72 - Si monocrystalline - 4 or 5 busbar - 156.75 x 156.75 mm
Glass			3.2 mm high transmittance, tempered, antireflective coating
Backsheet			Multilayer polyester-based
Frame			Anodized Al
Bypass diodes			3 diodes-45V/12A, IP67/IP68
Cables and connectors (See installation manual)			1200 mm Ø 5.7 mm (4 mm ²), MC4 compatible

Warranties		SILFAB SLG Monocrystalline	
Module product warranty			12 years 25 years
Linear power performance guarantee			≥ 97% end of 1 st year ≥ 90% end of 12 th year ≥ 82% end of 25 th year

Certifications		SILFAB SLG Monocrystalline	
Product			ULC ORD C1703, UL 1703, IEC 61215, IEC 61730, IEC 61701, CEC listed UL Fire Rating: Type 2 (Type 1 on request)
Factory			ISO 9001:2008



Warning: Read the installation and User Manual before handling, installing and operating modules.

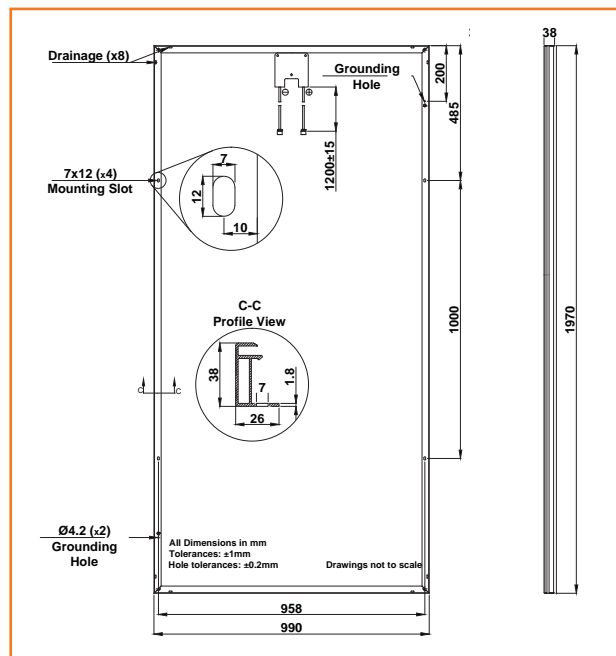
Third-party generated pan files from PV Evolution Labs available for download at:
www.silfab.ca/downloads



- Pallet Count: 30
- Container Count: 750



Silfab Solar Inc.
 240 Courtneypark Drive East • Mississauga,
 Ontario Canada L5T 2S5
 Tel +1 905-255-2501 • Fax +1 905-696-0267
info@silfab.ca • www.silfab.ca





Trust your system at every angle.

The IronRidge Tilt Mount System supports a wide range of solar module tilting angles, while also resisting the extreme wind and snow forces experienced over a building's lifetime.

Every component has been carefully engineered and rigorously tested, and the entire system uses only aluminum and stainless steel materials to resist corrosion.



Roof Friendly

Lightweight and compatible with industry-standard attachments.



PE Certified

Pre-stamped engineering letters available in most states.



Strength Tested

All components evaluated for superior structural performance.



Design Assistant

Online software makes it simple to create, share, and price projects.



UL 2703 Listed System

Meets newest effective UL 2703 standard.



25-Year Warranty

Products guaranteed to be free of impairing defects.

XR Rails & Tilt Legs

XR Rails



Attach directly to Tilt Legs. Available in three targeted sizes to support specific wind and snow loads.

- Unique curved profile
- Spanning capabilities up to 12'
- Clear and black finish

Tilt Legs ☺



Tilt assembly to desired angle, up to 30 degrees. Kits include South and North Tilt Leg and all hardware.

- Available in multiple lengths for a wide angle range
- Assembled South Tilt Legs include angle indicators
- Legs are electrically bonded to rails

Clamps & Grounding

UFOs ☺



Universal Fastening Objects secure and bond modules to rails.

- Fully assembled and lubricated
- Single, universal size
- Clear and black finish

Stopper Sleeves ☺



Snap onto the UFO to transform into a bonded end clamp.

- Bonds modules to rails
- Sized to match modules
- Clear and black finish

Grounding Lugs ☺



Connects Tilt Mount system to equipment ground.

- Low profile
- Single tool installation
- Mounts in any direction

Accessories

Bonded Splices ☺



XR Rails use internal splices for seamless connections.

- Self-drilling screws
- Varying versions to match rails
- Forms secure bonding connection

End Caps



Provide a finished look for rails while preventing debris buildup.

- Easy snap-in installation
- Varying versions to match rails
- UV-stabilized polymer

Wire Clips



Organize electrical wires from the rail's top slot.

- Simple snap-in installation
- Holds up to ten 5mm wires
- UV-stabilized polymer

Resources



Design Assistant

Go from rough layout to fully engineered system. For free.

[Go to IronRidge.com/design](https://www.ironridge.com/design)



NABCEP Certified Training

Earn free continuing education credits, while learning more about our systems.

[Go to IronRidge.com/training](https://www.ironridge.com/training)

Exhibit F
Site Photos

BEAVERTON PUBLIC SAFETY CENTER

EXTERIOR VIEWS



view from the east - daytime



view from the north - daytime



view from the east - nighttime



view from the north - nighttime



view from the southeast



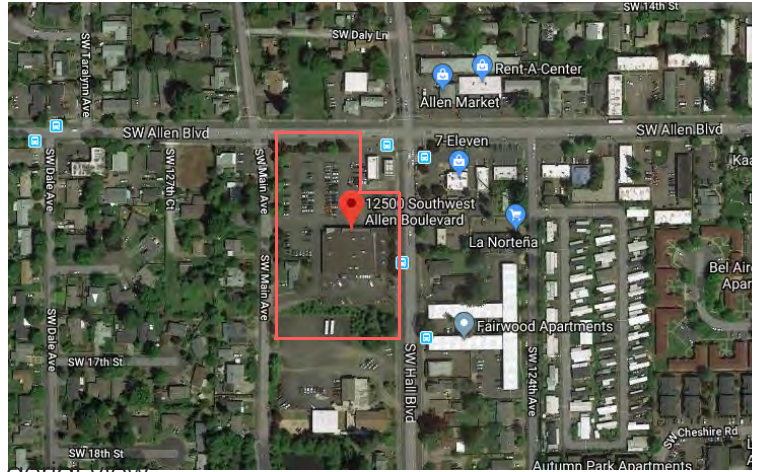
view from the southwest

BEAVERTON PUBLIC SAFETY CENTER

INTERIOR + AERIAL VIEWS



lobby entrance



aerial view

COMMUNITY PHOTOS



Exhibit G

Site Control Agreement

Recorded by TICOR TITLE 36261 704032

AFTER RECORDING RETURN TO:

City of Beaverton
12725 SW Millikan Way
PO Box 4755
Beaverton, OR 97076

SEND TAX STATEMENTS TO:

City of Beaverton
12725 SW Millikan Way
PO Box 4755
Beaverton, OR 97076

Washington County, Oregon **2018-002192**
D-DW
Stn=4 A STROM 01/10/2018 01:15:33 PM
\$35.00 \$11.00 \$5.00 \$20.00 **\$71.00**

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard Hobernicht, Director of
Assessment and Taxation, Ex-Officio

STATUTORY WARRANTY DEED

Portland Central Church A/G, an Oregon nonprofit corporation, formerly Central Church Assembly of God of Portland, Grantor, conveys and warrants to the City of Beaverton, an Oregon municipal corporation, Grantee, the following described real property free of encumbrances, except as specifically set forth in attached Exhibit 1 entitled "Permitted Exceptions":

SEE ATTACHED EXHIBIT A

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSONS RIGHTS, IF ANY, UNDER ORS AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY THAT THE UNIT OF LAND BEING TRANSFERRED IS A LAWFULLY ESTABLISHED LOT OR PARCEL, AS DEFINED IN ORS 92.010 OR 215.010, TO VERIFY THE APPROVED USES OF THE LOT OR PARCEL, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES, AS DEFINED IN ORS 30.930, AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010.

The true consideration for this conveyance is \$299,000.

[SIGNATURE PAGE FOLLOWS]

AFTER RECORDING RETURN TO:

City of Beaverton
12725 SW Millikan Way
PO Box 4755
Beaverton, OR 97076

SEND TAX STATEMENTS TO:

City of Beaverton
12725 SW Millikan Way
PO Box 4755
Beaverton, OR 97076

STATUTORY WARRANTY DEED

Portland Central Church A/G, an Oregon nonprofit corporation, formerly Central Church Assembly of God of Portland, Grantor, conveys and warrants to the City of Beaverton, an Oregon municipal corporation, Grantee, the following described real property free of encumbrances, except as specifically set forth in attached Exhibit 1 entitled "Permitted Exceptions":

SEE ATTACHED EXHIBIT A

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The true consideration for this conveyance is \$299,000.

[SIGNATURE PAGE FOLLOWS]

Recorded by TICOR TITLE 36261704030

Dated: January 10, 2018.

Portland Central Church A/G, an Oregon nonprofit corporation, formerly Central Church Assembly of God of Portland

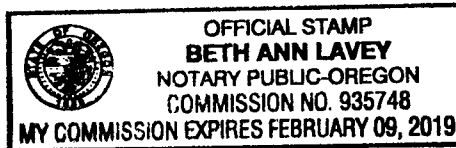
By: [Signature]
Its: _____

State of Oregon
County of Washington

This instrument was acknowledged before me on January 9, 2018, 2018,
by Samuel H. Ahn, as President of
the Portland Central Church A/G, an Oregon nonprofit corporation, formerly Central Church Assembly of
God of Portland.

[Signature]

Notary Public for the State of Oregon
My commission expires: 2/9/19



Seal:

The City of Beaverton, an Oregon municipal corporation, hereby approves and accepts the attached conveyance of title and interest.

City of Beaverton

By: _____
Denny Doyle, Mayor

State of Oregon
County of Washington

This instrument was acknowledged before me on _____, 2018,
by Denny Doyle as Mayor of the City of Beaverton.

Notary Public for the State of Oregon
My commission expires: _____

Seal:

Dated: January 10, 2018.

Portland Central Church A/G, an Oregon nonprofit corporation, formerly Central Church Assembly of God of Portland

By: _____

Its: _____

State of Oregon
County of Washington

This instrument was acknowledged before me on _____, 2018,
by _____, as _____ of
the Portland Central Church A/G, an Oregon nonprofit corporation, formerly Central Church Assembly of
God of Portland.

Notary Public for the State of Oregon

My commission expires: _____

Seal:

The City of Beaverton, an Oregon municipal corporation, hereby approves and accepts the attached conveyance of title and interest.

City of Beaverton

By: Denny Doyle
Denny Doyle, Mayor

State of Oregon
County of Washington

This instrument was acknowledged before me on January 9, 2018,
by Denny Doyle as Mayor of the City of Beaverton.

Carla Renae Saunders

Notary Public for the State of Oregon

My commission expires: 08-02-19

Seal:

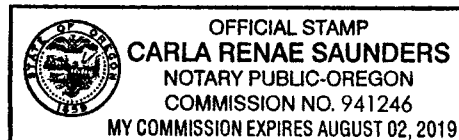


EXHIBIT A
LEGAL DESCRIPTION

EXPLANATION: THIS LEGAL DESCRIPTION IS PREPARED FOR CENTRAL CHURCH ASSEMBLY OF GOD AND THE CITY OF BEAVERTON FOR THE PURPOSE OF DESCRIBING A PARCEL OF LAND WITHIN PARCEL IAS SHOWN IN DEED 83-046699 IN THE WASHINGTON COUNTY RECORDERS OFFICE LOCATED SOUTH OF S.W. ALLEN BOULEVARD WEST OF S.W. HALL BOULEVARD, LYING IN THE NORTHEAST QUARTER (NE 1/4) OF SECTION 21, TOWNSHIP 1 SOUTH, RANGE 1 WEST, W.M., WASHINGTON COUNTY, OREGON.

A PARCEL OF LAND DESCRIBED WITHIN DEED 83-046699 AS PART OF PARCEL I IN THE CITY OF BEAVERTON, WASHINGTON COUNTY, STATE OF OREGON AND DESCRIBED AS FOLLOWS:

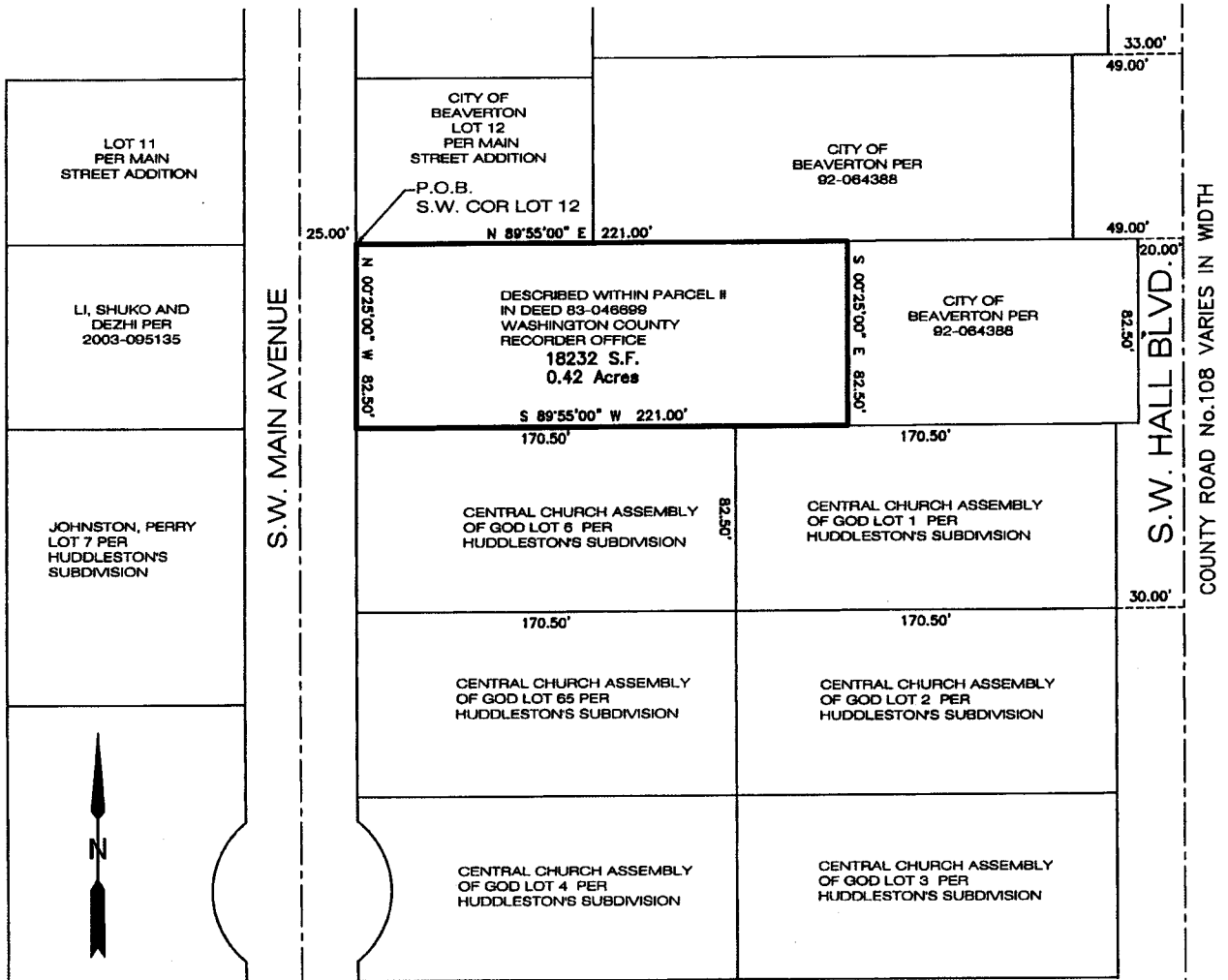
BEGINNING AT THE SOUTHWEST CORNER OF LOT 12 OF MAIN STREET ADDITION RECORDED SUBDIVISION IN BOOK 12, PAGE 50 WASHINGTON COUNTY RECORDERS OFFICE ALSO BEING ON THE EASTERLY RIGHT OF WAY LINE OF S.W. MAIN STREET; THENCE NORTH 89°55'00" EAST, A DISTANCE OF 221.00 FEET TO THE NORTHWEST CORNER OF CITY OF BEAVERTON PARCEL AS RECORDED IN DEED 92-064388 IN WASHINGTON COUNTY RECORDERS OFFICE; THENCE SOUTH 00°25'00" EAST, A DISTANCE OF 82.50 FEET TO THE SOUTHWEST CORNER OF SAID DEED 92-064388; THENCE SOUTH 89°55'00" WEST, A DISTANCE OF 221.00 FEET TO THE EAST RIGHT OF WAY LINE OF S.W. MAIN STREET; THENCE NORTH 00°25'00" WEST, A DISTANCE OF 82.50 FEET TO THE POINT OF BEGINNING.

HAVING AN AREA OF 18,232 SQUARE FEET, MORE OR LESS

SEE EXHIBIT "B", ATTACHED HERETO AND BY THIS REFERENCE MADE A PART HEREOF.

EXHIBIT B

LYING IN NORTHEAST QUARTER (NE 1/4) OF SECTION 21, OF TOWNSHIP 1 SOUTH, RANGE 1 WEST, W.M., WASHINGTON COUNTY, OREGON



REGISTERED PROFESSIONAL LAND SURVEYOR

Martin T. Sprague

OREGON
JULY 09 2013
MARTIN T. SPRAGUE
81280

1/4/18

RENEWAL DATE 06/30/18

SHEET 1 OF 1

Y:\SURVEY\CIP PROJECTS\Annex\2014-006\dwg\exhibit B.dwg



PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

JOB NO: 14-006
DATE: 11.02.17

REVISION: _____

DRAWN BY: MTS
CHECKED BY: MTS

REVISION: _____

APPROVED BY: _____

EXHIBIT 1

PERMITTED EXCEPTIONS

Order No.: 36261704032

1. The subject property is under public, charitable, fraternal, or religious organization ownership and is exempt from ad valorem taxation. Any change in ownership prior to delivery of the assessment roll may result in tax liability.

Tax Account No.: R171414, 1S121AA-00700

2. Covenants, conditions and restrictions but omitting any covenants or restrictions, if any, including but not limited to those based upon race, color, religion, sex, sexual orientation, familial status, marital status, disability, handicap, national origin, ancestry, source of income, gender, gender identity, gender expression, medical condition or genetic information, as set forth in applicable state or federal laws, except to the extent that said covenant or restriction is permitted by applicable law, as set forth in the document

Recording Date: April 12, 1951

Recording No: Miscellaneous Records Book 'N', Page 557

3. Easement(s) for the purpose(s) shown below and rights incidental thereto, as granted in a document:

Granted to: Portland General Electric Company

Purpose: Electric power line easement

Recording Date: May 9, 1983

Recording No: 83-015736

Affects: Strip 16 feet in width - Reference is hereby made to said document for location

4. Easement as disclosed by Deed

Recording Date: December 16, 1983

Recording No.: 83-046699

Affects: Strip 10 feet in width for gravel driveway

The exact location and extent of said easement is not disclosed of record.



Certification of Charges Paid
(2015 Oregon Laws Chapter 96)

Certification #

2018-002

All charges against the real property have been paid for the property that is the subject of the deed between:

Grantor

Central Church Assembly of God of Portland

Grantee

City of Beaverton

Signed on (date)

and for consideration of

\$ 299,000

Assessor's signature

Theresa R Ellis

Date

January 10th, 2018

1015
80-11
TI

TICOR TITLE
INSURANCE

92064388
Washington County

91061659
Washington County

STATUTORY BARGAIN AND SALE DEED

By this instrument THOMAS AND LINDA CARTER, Grantors, conveys and warrants to the CITY OF BEAVERTON, Grantee, the real property described in Exhibit "A" free and clear of any and all encumbrances, together with all improvements thereon, whereis, as is.

The true consideration for this conveyance is \$63,000 and other considerations.

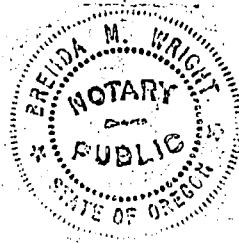
Dated this 19 day of May, 1991.

THOMAS CARTER

Thomas J Carter
Grantor

Acknowledged before me this 23rd day of May, 1991.

Brenda M. Wright
Notary Public for Oregon
My commission expires: 9-9-92



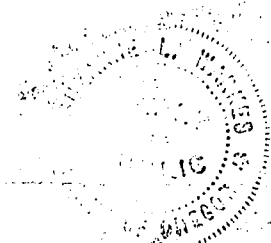
24 134 302

LINDA CARTER

Linda K Carter
Grantor

Acknowledged before me this 28th day of May, 1991.

Joseph R. Jones
Notary Public for Oregon
My commission expires: 2/2/93



Accepted for Grantee on condition that all taxes due on the property conveyed by this instrument have been paid.

Larry D. Cole
Larry D. Cole, Mayor

THIS DEED IS BEING RE-RECORDED TO CORRECT THE LEGAL DESCRIPTION OF THAT CERTAIN DEED RECORDED 11-15-91 FEE NO. 91061659, RECORDS OF WASHINGTON COUNTY, OREGON.

STATUTORY BARGAIN AND SALE DEED

1-2 1-3

000120

SEP 16 1992

000121

000121

000122

SEP 16 1992

File No. 2
Parcel 1

Exhibit "A"

~~A parcel of land lying in the Northeast Quarter of the Northeast Quarter (NE 1/4 NE 1/4) of Section 21, Township 1 South, Range 1 West, Willamette Meridian, Washington County, Oregon and a portion of that property known as Tax Lot 602, 1S1-21AA and described in that deed to Thomas J. Carter and Linda K. Carter, husband and wife, recorded as fee number 79012295, in Washington County Film Records; The said parcel being that portion of said property included in a strip of land 40 feet in width, lying on the westerly side of the centerline of SW Hall Blvd. The basis for the description of the centerline of SW Hall Blvd. is the Caswell Survey of SW Hall Blvd. for the City of Beaverton dated February 1983, County Survey Number 20,290.~~

~~The westerly line of said strip of land crosses the southerly and northerly lines of said property at 41.5 feet left (westerly) of approximate Station 164+22.79 and at 41.5 feet left (westerly) of approximate Station 165+05.52, respectively.~~

~~The parcel of land to which this description applies contains 1576 square feet, more or less, outside of the existing right-of-way.~~

Parcel 2

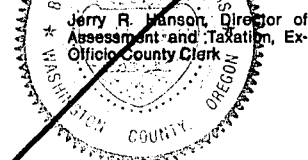
~~A parcel of land lying in the Northeast Quarter of the Northeast Quarter (NE 1/4 NE 1/4) of Section 21, Township 1 South, Range 1 West, Willamette Meridian, Washington County, Oregon and a portion of that property known as Tax Lot 602, 1S1-21AA and described in that deed to Thomas J. Carter and Linda K. Carter, husband and wife, recorded as fee number 79012295, in Washington County Film Records; The said parcel being that portion of said property lying between lines parallel with and 41.5 feet westerly and 51.5 feet westerly of the center line of SW Hall Blvd., as established by County Survey number 20290.~~

~~The parcel of land to which this description applies contains 825 square feet, more or less.~~

STATE OF OREGON
County of Washington

} SS

I, Jerry R. Hanson, Director of Assessment and Taxation and Ex-Officio Recorder of Conveyances for said county, do hereby certify that the within instrument of writing was received and recorded in book of records of said county.



2 2

Doc 91061659
Recd: 65119 38.00
12/05/1991 10:19:25AM

AMENDED DESCRIPTION

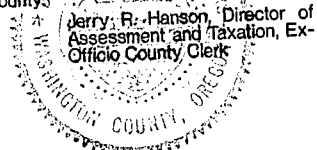
The East 150 feet of the following described real property situated in Section 21, Township 1 South, Range 1 West, Willamette Meridian, Washington County, Oregon:

Beginning at a point on the East line of Section 21, Township 1 South, Range 1 West of the Willamette Meridian, Washington County, Oregon, South 495.0 feet from the Northeast corner thereof which point is the Northeast corner of that certain tract of land conveyed to Hiram S. and Laura Davis by Deed recorded in Book 180, Page 493, Records of Deeds and running thence on the North line of said Davis Tract West 371 feet to the East line of S. W. 126th Avenue, thence South along said East line 82.5 feet to the North line of plat of HUDDLESTON'S SUBDIVISION; thence East along said North line 371 feet to the East line of Section 21; thence North along the East line of Section 21, 82.5 feet to the point of beginning.-----

SEP 16 1992

STATE OF OREGON }
County of Washington } SS

I, Jerry R. Hanson, Director of Assessment and Taxation and Ex-Officio Recorder of Conveyances for said county, do hereby certify that the within instrument of writing was received and recorded in book of records of said county.



Doc : 92064388
Rect: 85267 23.00
09/16/1992 02:54:06PM

3

Exhibit H
Financial Statements

CITY OF BEAVERTON, OREGON
GOVERNMENTAL FUNDS
BALANCE SHEET
June 30, 2017

	General Fund	Street Fund	Library Fund	Capital Development Fund	Other Governmental Funds	Total
Assets:						
Cash and investments	\$20,101,142	\$4,083,524	\$2,037,106	\$36,384,513	\$21,609,591	\$84,215,876
Property taxes receivable	1,620,539		140,531		205,154	1,966,224
Court fines receivable	2,532,861					2,532,861
Right of way/other receivables, net	1,471,068	30,162			526,614	2,027,844
Accrued interest receivable	71,064	9,897	7,450	39,484	52,500	180,395
Due from other funds	119,956					119,956
Due from other governments	404,661	522,216			406,236	1,333,113
Grants receivable	408,935				289,528	698,463
TOTAL ASSETS	\$26,730,226	\$4,645,799	\$2,185,087	\$36,423,997	\$23,089,623	\$93,074,732
Liabilities, Deferred Inflows of Resources, and Fund Balances:						
Liabilities:						
Accounts payable	\$596,694	\$483,485	\$134,714	\$139,020	\$1,882,795	\$3,236,708
Accrued salaries and payroll taxes	1,091,703	57,534	151,350		90,263	1,390,850
Interest payable					10,049	10,049
Due to other funds					119,956	119,956
Due to other governments	570,879				65,820	636,699
Deposits and retainages payable	1,183,783			12,611	2,477	1,198,871
Total Liabilities	3,443,059	541,019	286,064	151,631	2,171,360	6,593,133
Deferred inflows of resources:						
Unavailable revenue - municipal court fines	1,965,716					1,965,716
Unavailable revenue - property taxes	1,495,566		129,186		187,903	1,812,655
Unavailable revenue - transportation development tax					510,900	510,900
Unavailable revenue - assessment liens, and interest	71,064	9,897	7,450	39,484	66,908	194,803
Total Deferred Inflows of Resources	3,532,346	9,897	136,636	39,484	765,711	4,484,074
Fund balances:						
Restricted		4,094,883	1,762,387	34,667,297	18,439,155	58,963,722
Committed	933,063			1,565,585	1,713,397	4,212,045
Assigned	8,893,805					8,893,805
Unassigned	9,927,953					9,927,953
Total Fund Balances	19,754,821	4,094,883	1,762,387	36,232,882	20,152,552	81,997,525
TOTAL LIABILITIES, DEFERRED INFLOWS OF RESOURCES AND FUND BALANCES	\$26,730,226	\$4,645,799	\$2,185,087	\$36,423,997	\$23,089,623	\$93,074,732

CITY OF BEAVERTON, OREGON
STATEMENT OF ACTIVITIES
For the Fiscal Year Ended June 30, 2017

Functions/Programs	Expenses	Program Revenues			Net (Expense) Revenue and Change in Net Position		
		Charges for Services	Operating Grants and Contributions	Capital Grants and Contributions	Governmental Activities	Business-Type Activities	Total
Governmental activities:							
General government	\$38,232,521	\$9,433,303	\$1,339,454		(\$27,459,764)		(\$27,459,764)
Public safety	32,564,955	6,009,900	975,516		(25,579,539)		(25,579,539)
Highways and streets	10,836,814	93,709	6,032,502	\$3,614,147	(1,096,456)		(1,096,456)
Education	9,893,084	204,667	5,629,614		(4,058,803)		(4,058,803)
Cultural and recreation	1,025,135		3,070		(1,022,065)		(1,022,065)
Interest on long-term debt	745,611				(745,611)		(745,611)
Total governmental activities	93,298,120	15,741,579	13,980,156	3,614,147	(59,962,238)		(59,962,238)
Business-type activities:							
Water	9,899,339	12,581,709		694,169		\$3,376,539	3,376,539
Sewer	5,339,405	5,072,218		261,402		(5,785)	(5,785)
Storm drain	5,706,747	5,387,945		1,163,357		844,555	844,555
Total business-type activities	20,945,491	23,041,872		2,118,928		4,215,309	4,215,309
Total government	\$114,243,611	\$38,783,451	\$13,980,156	\$5,733,075	(59,962,238)	4,215,309	(55,746,929)
General revenues:							
Taxes:							
Property taxes, levied for general purposes					39,807,575		39,807,575
Property taxes, levied for debt service					1,739,224		1,739,224
City tax levied for lodging and marijuana					873,006		873,006
Intergovernmental revenues, unrestricted					3,327,083		3,327,083
Right of way fee revenues					8,526,616		8,526,616
Right of way fee revenues, allocated for debt service					1,084,060		1,084,060
Unrestricted investment earnings					600,708	334,342	935,050
Other revenues					1,562,736	153,959	1,716,695
Total general revenues					57,521,008	488,301	58,009,309
Change in net position					(2,441,230)	4,703,610	2,262,380
Net position--Beginning					164,389,722	227,993,174	392,382,896
Net position--Ending					\$161,948,492	\$232,696,784	\$394,645,276

CITY OF BEAVERTON, OREGON
GOVERNMENTAL FUNDS
BALANCE SHEET
June 30, 2016

	General Fund	Street Fund	Library Fund	Building Fund	Other Governmental Funds	Total
Assets:						
Cash and investments	\$20,726,759	\$3,795,921	\$1,876,629	\$2,700,940	\$12,495,977	\$41,596,226
Property taxes receivable	1,484,935		129,180		177,545	1,791,660
Court fines receivable	2,384,070					2,384,070
Assessment liens receivable					17,040	17,040
Right of way/other receivables, net	1,391,456	128,854			9,061	1,529,371
Accrued interest receivable	37,246	3,866	3,489	3,271	19,358	67,230
Due from other governments	810,428	522,718			281,552	1,614,698
Grants receivable	275,470				5,381	280,851
TOTAL ASSETS	<u>\$27,110,364</u>	<u>\$4,451,359</u>	<u>\$2,009,298</u>	<u>\$2,704,211</u>	<u>\$13,005,914</u>	<u>\$49,281,146</u>
Liabilities, Deferred Inflows of Resources, and Fund Balances:						
Liabilities:						
Accounts payable	\$729,403	\$303,880	\$123,435	\$3,467	\$361,084	\$1,521,269
Accrued salaries and payroll taxes	2,029,809	108,528	283,510	129,685	21,135	2,572,667
Due to other governments	549,959			206,384		756,343
Deposits and retainages payable	1,204,214			2,449		1,206,663
Total Liabilities	<u>4,513,385</u>	<u>412,408</u>	<u>406,945</u>	<u>341,985</u>	<u>382,219</u>	<u>6,056,942</u>
Deferred inflows of resources:						
Unavailable revenue - municipal court fines	1,844,207					1,844,207
Unavailable revenue - property taxes	1,365,189		118,479		162,204	1,645,872
Unavailable revenue - assessment liens and interest	37,246	3,866	3,489	3,271	36,399	84,271
Total Deferred Inflows of Resources	<u>3,246,642</u>	<u>3,866</u>	<u>121,968</u>	<u>3,271</u>	<u>198,603</u>	<u>3,574,350</u>
Fund balances:						
Restricted		4,035,085	1,480,385	2,358,955	11,261,751	19,136,176
Committed	932,017				1,163,341	2,095,358
Assigned	9,123,665					9,123,665
Unassigned	9,294,655					9,294,655
Total Fund Balances	<u>19,350,337</u>	<u>4,035,085</u>	<u>1,480,385</u>	<u>2,358,955</u>	<u>12,425,092</u>	<u>39,649,854</u>
TOTAL LIABILITIES, DEFERRED INFLOWS OF RESOURCES AND FUND BALANCES	<u>\$27,110,364</u>	<u>\$4,451,359</u>	<u>\$2,009,298</u>	<u>\$2,704,211</u>	<u>\$13,005,914</u>	<u>\$49,281,146</u>

CITY OF BEAVERTON, OREGON
STATEMENT OF ACTIVITIES
For the Fiscal Year Ended June 30, 2016

Functions/Programs	Expenses	Program Revenues			Net (Expense) Revenue and Change in Net Position		
		Charges for Services	Operating Grants and Contributions	Capital Grants and Contributions	Governmental Activities	Business-Type Activities	Total
Governmental activities:							
General government	\$37,849,035	\$8,909,143	\$914,721	\$907,540	(\$27,117,631)		(\$27,117,631)
Public safety	38,856,196	5,815,882	579,401		(32,460,913)		(32,460,913)
Highways and streets	10,926,614	184,635	5,981,528	2,379,921	(2,380,530)		(2,380,530)
Education	11,269,286	273,580	5,061,326		(5,934,380)		(5,934,380)
Cultural and recreation	1,133,869		95,062		(1,038,807)		(1,038,807)
Interest on long-term debt	462,607				(462,607)		(462,607)
Total governmental activities	100,497,607	15,183,240	12,632,038	3,287,461	(69,394,868)		(69,394,868)
Business-type activities:							
Water	9,554,092	13,242,782		1,154,845		\$4,843,535	4,843,535
Sewer	6,280,766	4,866,611		185,752		(1,228,403)	(1,228,403)
Storm drain	6,037,493	5,216,225		989,635		168,367	168,367
Total business-type activities	21,872,351	23,325,618		2,330,232		3,783,499	3,783,499
Total government	\$122,369,958	\$38,508,858	\$12,632,038	\$5,617,693	(69,394,868)	3,783,499	(65,611,369)
General revenues:							
Taxes:							
Property taxes, levied for general purposes					37,675,716		37,675,716
Property taxes, levied for debt service					1,743,748		1,743,748
Intergovernmental revenues, unrestricted					3,217,592		3,217,592
Right of way fee revenues					8,180,364		8,180,364
Franchise revenues, allocated for debt service					1,084,060		1,084,060
Unrestricted investment earnings					247,303	214,003	461,306
Loss on sale of land					(835,430)		(835,430)
Other revenues					741,055	77,480	818,535
Total general revenues					52,054,408	291,483	52,345,891
Change in net position					(17,340,460)	4,074,982	(13,265,478)
Net position--as previously reported					181,820,546	227,788,553	409,609,099
Adjustment for pension and OPEB (Note III.G.)					(90,364)	90,364	
Adjustment to Investment in Joint Venture (Note III.G.)						(3,960,725)	(3,960,725)
Net position - as restated					181,730,182	223,918,192	405,648,374
Net position--ending					\$164,389,722	\$227,993,174	\$392,382,896

Exhibit I

Secured Funding Sources



June 15, 2018

Portland General Electric
121 SW Salmon Street
Portland, OR 97204

Dear Selection Committee,

It is with great pleasure that we submit the following proposal in pursuit of a PGE Renewable Development Fund award for the new Beaverton Public Safety Center's photovoltaic system. In 2016, Beaverton voters passed a \$35 million bond to construct a new Public Safety Center at 12500 SW Allen Boulevard. The building will house the Beaverton Police Department as well as the city's Emergency Operation Center, allowing those departments to move out of a building that is located in a flood plain and is not built to current seismic standards. The new Public Safety Center will be an essential facility designed to remain fully operational after a major earthquake or other disaster, so that emergency services can be provided to the community during a crisis.

High resiliency and environmental goals have been set for the project and a robust photovoltaic system is a key element to achieving those goals. The project is a part of the Energy Trust of Oregon's Path to Net Zero program and seeks to maximize the size of its photovoltaic system to minimize energy use.

The City of Beaverton is proposing to install a 302kW photovoltaic system at a cost of \$985,784, which is proposed to be funded as follows:

\$210,000 – City of Beaverton

\$250,000 – ODOE Renewable Energy Development (RED) Grant [pending]

\$50,000 – Energy Trust of Oregon

\$564,589 – PGE Renewable Development Fund

\$1,074,589 Total Photovoltaic System Cost

If Portland General Electric grants the \$564,589 requested for the project, the City of Beaverton is committed to funding the City's \$210,000 portion of the funding plan, as well as up to an additional \$300,000 required if the city is not successful in securing funding from the Oregon Department of Energy RED grant or the Energy Trust of Oregon.

We are excited by the opportunity to partner with PGE to incorporate a vitally important photovoltaic system into our new Public Safety Center. We thank you for your time and consideration.

Sincerely,

A handwritten signature in blue ink that reads "Denny Doyle". The signature is written in a cursive style with a large initial "D".

Denny Doyle
Mayor

Certified

A RESOLUTION APPROVING THE RECORDING OF \$34,999,828 IN PROCEEDS FROM THE GENERAL OBLIGATION BONDS, SERIES 2017, IN THE CAPITAL DEVELOPMENT FUND OF THE CITY DURING THE FY 2016-17 BUDGET YEAR AND APPROVING THE APPROPRIATIONS FOR THE FUND

WHEREAS, the City Council reviews and approves the annual budget; and,

WHEREAS, during the year the Council may authorize the receipt of general obligation bonds sale proceeds and approve the associated appropriations of the bond sale through a Special Purpose Budget Adjustment Resolution; and,

WHEREAS, \$34,999,828 was received by the City from the General Obligation Bonds, Series 2017, bond sale to construct and equip a new public safety center, and the Council desires to record the bond sale proceeds and appropriate expenditures associated with the bond sale totaling \$398,617 and provide \$500,000 for estimated expenditures for the public safety center for the remainder of FY 2016-17; now therefore,

BE IT RESOLVED BY THE COUNCIL OF THE CITY OF BEAVERTON, OREGON:

Section 1. The Finance Director is hereby authorized and instructed to adjust the Capital Development Fund budget to reflect receipt of proceeds from the General Obligation Bonds, Series 2017, and the associated appropriations as follows:

Capital Development Fund – Public Safety Center Project 3509

Revenues:

Bond Sale Proceeds 301-03-3509-451 \$34,999,828

Expenditures:

Bond Issuance Costs 301-70-3509-497 \$ 99,118

Underwriter's Discount 301-70-3509-498 \$ 299,499

Capital Outlay Expense 301-70-3509-683 \$ 500,000

Contingency 301-70-3509-991 \$34,101,211

Adopted by the Council this 21st day of March, 2017.

Approved by the Mayor this 22nd day of March, 2017.

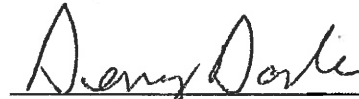
Ayes: 4

Nays 0

ATTEST:

APPROVED:


Catherine Jansen, City Recorder


Denny Doyle, Mayor

STATE OF OREGON
COUNTY OF WASHINGTON }
CITY OF BEAVERTON

§§ CERTIFICATION

I, CATHERINE JANSEN, Recorder for the City of Beaverton,
Washington County, Oregon, certify and attest that I have compared this copy
with its original and determined this instrument is a true and correct copy of the
original which is part of the official records of the City of Beaverton, Oregon.

Dated this 22ND day of MARCH, 2017.

Catherine Jansen
RECORDER, City of Beaverton

Exhibit J
Contractor Bids

SKANSKA

June 11, 2018

Shiels Oblatz Johnsen, Inc. 1140
SW 11th Ave.
Suite 500
Portland, OR 97205

RE: Beaverton Public Safety Center Photovoltaic System Proposal

Attn: Francesca Gambetti

Skanska is pleased to provide this budget proposal to furnish and install a 302kW Roof-Mounted Photovoltaic System on the Beaverton Public Safety Center. This proposal is based on the Design Development Documents prepared by FFA Architecture dated May 2, 2018 and supplemental PV design and equipment specifications provided by Imagine Energy.

Component	Cost
Design and Installation of the Photovoltaic system (see attached proposal from Imagine Energy)	\$ 727,832
Rooftop structural framework to support PV system	\$ 112,200
Patching of roof penetrations	\$ 14,800
Trenching and conduit between electrical room and covered parking	\$ 6,500
Upsize Main Distribution Board to 4000A for Battery Back-up System	\$ 55,000
SUBTOTAL	\$ 916,332
Contingency, Insurance, Bonds, & CM/GC Fee	\$ 139,740
TOTAL	\$ 1,056,072

Final system pricing may vary depending upon any modifications made in the final building design, and taxes and tariffs in effect at the time of system purchase, but a contingency is included to mitigate cost increases.

Please contact me if you need additional clarification. We appreciate the opportunity to be of service.

Regards,



David Standley
Preconstruction Director
Skanska USA Building, Inc.



Energy Systems Contract

June 15, 2018

GC: Skanska
222 SW Columbia St
Portland, OR 97201
503.382.0900

Owner: **Eric Oathes**
4755 SW Griffith Dr
Beaverton, OR 97005
503.536.2260
eoathes@beavertonoregon.gov

**PROJECT SCOPE :: BEAVERTON PUBLIC SAFETY
INCLUDES ALL LABOR AND MATERIALS FOR THE FOLLOWING TASKS:**

302.75 kW GRID-TIED PHOTOVOLTAIC SYSTEM \$727,832

(865) Silfab 350w Solar PV Modules

25-year linear performance guarantee, 12-year warranty
Tier 1 Solar Modules

INCENTIVES:

\$50,000 ETO Rebate

(4) SolarEdge SE66.6K Grid-Tied Inverters

97% efficiency rating, integrated DC disconnect switch, 12-year warranty

Incentives estimates based on current rates the date of contract. ETO incentive rates are subject to change and are not secured until applications have been submitted and accepted, typically 3-4

IronRidge XR-1000 Mounting System

Clear anodized aluminum racking system w/ all stainless steel mounting hardware
Comes with rails, clamps, junctions, L-feet, lag screws, and all connecting hardware
Mounted to engineered steel structure above roof deck on main building

INCLUSIONS

- All local permits
- All wiring, conduit, disconnects, and grounding according to 2019 NEC
- Commission system with you present
- Provide filing assistance for all incentive + net-metering paperwork
- Provide 10-year warranty on all parts and labor + manufacturer's warranties
- Provide system operation and safety walkthrough, and owner's manual with all design documentation

APPROXIMATE SAVINGS

312,438 kWh/yr

EXCLUSIONS

- Net metered saving amounts are estimates only and are not guaranteed**
- Structural modifications as required by local jurisdiction**
- Repair to existing roof conditions on a T+M basis**
- Changes in design/ scope of work related to utility reqs after interconnection application**
- Conduit runs other than originally planned may be accommodated for additional expense**
- Trenching between carports and electrical room**
- Above-roof steel structure and carport structure to be built and provided by Skanska**

FIRST COST TO CLIENT \$727,832

Zach Parrott

Date

Skanska Authorized Representative

Date

Energy Systems Contract

Jun 15, 2018

GC: Skanska
222 SW Columbia St
Portland, OR 97201
503.382.0900

Owner: **Eric Oathes**
4755 SW Griffith Dr
Beaverton, OR 97005
503.536.2260
eoathes@beavertonoreg

PAYMENTS AND CONDITIONS

- 20% due upon signing [\$145,566.40], 50% due at material delivery [\$363,916] and 30% due upon final inspection [\$218,349.60]
- Payment includes costs listed above plus and any accrued consulting hours.
- Cash, Check, and Bank Transfer payments accepted. A 3% charge will be added for credit card transactions.
- Contract pricing expires after 30 days

One and one-half percent interest per month on the unpaid balance will be charged on delinquent accounts after 30 days. Payments received on this account will first be applied to service changes and then to balance of fees. Client agrees that the invoice balance is correct unless the Contractor is notified in writing within 10 days of the invoice date. If the Contractor brings an action to collect Client's account, the prevailing party shall be entitled to reasonable collection and attorney fees at trial and on appeal. In the event of a non-payment of any invoice, the Contractor reserves the right to immediately stop working on this project and/or terminate this agreement. In the event of a work delay longer than 120 days, other than caused by weather, the Client may request to terminate the contract, in writing, after payment for all mutually approved and completed work performed. Services beyond the scope of the work outlined in this contract and/or changes that arise during the course of the project will be submitted for your approval in a change order.

COMMISSIONING/MANUAL

Imagine Energy will conduct a commissioning process for each system to prove its proper functionality and performance in a variety of modes. A complete instruction manual will be provided for each system, including design specifications, manufacturer's data, warranties, troubleshooting, and maintenance info. To be provided to general contractor for inclusion in their owner's manual.

INDEMNIFICATION

To the fullest extent permitted by law, the Clients shall indemnify, defend and hold harmless the Contractor and its agents, from and against claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from work performed outside of the scope of this contract, past the substantial completion date of the project, or performed by other Contractors, homeowners, or the Clients themselves.

WARRANTY

All work described herein is covered by a warranty period of (5) years from the walkthrough date of each substantial system. Imagine Energy, at its sole determination, will repair or replace components of the system that are improperly performing due to design or installation defects. The customer agrees to grant Imagine Energy the necessary time and opportunity to rectify any such fault. Some manufacturers of the major components of the system offer product warranties beyond the period of Imagine Energy's warranty. These warranties should be reviewed individually.

Exclusion of Liability: improper use or operation, force majeure (lightning, storm, fire, animals), physical abuse or damage, damage from other systems not installed by Imagine Energy, consequential damage due to system failure or poor performance.

We reserve the right to make alterations that will improve the system function.

INSURANCE

The Contractor represents that it has purchased and agrees that it will keep in force for the duration of the performance of the work or for such longer term as may be required by this agreement, in a company or companies lawfully authorized to do business in the States of Oregon and Washington, such insurance as will protect the Contractor and the owners of the site, if the site is not owned by the Clients, from claims for loss or injury which might arise out of or result from the Contractor's operations under this project.

The Contractor represents and agrees that said insurance is written for and shall be maintained in an amount not less than the limits of the liability specified below or required by law, whichever coverage is greater. The Contractor certifies that coverage written on a "claims made" form will be maintained without interruption from the commencement of work until the expiration of all applicable statutes of limitation.

- (1) Comprehensive General Liability with limits of not less than \$ 1,000,000 per occurrence.
- (2) Comprehensive Automobile Liability (owned, non-owned, hired) of \$ 300,000 for each accident.

WORKING HOURS

The Installation and Service Teams of Imagine Energy work Monday through Thursday, from 7 am to 5:30 pm. Imagine Energy will make every effort to accommodate our clients' schedules but work *required* to be performed outside of these hours may be subject to additional labor charges.

BACK-UP BID



ADVANCED
ENERGY
SYSTEMS



Turning tax liability into renewable energy

To: Derek Bourque - Skanska USA
Re: Beaverton Public Safety Center
Division 26 31 00

System Description:

A PV power system, including solar modules, a custom racking system, stainless steel hardware, DC/AC inverter(s), live solar monitoring web page and all necessary conduit, wire, fuses and disconnects for an NEC compliant system. Prevailing wages for on-site workers, trade permit, ETO incentive application, utility interconnection coordination included.

Base Bid - 301.92 kW Solar Electric (PV) System **\$829,930**

The price listed here does not subtract an available Energy Trust of Oregon Grant for \$50,000

Addenda Received and Reviewed:

Basic Budgetary Information received from Derek Bourque.

Exclusions (for all options):

- 1) Roofing products, seals (booting) to membrane roofing.
- 2) Payment and Performance Bonds.
- 3) Steel stantions and steel frame to support the Solar PV array.
- 4) ETO grant subject to "First come First Served" and may change in the future.

Relevant Certifications:

NABCEP Certification 091110-27 (Ken DenOuden, AES Supervising Electrician)
AES is a Trade Ally of the Energy Trust of Oregon (ETO)
Oregon Department of Energy (ODOE) Tax Credit Certified Installer (Eric Nill, AES Principal)
CCB 160523

For questions, or to signal acceptance of this bid, contact: Ken DenOuden, ken@aesrenew.com (541) 683-2345 x205

Confidentiality Notice: This document is for the sole use of the intended recipient(s) and may contain confidential and privileged information. Any unauthorized review, use, disclosure, or distribution is prohibited. If you are not the intended recipient, please contact the sender, and destroy all copies of the original document.

Advanced Energy Systems • 65 Centennial Loop, Eugene, OR 97401 • 541-683-2345 • www.aesrenew.com • CCB 160523



Engineering Costs	\$1,130
Design Costs	\$3,557
Equipment Costs	
Modules	\$245,196
Inverters	\$41,561
Electrical BOS	\$87,571
Racking System	\$93,281
Hardware	\$43,785
Labor Installation Costs	\$279,020
Permit Fees	\$15,395
Monitoring Costs	
Kiosk	\$2,177
Electrical BOS	\$2,119
Communication Comp.	\$1,015
Racking System	\$0
Hardware	\$0
Rental Equipment	\$14,124
TOTAL	\$829,930

Exhibit K

Project Development Timeline

Exhibit L

Education Plan

Beaverton Public Safety Center Solar Installation Education Plan

Installing a PV system in a community facility creates an opportunity to teach local residents about the environmental and economic benefits of renewable energy production. The state of the art technology will solidify the City of Beaverton as a leader in green energy production and an example for other development in the region. Below is a proposed plan for how the City and its Sustainability Coordinator will engage residents of Beaverton and visitors of the Public Safety Center with the solar installation.

- Prior to construction of the BPSC, the City will host a groundbreaking event, planned for August 2018, where it plans to announce publicly the incorporation of the PV system, as well as statistics including the amount of energy generated, the amount of tax dollars saved on a yearly basis, and other highlights. Although PGE RDF grant awardees will not yet be announced, we will acknowledge that we have submitted an application and appreciate PGE Green Future participants for allowing us the opportunity. The event is projected to attract 150-200 participants.
- Informational articles in the City of Beaverton's Newsletter, *Your City*, and media releases will highlight the sustainable features of the new BPSC and the funding incentives that were essential to bringing the project to fruition. Media blasts will recognize PGE Green Future participants, and direct people to PGE's website for information.
- The City has committed to installing an interactive educational kiosk in the lobby of the BPSC, providing real-time tracking of onsite solar production and historical generation, as well as equivalencies showing generated power as gas saved, carbon offset, and other data.
- Offer real-time tracking of power generation on the City's website. The breadth of this educational component of the project is vast, as it can be accessed from anywhere in the world.
- Integrate the PV data and technology into the STEM curriculum at local schools. Students will be able to access the data remotely via the website to gain a better understanding of photovoltaic system technology. The partnerships with the local STEM programs will be coordinated by a staff person from the city's Sustainability Department.
- All components combined, educational opportunities associated with the BPSC solar installation are projected to reach over 30,000 people.
- Further, educational components of the installation will recognize financial supporters of the system as a way of acknowledging the benefit of the financial investment and educating visitors on available resources for green energy.

Portland General Electric Renewable Development Fund 2018 Award Application Process - Application Form

Applications due Friday, June 15, 2018 by 5 p.m.

Thank you for your interest in applying for a Renewable Development Fund (RDF) award to help support the installation of your renewable energy project. Portland General Electric (PGE) strives to promote innovation and to work with customers and communities to increase the visibility of renewable energy generation technologies through education and community outreach.

Background

Through the RDF program, PGE provides opportunities to qualifying parties to receive financial support to help advance the construction of qualifying new non-residential renewable energy projects. For additional information on the RDF program and/or project funding please visit our website, portlandgeneral.com/RDF.

How to Apply for Funds

Step 1: Review applicant Q&A, eligibility requirements, award recipient responsibilities, and evaluation and selection criteria at portlandgeneral.com/RDF.

Step 2: Complete the application form and supplemental document checklist. Applicants must complete all fields in the application form provided in order for their project to be considered for funding. This application and supplemental material provided at the time of application will serve as the primary means by which projects will be evaluated. Portland General Electric and/or its designee may contact you for further information, so please provide current contact information. In an effort to ensure complete applications and earlier submissions, one week will be granted to applicants to amend their applications after being reviewed by the RDF Project Manager prior to the deadline. Please note that June 15, 2018 at 5 p.m. is still a hard deadline and any outstanding changes will not be accepted after that deadline.

Step 3: Submit completed application form, supplemental document checklist, and supplemental documents to Portland General Electric by 5 p.m. on 6/15/18 by sending to RenewableDevFund@portlandgeneral.com. Multiple emails are acceptable and expected based on the size of the application and number of appendices.

Questions about the funding award, the application, and the funding process should be submitted to RenewableDevFund@portlandgeneral.com.

Application/Award Timeline

Monday, 4/16/18	Portland General Electric begins accepting applications
Friday, 6/15/18	5 p.m. PDT – Submittal deadline
By Friday, 10/19/18	Applicants will be notified in writing of award decision; projects selected for funding will be asked to sign an agreement detailing the conditions and requirements of accepting Renewable Development Fund award. Funds will be disbursed upon completion of the project and once reporting requirements are met.

Please note: Project installations must be completed no later than June 30, 2020. (*Extensions to this timeline may be considered on a case-by-case basis for projects associated with the construction of a new building or structure*).

A. Summary Information

APPLICANT INFORMATION	
Project Name	Beaverton Public Safety Center Solar Installation
Project Lead <i>List name of host organization or project developer</i>	City of Beaverton
Type of organization <i>Government, private, nonprofit, etc.</i>	Local Government
Describe the project lead <i>Including but not limited to its mission, history, purpose and who it serves. Please address whether project lead and/or site is located in PGE service territory.</i>	<p>The City of Beaverton is a local government located in Washington County, Oregon, serving approximately 98,000 residents. The city has eight departments that are responsible for services, including public safety, utilities, street maintenance, library services, and permits and inspections. Beaverton is Oregon's sixth largest city and the second-largest incorporated city in Washington County. It has a diverse population of residents, with approximately 39% identifying as minorities and over 15% living at or below the poverty level.</p> <p>The proposed solar installation project will be located on the roof of the Beaverton Public Safety Center (BPSC), which will start construction in fall 2018. The BPSC will provide essential facilities for the Beaverton Police Department and the Emergency Management Program.</p> <p>The Beaverton Police Department employs 185 sworn and non-sworn personnel who are committed to providing a safe and livable community, and serve citizens with compassion and respect. They provide education programs, engage with the community and serve as mentors to area youth. The Department's mission is: To protect with courage. To serve with compassion. To lead with integrity.</p> <p>The Emergency Management Program develops and maintains the City's ability to prepare for, respond to, recover from, and mitigate against major emergencies and disasters. They coordinate available resources to combat emergencies effectively, and thereby minimize the loss of life and property, ensure continuity of government, and facilitate rapid recovery.</p> <p>The BPSC is located in PGE service territory.</p>
Have you read the <i>Eligibility Requirements</i> on our website and verified that the project satisfies these requirements?	Yes
Project lead organization website	Beavertonoregon.gov

<p>Primary project contact information: Name Title Phone number E-mail address Organization name Mailing Address Role in the project <i>Please note: This person will also be responsible for providing ongoing reporting for the project</i></p>	<p>Eric Oathes Police Captain 503-526-2289 eoathes@beavertonoregon.gov Beaverton Police Department PO Box 4755 Beaverton, Oregon 97076 Project Lead</p>
<p>Contractor/Installer/Engineer contact information: Name Title Phone number E-mail address Organization name Role in the project ETO Trade Ally? (check box) <input checked="" type="checkbox"/> <i>If more than one party, please briefly describe each role and identify a single contact willing to act as point person for the purposes of this funding application. If non-solar, please put N/A for ETO Trade Ally purposes.</i></p>	<p>Solar Consultant: Imagine Energy - ETO Solar Trade Ally Zach Parrott Energy Analyst z.parrott@imagineenergy.net Role: Solar Assessment</p> <p>Electrical Engineer: PAE Engineers Karina Hershberg 503.542.0534 Karina.hershberg@pae-engineers.com Role: Electrical Engineer / Develop design/build specifications for solar</p> <p>Structural Engineer: KPFF Stuart Finney, PE, SE 503.764.0549 Stuart.Finney@kpff.com</p> <p>Contractor: SKANSKA Kelly Roth Project Executive 503.382.0915 Kelly.roth@skansa.com Role: CM/GC</p> <p>*Note: The solar installer will be a subcontractor to Skanska and will be selected through a competitive process.</p>
<p>Project owner (if different from project lead). <i>If more than one party, describe ownership structure</i></p>	
<p>Name of individual completing application <i>Include affiliation and contact information if different from primary contact or contractor/installer/engineer</i></p>	<p>Francesca Gambetti Project Manager/Owner's Representative 503-970-1983 francesca@sojpdx.com Shiels Oblatz Johnsen, Inc. 1140 SW 11th Avenue, Ste 500 Portland, OR, 97205</p>

PROJECT INFORMATION	
<p>Physical address where project will be installed <i>Include facility name, street address, city, state, zip code, and/or GPS coordinates where appropriate.</i></p>	<p>Beaverton Public Safety Center 12500 SW Allen Boulevard Beaverton Oregon 97008</p>
<p>Is this project a new installation, an addition to an existing installation, an educational effort, or research and development? If a new installation, please address whether the project demonstrates a new or innovative technology, and if so how.</p>	<p>The BPSC solar project is a new installation and has the potential to serve as an innovative demonstration project. The new BPSC will provide essential facilities for the Beaverton Police Department and the Emergency Management Program. It will be built to critical facility standards so that it can provide emergency services to the community during disasters, including wind, flood, and earthquake events. The proposed Photovoltaic (PV) system is essential to achieving the resiliency and sustainability goals of the facility. In addition to providing green power to the facility during normal operations, it will supplement the emergency back-up power fueled by a diesel generator. The photovoltaic system will extend the duration of the diesel tank and provide essential power if diesel delivery is impeded during a disaster event.</p> <p>Further, our project team is in conversations with PGE about the potential for the BPSC project to participate in the utility's new Microgrid Pilot Project, which is currently going through the Oregon Public Utility Commission (PUC) approval process. Based on the site selection criteria proposed in PGE's PUC filing, the BPSC project would be a great fit as a potential site for a project. The City of Beaverton plans to make the facility battery-ready in anticipation of adding a robust battery backup system potentially in partnership with PGE. Since PGE's pilot project is still in development, the requirements and final design is to be determined. One potential design of the microgrid system could be that energy generated onsite could be utilized first by the building, and then charge the battery. During normal operations PGE might control and operate the battery storage for grid services; during outages the batteries could disconnect from the grid to power the BPSC. With this design, when grid power is lost in an emergency event, the battery and PV systems would become a functional microgrid to provide power to the building for indefinite emergency operations.</p>
<p>Technology type <i>Wind, solar, geothermal, etc.</i></p>	<p>Solar</p>
<p>Project size <i>Please represent in both kW DC and AC, where applicable.</i></p>	<p>302 kW DC / 267 kW AC</p>
<p>Is the project directly interconnected to the grid or will power be delivered to PGE pursuant to a PPA? <i>Projects must conform to one of these two scenarios to be eligible for a PGE Renewable Development Fund award.</i></p>	<p>During normal operating conditions, the PV array will be grid connected. Energy generated onsite will be utilized first by the building, then the battery, and lastly fed back to the grid in a net-metering arrangement with PGE. During emergency conditions, such as a long-term utility outage due to a major natural disaster, the PV system will serve the optional standby loads of the building allowing for the long-term operation of the mechanical, electrical and plumbing systems.</p>

Is this an onsite (behind the meter) project or utility-side (in front of the meter) project? ¹	Onsite project
Estimated annual kWh generation	331,800 kWh
If generation will be used onsite, what is the current annual kWh consumption of the facility where the power will be consumed? <i>If this is a new site, please provide the estimated annual kWh consumption. If this is a utility-side project, mark N/A.</i>	The anticipated annual building demand is 824,000 kWh. The proposed PV array will generate enough production annually to offset approximately 40% of the building load.
Anticipated commissioning/on-line date	1/31/2020
Has the project identified interconnection options and been in contact with the utility's customer generation group? <i>Please contact Netmetering@pgn.com for questions and proper documentation. For additional information, visit PGE's interconnection web page.</i>	The project has identified interconnection options and has been coordinating with PGE's customer generation group to complete the Application for Net Metering Facility Interconnection, Level 2 Interconnection.
RENEWABLE DEVELOPMENT FUND INFORMATION	
Has your organization applied for or received a Renewable Development Fund award in the past? <i>If yes, describe the project, whether an award was granted, and the application year. Specify whether the prior project is the same project proposed in this application.</i>	No, the City of Beaverton has not applied for or received a Renewable Development Fund award in the past.
How did you hear about the Renewable Development Fund program? Please be specific.	We were notified about the RDF program through our communications with PGE representatives regarding the Microgrid Pilot Project. Also, the City's consultants have previous experience with the RDF program.
If your project involves solar PV, have you reserved your Energy Trust solar incentive?	In process. The project is enrolled in Energy Trust's Solar program, and has submitted the Incentive Application, which is currently under review. The project is also officially enrolled in Energy Trust's New Buildings Program and the Path to Net Zero Program.

¹ **Onsite projects** generate electricity that is consumed onsite and excess electricity is passed through a meter and onto the grid. **Utility-side projects** are intended to provide power directly to the grid.

B. Project Narrative

PROJECT FEASIBILITY

1. Provide a brief summary of the proposed renewable energy project, including the goals of the project and how it ties into the overall mission of the host organization.

Include why the particular technology was chosen and why the specific location is suitable for the proposed technology. What will this project add to your organization/community?

The new BPSC will provide essential facilities for the Beaverton Police Department (BPD) and Emergency Management Program (EMP). The main, three-story, 73,000 square-foot building will include emergency management training spaces, community rooms, office space, booking facilities, property and evidence storage, locker rooms and physical fitness facilities. As a civic facility, the site is designed to incorporate substantial public space and will contribute to the community vision for equitable revitalization and improvement of the broader neighborhood.

The BPD and EMP currently operate out of a building that was not designed for public safety functions and is not well suited to the specialized space requirements. Additionally, the building does not meet modern earthquake safety standards and is located in the flood plain. This new facility is urgently needed for the relocation of these essential departments.

The new BPSC will be built to critical facility standards so that it can provide emergency services to the community during disasters—including wind, flood, and earthquake events. The proposed 302kW PV system is essential to achieving the project’s resiliency and sustainability goals. In addition to providing solar power to the facility during normal operations, it will be partnered with a 1 megawatt diesel generator to provide emergency back-up power.

The PV system plays a critical role since experts anticipate that in the event of a major earthquake, it could be weeks until transportation services are functional again. Since generators (diesel and natural gas) rely on outside fuel sources, their operation will be limited to the amount of fuel available at the time of the event. In the case of diesel, this limitation is the fuel in the storage tank and the ability for it to be refilled. For natural gas, fuel could be unavailable if natural gas lines are disrupted during the event. An onsite PV system, especially if partnered with a battery system, can run indefinitely without requiring any outside inputs.



Figure 1. Rendering of North Elevation (from SW Allen Blvd.)

Further, the BPSC Project Team is in conversations with PGE about the potential for the development to participate in PGE's new Microgrid Pilot Project, which is currently going through the Oregon Public Utility Commission (PUC) approval process. Based on the site selection criteria proposed in PGE's PUC filing, the BPSC project would be a great fit as a potential site for a project. The City of Beaverton plans to make the facility battery-ready in anticipation of adding a robust battery backup system potentially in partnership with PGE. Since PGE's pilot project is still in development, the requirements and final design is to be determined. One potential design of the microgrid system could be that energy generated onsite could be utilized first by the building, and then charge the battery. During normal operations, PGE might control and operate the battery storage for grid services while during outages, the batteries could disconnect from the grid to power the BPSC. With this design, when grid power is lost in an emergency event, the battery and PV systems would become a functional microgrid to provide power to the building for indefinite emergency operations.

The BPSC will be on a 480/277V service with Portland General Electric. The array will be located on the main roof above the third floor, on the southern section of the lower roof above the first floor, and on the parking canopies south of the building. A total of 39,199 square feet of roof area is allotted for the fixed-angle array, including 32,046 on the building and 7,153 on the parking canopies. Due to the favorable building location and orientation, these roofs are ideally situated for photovoltaic production and will have minimal shading impacts (see Figure 2). The combined Total Solar Resource Fraction (TSRF) of the 5° tilt array is estimated at 88%.

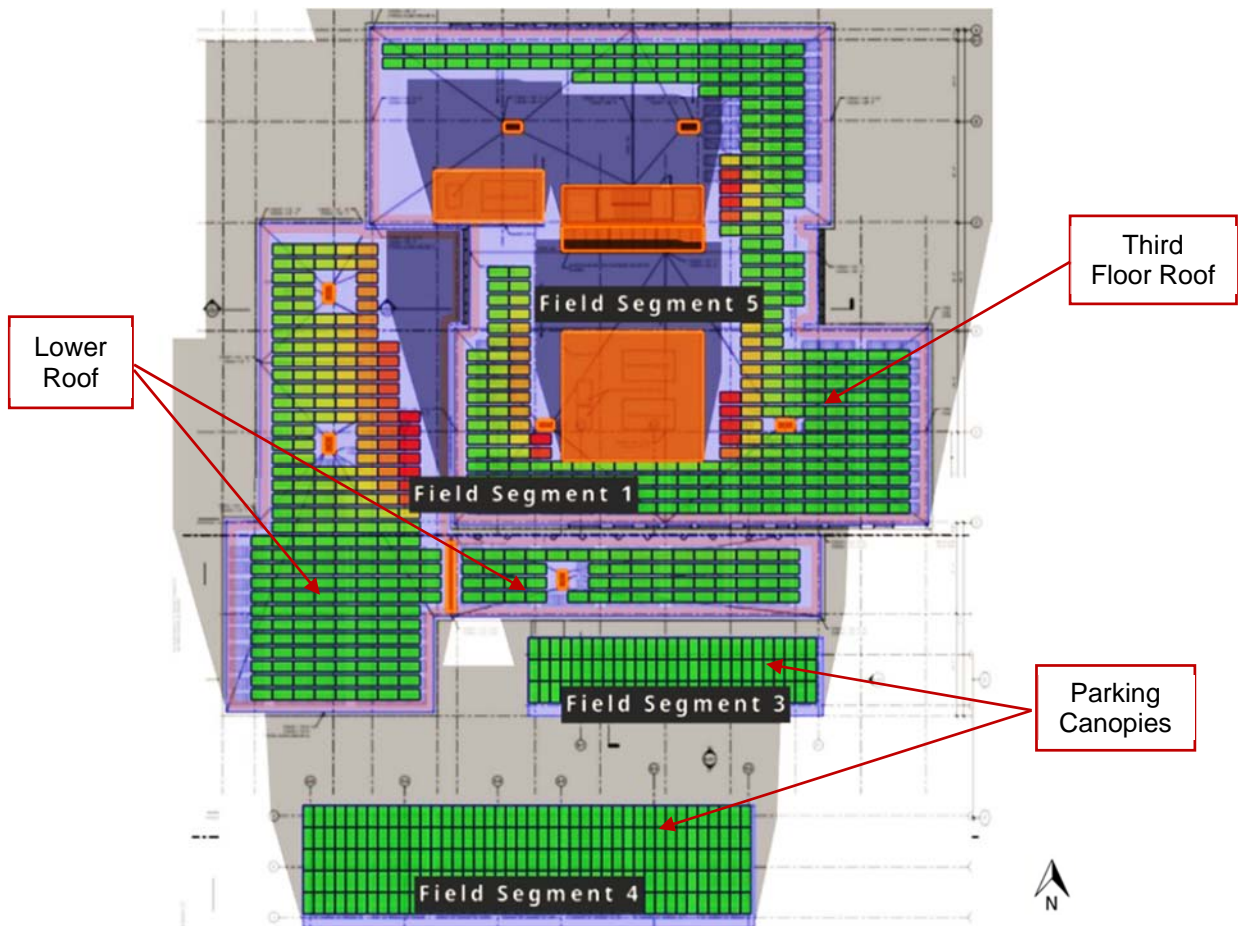


Figure 2. Rooftop PV Array and Shading Study

2. Describe the overall structure of the project team and the primary roles of each team member.

List and describe each project team members' relevant experience and credentials demonstrating their ability to satisfy their role. If certain key contractors have not yet been selected, describe your contractor selection process and why a decision has not yet been made.

The City of Beaverton conducted a competitive selection process to select its design team, general contractor and Owner's Representative for the BPSC. This experienced team includes:

- Owner's Representative: Shiels Oblatz Johnsen, Inc,
- Project Architect: FFA Architects
- Electrical Engineer: PAE Engineers
- Structural Engineer: KPFF
- Construction Manager/General Contractor: Skanska
- Solar Consultant: Imagine Energy, an Energy Trust Solar Trade Ally

PAE Engineers is developing the design/build performance specifications for the PV system with input from Imagine Energy, which performed the solar assessment (Exhibit C). KPFF is designing the structural system to support the PV array.

Skanska will issue an opportunity for competitive bids to select an Energy Trust Solar Trade Ally to provide the full design, installation, and commissioning of the PV system. Project management services for the design and installation of the PV system is by Shiels Oblatz Johnsen, Inc.

Team members' relevant experience and credentials demonstrating their ability to satisfy their roles are provided in Exhibit B.

3. Describe the current status of the project, planning and design work that has been completed to date, and the plan for bringing the project to completion.

Identify potential challenges and risks to completing the project on time and your strategy for mitigating each of those risks.

Extensive planning and design work has taken place to incorporate a robust PV system into the BPSC project. The design for the BPSC is currently in the Construction Document phase and will be completed by the end of August 2018. The project is on target to start early site work in August and obtain Substantial Completion by the end of January 2020.

PAE engineers has been developing the design/build specifications for the PV system throughout the design phase, with input from Imagine Energy. KPFF has been developing the structural plans to accommodate the PV system. Skanska has been participating in the project from the start of design, and has been providing cost estimating with subcontractor input and constructability review throughout the design phase.

The solar assessment, custom single line diagram, cut sheets of specified equipment and site plan are provided in Exhibits C, D and E.

Equipment to be installed will include:

- The Basis of Design PV panel is the Silfab 350w Solar PV Modules
- Basis of Design inverter is the SolarEdge SE66.6K Grid-Tied Inverter
- IronRidge XR-1000 racking
- Wire, conduit, fuses, disconnects, combiner boxes, meter base, grounding equipment and other balance of system components

In July 2018 Skanska will formally bid out the solar project and the selected Solar Trade Ally will perform the full design and installation of the PV system. The timeline to bring the PV project and entire BPSC facility to completion is as follows:

Task	Start Date	End Date
Complete Design Development Plans + Specs for BPSC		5/2/2018
Complete 100% Construction Documents for BPSC		8/31/2018
Bid Project / Execute Construction Contract (in phases)	6/15/2018	10/15/2018
Permit, Bid and Conduct Early Site Work	6/18/2018	11/1/2018
Groundbreaking Celebration		8/2018
Obtain Building Permits (in phases)	9/5/2018	12/1/2018
PV Submittal Package	11/1/2018	12/1/2018
PV Materials Acquisition	12/15/2018	3/1/2019
Installation of PV System	3/1/2019	1/15/2020
PV Commissioning	1/1/2020	1/20/2020
Jurisdictional Inspections	1/15/2020	1/31/2020
Substantial Completion / Temporary Certificate of Occupancy		1/31/2020
OPERATIONAL DATE	→ → → → → →	1/31/2020

4. Please identify the status of all necessary permits or other approvals required for the project:

Permit/Agreement Description	Not required	Required, Application not yet Submitted	Application Submitted	Permit/ approval received	Unsure if required
Structural		x			
Electrical		x			
Interconnection/ net metering		x			
Air/land use	x				
Water use	x				
Mechanical	x				
Plumbing	x				
Zoning	x				
Environmental impact	x				
Cultural/historic impact	x				
Power purchase agreement	x				
City council/ board approvals				x	
County approvals	x				
Oregon Department of Energy or other state approvals			x		
Other:	x				
Other:	x				

Please explain, if necessary:

5. What operations and maintenance (O&M) activities are required over the project life? Describe the long-term O&M plan, including sources of funding to implement the plan. Will the project be insured?

List any warranties on equipment and/or, agreements with O&M service providers.

The selected Solar Trade Ally will commission the system to ensure it operates per the design specifications. Operations and maintenance activities are typically limited on solar PV, and will include the following:

- Installer will verify operation to design specifications and will train City of Beaverton facility staff in the maintenance of the system
- City of Beaverton facility staff will regularly wash the panels and monitor energy production to ensure they are performing at capacity.
- The system is expected to produce for 25+ years. The panels have a 12-year warranty and are expected to produce 82% of nameplate capacity after that period, and the inverters have a 12-year warranty that is extendable to 25 years. The tilt mount system has a 25 year warranty. (For more information, see Exhibit E).

Continued maintenance for the system will be a part of the BPSC's annual budget. The project will be insured.

COMMUNITY IMPACT

6. What are the community-wide benefits of the proposed project?

Include environmental and economic benefits to the community, transformation or emergence of new renewable technologies, jobs created, etc.

Providing Economic Opportunities for a Distressed Area

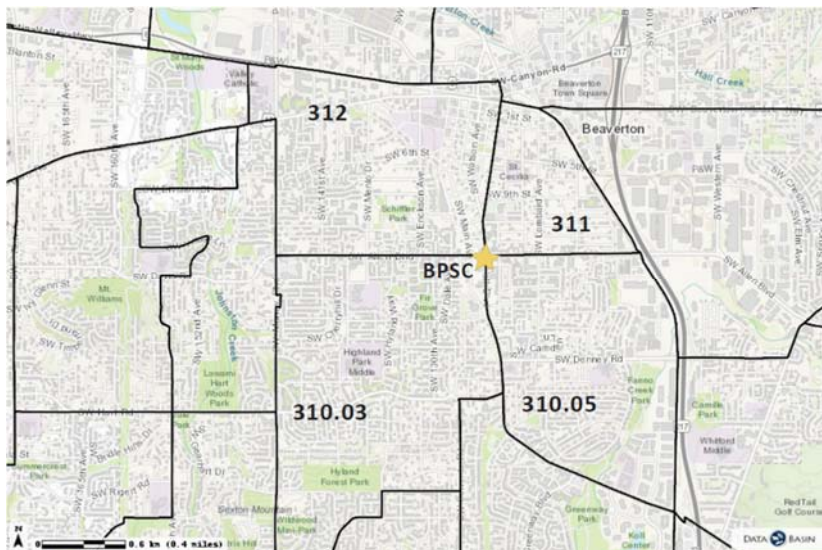
The future site of the BPSC is in the middle of one of Beaverton’s most distressed areas; it suffers from higher unemployment and lower per capita income than the rest of the City. Demographic data for our target area¹, the city, State of Oregon and United States of America are summarized below. The target area continues to lag behind the rest of the city, state and country in unemployment, poverty and job growth (See Table 2).

Table 2. Demographic Data¹

Data Type	Target Area	Beaverton	State of Oregon	United States
Population	5,953	93,919	3,900,343	316,127,513
Unemployment Rate	10.28%	8.70%	5.60%	8.30%
Poverty Rate	22.50%	15.40%	16.70%	15.50%
% Minority Population	46.13%	39.13%	14.90%	37.80%
Median Household Income	\$48,893	\$56,882	\$50,521	\$53,889

¹ The Target Area is defined by Census Tracts 310.03, 310.05, 311, and 312. All data for the Target Area are averages of Census Bureau data for each Census Tract. Source: U.S. Census Bureau American Community Survey 5-Year Estimates, 2011-2015

As evidenced by the demographic table above, the unemployment rate in the Target Area is 4.7% higher than the State of Oregon. Further, the Target Area has a poverty rate 7% higher than the national average and nearly 6% higher than the state, and the median income in the Target Area is 14% less than the city’s median income. As one of the most ethnically diverse cities in Oregon, these statistics disproportionately impact Hispanic, Asian and African American populations.



Source: Data Basin, US Census Bureau 2015

Figure 3. Site Location and Census Tract Map

The City of Beaverton has set ambitious goals to keep economic opportunities associated with the construction of the BPSC within the local community. The BPSC’s solar project provides significant job creation opportunities—all jobs identified in the jobs data table below either have been locally sourced or are targeted for local sourcing.

Table 3. Jobs Data

Skill/ Discipline		2018 Hours	2019 Hours	2020 Hours	2021 Hours	2022 Hours	Total Hours
Solar Consultant	Conduct solar feasibility analysis	25					25
Electrical Engineering - PV Design	Conduct solar study / develop electrical one-line diagram / research equipment options / prepare plans and specifications for PV system / provide construction phase assistance	120	15	-	-	-	135
Architect	Coordinate drawings and specifications / assist with solar assessment and PV design / oversee construction	60	25				85
Structural Design/ CAD Tech	Prepare site plan, roof layout, elevation profile, structural calculations and documentation / provide construction phase assistance	80	5	-	-	-	85
Engineering / Permit Review	Permitting / Confirmation of structural calculations	10	-	-	-	-	10
Lead Electrician	Attend on-site meetings / conduct electrical assessment / review plans and specifications	10	70		-	-	80
Electrical Signing Supervisor	Conduct constructability reviews of PV design / supervise electrical installation	10	46		-	-	56
Project Coordinator	Manage project start-up, documentation and permitting / assess material availability / process submittals / order and receive materials / prepare net metering submittal and grant documentation / prepare O&M Manual / perform final system walk-through	30	50	40	-	-	120
Construction Superintendent	Prepare scheduling / procure materials / coordinate crews / oversee install / coordinate all on-site activities		40		-	-	40
Journeyman Electrician	Install electrical/PV		620		-	-	620
Licensed Renewable Energy Tech	Install PV system		240		-	-	240
Construction Laborer	Install of racking	-	540		-	-	540
Bookkeeper / Account Manager	Process invoices, payment collection, payroll and prevailing wage documentation / manage grant requirements	10	20	15	10	10	65
Facilities Maintenance	Wash, monitor and maintain PV system	-	-	20	20	20	60
Owner's Representative/ Project Manager	Review plans and specs / facilitate design and construction meetings / oversee pre-construction and construction activities / review invoices / process payments / attend training / facilitate funding	80	80	15	-	-	175
Total Hours		435	1,751	90	30	30	2,336

Providing Energy for a Community Facility

The new BPSC will function as an important community facility in its daily operations as the home of the Beaverton Police Department and the Emergency Management Program. Continued energy cost savings will reflect good stewardship of public funds, allowing more money to flow into the essential day-to-day operations of the community safety facility. Further, the future BPSC will be vitally important in the event of a significant disaster, as it will provide emergency services to the surrounding community.

Investing in the Health of an Underserved Community

As stated above, the future home of the BPSC is located in one of Beaverton's most distressed areas, a fact not helped by the current environmental state of the BPSC's proposed location. Sitting adjacent to the BPSC site is a Shell gas station with a history of petroleum contamination dating back to 1994. As a designated brownfield, an investment in green infrastructure will signal to its constituents the City's prioritization of a historically underserved community.

Further, investment in solar energy results in fewer air pollutants. An analysis by the National Renewable Energy Laboratory (NREL) found that widespread solar adoption would significantly reduce pollutants that impact health, such as nitrous oxides, sulfur dioxide, and particulate matter emissions. NREL found that, among other health benefits, solar power results in fewer cases of chronic bronchitis, respiratory and cardiovascular problems, and lost workdays related to health issues (Health & Environmental Benefits of Solar Energy, energysage).

7. What educational benefits are associated with the proposed project?

Outline how you plan to educate the community about the project and renewable energy and/or attach an education plan. How many people will see/learn/benefit from the project per year, and at what level of engagement? Identify a point person who will take the lead on community education and how you will ensure that educational benefits continue beyond the first year of project operation. If you are requesting funds for educational programs, attach an education plan, identify the number of people served by the education program, and describe the qualifications of staff who will deliver the program.

Installing a PV system in a community facility provides an opportunity to teach local residents about the environmental and economic benefits of renewable energy production. An interactive educational kiosk will be installed in the lobby of the BPSC, providing real-time tracking of onsite solar production and historical generation, as well as equivalencies showing generated power as gas saved, carbon offset, and more. The City also plans to include real-time tracking of power generation on its website and integrate the data and technology into the STEM curriculum at local schools. Educational components of the installation will recognize financial supporters of the system as a way of acknowledging the benefit of the financial investment and educating visitors on available resources for green energy. **See Exhibit L for more information.**

The project's community education point person will be the Sustainability Coordinator from the City's Sustainability Department. The system provides the City the opportunity to be a leader in green energy production and act as an example for other development in the area.

8. How will the project recognize PGE Green FutureSM participants for their contribution to the project and encourage participation in these programs?

Be specific about recognition opportunities upon completion and on an ongoing basis. Address whether the project is physically visible to the public and why these opportunities were chosen.

- ✓ Signage
- ✓ Onsite monitoring display (kiosks, display screens)
- ✓ Media and publications
- ✓ Celebrations or events
- ✓ Website information
- ✓ Other

Please describe each of the recognition efforts marked above:

Signage will be posted onsite recognizing PGE and their Green Future participants for their contribution to the project. A visible display on the educational kiosk will also provide recognition and encourage participation in the PGE Green Future program.

Several media blasts will be published about the project, including articles in local newspapers as well as in the City of Beaverton's Newsletter, *Your City*. Media blasts will recognize PGE Green Future participants, and direct people to PGE's website for information.

Additionally, recognition of and information on the PGE Green Future program will be provided at the ground-breaking celebration of the BPSC, being scheduled in August 2018.

Information on the project is routinely updated on the City of Beaverton's website, and will also recognize and educate visitors on the PGE Green Future program. All recognition efforts were chosen because they nest easily into currently slated activities and installations.

9. Describe any community outreach or other publicity planned to inform the public of the proposed project.

Summarize both positive and negative community feedback received to date, how potential positive impacts will be communicated to community members, and how potential negative impacts will be mitigated.

In February 2018, the City hosted a Community Open House for the design of the BPSC. In March 2018, City Council approved the application to both the PGE RDF Grant and the Oregon Department of Energy Renewable Energy Development Grant.

Articles in local newspapers and the City of Beaverton's Newsletter (*Your City*), as well as information posted on the city's website, will further inform the public of the proposed PV project.

Community members are excited to see City investment in an under-served part of town and look forward to the future shared community space. The project is widely accepted by the community, and has not received negative community feedback—and we do not expect any future negative feedback.

PROJECT COSTS AND FINANCING

10. Describe the financial structure of the project.

Describe who will pay for and own the project, who will receive the financial benefits, who the financial partners are, and who will pay for maintenance and repairs. Include a discussion of the host organization's current financial status, and indicate how the host organization will fund its portion of project costs (including relevant evidence of creditworthiness, balance sheets, or other documentation as needed). Identify the other funding sources. Please be aware that total funding from all outside funding sources (RDF, Energy Trust, ODOE, etc.) is capped at 85 percent. The RDF will not fund beyond that.

The project will be owned by the City of Beaverton and the city anticipates partnering with the Oregon Department of Energy, Energy Trust of Oregon and PGE to bring this exciting project to fruition. The funding from the City of Beaverton comes from the \$35 million bond voters passed in 2016 to construct the new BPSC (See Exhibit I). The funding breakdown is as follows:

Table 4. BPSC PV System Funding Sources

Source	Amount	Status	% of Total Cost
City of Beaverton Bond Funds	\$210,000	Committed	19.5%
ODOE Renewable Energy Development Grant	\$250,000	Requested	23.3%
Energy Trust of Oregon Incentive	\$50,000	Requested	4.7%
PGE Renewable Development Fund Grant	\$564,589	Requested	52.5%
TOTAL	\$1,074,589		100%

This project will represent financial benefits for both the City as well as its constituents, as money saved in energy costs will be funneled back into the daily operations of the Public Safety Center to better serve Beaverton residents. Maintenance and repairs will be a part of the yearly operating budget for the BPSC.

Note that as a public entity the City of Beaverton is required to spend 1.5% of the BPSC construction costs on Green Energy Technology, which is estimated at \$510,000. It is the city's understanding that the PGE grant funds cannot be used to offset those costs. The City is committed to investing the 1.5% into the PV system and if PGE funding is not granted, a significantly smaller system will be installed.

11. Describe efforts to ensure that the proposed budget represents the maximum value for the cost of the project.

Explain any significant price deviations from industry norms and whether you received multiple bids from competitive contractors. Prove the reasonableness of this bid.

The proposed budget is based on a contract proposal from Imagine Energy—a highly experienced, local Solar Trade Ally. It also includes pricing provided by Skanska for patching roof penetrations, installing the steel framework to support the PV system, insurance and the contractor fee. A second cost estimate was provided by Advanced Energy Systems, another experience Solar Trade Ally. Our Project Team is confident that the proposed budget is reasonable and there may be an opportunity to realize some savings when we bid out the PV system in July and the structural system in September 2018.

The panels selected for the system strike a balance of cost effectiveness and maximum system size—we believe they provide the best value of the panels currently on the market.

The following are items included in the proposed budget that may deviate from industry norms:

- Prevailing wage. The project is required to meet the higher of state or federal prevailing wage rates.
- Rooftop structural framework to support the PV system. Although there is a cost premium for the structural framework to be installed on the roof, it offers the notable benefit of drastically reducing the number of roof penetrations. This approach results in reduced costs for sealing roof penetrations and less opportunities for roof leaks.
- Battery-ready upgrades. The budget includes \$55,000 to upsize the main distribution board to 4000A to accommodate the PV system and a potential battery back-up system.
- Contractor insurance and fee. The budget includes contractor markups for the project, which include 1.25% for subcontractor default insurance, 1.0% for general liability insurance and a 2.25% contractor fee.
- Contingency. An overburdened construction industry and solar, steel and aluminum tariffs are impacting the cost of construction; a 10% contingency is included in the budget to be able to absorb potential cost hikes and any unforeseen changes required during final design and construction.

12. Identify potential challenges and risks to completing the project within budget and your strategy for mitigating each of those risks.

Is the timeline and budget reasonable? Projects significantly beyond budget and timeline are subject to re-evaluation and cancelation.

Completion of the proposed PV system is contingent on the completion of the BPSC facility. Potential schedule risks include delays in completing design work, obtaining permits or constructing the facility. However, the proposed timeline for the project is expected to hold consistent as all critical path items are carefully monitored and there is some “float” included. Further, the design team has been meeting all milestones and is meeting frequently with city permit reviewers to walk through plans and the project schedule to ensure permits will be issued expeditiously. Skanska, the general contractor, has been engaged with the project since the start of design and has been providing constructability reviews, pricing and schedules. Having a very experienced contractor engaged early in the design is key to setting up an efficient process and avoiding schedule delays.

The proposed budget is based on a contract proposal provided by Imagine Energy as well as other pricing elements (including the structural framework, sealing of roof penetrations and conduit to the parking canopies) provided by Skanska. An additional cost proposal was provided by Advanced Energy Systems (see Exhibit J). The PV system will be competitively bid out in July and could actually result in some cost reductions.

Potential challenges to completing this project within budget include the newly imposed tariffs on solar, steel and aluminum. While this, and other potential market uncertainties, could increase the cost of the project, this risk is mitigated by including a contingency.

13. Are funds from the Renewable Development Fund imperative to make the project successful? Please explain.

The funds from the Renewable Development Fund are imperative to implementing the proposed project. The City of Beaverton is committed to incorporating renewable energy into the new BPSC, and as a public entity is required to spend 1.5% of the BPSC construction costs on Green Energy Technology, which is estimated at \$510,000. The City is committed to investing the 1.5% into the PV system and if PGE funding is not granted, a smaller system of approximately 150 kW will be installed.

If able to leverage the PGE Renewable Development Funds, the city will be able to expand the system to the proposed capacity, effectively offsetting power consumption by approximately 40%. The larger PV system will provide power to the building for indefinite emergency operations. Further, with a system of this size the city will be able to effectively pursue a Path to Net Zero building designation from Energy Trust of Oregon. Without the PGE’s incentive funds, the sustainability and resiliency goals for the building will not be met.

C. Project Costs and Financing

PROJECT BUDGET		
<i>Please provide an itemized budget for eligible costs including the categories listed below.</i>		
Renewable Energy Project Component	Cost	Line Item Description
Eligible Renewable Energy System Project Costs		
A. Engineering Costs	\$31,089	Imagine Energy [\$12,589] PAE Engineers/ FFA [\$18,500]
B. Design Costs	25,361	Imagine Energy (includes Project Management)
C. Equipment costs		
Generator or modules	331,485	
Inverters	94,390	
Electrical components	61,212	
Racking or structural components	175,839	Racking by Imagine Energy [\$63,639] Structural framework to support PV system [\$112,200]
Hardware		
D. Labor installation costs	129,244	
E. Permitting fees, if applicable (please itemize)	5,831	
F. Monitoring costs and components (please itemize)		
Kiosks/Interfaces	1,645	
Electrical Components	1,031	
Communication Components	640	
Racking or Structural Components	490	
Hardware	275	
G. Other renewable energy installation components	\$216,057	Seal roof penetrations [\$14,800] Battery ready upgrades [\$55,000] Conduit to parking canopy [\$6,500] Contingency [10% - \$93,483] Insurance/contractor fee [4.5%-\$46,274]
H. Signage Costs		
I. Permanent Educational Displays		
J. TOTAL ELIGIBLE RENEWABLE ENERGY SYSTEM PROJECT COSTS (Sum of A through I)	\$1,074,589	
K. Amount of Renewable Development Fund funding requested for Project Costs	\$564,589	
L. Funding request as % of Total Eligible Renewable Energy System Project Costs (K/J) Maximum of 85% total from outside funding sources	52.5%	
xOptional: Educational Program Costs*		
M. Total eligible Educational Program costs (please itemize).	\$	
Training Costs	\$	
Curriculum Costs	\$	
Tour Costs	\$	
Competition Fees	\$	
N. Amount of Renewable Development Fund funding requested for Educational Programs (Up to 100% of Educational costs are eligible)	\$	
O. TOTAL Award Request (K+N)	\$564,589	

**Educational program costs include programmatic expenses for community or student workshops or tours, teacher trainings, and other educational programs. These costs are eligible for 100 percent RDF funding. Kiosks, interpretive signage, and other permanent educational installations directly related to the project should be included in Eligible Renewable Energy Costs instead.*

The following costs are NOT eligible for reimbursement via the RDF:

- Activities not directly associated with the capital costs of new renewable energy systems, including structural or site improvements required prior to project construction such as canopies, roofing, tree removal, lighting, flooring, and structural reinforcement.
- Fees incurred for project estimates or bids and site evaluation expenses.
- Landscaping costs.
- Construction bond costs.
- Facility maintenance or repair costs.
- Interest or warranty charges.
- Donated, in-kind, or volunteer materials or labor.
- Marketing or advertising, other than approved on-site educational signage.

SOURCES OF FUNDING

List and describe all funding sources and income streams of the project, as well as the nature of the contribution – grant, donation, incentive, cash or in-kind.	Source of Funding and Type of Contribution	Amount	% of Total Project Cost	Secured or Pending
Please identify the dollars and percent of total project cost each funding source represents – Renewable Energy System and Educational Program costs ONLY.	Renewable Development Fund (cash reimbursement)	\$564,589	52.5%	Pending
	Energy Trust Incentive	\$37,500	3.5%	Secured
	Applicant's Contribution	\$472,500	44%	Secured
	Please provide documentation confirming secured funding sources.	Totals	\$1,074,589	100%

Describe the status and timeline for any 'pending' funding sources

PGE RDF application under review

Appendix A: Supplemental Document Checklist Competitive Application Process (All Projects)

Applicants must include the following required application documents for their project to be considered for funding. Please submit this completed checklist along with your application. If any required documents are not included, please identify the reason why (below).

REQUIRED APPLICATION DOCUMENTS

Please clearly label each attachment included in your application with the labels **in bold**.

- Letters of support.** A support letter is required from the project owner, if different from the person compiling the application. If requesting organization is a school, a support letter is required from the district superintendent or college/university president. Other support letters from key community members may also be provided. [EXHIBIT A]
- Credentials.** Include resume of project manager and other key team members. Include list of similar projects completed. [EXHIBIT B]
- Site Evaluation.** Must include a project-specific renewable resource assessment and energy production estimate, any structural or installation feasibility assessments, and may include interconnection analysis or documentation of discussions with the Portland General Electric customer generation group. [EXHIBIT C]
- Design Drawings.** Custom one-line electrical diagram and site plan showing the location of the project components on the property. [EXHIBIT D]
- Equipment specifications.** Include warranty and performance information for all major components to be installed. [EXHIBIT E]
- Site Photos.** Photos or renderings of proposed project site and/or building with captions (compiled into single PDF) [EXHIBIT F]
- Site Control Agreement.** Land ownership documentation or long-term lease agreement. [EXHIBIT G]
- Financial Statements.** Host organization should submit 1) Statements of Revenue and Expense and 2) Balance Sheets for the most recent two fiscal years, or equivalent documentation demonstrating organizational financial health. [EXHIBIT H]
- Secured Funding Sources.** Documentation (i.e. award letters, confirmation e-mails, other communication) confirming secured or granted funding sources and amounts [EXHIBIT I]
- Contractor Bids.** Proposals, bids and/or contracts to support budget estimates. Multiple bids are ideal. [EXHIBIT J]
- Project Development Timeline.** A Gantt chart or schedule that includes duration of each development stage and dates of major milestones (e.g., equipment procurement, equipment delivery on site, construction begins, construction ends, commissioning, etc.). [EXHIBIT K]
- Education Plan.** Outline how you plan to educate the community about the project and renewable energy, how many people will be served by the education program, and the qualifications of the staff who will deliver the program. [EXHIBIT L]
- Energy Trust of Oregon cover sheet.** All solar projects receiving funds from Energy Trust receive this from their Energy Trust incentive application.

- | |
|--|
| <input checked="" type="checkbox"/> Justification for missing documentation:
The Energy Trust of Oregon cover sheet is pending. The Solar Development Assistance Incentive Application has been submitted and is under review. |
|--|

Appendix B: Supplemental Document Checklist Competitive Application Process (Projects >500kW)

Applicants submitting for projects greater than 500 kW (AC) must include the following required application documents for their project (in addition to the documents required in Appendix A) to be considered for funding. Please submit this completed checklist along with your application. If any required documents are not included, please identify the reason why (below).

REQUIRED APPLICATION DOCUMENTS

Please clearly label each attachment included in your application with the labels in **bold**.

- Proof of Financial Health.** The Applicant and Contractor/Engineer/Installer shall provide the previous three (3) years of audited financial reports, prepared in accordance with generally accepted accounting principles, reflecting the current financial condition of the Applicant and Contractor. Reports must include balance sheet, income statement, credit report and cash flow statement along with applicable footnotes.
- Legal Good Standing.** Please explain if the Applicant has or is currently part of a legal dispute or bankruptcy proceedings.
- Project References.** Include references for three (3) renewable energy projects previously developed by the Applicant; or Contractor, if applicant is Host Organization, with contact information for the project host. Provide the contact name, mailing address, phone number, and email address, in addition to a brief description of the work performed, such as the project size, location, public or private client, current project status.
- Interconnection Analysis.** Must include an interconnection analysis performed in conjunction with Portland General Electric, assessing the feasibility and estimated costs of interconnection or documentation of discussions with the Portland General Electric customer generation group.
- Energy Yield Estimate.** Enclose backup calculations for energy yield analysis including, at a minimum, basis for resource estimate, modeling tool output reports (e.g., PVSyst, WindPro), assumptions for system losses, proposed equipment, and key system design specifications. Explain the approach to remedying a shortfall in expected production.
- Off-Taker Information.** If Applicant will not utilize the power directly, please provide contact information for additional off-takers. Provide the contact name, mailing address, phone number, email address, and the percentage of total system capacity each off-taker agreed to purchase.
- Data Monitoring Specifications.** Provide details on the proposed data monitoring system including the type of data that will be collected and the communication capabilities. If the project will use smart inverters, describe the communications standard that will be used so the utility might be able to communicate with the smart inverters in the future.

Justification for missing documentation:

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D. Certification

I certify that in preparation for submitting this application I have reviewed the applicant as well as the award recipient requirements and guidelines, understand that should this project be awarded funding, my organization will be able to meet the award recipient requirements as described on the Portland General Electric website, and attest that the information provided above responding to this application is both accurate and current. I agree to allow my information to be shared with the Energy Trust for evaluation purposes. I also understand that submitting an application in no way obligates Portland General Electric to provide funding and that funds are distributed at the sole discretion of Portland General Electric.

Signature: Eric OATHES Date: 7/27/18
Printed Name: Eric Oathes
Title: Police Captain
Company: Beaverton Police Department
Contact number 503.526.2289

If this request is being submitted by multiple parties or a party other than the host, please indicate below by providing the party's name, title and contact information. The project host/owner must approve the submittal on their behalf through signature demonstrating that the all parties linked to installation have reviewed the application and support the project, along with supporting documentation - please see below for a comprehensive list of required attachments.

Approving party (project host/owner) – if other than project applicant

Signature: _____ Date: _____
Printed Name: _____
Title: _____
Company: _____
Contact number _____



7/17/2018

TO: **SYSTEM HOST: Beaverton Public Safety Center**
Francesca Gambetti
francesca@sojpdx.com

TRADE ALLY: Imagine Energy
Zach Parrott, z.parrott@imagineenergy.net

SUBJECT: Solar Development Assistance – Utility Grant Coversheet

POWERCLERK APPLICATION #: N/A
PROJECT NAME: Beaverton Public Safety Center Solar
SYSTEM OWNER: Francesca Gambetti, Beaverton Public Safety Center
SITE ADDRESS: 12500 SW Allen Blvd. Beaverton OR 97008

Congratulations! This letter is to notify you that Energy Trust has completed the design review of the proposed **302.00 kW** system referenced above with an estimated annual production of **306,470 kWh**. Based on the information provided at this time, the proposed system meets program requirements. The application has been processed and approved to pursue additional funding from a utility grant program and is eligible to receive an Energy Trust incentive as described below.

As of **7/17/2018** this project is eligible to receive an incentive amount of **\$37,500.00** for the system, subject to the terms and conditions of our **Form 220** agreement. A Funding Reservation Letter detailing the incentive reservation period will be issued separately.

Based on the information provided, this project will NOT receive tax benefits and has reported the financial details below:

Total Eligible Project Costs:	\$1,074,589.00
Reserved Energy Trust Incentive:	\$37,500.00
Net Eligible Project Cost:	\$1,037,089.00

Maximum Suggested Utility Grant Award Request*:	\$875,900.65

**Projects are most competitive if Total Funding Request (Energy Trust Incentive + Utility Grant Award) does not exceed 85% of Total Eligible Project Costs.*

In order to qualify for the incentive, the system must be installed and the installation verified by the Energy Trust Solar program during the Reservation Period. **Any revisions to the project proposal, system design, or funding sources must be reviewed and approved by both Energy Trust and the respective utility grant program.**

Please notify us immediately if you decide to cancel the project at any point during the Reservation Period. If you have any questions, please do not hesitate to contact program staff at 503.546.3611 or solar@energytrust.org.

DPI Specialty Foods

Tualatin, OR

Project Summary			
Project Size	1432 kW	Estimated Annual Generation	1,510,000 kWh
Technology	Solar PV	Estimated Generation as % of Site Electricity Use	47%
Capacity Factor	12%	Anticipated On-Line Date	Dec-18
Project Cost Summary			
Total Project Cost	\$2,164,980	RDF Funding Request	\$390,000
Total Project Cost Per Watt	\$1.51/W	Request as a % of Total Project Cost	18%

**Includes \$61,500 optional educational funding for job training partnerships.*

OVERVIEW SUMMARY STATEMENT

DPI Specialty Foods is a private for-profit company, headquartered in California, that provides sales and services to retailers and foodservice providers through eight distribution centers located across the United States. The northwest distribution center is located in Tualatin, Oregon, and focuses on highly perishable specialty foods as well as specialty dry and frozen foods. The 250,000 square foot warehouse has already undergone significant energy efficiency upgrades since 2016, reducing annual electricity consumption by over 30%. In order to reduce diesel fuel consumption from their fleet of temperature-controlled trailers, DPI Specialty Foods has replaced some of its fleet with hybrid electric and all-electric trailers. These trailers will be plugged in when docked at the distribution center, which will increase the electricity consumption of the facility by about 200,000 kWh per year. DPI Specialty Foods proposes to install a 1.4 MW solar PV system in order to supply solar electricity to their warehouse facility as well as the electric trailers.

Location: The solar array will be installed on the flat roof of the warehouse building and has been sized to occupy all available roof space. It will not be physically visible from ground level.

Equipment: The 1.4 MW solar PV system will consist of Hyundai solar modules, Fronius inverters, and Unirac ballasted roof mounting equipment (pending structural evaluation).

Status: The preliminary system design is complete. Final engineering and net metering application will be completed upon notice of funding. The anticipated system online date is December 2018.

Key Strengths:

- Demonstrated commitment to energy efficiency and sustainability.
- Good marketing and publicity potential around solar-powered food transportation.
- Potential job training and job growth opportunities.

Key Weaknesses:

- A California-based for-profit applicant.
- The system design has not been finalized, including interconnection plan and structural engineering, resulting in risks to the budget and timeline.
- After initial media, long-term RDF recognition and public education will be limited.

PROJECT FEASIBILITY & READINESS

- **Project Team.** The applicant's project team is adequately qualified. The host has experience managing contractors and overseeing energy system improvements. The selected solar contractor, DPI Solar (no affiliation with DPI Specialty Foods), is an Energy Trust Trade Ally and has experience with commercial solar installations, but this will be their largest project to date.
- **Project Site.** The site has good solar exposure, free of shading or obstruction. The roof structure has not yet been evaluated by a professional engineer, and due to the size and weight of the proposed ballasted array, there is risk that design changes may be required.
- **Energy Estimate.** Energy production has been estimated using the Helioscope software and includes a site-specific shade analysis and energy loss calculations. The total solar resource fraction is 84% and the estimated net capacity factor is 12%.
- **Timeline.** The preliminary system design is complete. Final system design and engineering and the required permit and net metering applications will be submitted upon notice of funding. The proposed online date is December 2018. Due to the large system size and required structural engineering analysis, this timeline will likely be delayed.
- **O&M.** DPI Solar will provide annual inspections and data monitoring as part of their 10-year workmanship warranty. DPI Specialty Foods staff will be trained on annual module cleaning procedures and will regularly monitor energy production data. A maintenance reserve would be set aside and the solar equipment will be included in the building insurance policy.

COMMUNITY BENEFITS & RENEWABLE DEVELOPMENT FUND EXPOSURE

- **Community Benefits.** The project will provide community benefits by reducing operating costs and allowing DPI Specialty Foods to add delivery routes and hire three new drivers. The project provides economic benefits by hiring a local installation contractor who has pledged to provide hands-on job training opportunities for three local non-profit organizations (Constructing Hope, Portland Youth Builders, and Oregon Tradeswomen). Letters of support were provided by Forth, Columbia Willamette Clean Cities Coalition, and Neighbors for Clean Air. DPI Specialty Foods participates in the local community with food bank donations and contributions to the Chamber of Commerce and high school.
- **Educational Benefits.** The applicant will install a data monitoring display in the lobby, host a tour for the Roadmap Conference in June 2019, and create written and video case studies that will be shared via social media and through the U.S. Department of Energy's Alternative Fuel Data Center. Three local non-profits have committed to helping with community education.
- **RDF Recognition.** The project will provide RDF recognition by installing a vinyl wrap on five of the new electric trailers with details about the project, hosting a ribbon-cutting ceremony with local media, and including information on the websites of DPI Specialty Foods, DPI Solar, and Clean Future. The solar array will not be physically visible, except during tours.
- **Publicity.** Community members have not been notified about the project, but several local non-profits have expressed support. Negative feedback is not anticipated.

PROJECT COSTS & FINANCIAL FEASIBILITY

- **Financial Structure.** DPI Specialty Foods plans to pay for and own the project, and receive associated financial benefits. The applicant is in good financial health and is able to pay for the entire upfront cost of the system until RDF reimbursement is received.
- **Renewable Energy Credits.** DPI Specialty Foods plans to retain all project RECs.
- **Funding Sources.** The applicant is requesting 18% funding from RDF and is providing 82% match. They are requesting an additional optional \$61,500 for job training and educational expenses. They have not applied for any other external funding sources and are not eligible for Energy Trust of Oregon incentives.
- **Additionality.** RDF funding is not necessary for the project to proceed; no award or a partial award would result in a scaled-back project.
- **Project Budget.** The proposed budget is within a reasonable range for this type and size of project, but is based on a preliminary system design. Structural engineering and an interconnection study may result in budget increases. The budget includes sufficient contingency.

Appendix A: Supplemental Document Checklist Competitive Application Process (All Projects)

Applicants must include the following required application documents for their project to be considered for funding. Please submit this completed checklist along with your application. If any required documents are not included, please identify the reason why (below).

REQUIRED APPLICATION DOCUMENTS

Please clearly label each attachment included in your application with the labels **in bold**.

- Letters of support.** A support letter is required from the project owner, if different from the person compiling the application. If requesting organization is a school, a support letter is required from the district superintendent or college/university president. Other support letters from key community members may also be provided.
- Credentials.** Include resume of project manager and other key team members. Include list of similar projects completed.
- Site Evaluation.** Must include a project-specific renewable resource assessment and energy production estimate, any structural or installation feasibility assessments, and may include interconnection analysis or documentation of discussions with the Portland General Electric customer generation group.
- Design Drawings.** Custom one-line electrical diagram and site plan showing the location of the project components on the property.
- Equipment specifications.** Include warranty and performance information for all major components to be installed.
- Site Photos.** Photos or renderings of proposed project site and/or building with captions (compiled into single PDF)
- Site Control Agreement.** Land ownership documentation or long-term lease agreement.
- Financial Statements.** Host organization should submit 1) Statements of Revenue and Expense and 2) Balance Sheets for the most recent two fiscal years, or equivalent documentation demonstrating organizational financial health.
- Secured Funding Sources.** Documentation (i.e. award letters, confirmation e-mails, other communication) confirming secured or granted funding sources and amounts
- Contractor Bids.** Proposals, bids and/or contracts to support budget estimates. Multiple bids are ideal.
- Project Development Timeline.** A Gantt chart or schedule that includes duration of each development stage and dates of major milestones (e.g., equipment procurement, equipment delivery on site, construction begins, construction ends, commissioning, etc.).
- Education Plan .** Outline how you plan to educate the community about the project and renewable energy, how many people will be served by the education program, and the qualifications of the staff who will deliver the program.
- Energy Trust of Oregon cover sheet.** All solar projects receiving funds from Energy Trust receive this from their Energy Trust incentive application.

Justification for missing documentation:

- Site Control Documentation** – letter attesting to DPI Specialty Food’s ownership.
- Financial Statements** – See Appendix B footnote.
- Secured Funding Sources** – Funding sourced from DPI Specialty Foods’ internal funds and application to Renewable Development Fund, no other sources of funding available.
- Contractor Bids** – DPI Specialty Foods did a screening evaluation of three different Trade Allies referred by Energy Trust of Oregon. Dynamic Power Innovations LLC (dba DPI Solar) was selected for a final bid which is included with this application to the RDF so only one bid is attached.

Energy Trust of Oregon cover sheet – The proposed project is ineligible for any incentives as the DPI project exceeds project cap size limits, reference email from Matt Gretchell at Energy Trust of Oregon on May 16, 2018 to Josh Kopczynski.

Appendix B: Supplemental Document Checklist Competitive Application Process (Projects >500kW)

Applicants submitting for projects greater than 500 kW (AC) must include the following required application documents for their project (in addition to the documents required in Appendix A) to be considered for funding. Please submit this completed checklist along with your application. If any required documents are not included, please identify the reason why (below).

REQUIRED APPLICATION DOCUMENTS

Please clearly label each attachment included in your application with the labels in **bold**.

- Proof of Financial Health.** The Applicant and Contractor/Engineer/Installer shall provide the previous three (3) years of audited financial reports, prepared in accordance with generally accepted accounting principles, reflecting the current financial condition of the Applicant and Contractor. Reports must include balance sheet, income statement, credit report and cash flow statement along with applicable footnotes.
- Legal Good Standing.** Please explain if the Applicant has or is currently part of a legal dispute or bankruptcy proceedings.
- Project References.** Include references for three (3) renewable energy projects previously developed by the Applicant; or Contractor, if applicant is Host Organization, with contact information for the project host. Provide the contact name, mailing address, phone number, and email address, in addition to a brief description of the work performed, such as the project size, location, public or private client, current project status.
- Interconnection Analysis.** Must include an interconnection analysis performed in conjunction with Portland General Electric, assessing the feasibility and estimated costs of interconnection or documentation of discussions with the Portland General Electric customer generation group.
- Energy Yield Estimate.** Enclose backup calculations for energy yield analysis including, at a minimum, basis for resource estimate, modeling tool output reports (e.g., PVSyst, WindPro), assumptions for system losses, proposed equipment, and key system design specifications. Explain the approach to remedying a shortfall in expected production.
- Off-Taker Information.** If Applicant will not utilize the power directly, please provide contact information for additional off-takers. Provide the contact name, mailing address, phone number, email address, and the percentage of total system capacity each off-taker agreed to purchase.
- Data Monitoring Specifications.** Provide details on the proposed data monitoring system including the type of data that will be collected and the communication capabilities. If the project will use smart inverters, describe the communications standard that will be used so the utility might be able to communicate with the smart inverters in the future.

Justification for missing documentation:

Off-Taker Information – not applicable

Proof of Financial Health:

- Proof of Financial Health for Contractor/Engineer/Installer – enclosed
 - Proof of Financial Health for Applicant – pending submittal contingent on notification of award. DPI Specialty Foods is a privately held company with \$1.5 billion in annual sales corporate-wide. The project was just awarded on June 1st, 2018 and there was insufficient time for DPI Specialty Foods to prepare audited financial reports for the DPI Specialty Foods Northwest (the Tualatin location) with location sales of \$275 million per RDF application requirements. Financial documents for DPI Specialty Foods Northwest will be provided upon notice of intent to award.

Portland General Electric Renewable Development Fund 2018 Award Application Process - Application Form

Applications due Friday, June 15, 2018 by 5 p.m.

Thank you for your interest in applying for a Renewable Development Fund (RDF) award to help support the installation of your renewable energy project. Portland General Electric (PGE) strives to promote innovation and to work with customers and communities to increase the visibility of renewable energy generation technologies through education and community outreach.

Background

Through the RDF program, PGE provides opportunities to qualifying parties to receive financial support to help advance the construction of qualifying new non-residential renewable energy projects. For additional information on the RDF program and/or project funding please visit our website, portlandgeneral.com/RDF.

How to Apply for Funds

Step 1: Review applicant Q&A, eligibility requirements, award recipient responsibilities, and evaluation and selection criteria at portlandgeneral.com/RDF.

Step 2: Complete the application form and supplemental document checklist. Applicants must complete all fields in the application form provided in order for their project to be considered for funding. This application and supplemental material provided at the time of application will serve as the primary means by which projects will be evaluated. Portland General Electric and/or its designee may contact you for further information, so please provide current contact information. In an effort to ensure complete applications and earlier submissions, one week will be granted to applicants to amend their applications after being reviewed by the RDF Project Manager prior to the deadline. Please note that June 15, 2018 at 5 p.m. is still a hard deadline and any outstanding changes will not be accepted after that deadline.

Step 3: Submit completed application form, supplemental document checklist, and supplemental documents to Portland General Electric by 5 p.m. on 6/15/18 by sending to RenewableDevFund@portlandgeneral.com. Multiple emails are acceptable and expected based on the size of the application and number of appendices.

Questions about the funding award, the application, and the funding process should be submitted to RenewableDevFund@portlandgeneral.com.

Application/Award Timeline

Monday, 4/16/18	Portland General Electric begins accepting applications
Friday, 6/15/18	5 p.m. PDT – Submittal deadline
By Friday, 10/19/18	Applicants will be notified in writing of award decision; projects selected for funding will be asked to sign an agreement detailing the conditions and requirements of accepting Renewable Development Fund award. Funds will be disbursed upon completion of the project and once reporting requirements are met.

Please note: Project installations must be completed no later than June 30, 2020. (*Extensions to this timeline may be considered on a case-by-case basis for projects associated with the construction of a new building or structure*).

A. Summary Information

APPLICANT INFORMATION	
Project Name	DPI Specialty Foods Solar Installation for Grid-connected Electric Trailers
Project Lead List name of host organization or project developer	DPI Specialty Foods
Type of organization <i>Government, private, nonprofit, etc.</i>	Private/non-profit partnership
Describe the project lead <i>Including but not limited to its mission, history, purpose and who it serves. Please address whether project lead and/or site is located in PGE service territory.</i>	DPI Specialty Foods, located in PGE Service Territory, is partnering with Dynamic Power Innovation LLC (dba DPI Solar, not affiliated with DPI Specialty Foods) and a local community of non-profit builders to take the next step in an energy efficiency initiative that began in 2016. DPI Specialty Foods is on pace to reduce consumption by 2.69 million kWh, the energy equivalent of nearly 11 entire railcars worth of coal, every single year according to the EPA carbon offset calculator. This reduction has been a huge achievement in energy efficiency. DPI Specialty Foods is furthering its commitment to the community by launching a fleet of hybrid electric and all-electric refrigerated trailers to displace diesel fuel and installing 1.43MW of solar energy with the goal of becoming a "Net-Zero" energy consumer with a fractional carbon footprint.
Have you read the <i>Eligibility Requirements</i> on our website and verified that the project satisfies these requirements?	Yes.
Project lead organization website	http://www.dpispecialtyfoods.com/
Primary project contact information: Name Title Phone number E-mail address Organization name Mailing Address Role in the project <i>Please note: This person will also be responsible for providing ongoing reporting for the project</i>	Joe Kemetz Director of Operations Tel: 503-612-8009 Email: Joe.Kemetz@dpispecialtyfoods.com DPI Specialty Foods - Northwest 12360 S.W. Leveton Dr. Tualatin, OR 97062
Contractor/Installer/Engineer contact information: Name Title Phone number E-mail address	DPI Solar Josh Kopczynski President Mobile: 503-709-9300 josh@dpisolar.com

<p>Organization name Role in the project ETO Trade Ally? (check box) <input checked="" type="checkbox"/> <i>If more than one party, please briefly describe each role and identify a single contact willing to act as point person for the purposes of this funding application. If non-solar, please put N/A for ETO Trade Ally purposes.</i></p>	<p>Dynamic Power Innovations LLC (dba DPI Solar) Contractor/Installer/Trade Ally</p>
<p>Project owner (if different from project lead). <i>If more than one party, describe ownership structure</i></p>	<p>DPI Specialty Foods</p>
<p>Name of individual completing application <i>Include affiliation and contact information if different from primary contact or contractor/installer/engineer</i></p>	<p>Josh Kopczynski President DPI Solar 20345 SW Pacific Hwy, Suite 103 Sherwood, OR 97140 Email: Josh@dpisolar.com Office: 503-857-0099 Cell: 503-709-9300 CCB: 185494 Electrical Contractor #C1255 Website: www.dpisolar.com</p>

PROJECT INFORMATION	
Physical address where project will be installed <i>Include facility name, street address, city, state, zip code, and/or GPS coordinates where appropriate.</i>	12360 Leveton Dr, Tualatin, OR 97062
Is this project a new installation, an addition to an existing installation, an educational effort, or research and development? If a new installation, please address whether the project demonstrates a new or innovative technology, and if so how.	The project is a new solar power installation in PGE service territory. It is the result of DPI Specialty Foods' work over several years to improve energy efficiency and sustainable business practices. DPI Specialty Foods will be launching a fleet of Electric Refrigeration Trailers to replace diesel and will power those trailers with solar from their own rooftop.
Technology type <i>Wind, solar, geothermal, etc.</i>	Solar PV, Energy Efficiency, Electric Vehicles.
Project size <i>Please represent in both kW DC and AC, where applicable.</i>	1432.08 kW DC
Is the project directly interconnected to the grid or will power be delivered to PGE pursuant to a PPA? <i>Projects must conform to one of these two scenarios to be eligible for a PGE Renewable Development Fund award.</i>	Project will interconnect to the grid directly.
Is this an onsite (behind the meter) project or utility-side (in front of the meter) project? ¹	This is an onsite (behind the meter) project.
Estimated annual kWh generation	1,510,844 kWh per Helioscope Production report.
If generation will be used onsite, what is the current annual kWh consumption of the facility where the power will be consumed? <i>If this is a new site, please provide the estimated annual kWh consumption. If this is a utility-side project, mark N/A.</i>	<u>2016</u> = 4,420,662 kWh annual <u>2017</u> = 3,741,974 kWh annual <u>2018</u> (estimated)= 3,244,402kWh annual (this includes the additional loading that will be seen from the hybrid electric trailers and the next-gen electric trailers)
Anticipated commissioning/on-line date	12/31/2018
Has the project identified interconnection options and been in contact with the utility's customer generation group? <i>Please contact Netmetering@pgn.com for questions and proper documentation. For additional information, visit PGE's interconnection web page.</i>	Yes.
RENEWABLE DEVELOPMENT FUND INFORMATION	

¹ **Onsite projects** generate electricity that is consumed onsite and excess electricity is passed through a meter and onto the grid. **Utility-side projects** are intended to provide power directly to the grid.

<p>Has your organization applied for or received a Renewable Development Fund award in the past? <i>If yes, describe the project, whether an award was granted, and the application year. Specify whether the prior project is the same project proposed in this application.</i></p>	<p>No. First time applying for RDF. DPI Solar has facilitated successful RED Grants (through ODOE) in the past with projects sized >150kW and awarded funds >\$135,000 for smaller projects</p>
<p>How did you hear about the Renewable Development Fund program? Please be specific.</p>	<p>DPI Solar is a member of SEIA, OSEIA, Energy Trust of Oregon Trade Ally, and ODOE Tax Credit Certified Technicians. DPI Solar is active in all of these organizations and counsel our customers as to the real viability of grant award success. We hand pick our applicants based on the grant and the project. With that being said, we are regularly involved and receive updates on various grant programs from these and other agencies we work with.</p>
<p>If your project involves solar PV, have you reserved your Energy Trust solar incentive?</p>	<p>At 1.432 MW, this project exceeds the size limitations for Energy Trust solar incentive funding (currently capped for projects <= 400,000 watts/400kW). A letter of confirmation from Energy Trust of Oregon has been received specific to this project verifying that no Energy Trust of Oregon funds will be available for a project of this scope and size. Please see attached (printed) email confirmation in response to the request/inquiry on behalf of DPI Specialty Foods inquiring on possible Energy Trust of Oregon incentives.</p>

B. Project Narrative

PROJECT FEASIBILITY

1. Provide a brief summary of the proposed renewable energy project, including the goals of the project and how it ties into the overall mission of the host organization.

Include why the particular technology was chosen and why the specific location is suitable for the proposed technology. What will this project add to your organization/community?

DPI Specialty Foods has shown a strong commitment to reducing their carbon footprint and leading by example in their industry. During calendar year 2016, DPI Specialty Foods used 4,420,662 kWh of power. During that year, a concentrated effort regarding sustainability and conservation yielded a substantial reduction in power consumption. In just one year, DPI Specialty Foods dropped their electrical appetite from 4,420,662 kWh by 18%, down to 3,741,914 kWh. In general, when a facility manager can save just 3% in operational expenses, they are heralded as a “success”, so an 18% reduction in just one year is not just uncommon, it is industry-changing.

Yet, DPI Specialty Foods was not done yet. During the first quarter of 2018, their reductions in power usage continued to drop. Year-to-year, to date, this company has again reduced their electrical consumption from 3,741,914 kWh used in 2017 DOWN to (estimated) 3,044,403 kWh in 2018. This not only represents a 15% reduction from one year to the next, but during two years it represents a staggering 31% reduction in electrical usage, all from processes and energy conservation measures taken thus far by DPI Specialty Foods. They have spent a considerable amount of their time, money, and resources to work their way into the role of “industry leader in sustainability”.

In early 2018, DPI Specialty Foods committed further to environmental sustainability: They have committed to replacing, at their own cost, ½ of their commercial trailer diesel-powered refrigeration fleet with new, leading edge technology electric refrigeration trailers that will be powered by the building during docking and powered by the trucks that haul them during deliveries.

It was during this project that the subject of electrical savings came up: to date, DPI Specialty Foods has demonstrated their commitment to environment and sustainability with their previous efforts. Yet, this new endeavor will add electrical consumption to their building; the same building they have been working hard to reduce load and environmental impact through energy conservation. The next step in this project is to adopt a power plant that will take them even further into the sustainability leadership role they currently hold.

The proposed solar project aims to cover every available square foot roof space with solar panels. This is a scope and path that few companies embrace, much less justify. By installing a 1.43MW solar array on the building they own and occupy, this company will further reduce their electrical consumption by an additional 47% of today’s usage, including the additional electrical loads incurred with the next-gen electric refrigeration trailers they are currently putting into service. When complete, the generation of this Phase 1 solar project is estimated at 1,510,000 kWh/year. This will leave the customer with a net electrical usage of 1,734,403 kWh/year after accounting for the extra loads added by the electric refrigeration trailers.

This project, along with all the other efficiency measures (including but not limited to lighting upgrades, addition of a refrigeration control system, new HVAC system, new efficient dock doors and vestibules, and innovations) by DPI Specialty foods will result in an astounding 60% reduction in power consumption in the last three years.

DPI Specialty Foods is committed to reducing impact and carbon footprint, having demonstrated this commitment with current and existing efforts that have taken them nearly as far as current technology will allow. DPI Specialty Foods is currently completing an upgrade of all relevant lighting to LED lamps and fixtures which will further reduce their carbon footprint and electrical consumption.

Solar PV is the next phase of this established, committed path for DPI Specialty Foods. The project team has exhausted all options for alternate funding and required by the RDF. DPI Solar stands apart in their commitment to conservation and positive environmental impact

On top of all of this effort and commitment, DPI Specialty foods has agreed to use this project to introduce Constructing Hope, Portland Youth Builders, and Oregon Tradeswomen (all non-profit groups) to the solar industry by using project costs to pay the participants of these groups to come onsite and gain valuable skills in the electrical and carpentry trades that many of these groups' participants strive to become a part of.

This project creates much more than just a sustainable, proactive facility for DPI Specialty foods; the partnership between DPI Specialty Foods and DPI Solar also shows commitment to creating and educating our future trades people by drawing those people from at-risk youth groups, minorities with less access to inroads for life-time careers, and people from our community working to rebuild their own lives by applying themselves to a trade such as electrical or carpentry. All of these groups will be under the direct supervision of DPI Solar, a long standing electrical solar contractor in the state of Oregon. DPI Solar is also a member of NECA and IBEW Local 48 which means they employ some of the best trained people in the industry. DPI Solar is a registered training agent that offers apprenticeship for all electrical trades through IBEW Local 48. This strong commitment to training means DPI Solar endorses and trains current and future apprentices by tutoring and providing hands-on experience to help others along the path to become a part of their trade.

2. Describe the overall structure of the project team and the primary roles of each team member.

List and describe each project team members' relevant experience and credentials demonstrating their ability to satisfy their role. If certain key contractors have not yet been selected, describe your contractor selection process and why a decision has not yet been made.

John Thornton, CleanFuture President - CleanFuture helps food service and grocery distributors reduce fuel burn and refrigerated transport operating costs since 2009. John's work with DPI Specialty Foods began through a technical assistance collaboration between Portland State University Transportation Research Education Center and Forth through an EPA technical assistance project. DPI Specialty Foods was a successful outcome of the project by installing electric infrastructure to plug-in hybrid electric refrigerated trailers while parked instead of running on diesel, and with acquisition of 12 hybrid electric transport refrigeration units in the first phase. When DPI Specialty Foods expressed interest in solar as part of an expanded rollout of additional hybrid electric and all-electric trailers he connected them with local solar providers among whom DPI Solar was determined the most suitable.

Joe Kemetz, Director of Operations DPI Specialty Foods Northwest

Josh Kopczynski, President, DPI Solar - DPI Solar has been serving the Northwest region for 10 years and maintains the highest (3 star) rating with the Energy Trust of Oregon. Josh's 20-year experience as an electrician and 10-year experience exclusively in the solar industry provides the team with indispensable practical knowledge and experience. A regular attendee of national and international solar workshops and tradeshow keeps his company on the cutting edge of the industry. He currently is working with significant battery installations for large-scale distribution to implement "peak-load shedding". His company, DPI Solar, has delivered many successful projects of a similar scale including at the Oregon Zoo, Essential Wholesale, multiple Chevron locations, as well as a multitude of rural installations.

Mike Landauer, Signing Supervisor, DPI Solar: Mike started his electrical career in the same year as Josh Kopczynski. Mike and Josh have worked together most of their career. Mike has extensive experience in medium-voltage installations in regard to large-scale (utility scale) solar and wind projects. Mike is certified in medium voltage splicing and terminations (600volts-69,000volts). Mike is also proficient in design and installation of large scale transformer and interconnected renewable energy

systems associated with large wind and solar projects he has contracted work for throughout the U.S.

David Voyton, Project Manager - David achieved certification with the North American Board of Certified Energy Practitioners in October of last year. He has been managing solar projects since August 2015.

DPI Solar Installation Crew: All crew are members of IBEW Local 48 as either electrical helpers, apprentice electricians, or Journeyman electricians. The combined experience of the installation crew exceeds 100 years (combined). The inside wireman journeyman electricians on project have worked at a multitude of commercial and industrial facilities with decades of experience with switch gear, large scale wind projects, conduit installation, wiring methods, and NEC Code Compliance.

3. Describe the current status of the project, planning and design work that has been completed to date, and the plan for bringing the project to completion.

Identify potential challenges and risks to completing the project on time and your strategy for mitigating each of those risks.

The project is ready for Oregon Engineering Stamp, electrical engineering and net meter application. The Project has been engineered to be 3.51 psf of deadload (which is within limits established by Oregon BCD). The live load has been engineered to withstand windspeeds in excess of 110 mph as required by the state of Oregon Building Codes Division.

The potential challenges and risks associated with this project include:

- 1) Coordination and lift-safety for crane-hoisted materials onto the structure
 - a) A proper lift plan provided by Axis Crane eliminates the potential preventable risks associated with cranes and mobilizations
- 2) Alternate method of attachment for solar modules on roof
 - a) Proper engineering of system to limit dead-load on roof is already planned
 - b) Should the need arise to alter the attachment mechanisms due to dead-load, physical attachments can be substituted (at an altered cost) to decrease ballast weight on roof and meet engineering and permitting requirements.

4. Please identify the status of all necessary permits or other approvals required for the project:

Permit/Agreement Description	Not required	Required, Application not yet Submitted	Application Submitted	Permit/ approval received	Unsure if required
Structural		X			
Electrical		X			
Interconnection/ net metering		X			
Air/land use	X				
Water use	X				
Mechanical	X				
Plumbing	X				
Zoning	X				
Environmental impact	X				
Cultural/historic impact	X				
Power purchase agreement	X				
City council/ board approvals	X				
County approvals		X			
Oregon Department of Energy or other state approvals	X				
Other:					
Other:					

Please explain, if necessary:

Energy Trust of Oregon Funding not available for projects of this size.

5. What operations and maintenance (O&M) activities are required over the project life? Describe the long-term O&M plan, including sources of funding to implement the plan. Will the project be insured?

List any warranties on equipment and/or, agreements with O&M service providers.

DPI Solar offers a 10-year installation warranty.

DPI Solar offers ongoing operations and maintenance included with their 10-Year warranty. This service includes annual inspection of the project.

Each year, the inspection will verify system performance, inspect project components for integrity, and coordinate a cleaning with DPI Specialty Foods where on-site personnel will be trained and given supervision for the cleaning process (as required).

Electrical equipment will be inspected and heat-gun tested to ensure that the equipment is running within operational parameters.

Lifetime inverter monitoring is included with this installation. Fronius systems are set to email all associated contacts on the account with critical updates as they are required. All systems are live-monitored which allows all subscribers to the system to stay up-to-date with system performance and maintenance, as needed. DPI Solar (administrative subscriber to the monitoring system) is always made aware of required maintenance and services needed through this software.

Equipment warranties:

Solar Modules: 10-Year manufacturer with an additional 25-Year production warranty

Fronius inverters: 10-Year manufacturer warranty

Unirac RMDT Solar Racking: 25-Year manufacturer warranty.

COMMUNITY IMPACT

6. What are the community-wide benefits of the proposed project?

Include environmental and economic benefits to the community, transformation or emergence of new renewable technologies, jobs created, etc.

Since 2016 DPI Specialty Foods has implemented processes and equipment that have reduced their electrical consumption by over 32% (they went from using 4,420,662 kWh/year down to an estimated 3,044,403 kWh). DPI Specialty Foods is committed to doing what they can to lead the way in their industry (the food industry) when it comes to conservation, environmental awareness, and sustainability. They are even changing their diesel refrigeration trailers to electric powered refrigeration just to make sure they are not pumping exhaust into our environment.

This project has a mix of both electrical and structural components of which we will be able to pass on knowledge and skill sets to what we hope will be future leaders and drivers of the energy industry - the people who are looking for a path such as Portland Youth Builders, Oregon Tradeswomen, and Constructing Hope.

The long-term benefits of this project, environmental notwithstanding, include significant reductions in cost of operations of the facility. This long term, reliable reduction in operation costs has already freed up monies to create new positions inside of the company, and as such, the company has exhibited verifiable growth. Phase One total reduction in electrical costs (which results in a total reduction of 60% power consumption compared to calendar year 2016) has absolutely freed up pre-budgeted funds which have, in turn, allowed the company to re-purpose this budgeted money into job creation and growth.

From a financial standpoint, the support of renewable energy as DPI Specialty Foods' primary source of power will end up creating long term jobs inside of the facility (unrelated to the solar project itself).

The transformation of this facility from a utility-and-diesel powered location to a cutting edge, modern, efficient and renewable-energy facility will have ripple effects for years to come on the local community. Long term job creation, a leadership role and ambassador of modernization to their peers in the industry, and quantifiable cost reductions will make this company the first of many to push their industry into the modern age of responsible large-scale companies who understand the long-term benefits of energy efficiency and renewable energy.

To DPI Specialty Foods, this project is not just about the bottom line but goes beyond to share the next evolution in the food distribution industry and enables DPI Specialty Foods to demonstrate their corporate commitment to environmental responsibility.

7. What educational benefits are associated with the proposed project?

Outline how you plan to educate the community about the project and renewable energy and/or attach an education plan. How many people will see/learn/benefit from the project per year, and at what level of engagement? Identify a point person who will take the lead on community education and how you will ensure that educational benefits continue beyond the first year of project operation. If you are requesting funds for educational programs, attach an education plan, identify the number of people served by the education program, and describe the qualifications of staff who will deliver the program.

One of the primary educational goals of this project is to feature trade/career opportunity to three community trade organizations that promote training/re-training youth, women, minorities, and others to learn and secure work in the construction trades. DPI Specialty Foods is proud to partner with Oregon Tradeswomen, Constructing Hope and Portland Youth Builders. Kyle Oram at DPI Solar will be responsible for implementation of the education strategy including on site construction participation of trades students the broader media campaign bringing greater attention to these organizations through trailer wraps, radio ads and ribbon cutting event.

DPI Specialty Foods is also partnered with Forth, Columbia Willamette Clean Cities Coalition, Oregon Environmental Council, and Neighbors for Clean Air to demonstrate and showcase electrified transportation to deliver our food with trailers cooled by renewable solar electricity. A field trip to showcase the solar installation powering grid-connected electric trailers at the Roadmap Conference in June 2019 is planned. Case studies, both written and via video, will be created to demonstrate DPI Specialty Foods' commitment to sustainability. These educational materials will be shared via social media with the help of project partners, and also promoted on the national scale through the Roadmap Conference and through the US DOE Alternative Fuel Data Center.

8. How will the project recognize PGE Green FutureSM participants for their contribution to the project and encourage participation in these programs?

Be specific about recognition opportunities upon completion and on an ongoing basis. Address whether the project is physically visible to the public and why these opportunities were chosen.

The project will feature the Green Future program in the following ways:

- Signage
- Onsite monitoring display (kiosks, display screens)
- Media and publications
- Celebrations or events
- Website information
- Other

Please describe each of the recognition efforts marked above:

- 1) Signage:
 - a) Five of the new Electrical Refrigerated Trailers will be vinyl wrapped with details about the solar project and provide recognition of the support from the Renewable Development Fund. Specific content is planned to include but not be limited to project facts, the benefits of solar electricity, and other project details to educate the community on sustainable solar food delivery.
- 2) Onsite Monitoring Display:
 - a) A permanently mounted display will be installed during the project at DPI Specialty Foods for viewing in their lobby. The display will show continuous, instantaneous output of their solar array along with an assortment of details referencing saved CO² emissions, equivalent coal not burned to provide equivalent power, or miles not driven by a car in relation to CO² emissions equivalent to current power production.
- 3) Media and Publications:
 - a) The Portland Tribune, The Times (Tigard/Tualatin), and other media will be invited to the ribbon-cutting/Flip-The-Switch ceremony where the various participants in the project will be present and available for reference on the project. Additionally, 1190 KEX with Mark Mason will be present during this event to do a live broadcast with the intentions and focus being on the funding from the Renewable Development Fund, the participation of the various non-profit trades groups, and the significant environmental impact of such a dramatic reduction in power consumption.
 - b) Additional publications: DPI Specialty Foods already has in place a 4"x6" multi-media player

that is provided to their patrons (both present and future) that boasts of their current efforts in sustainability. DPI Specialty Foods will update this multimedia player to include details of this project (which will include the details of the Renewable Development Fund award as well as participants, and to-date production for this project).

4) Celebrations or Events:

- a) As previously noted, there is a “Flip-The-Switch” event planned for the commissioning of this system. This event will include local media as well as a live radio broadcast detailing the funding, project, participants, current and future goals

5) Website Information:

- a) DPI Specialty Foods, DPI Solar, and Clean Future, Inc will be updating their respective websites to include browsable details about this project. Key details will include links to the Renewable Development Fund webpage, the live, cloud-based monitoring page for the site, as well as links to Portland Youth Builders, Oregon Tradeswomen, and Constructing Hope websites.

6) Other:

- a) The project team will take advantage of other opportunities as they arise to recognize the role of PGE Green PowerSM participants and education the community on the benefits of the project.

9. Describe any community outreach or other publicity planned to inform the public of the proposed project.

Summarize both positive and negative community feedback received to date, how potential positive impacts will be communicated to community members, and how potential negative impacts will be mitigated.

This project involves partnership with Oregon Tradeswomen, Portland Youth Builders and Constructing Hope. These organizations assist individuals by providing training, pre-apprenticeships and experience to prepare for good careers in the trades. Their involvement will provide additional networks of community awareness. IHeartMedia has also expressed interest in on the ground involvement at the ribbon cutting ceremony.

PROJECT COSTS AND FINANCING

10. Describe the financial structure of the project.

Describe who will pay for and own the project, who will receive the financial benefits, who the financial partners are, and who will pay for maintenance and repairs. Include a discussion of the host organization’s current financial status, and indicate how the host organization will fund its portion of project costs (including relevant evidence of creditworthiness, balance sheets, or other documentation as needed). Identify the other funding sources. Please be aware that total funding from all outside funding sources (RDF, Energy Trust, ODOE, etc.) is capped at 85 percent. The RDF will not fund beyond that.

DPI Specialty Foods will pay for and own the project. DPI Solar will donate \$30,000 in profits from project to non-profit partners (Portland Youth Builders, Oregon Tradeswomen, and Constructing Hope). Additionally, to provide an introduction to the solar industry, DPI Solar has budgeted an additional \$18,000 to provide wages for up to 10 future trades-people from the three non-profit organizations (40 hours per week, 2 weeks per person). The financial benefits to DPI Specialty foods will be realized in the form of tax credits, depreciation and power bill savings. The project costs are projected to break even less than 6 years while simultaneously lowering operating costs during and after the payback period. This will enable DPI Specialty Foods to invest normal energy expenses back into the company via job creation.

11. Describe efforts to ensure that the proposed budget represents the maximum value for the cost of the project.

Explain any significant price deviations from industry norms and whether you received multiple bids from competitive contractors. Prove the reasonableness of this bid.

Per Technical Report NREL/TP-6A20-68925 September 2017 (Contract No. DE-AC36-08GO28308), which tracks costs and benchmarks for the solar industry, projects of this scope and size had an average cost of installation \approx \$1.85-per-Watt (nationally) in calendar year 2017.

The DPI Specialty Foods project per-Watt cost is \approx \$1.52 before any incentive funding is applied. The proposed cost-per-Watt of this project represents 18% lower costs compared to the national average. For comparison purposes, this cost does not reflect DPI Specialty Foods as receiving any additional incentive funding for this project. What makes this project even more remarkable is that all individuals employed to bring this project online will be paid prevailing wages according to their license and craft.

The net project cost for the proposed project will drop to \$1.24 per-Watt if DPI Specialty Foods receives this grant. At this price, DPI Solar's bid will substantially challenge the current cost structure of solar installations, both large and small. This net price would be \approx 33% less than the national average. The project cost, execution, and reasonableness does not deviate in any way shape, or form from industry norms. In fact, this project represents an effort to redefine such industry norms.

12. Identify potential challenges and risks to completing the project within budget and your strategy for mitigating each of those risks.

Is the timeline and budget reasonable? Projects significantly beyond budget and timeline are subject to re-evaluation and cancellation.

As this project qualifies for a Level 2 net metering application, the electrical design and feasibility fall well within the realm of DPI Solar's expertise and skill set. The project is a proposed ballasted system with seismic supports regularly mounted to meet building codes. No significant challenges to this installation are anticipated (pending successful structural engineering design).

Should the structural engineering review determine a ballasted system would not meet the standards required in the state of Oregon, DPI Solar has an alternative mounting method which will secure the entire array to the building structure while simultaneously reducing the dead-load/point-loading characteristics of the solar array. This would result in a potential increase in project cost by no more than 5% of the total gross cost of the system.

Should the need arise to re-engineer the mounting system, this could result in a delay of 4-6 weeks while the re-design is confirmed and submitted for plan review with the city/county permitting offices.

DPI Solar, coordinating with DPI Specialty Foods, are fully aware of this potential re-design and have discussed the impacts associated with this kind of challenge. There are no indications that this portion of the project would risk the feasibility of the project nor would it result in a substantial cost increase that would put the project out of financial viability ranges.

13. Are funds from the Renewable Development Fund imperative to make the project successful? Please explain.

Funding from the Renewable Development Funds is imperative to support such a showcase project; DPI Specialty Foods has made substantial investment in facility energy efficiency improvements and in electrifying their refrigerated fleet operations both in installing electric infrastructure for trailers and in the first phase of replacing diesel-only refrigerated trailers with hybrid electric trailers that can plug-in while parked. DPI is committing capital for expanded fleet replacement to early replace diesel-only refrigerated trailers with hybrid electric trailers and all-electric trailers. Funding support for the build-mounted solar project provides an incentive for continued innovation and an inducement to share project details to encourage adoption by others to transform the market.

C. Project Costs and Financing

PROJECT BUDGET		
<i>Please provide an itemized budget for eligible costs including the categories listed below.</i>		
Renewable Energy Project Component	Cost	Line Item Description
Eligible Renewable Energy System Project Costs		
A. Engineering Costs	\$ 13,000	Engineering & Design
B. Design Costs	N/A	Included in Engineering Costs
C. Equipment costs		
Generator or modules	\$1,048,208	3978 Hyundai HiS-S360RI - 360 Watt 72 Cell
Inverters	\$ 263,411	55 Fronius 24kW SYMO 480v 3-Phase Inverters
Electrical components	\$ 255,503	(5) 400 Amp Sub panels loaded at 80%. (55) 40 Amp/ three-pole circuit breakers, 5000 ft EMT, associated fittings & attachment mechanisms. (1) 2000 Amp distribution panel. (5) 400 Amp three-pole circuit breakers. Various sizes of wire to accommodate voltage drop and ampacities throughout the AC and DC circuitry. Associated grounding and bonding equipment and conductors.
Racking or structural components	\$ 162,388	UNIRAC RMDT
Hardware	\$ N/A	Included in electrical budget
D. Labor installation costs	\$ 414,525	2600 hours

E. Permitting fees, if applicable (<i>please itemize</i>)	\$ 5,445	\$945 Electrical Washington County Renewable Electrical Permit application, \$1500 Electrical Engineering Design, \$1500 Structural Design, \$1500 Structural permit.
F. Monitoring costs and components (<i>please itemize</i>)	\$ 0	Included with inverter budget
Kiosks/Interfaces	\$ 1,500	Wi-Fi connected display
Electrical Components	\$ 0	Plug-in to portal
Communication Components	\$ 0	Wi-Fi
Racking or Structural Components	\$ 0	Included under Kiosk costs
Hardware	\$ 0	Included under Kiosk costs
G. Other renewable energy installation components	\$ 0	
H. Signage Costs	\$ 12,500	Vinyl wraps on electric trailers with educational signage about the project, attribution of the support by the Renewable Development Fund, and referring to a project website for more information on the environmental, educational, and long-term benefits of the project.
I. Permanent Educational Displays	\$ 1,000	Educational signage on 124th Ave
J. TOTAL ELIGIBLE RENEWABLE ENERGY SYSTEM PROJECT COSTS (Sum of A through I)	\$2,177,480	
K. Amount of Renewable Development Fund funding requested for Project Costs	\$ 341,000	
L. Funding request as % of Total Eligible Renewable Energy System Project Costs	15.6%	
Optional: Educational Program Costs*		
M. Total eligible Educational Program costs (<i>please itemize</i>).	\$ 49,000	
Training Costs	\$ 18,000	9 trade students paid \$25/hr for 80 hours
Curriculum Costs	\$ 30,000	Donations to Oregon Tradeswomen, Portland Youth Builders, and Constructing Hope for their participation in this project. This donation is specifically and non-specifically related to the solar portion of this project. The non-specific relation to this project is due to each group individually determining the best investment of the donation to specifically benefit their students/participants.

Tour Costs	\$ 1,000	Ribbon Cutting Event
Competition Fees	\$ 0	N/A
N. Amount of Renewable Development Fund funding requested for Educational Programs (Up to 100% of Educational costs are eligible)	\$ 49,000	
O. TOTAL Award Request (K+N)	\$ 390,000	

**Educational program costs include programmatic expenses for community or student workshops or tours, teacher trainings, and other educational programs. These costs are eligible for 100 percent RDF funding. Kiosks, interpretive signage, and other permanent educational installations directly related to the project should be included in Eligible Renewable Energy Costs instead.*

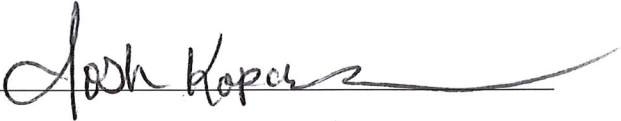
The following costs are NOT eligible for reimbursement via the RDF:

- Activities not directly associated with the capital costs of new renewable energy systems, including structural or site improvements required prior to project construction such as canopies, roofing, tree removal, lighting, flooring, and structural reinforcement.
- Fees incurred for project estimates or bids and site evaluation expenses.
- Landscaping costs.
- Construction bond costs.
- Facility maintenance or repair costs.
- Interest or warranty charges.
- Donated, in-kind, or volunteer materials or labor.
- Marketing or advertising, other than approved on-site educational signage.

SOURCES OF FUNDING				
List and describe all funding sources and income streams of the project, as well as the nature of the contribution – grant, donation, incentive, cash or in-kind. Please identify the dollars and percent of total project cost each funding source represents – Renewable Energy System and Educational Program costs ONLY. Please provide documentation confirming secured funding sources.	Source of Funding and Type of Contribution	Amount	% of Total Project Cost	Secured or Pending
	Renewable Development Fund (cash reimbursement)	\$ 390,000	17.91%	Pending
	ODOE Renewable Energy Development Grant (cash reimbursement)	\$ 0	N/A	N/A
	Energy Trust Incentive	\$ 0	N/A	N/A
	Applicant's Contribution	\$1,787,480	82.09%	secured
	Other Funding	\$		
		\$		
	Totals	\$2,177,480	100%	
Describe the status and timeline for any 'pending' funding sources				
The RDF Grant time frame to award is estimated to occur on October 19, 2018.				

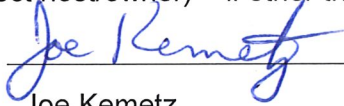
D. Certification

I certify that in preparation for submitting this application I have reviewed the applicant as well as the award recipient requirements and guidelines, understand that should this project be awarded funding, my organization will be able to meet the award recipient requirements as described on the Portland General Electric website, and attest that the information provided above responding to this application is both accurate and current. I agree to allow my information to be shared with the Energy Trust for evaluation purposes. I also understand that submitting an application in no way obligates Portland General Electric to provide funding and that funds are distributed at the sole discretion of Portland General Electric.

Signature:  Date: 6/15/2018
Printed Name: Josh Kopczynski
Title: President
Company: DPI Solar (Dynamic Power Innovation, LLC)
Contact number 503-857-0099

If this request is being submitted by multiple parties or a party other than the host, please indicate below by providing the party's name, title and contact information. The project host/owner must approve the submittal on their behalf through signature demonstrating that the all parties linked to installation have reviewed the application and support the project, along with supporting documentation - please see below for a comprehensive list of required attachments.

Approving party (project host/owner) – if other than project applicant

Signature:  Date: 6/15/2018
Printed Name: Joe Kemetz
Title: Director of Operations
Company: DPI Specialty Foods
Contact number 503-612-8009

Solar Power Plan



PREPARED FOR:
DPI Specialty Foods
12360 Leveton Drive
Tualatin, OR 97062
TBD
TBD
Acct # PGE: TBD

PROUD MEMBER OF:



Josh Kopczynski, President
503-709-9300
josh@dpisolar.com
www.DPISolar.com
CCB: 185494
UBI: 603251725



How much are YOU paying for your power?

If you choose to Purchase ##### kWh @ Portland General Electric for 25 years with a National Average Rate Increase (of 4%) annually:

Your ESTIMATED AVERAGE cost per kWh for this volume of electricity (over 25 years) will be: **11.7 ¢/kWh**
(Current price per kilowatt-hour from your utility is: 7 ¢/kWh)

Adding Solar Panels and Generating 47% of the power you use while locking in your rate PERMANENTLY for onsite-generated power:

Your ESTIMATED AVERAGE cost per kWh for this volume of electricity (over 25 years) will be: **4.7 ¢/kWh**

- 1: This estimate is based on a 0.3% decrease in production (per year) of the solar modules over 25 years - Industry Standard
- 2: This estimate is calculated using the final cost to the customer (after tax credits/local grants have been deducted)
- 3: The estimated average cost per kWh (without tax credits/local grants), for 25 years) for power generated by solar panels: 6.3 ¢/kWh



ABOUT DPI SOLAR

DPI Solar specializes in residential and commercial grid-tied turn key solar electric systems. We are an industry leader in the engineering, design and integration of solar panels for both residential and commercial clients. It is our constant mission to exceed our customer's expectations by consistently delivering installations that exceed expected production estimates while maintaining strong aesthetics. We combine our technical expertise, project management experience, outstanding customer service, exacting workmanship, and premier engineering to provide you with a fully integrated solar package with several financing options including Zero Down and low monthly payments. Unlike many solar companies, we personally handle every aspect of the permitting, design, installation and rebate process. Our in-house CAD-designer, HOA and permitting professionals all work together to make the process smooth, efficient and customer service friendly. Similarly, our installation teams boast an average of 10 years experience with solar electric systems.

10 YEARS EXPERIENCE WITH SOLAR ELECTRIC INSTALLATIONS

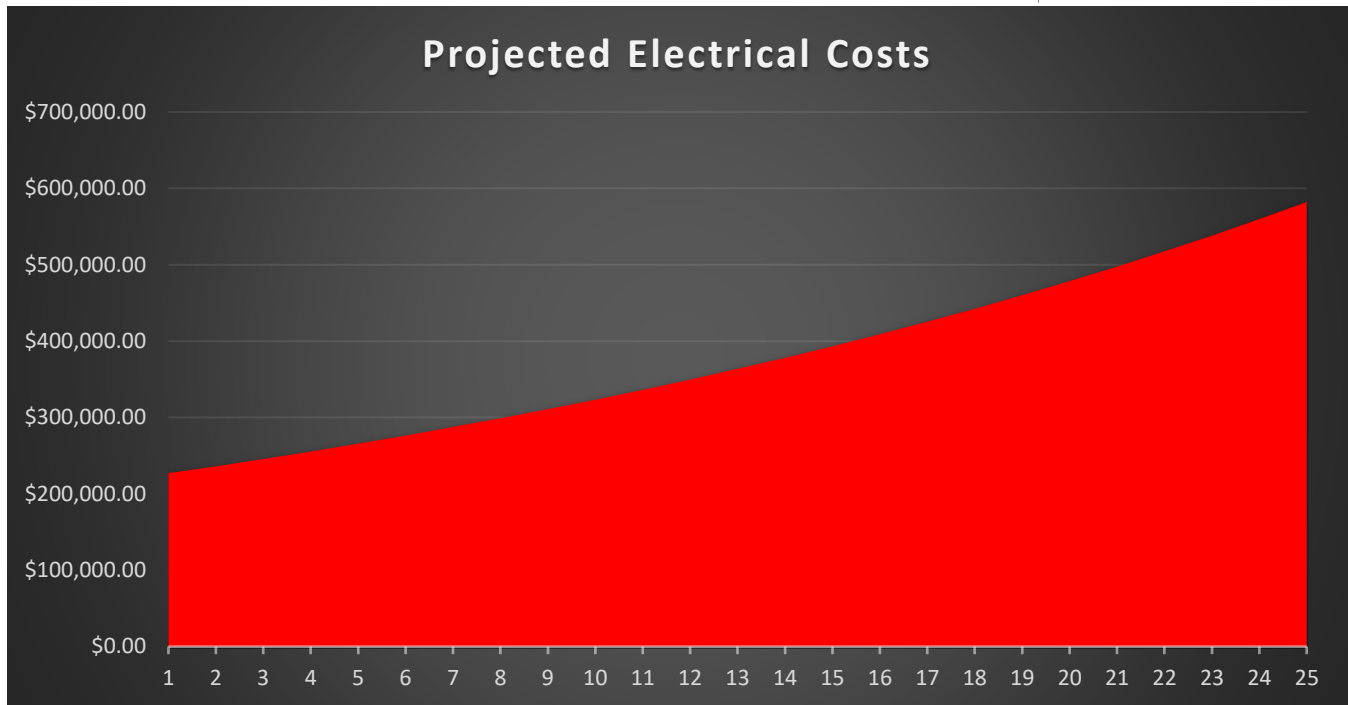
AN INDUSTRY LEADER
STARTED BY ELECTRICAL CONTRACTORS, DPI SOLAR BRINGS A UNIQUE SET OF QUALIFICATIONS TO THIS INDUSTRY. OUR INSTALLATIONS SET THE STANDARD FOR BOTH AESTHETICS AND PERFORMANCE AS WELL AS WORKMANSHIP. OUR BEST ENDORSMENT COMES FROM THE OPPORTUNITIES WE HAVE TO PARTICIPATE IN TRAINING THE JURISDICTIONAL INSPECTORS TO OUR STANDARDS AND PRACTICES.

450+ INSTALLATIONS
...AND COUNTING.
WITH INSTALLS IN OREGON, WASHINGTON AND IDAHO, DPI SOLAR HAS SEEN THE BEST THE NORTHWEST HAS TO OFFER AND KNOWS HOW TO MAKE A SOLAR ARRAY WORK FOR YOU

AFFILIATIONS:



DO NOTHING:



Today

Your total electrical costs over 25 years will be:

25 Years

\$9,458,128

It's very likely that what you pay for electricity this year will be higher than last, and that trend will continue. USA Today reported on this trend in December 2011 headlining that US household electricity bills are skyrocketing. Electricity is consuming a greater share of Americans' after-tax income than at any time since 1996-about \$1.50 of every \$100 in income at a time when income growth has been flat, a USA TODAY analysis of Bureau of Economic Analysis data found. The Energy Information Administration also reports electricity prices are climbing, hitting a record 11.8 cents per residential kilowatt hour so far this year, with California, Massachusetts and New Jersey well above that.

SKYROCKETING COSTS

US Households paid a record \$1,419 on average for electricity in 2010, the fifth consecutive yearly increase above the inflation rate. The jump has added about \$300 a year to what households pay for electricity-the largest sustained increase since the 1970s.

LACK OF CONTROL AND CHOICE

Most of your electricity today is produced from burning coal, oil and natural gas which releases unhealthy chemicals in the atmosphere, polluting the air you breathe. Utilities in America produce the bulk of their energy from fossil fuels. Burning coal, oil and natural gas puts nasty chemicals into the atmosphere.

OWNING YOUR SOLAR ARRAY:

Estimated Customer Tax Bracket: 30%

(Estimated tax bracket affects cash-value of depreciation)

SYSTEM SPECIFICATIONS:

Electricity produced in year 1: 1,510,844 kWh

Electricity usage offset by solar: 47%

BENEFITS:

- * You choose repayment terms and rates
- * You own the asset, choose your own monitoring and maintenance services and receive state and federal incentives

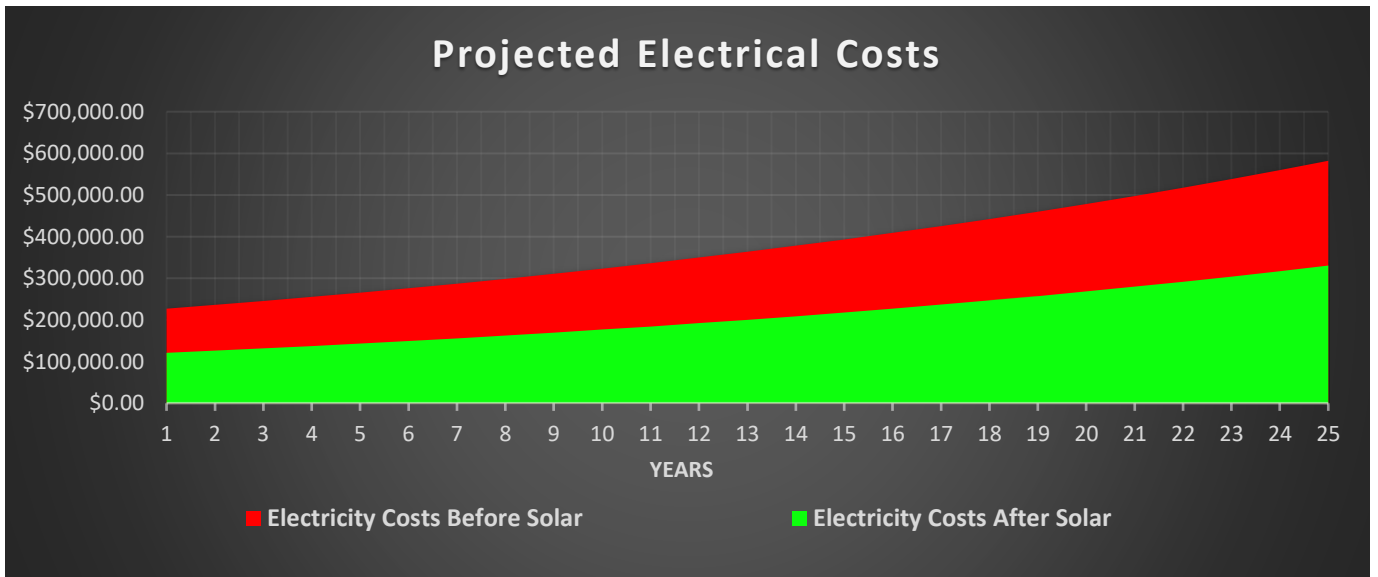
Cash Ownership Overview:

System Cost:	\$2,177,480
Federal Tax Credit:	\$536,244
5-Year MACRS + Bonus Depreciation, Adjusted by Tax Bracket	\$572,808
Utility Grant (If Applicable):	\$390,000
Net System Cost AFTER Incentives:	\$678,429
New Monthly Utility Bill (avg):	\$10,112
Estimated Monthly Savings:	\$8,813
Electrical Savings over 25 Years:	\$4,219,349

Net System Cost Does NOT Reflect Year 1 Energy Production Savings



Lock in your savings with Solar



Your total electrical costs AFTER installing solar (for 25 years) will be:

\$5,238,779

Advantages of OWNING your Solar Array:

- * Access to Standard 5-Year Depreciation + Bonus First Year Depreciation.
- * Owning the Power Plant ensures that your rates will never go up for the electricity you produce
- * Tax deductible interest (Loan-Dependent)
- * Ownership rights to all tax credits, rebates and incentives and ability to apply all of them to your loan and lower your monthly payments
- * Fixed cost of electricity ensures predictable operating costs of facility

Solar Quote from DPI Solar



20345 SW Pacific Hwy, Ste. 103
 Sherwood, OR 97140
 1-800-864-3517



DATE: 6/15/2018
 Quotation # 54365

Quotation Valid Until: 6/25/2018
 Salesman: Josh Kopczynski, President
 Cell Phone: 503-709-9300
 Employee Referral? NO

Percentage of Power Usage Offset by this system:	47%
NET Price Per Watt:	\$1.52

DPI Specialty Foods
 12360 Leveton Drive
 Tualatin, OR 97062
 TBD
 TBD
 Acct #: PGE: TBD

QTY	ITEM #	Description	Unit Price	Price
		Photovoltaic Solar Array Kit which includes:	\$2,177,480.45	\$2,177,480.45
3978	DS1121298	Hyundai HiS-S360RI - 360 Watt 72 Cell Module		
55	DS-Fron-24/3P-480	Fronius 24kW SYMO 480v 3-Phase Inverter w/ Monitoring		
1	388	All mounting mechanisms required to secure to: Asphalt Roof Orientation: Portrait		
1	PERMIT	PERMIT COST (ESTIMATED)	\$5,000.00	Included in Price
1	ENG	ENGINEERING COSTS (ESTIMATED)	\$8,000.00	Included in Price
1	Federal Tax Credit	Federal Tax Credit (30% of Net Cost)*	\$536,244.14	
1	Depreciation	Depreciation (adjusted by tax bracket) - 100% Available in Year 1	\$572,807.52	
1	Electricity	Value of 25 years of ON-SITE Electrical Generation	\$4,219,349.09	
1	Utility Grant	Utility Grant Monies Available for Project	\$390,000.00	
		Total Construction Hours bid for job: 2520		
		Total ELECTRICIAN hours bid for job: 630		
		Construction hours = one person @ 8 hours per day, drive time included		
		Electrician Hours INCLUDED in Total Construction Hours		

Cash Price: (Out of Pocket)	\$2,177,480.45
--	-----------------------

*Out of Pocket costs do NOT include available tax credits

Notes:

- EXECUTION OF THIS CONTRACT IS SUBJECT TO INCENTIVE RESERVATION
- DPI will furnish and install a fully functional PV system with all engineering and inspections
- Application/Permit/Engineering fees are the customer's responsibility. ESTIMATED FEES are included; actual costs may vary. Actual costs will be detailed on final invoice. Permits that cost less than estimated amount will result in a reduction in total costs. Permits that cost more than estimated amount will result in an increase in total costs.
- DPI Solar will provide and execute any Utility Net Metering and Utility Interconnection agreements for this project. DPI Solar will request the Net Meter installation once your project has passed all inspections AND DPI Solar has received all monies due for this project.
- Price does NOT include additional roofing costs (if any), excavation, or additional costs associated with systems with ANY single wire lengths exceeding 150'
- By signing this quote, you are agreeing to contract DPI Solar to furnish and Install a **1,432,080** watt solar array upon successful acquisition of available incentives, permits, and customer (your) approval. Should project be terminated, any accumulated costs become the customer's responsibility (ie: finance, permit, engineering, re-stocking fees)
- Quote assumes a LEVEL 1 utility interconnection agreement (\$0.00). Utility determines if customer meets LEVEL 1 requirements. If Utility requires a LEVEL 3 interconnection agreement, application and transformer upgrade costs are customer's responsibilities. These costs will be confirmed and approved before construction begins.
- DPI Solar will secure all permits, materials, and schedule your installation. CASH CUSTOMERS will be required to pay a deposit in the amount of **\$1,088,740.23** prior to commencing your installation. All remaining balances are due within 5 business days of City/County Final Inspections.
- Customer takes ownership of any materials upon delivery to job site. Theft/vandalism to equipment/materials is customer's responsibility. Please secure material/equipment.

Customer's Signature: _____

Date: _____

DPI Solar Representative: Josh Kopczynski

Date: 6/15/2018

PAYBACK SCHEDULE FOR PV SYSTEMS

DEPRECIATION BASED ON **30%** TAX BRACKET

System Size In Watts 1,432,080	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
COST OF SYSTEM * ₁	(\$2,177,480)	(\$572,670)	(\$462,680)	(\$348,291)	(\$229,327)	(\$105,603)	\$23,069	\$156,888	\$296,060	\$440,798
FEDERAL TAX CREDIT * ₂	\$536,244									
Bonus Depreciation (Year 1)	\$572,808									
UTILITY GRANT (If Applicable)	\$390,000									
Value of ENERGY SAVED Annually * ₃	\$105,759	\$109,989	\$114,389	\$118,965	\$123,723	\$128,672	\$133,819	\$139,172	\$144,739	\$150,528
CUMULATIVE RETURN ON INVESTMENT * ₄	(\$572,670)	(\$462,680)	(\$348,291)	(\$229,327)	(\$105,603)	\$23,069	\$156,888	\$296,060	\$440,798	\$591,326

System pays for itself in approximately **YEAR 6**

Assumes 4% increase in the price of power per year.

ANNUAL NET ELECTRICAL COSTS AFTER INSTALLING SOLAR ARRAY	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
	\$121,349	\$126,203	\$131,251	\$136,501	\$141,961	\$147,640	\$153,545	\$159,687	\$166,075	\$172,718

TOTAL TAX CREDITS AVAILABLE (FEDERAL ITC) **\$536,244**

UTILITY GRANT (If Applicable) **\$390,000**

ACTUAL OUT-OF-POCKET COSTS **\$2,177,480**

Value of All Available Depreciation, Adjusted by Tax Bracket **\$572,808**


NET OUT-OF-POCKET COSTS AFTER TAX CREDITS AND INCENTIVES **\$678,429**

CURRENT ANNUAL POWER USAGE/CONSUMPTION
3,244,403 kW Hours

PERCENTAGE OF POWER SAVED ANNUALLY AFTER INSTALLING SOLAR ARRAY **47%**

DPI Specialty Foods
12360 Leveton Drive
Tualatin, OR 97062
TBD
TBD





Over the next 25 years, your system will save the equivalent of:

17048.6
Tons of Greenhouse Gases

Or...

31,076,136
Miles Driven in Your Car

Or...

683818.2
Trees that make the air we

NOTES:

*1: Cost of system is the initial cost of the system. Each year the tax credits, incentives and value of power produced are subtracted from the previous END OF YEAR net value .

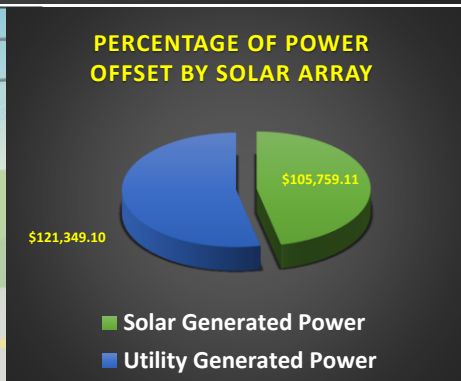
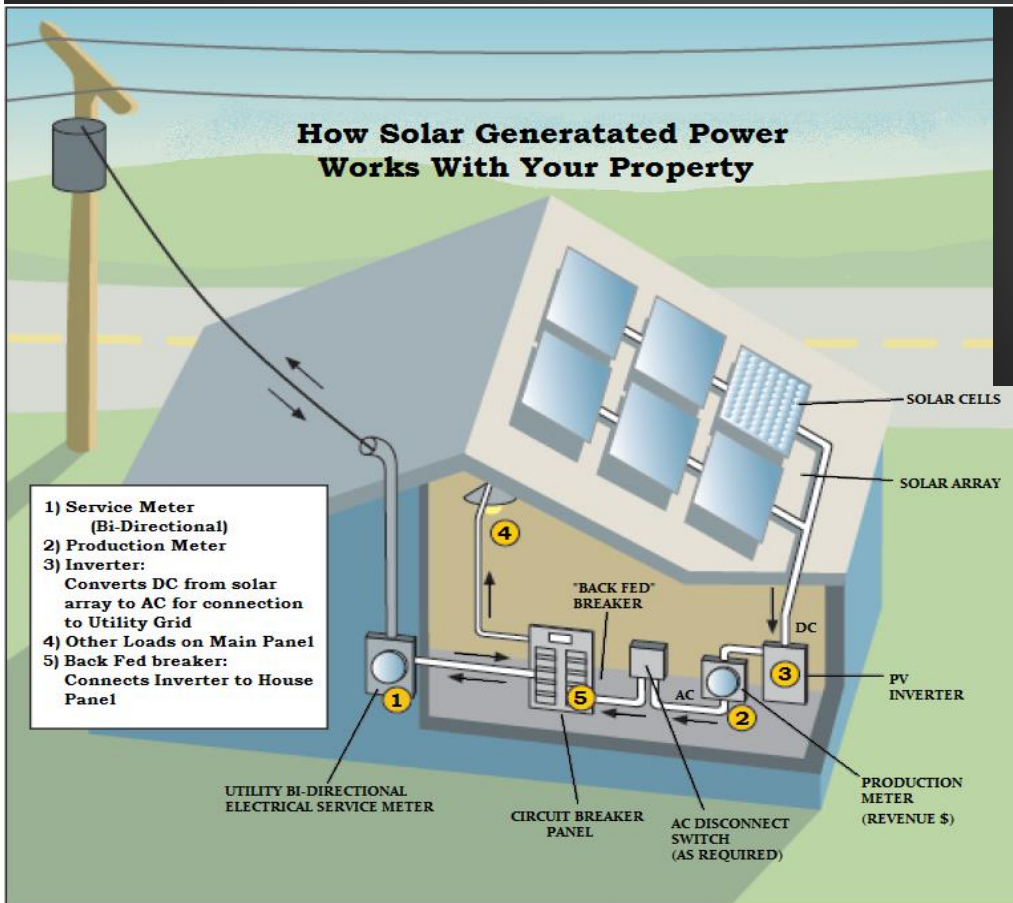
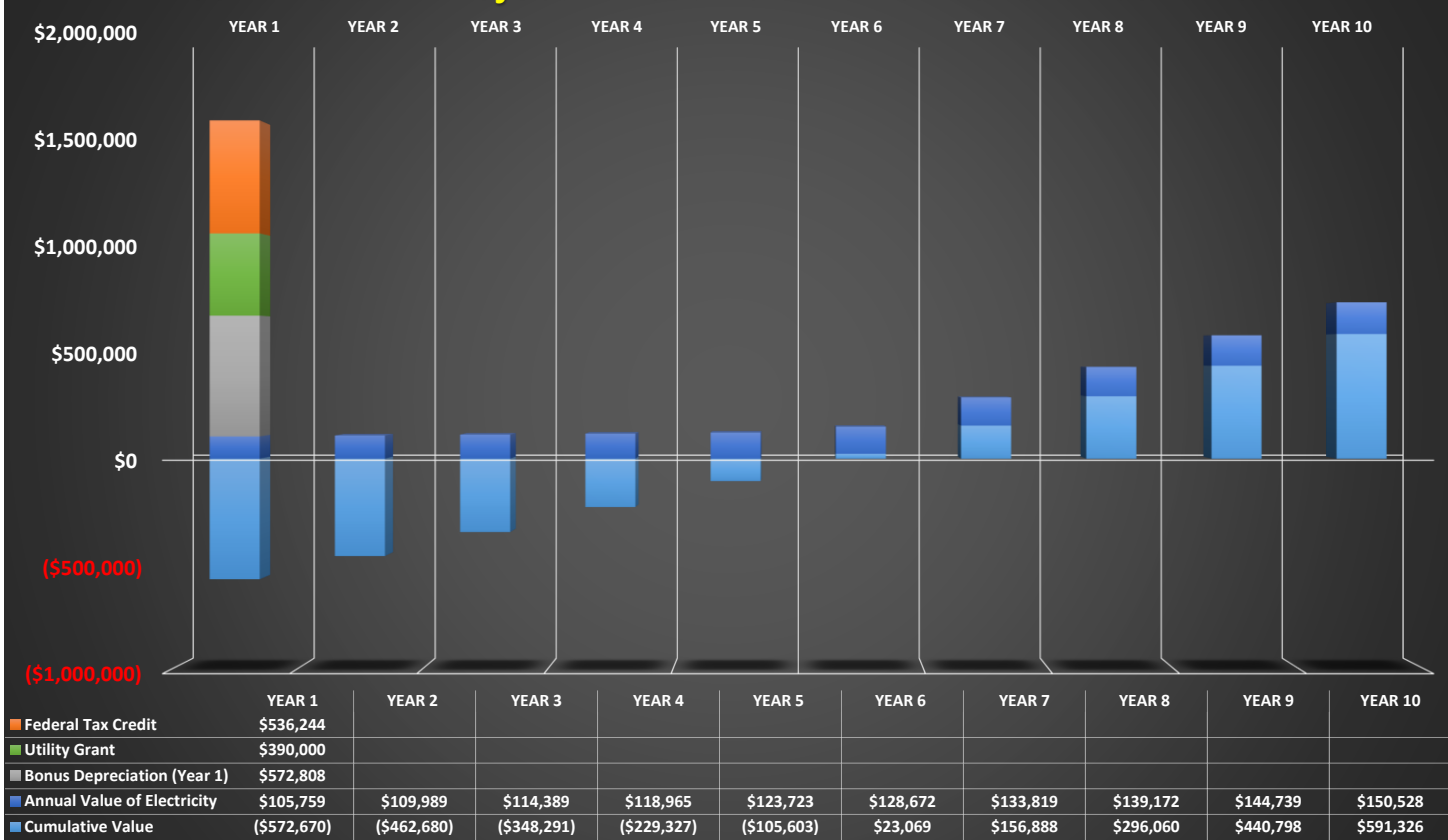
*2: The Federal Tax Credit is 30% of the cost of the system. Can be taken in ONE year if desired or carried forward to succeeding years.

*3: The Value of Energy Produced is based on your current electric rates and applied to the estimated amount of energy the system will produce in kWh (based on 80% efficient systems)

*4: Cummulative Return on Investment reflects how much the incentives have lowered the cost of the system and shows when the system has payed for itself. The Panels are guaranteed for 30 years. Knowing the MINIMUM value of energy produced will demonstrate how the system begins to create positive cash flow

PRICE DOES NOT INCLUDE ADDITIONAL ROOFING COSTS (IF ANY), EXCAVATION, OR ADDITIONAL COSTS ASSOCIATED WITH SYSTEMS EXCEEDING 150' FROM ARRAY TO INVERTER

Commercial Project Investment Timeline for Incentives



**PROPOSED
SYSTEM SIZE:
1,432,080
DC WATTS**

0
DPI Specialty Foods
 12360 Leveton Drive
 Tualatin, OR 97062
 TBD
 TBD



TERMS AND CONDITIONS:

THIS IS THE ENTIRE PROPOSAL. CLIENT UNDERSTANDS AND AGREES THAT THE TERMS AND CONDITIONS ATTACHED TO THIS CONTRACT ARE A PART OF THE CONTRACT, AND THAT CLIENT HAS HAD FULL OPPORTUNITY TO REVIEW AND UNDERSTAND THOSE TERMS AND CONDITIONS.

1. PRICE : *Quoted pricing is good for 10 days. Solar modules are a commodity. As such, their pricing can vary from the time of quote to the time of purchase. DPI Solar will place your order upon receipt of signed contract to lock in pricing. Due to recent solar tariffs being imposed, DPI Solar's pricing on modules IS NOT fixed nor ensured. DPI Solar will maintain our quoted price point if possible regardless of impact of imposed tariffs. As such, DPI Solar will reserve the right to rescind this contract for work. Should the need arise, DPI Solar will work with the customer to requote any project with compromised pricing to ensure project completion without compromising the financial stability of the project.*

2. TAXES : *All prices or quotes specifically exclude any sales, use, franchise, license, excise or other taxes in respect to sale or delivery of the goods or services furnished hereunder.*

3. PERMITS : *DPI Solar will obtain all permits or authorizations from applicable authorities having jurisdiction as needed or required. Engineering, as needed or required for the project, shall be contracted for the customer by DPI Solar with a licensed engineer of our choice. In the event that the customer withdraws from this contract, any incurred costs associated with permitting or engineering shall be due immediately. In this event, an itemized invoice will be submitted to the customer detailing any incurred costs associated with permits or engineering.*

4. TERMS OF PAYMENT : *Unless otherwise specified in writing, and subject to credit approval which may be revoked at any time by seller, the terms of payment shall be 50% due on receipt of parts and balance payable upon completion of jurisdictional inspections. All amounts owing in excess of thirty (30) days shall be subject to an interest carrying charge of 1-1/2% per month on the outstanding balance. Customer agrees to pay all Contractors reasonable costs of collection for any unpaid balance, including, but not limited to, Contractors reasonable costs, disbursements and attorney's fees, regardless of whether litigation or arbitration is commenced.*

5. OWNERSHIP AND LIABILITY : *Customer assumes liability of goods delivered against vandalism, theft, or damage unrelated to the construction process. This liability starts upon delivery of goods and remains in perpetuity until construction is complete. Customer assumes liability for repair or replacement due to theft or vandalism (that occurs to rented equipment that is contracted for use) during construction of this project.*

6. PROGRESS PAYMENTS : *In the event that Customer and Contractor agree in writing to progress payments during the work, then such progress payments shall be made according to the terms of payment set forth in paragraph 4 above. In the event that any progress payment becomes past due, Contractor shall be entitled to cease all further work until full payment is made.*

7. DELIVERY : *Many of our vendors provide free shipping. However, unless otherwise agreed to between Customer and Contractor in writing, the customer agrees to pay any and all shipping charges for goods. Typical examples of shipping charges would include customer-requested expedition of shipping such as overnight or special orders. Customer will be made aware of any specific shipping charges at time of quote or in writing prior to DPI Solar authorizing additional shipping charges.*

8. DELAYS : *Contractor shall not be responsible for reasonable or excusable delays in filling an order. Excusable delays include, without limitation, delays resulting from: accidents; acts of God; fires; floods; freight embargoes or transportation delays; inspection delays; shortages of labor; inability to secure fuel, material supplies or power, all at present prices or on account of shortages thereof; any existing or future laws, acts, regulations, orders, requests or decrees of the federal or any state government affecting the conduct of Contractors business which Contractor in its judgment and discretion deems it advisable to comply with as a legal or patriotic duty.*

9. WARRANTIES : *Contractor warrants to the Customer that the services furnished hereunder is, for a period of 10 years from commencement of installation by Contractor work, free from defects in workmanship and compliant with applicable codes and industry standards. Contractor also warrants that the parts installed by Contractor are free of defect in material and manufacture for 10 years from the commencement of installation, unless the manufacturer warrants a part for a shorter period. In such cases, Contractor's warranty for the part will be limited to the duration of the applicable manufacturer's warranty. Contractor will also honor manufacturer's warranties according to their terms. Any warranty service will be performed FOB to Contractor's nearest service center. Customer's sole remedy under this warranty shall be limited, at Contractor's option, to replacement of any defective goods and/or services. Customer shall not return goods unless authorized in writing by Contractor. Contractor shall have the right to inspect the alleged defective goods and services at Customer's facilities. Customer's failure to give prompt written notice within the above warranty period shall constitute a waiver by Customer of all claims with respect thereto. Authorized returned goods shall be subject to a restocking fee of 25% of the sale price charged by Contractor to Customer. Electrical and special-order parts are not returnable unless Contractor agrees otherwise. In that case, Contractor is entitled to a restocking fee up to the amount of its purchase price for the item. Please see DPI Solar's Limited Warranty for further clarifications, inclusions, and exclusions.*

EXCEPT AS STATED HEREIN, THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED. CONTRACTOR EXPRESSLY DISCLAIMS ANY AND ALL EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, AND THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

10. LIMITATION OF LIABILITY: Under no circumstances shall Contractor be liable to Customer for any consequential damages, lost profits or any other incidental or consequential loss. Customer's sole remedy under the contract is limited to the remedies set forth in Paragraph 9 relating to warranties.

11. GOVERNING TERMS AND CONDITIONS: If any of the terms or conditions of Customers order form conflict with the terms and conditions of this contract, then the terms of this contract will control.

12. GOVERNING LAW: The laws of the State of OREGON, shall govern the validity, interpretation, construction, performance and enforcement of this contract. Venue for any legal proceedings whether in court, arbitration or otherwise, shall be in Sherwood, Oregon. Customer stipulates and consents to personal jurisdiction in any proceeding in Washington County Circuit Court.

13. HIDDEN CONDITIONS: Contractor is not responsible for any additional expense, delay or other loss caused by hidden conditions in the work or at the jobsite which could not reasonably have been discovered upon inspection prior to entering into this contract.

14. CHANGES TO WORK: Contractor may rely on verbal changes ordered to the work made by representatives of Customer, unless and until Customer identifies those individuals with sole authority to order changes in the scope of work. Hidden conditions which dictate change orders in excess of \$2,000.00 must receive written authorization by authorized customer representative via change-order provided (and signed by) DPI Solar authorized representative. Contractor may, at its option, request a signed change-order for changes less than \$2,000.

15. UTILITY GRANT FUNDING: Grants are time sensitive and are quoted in good faith. Actual award may vary dependent upon monies available through the Grantor. Subsequent reductions or increases in the award shall be accounted for in the final billing to the customer.

16. OWNER CANCELLATION RIGHTS: Should owner deliver a completed Notice of Cancellation within three (3) business days after the date of this agreement, DPI Solar shall refund and return any deposits made in full to the owner within ten (10) business days after receipt of such notice. (unsigned "Notice of Cancellation" document is attached to this quote). Owner further acknowledges that DPI Solar will spend time and pay wages to evaluate the project and property, design the solar project, and prepare the project for installation. Should owner cancel this project after ten (10) business days, a cancellation fee of \$1,000 will be charged (or deducted from any deposits received). Any permitting costs, re-stocking fees, or un-recoverable equipment rental costs incurred by DPI Solar will be added to the cancellation fee and charged accordingly (or deducted from any deposits received).

Customer's Signature: _____

Date: _____

Installation Notes:

Ballasted Roof mounted solar project. Engineering required. 2000 Amp main electrical service. Roof should be replaced prior to installation of solar project. Electrical Infrastructure upgrades will be required for this project prior to interconnection.

I have read the installation notes: _____

Date: _____

72-Hour Notice of Cancellation

Please complete this form and mail, fax, or email if you intend to cancel this project.

DPI SOLAR
20345 SW Pacific Hwy, Ste. 103
Sherwood, OR 97140
1-800-864-3517
Email: INFO@DPISOLAR.COM
FAX: 503-822-5641

Grace Period Date: 6/20/2018
If date of this notice falls after date listed,
Please strike through and write in current
amended date below

RE: Quote Number: 30591 Cancellation

↓ Amended Date ↓

I am sending DPI Solar this written request of cancellation of my solar project effective _____

I am requesting that I be sent written confirmation within 5 days that this notice has been received and put into effect.

INITIALS ↓

This notice has been signed and postmarked within the 72 hours given. There are no fees due to me and any/all deposits made on this project will be refunded to me without penalty.

OR

INITIALS ↓

This notice has been signed and postmarked AFTER the grace period date shown above. As such, a fee of \$1,000 will be charged to me or deducted from any deposits given. Additionally, any permitting costs, re-stocking fees, or un-recoverable equipment rental costs incurred by DPI Solar will be added to the cancellation fee and and charged accordingly (or deducted from any deposits received).

Thank you for your prompt attention to this matter.

Sincerely:

Customer Signature: _____
DPI Specialty Foods
12360 Leveton Drive
Tualatin, OR 97062
TBD
TBD

DATE: _____

Name: John A. Thornton		Position Title: Project Manager	
Education			
Institution and Location	Major/Field of Study	Degree	Year
Oregon State University, Corvallis, Oregon	Business Admin. / Industrial	B.S.	1989
Portland State University, Portland, Oregon	Engineering	M.B.A	1998

PROFESSIONAL EXPERIENCE.

2009 – present **Principal Consultant**, CleanFuture, Inc., Portland, OR.

- Conducted fleet operating analyses for refrigerated truck fleets. Quantified benefits of shore power electric standby in transport refrigeration units (eTRU). Studies included use of advanced business intelligence tools, telemetry and GPS for fleet analyses.
- Program manager and principal investigator for development of onboard energy storage systems and advanced technology development for off-wire operation of modern streetcar vehicles for United Streetcar
- Created, developed and collaborated on “Drive Oregon” initiative for electric vehicles for \$2.45 million funding in 2011 – 2013 Oregon Innovation Plan by the Oregon Innovation Council.

2007 – 2009 **Vice President**, Porteon Electric Vehicles, Inc.

- Developed marketing requirements documents, product specifications including component and system specifications, and product development program.
- Facilitated and led product development process

1996 – 2007 **Manager, Development**, Hyster-Yale Materials Handling Group, Inc.

- Developed strategic technology roadmaps & managed product development in advanced powertrains, battery & energy storage systems, rapid charging, fuel cells and hybrids, power management, user-interface displays/controls, embedded systems.

PUBLICATIONS

Market and Technology Assessment of Electric Transport Refrigeration Units. EPRI, Palo Alto, CA: 2015. [3002006036](#).

"Market Assessment and Technology Review of Truck Stop Electrification and Electric Transport Refrigeration Units," in *Electrification Initiative: Tri-State Generation and Transmission Association, Inc. Case Study Report*, Palo Alto, EPRI, 2016. [3002003528](#).

Barrow, Pamela and John Thornton. 2013. “Mobilizing Industry: Energy Intensity Reduction Goal Setting for Global Competitiveness.” In *Proceedings of the ACEEE 2013 Summer Study on Energy Efficiency in Industry*, 5:1-14, Washington, D.C.: American Council for an Energy-Efficient Economy. http://aceee.org/files/proceedings/2013/data/papers/5_201.pdf

Thornton, John, et al. 2013. “Collaboration Across Organizational Boundaries: A Successful Model of Industry Sharing to Improve Competitiveness.” In *Proceedings of the ACEEE 2013 Summer Study on Energy Efficiency in Industry*, 6:1-13, Washington, D.C.: American Council for an Energy-Efficient Economy. http://aceee.org/files/proceedings/2013/data/papers/6_200.pdf

Thornton, John, John MacArthur, and Husam Barham. 2018. “Electrification of Transport Refrigeration Units for Temperature-Sensitive Freight: U.S. Environmental Protection Agency Region 10 Technical Assistance Case Study.” *Transportation Research Record: Journal of the Transportation Research Board*, May. <https://doi.org/10.1177/0361198118773194>

Case Study of Refrigerated Trailers in use at a Food Manufacturing Plant in the U.S. EPRI, Palo Alto, CA: 2017.

Electrified Transport Refrigeration Units Technical Assessment: Refrigerated Fleet Technical Assessments for Electrification. EPRI, Palo Alto, CA: 2017. 3002009837.

Electrified Transport Refrigeration Units Technical Assessment for Alabama Power (EPRI)

Electrified Transport Refrigeration Units Technical Assessment for Georgia Power (EPRI)

Electrified Transport Refrigeration Units: Fleet Operations Assessments for Georgia Power (EPRI)

Fleet Analysis: Electric Standby to Provide Shore Power to Refrigerated Trailers

“Market Assessment and Technology Review of Truck Stop Electrification for BC Hydro” in *BC Hydro Electrification Portfolio Assessment*, Palo Alto, EPRI, 2016. [3002008686](#).

“Market Assessment and Technology Review of Electrified Transport Refrigeration Units for CenterPoint Energy,” in *CenterPoint Energy Electrification Portfolio Assessment*. EPRI, Palo Alto, CA: 2017.

“Market Assessment and Technology Review of Truck Stop Electrification and Electrified Transport Refrigeration Units,” in *Electrification Initiative: Commonwealth Edison Case Study Report*. EPRI, Palo Alto, CA: 2017. 3002003531.

Pollution Prevention Technical Assistance for Idle Reduction and Electrification of Transport Refrigeration Units

Thornton, J. 2016a. “Reducing Refrigeration Transport Cost with Shore Power Electric Standby.” Workshop at the Northwest Food & Beverage Manufacturers Expo & Conference, Portland, OR, January 11 - 13.

Thornton, J. 2016b. “Idle Reduction Technologies: How to Lower Your Fuel Consumption and Save Money.” presented at Louisiana Alternative Fuels & Expo 2016, Lafayette, LA., April 14.

Thornton, J. 2016c. “Gap Analysis on Electrified Parking Spaces (EPS) / Truck Stop Electrification (TSE) / Electrified Transport Refrigeration Units (eTRU)” presented to Northeast Clean Freight Corridors Working Group, July 28.

Thornton, J. 2016d. “Electric TRU Infrastructure.” Presented to CARB Clean TRU Technologies Webinar, August 31.

Thornton, J., E. Harmon, and S. Stidham. 2016. “Ways to Drive Cost Out of your Transportation Business.” Presentation at International Foodservice Distributors Association (IFDA): Distribution Solutions Conference, Tampa, FL., October 16-19.

Thornton, J. 2017a. “Driving Down Refrigerated Transport Cost with Shore Power Electric Standby.” Workshop at the Northwest Food & Beverage World 2017, Portland, OR, January 9 - 11.

Thornton, J. 2017b. “Refrigerated Transport and the Case for Freight Sustainability in Communities.” presented at Green Transportation Summit & Expo 2017, Portland, OR, April 14.

DPI Solar
20345 SW Pacific Hwy #103, Sherwood, OR 97140
Phone 503-857-0099 **Fax** 503-822-5641
info@dpsolar.com
www.dpsolar.com



Statement of Qualifications/Credentials for Josh Kopczynski and DPI Solar

Dynamic Power Innovation would like to submit the following in response to the request for references for the Renewable Development Fund project in conjunction with DPI Specialty Foods.

Dynamic Power Innovation was incorporated in 2007 and reincorporated in 2009, and is a full service electrical and solar design and installation contractor.

Dynamic Power Innovation has installed hundreds of residential, commercial, and industrial projects across the Northwest. We are a proud member of IBEW Local 48 and a training agent for electrical apprentices in Oregon.

We are an Energy Trust of Oregon Trade ally since 2007. Our CCB is 185494, and we are licensed as an electrical contractor BCD# CLR34 and BCD# C1255. DPI's founder, president and electrician is Josh Kopczynski, who is well versed not only in electrical installations, but system design, engineering, and commissioning as well. Mr. Kopczynski's electrical license number is 22895J. He has certificates of completion for: Calc and Code for Supervisors (BCD#124), Oregon Tax Credit Certified Technician, all required continuing education certificates to maintain all required business and professional licenses.

DPI Solar has completed the following large-scale installs within 500 miles of this proposed project site: Laurel Parc Bldg A,B,C,D, Highland Food Market, FioraVonti Custom Products, Farm 47 LLC, CPHH Barcelona, Metro DBA Oregon Zoo Asian Elephant Habitat, Kevedy Inc., and Woodburn Chevron.

Please contact us with any questions or requests for additional information.

Respectfully,

Josh Kopczynski

PRESIDENT, DPI SOLAR

June 15, 2018

David Voyton

6835 SW Nyberg St H-201 • Tualatin, OR 97062 • Cell: 570-417-4650 • E-mail: Dvoyton570@gmail.com

Career Focus: Furthering knowledge in the solar industry, with main focus being the solar industry in Oregon

Education

Bachelors Philosophy

Bachelors Industrial Engineering - 135/147 credits completed

West Virginia University, Morgantown, WV• 08/09 - 05/15

Work Experience

Project Manager, DPI Solar, Sherwood, OR• 05/18 - Present

- Overseeing the completion of projects from Contract Approved to Inspection Complete on budget
- Setting up job accounts with vendors for project materials
- Coordinating with design engineers on creating project plans
- Fulfilling permitting needs
- Scheduling material delivery from vendors and installation time line with customers
- Troubleshooting install difficulties with crew
- Owner's manual delivery and system walk-through with customers
- Scheduling and budgeting electrical service work

Fulfillment Manager, Auric Solar, Tualatin, OR• 01/17 - 05/18

- Responsible for launching the Fulfillment side of the company in the new Oregon branch.
- Coordinate the teamwork of multiple departments to efficiently hit project deadlines.
- Effectively manage warehouse inventory to ensure supply for the day-to-day installation of systems.

Project Manager, Auric Solar, West Valley City, UT• 12/15 - 01/17

- Oversaw the completion of projects from Contract Approved to Inspection Complete.
- Handled escalations from customers bringing them back to good standing with the company.

Door to Door Appointment Setter, Auric Solar, Midvale, UT• 08/15 - 12/15

- Set appointments for sales representatives.

Certifications and Honors:

NABCEP PV Installation Professional

Six Sigma White Belt

May 22, 2018



Statement of Qualifications | Core Services

Presented by John A. Thornton
CleanFuture, Inc.
P.O. Box 23813
Portland, OR 97281-3813
503-806-1760
<http://CleanFuture.us>

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Corporate Summary

CleanFuture, Inc. helps foodservice and grocery distributors reduce fuel burn and refrigerated transport operating costs by up to 70%. Our proven approach has helped clients across the country and we guarantee similar results.

Our expertise helps refrigerated fleets:

- Identify, recommend and quantify savings opportunities
- Implement technology and best operating practices
- Develop a pipeline of grant & incentive funding with over \$11.8 million in grant funding for clients
- Stay ahead of evolving regulatory requirements in California and elsewhere.

If you operate a business with transport refrigeration units and are looking to cut your costs using a proven process, please contact CleanFuture today and we'll share best practices, strategies, and technologies to help you achieve cost savings.

Overview

Our Services

CleanFuture, Inc. is nationally recognized in refrigerated fleet efficiency and electrification of transport refrigeration. CleanFuture's expertise on electric standby refrigeration, also known as shore power electric standby, provides grid-supplied electricity instead of burning diesel while reefers are parked reduces your operating cost. We provide technical assistance, project development, grant funding development, and project management for refrigerated transport electrification and electric standby. This document includes examples of CleanFuture's breadth and depth of expertise to save money in reefer fleets.

Our Staff

John Thornton is president of CleanFuture, a sustainable energy consulting practice assisting companies and industry to become more energy efficient while reducing costs.

While providing energy consultations at food manufacturing plants and cold storage warehouses for the past seven years John recognized extended parked run time in refrigerated trailer units as ways for businesses to cut costs, save fuel and reduce emissions. CleanFuture applies an energy management systems approach to treat reefer fuel burn as a controllable cost. CleanFuture makes use of reefer telematics systems for data acquisition; combined with advanced analytics and business intelligence, to deliver predictive Total Cost of Operations analyses to quantify, measure, and verify savings.

John has over 27 years' experience in industry. Prior to founding CleanFuture John was vice president for an electric vehicle technology company. John also spent 11 years with Hyster-Yale Materials Handling Group, Inc., producer of Hyster® and Yale® lift trucks, where he played key roles in the launch of industrial electric vehicles and related technologies. He has directed cross-functional teams in the development, launch and introduction of new products and processes on a global scale. John earned a B.S. degree from Oregon State University, and an M.B.A. from Portland State University.

Gary W. Cullen provides operational and logistical expertise gained from 38+ years in the retail grocery and foodservice industry. Gary spent the first 19 years of his career with Safeway Stores in Houston, Texas in both the Warehouse and Distribution area as Vice President of Distribution. Gary completed his next 19 years as Vice President of Operations for the Houston Sysco Operating Company and then as the Vice President of

Distribution Services with the Sysco Corporation. Gary started Cullen Consulting Concepts in August of 2012 to help companies improve operations performance and reduce overall operating costs.

Lindsay R. Ashmore provides logistics maintenance expertise gained from 45+ years in the transportation and distribution industry. Lindsay spent the first 10 years of his career as a maintenance mechanic with Zellerbach paper in Portland, Oregon. Lindsay completed his last 35 years with Kroger/Fred Meyer Logistics; holding various positions from maintenance technician, fleet maintenance manager, regional manager fleet and facility, and regional manager western US transportation and facility maintenance, and most recently as regional manager of the western US. Lindsay started Ashmore Consulting in March of 2017 to help clients reduce overall fleet and facilities maintenance costs by providing expertise in best operating practices and procedures.

Husam Barham is a software engineer, business analyst, and project manager at CleanFuture. Husam has experience in data analysis & modeling, software development (Business Intelligence dashboards, systems integration through webservices), and development of energy information systems. Barham has 15 years' experience as a full-stack software engineer and IT project manager. Barham's work included developing software systems related to big data, online services, B2B integration, and from-scratch transactional systems, just to name few. Husam holds a bachelor's degree in computer science, master's degree in international business, and is a technology management PhD student in Portland State University. He is a researcher in the technology management field, particularly focusing on management challenges and applications of big data.

Nina Chaichai is a data scientist and engineer at CleanFuture. Nina has experience in decision making methods, operation research, engineering economics, qualitative and quantitative data analysis, and decision support system: data mining and warehousing. Nina holds a bachelor's in electrical engineering, master's in electrical engineering, master of science in engineering and technology management, and is a PhD student at Portland State University.

Markets Served

Refrigerated Transport

The formula for driving down refrigerated transport costs seems simple: refrigeration units that spend fewer hours running on diesel fuel means less fuel burned, which lowers fuel costs, maintenance costs and reduces a distributor's carbon footprint. And this all equals greater bottom-line profits. But what does it take to get there?

CleanFuture helps businesses reduce operating costs with technologies and best practices to reduce cost, increase efficiency, and improve your carbon footprint.

Electric Power Industry

The electric power industry and electric utilities are increasingly looking towards beneficial electrification to increase customer value, enhance economic development, and improve the environment. Beneficial electrification describes the electrification of end-uses that have historically been powered by fossil fuels (natural gas, propane, fuel oil, or gasoline), to reduce costs and greenhouse gas and other emissions.

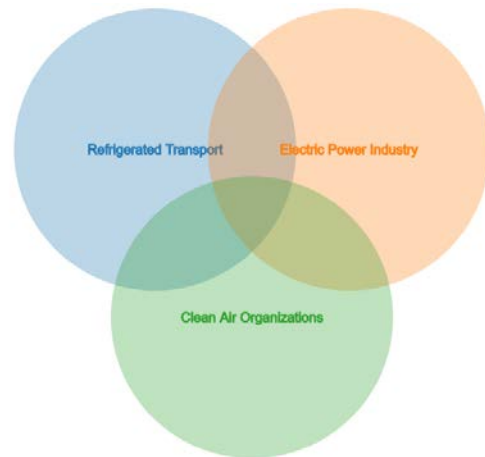
Benefits to electric utilities includes increased electricity use and an increase in demand. Through demand side management programs this can result in strategic load growth, valley filling, or flexible load shape. Electrification of transport refrigeration units (eTRU) is a promising electrotechnology for beneficial electrification.

CleanFuture offers technical support and consulting to evaluate transport refrigeration electrification, and jumpstart growth in electrification of transport refrigeration units (eTRU).

Clean Air Organizations

Clean air organizations are increasingly seeking cost-effective ways to reduce fossil fuel consumption and criteria pollutants while also reducing greenhouse gas emissions.

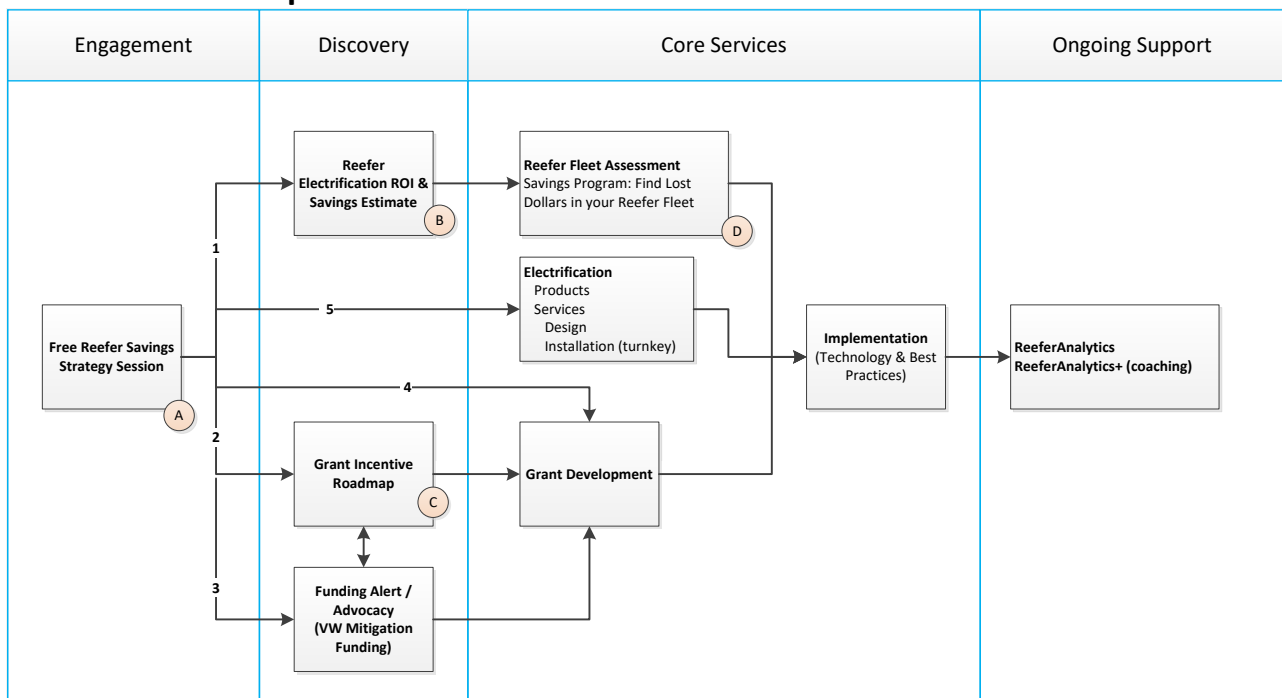
CleanFuture develops projects to electrify refrigerated transport to implement cost-effective emission reductions. CleanFuture works with refrigerated transport providers to access grants and incentives for cleaner operations.



Representative Services

- Reefer Savings Strategy Session
- Reefer Electrification ROI & Savings Scoping Study
- Reefer Fleet Assessment
- Grant Incentives Roadmap
- Grant Development
- Grant Funding Alert
- Grant Funding Advocacy
- VW Mitigation Funding
- Implementation (Technology & Best Practices)
- ReeferAnalytics & ReeferAnalytics+

CleanFuture Example Process Flow



Representative Clients

Client	Refrigerated Transport	Electric Utility	University, Non-profit, Trade Association, and Other	Technology Provider
Advanced Charging Technologies				X
Alabama Power Company		X		
Albertson's Companies / Safeway	X			
Alpine Food Distributing	X			
Atlantic Dynamics LLC				X
Bartlett Dairy	X			
Bozzuto's	X			
C & S Wholesale Grocers	X			
Charlie's Produce	X			
City University of New York			X	
CNR Refrigeration				X
Columbia Willamette Clean Cities Coalition			X	
Coretex				X
CVS Caremark	X			
DPI Specialty Foods	X			
Drive Oregon			X	
Electric Power Research Institute		X		
Food Services of America	X			
Forth			X	
Gelson's Markets	X			
Georgia Power Company		X		
Golden State Foods	X			
HP Hood	X			
Hyster Company				X
Idaho National Laboratory			X	
IldeAir				X
Kool Pak LLC	X			
Linn-Benton Community College			X	
McLane Company	X			
Meals on Wheels People	X			
Merchants Distributors, LLC	X			
Merchants Foodservice	X			
Motive Energy				X
Northwest Food Processors Association			X	

Client	Refrigerated Transport	Electric Utility	University, Non-profit, Trade Association, and Other	Technology Provider
Organically Grown Company	X			
Pacific Northwest National Laboratory			X	
Papa John's International	X			
Performance Customized Distribution	X			
Performance Food Group	X			
Piggly Wiggly Alabama Distributing Company	X			
Portland State University			X	
Producers Dairy	X			
Quality Custom Distribution	X			
Raley's	X			
ReeferAnalytics				X
S. Katzman Produce	X			
SafeConnect Electric Standby Systems				X
Shorepower Technologies				X
Smart & Final Stores	X			
Southwest Traders	X			
System Services of America	X			
Sysco	X			
United Streetcar				X
University of Idaho			X	
Yale Materials Handling				X

Representative Project & Case Study

The Challenge:

To reduce costs by optimizing fuel consumption and reducing wasted fuel burn and dwell times in a food distribution fleet at their distribution center.

The Solution:

To use CleanFuture's proven process with a Refrigerated Fleet Assessment delivered expert technical assistance and guidance to improve fleet efficiency.

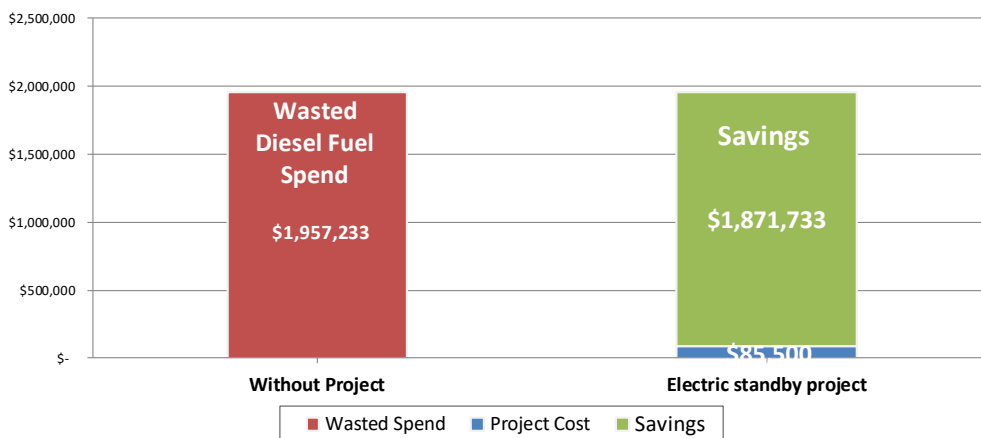
The Result:

CleanFuture's expertise identified & quantified wasted diesel burn, recommended cost-saving solutions by using electric standby, procured grant incentive funding to reduce capital spend, and implemented technology and best operating practices in a food distribution company's refrigerated fleet.

Economics Summary

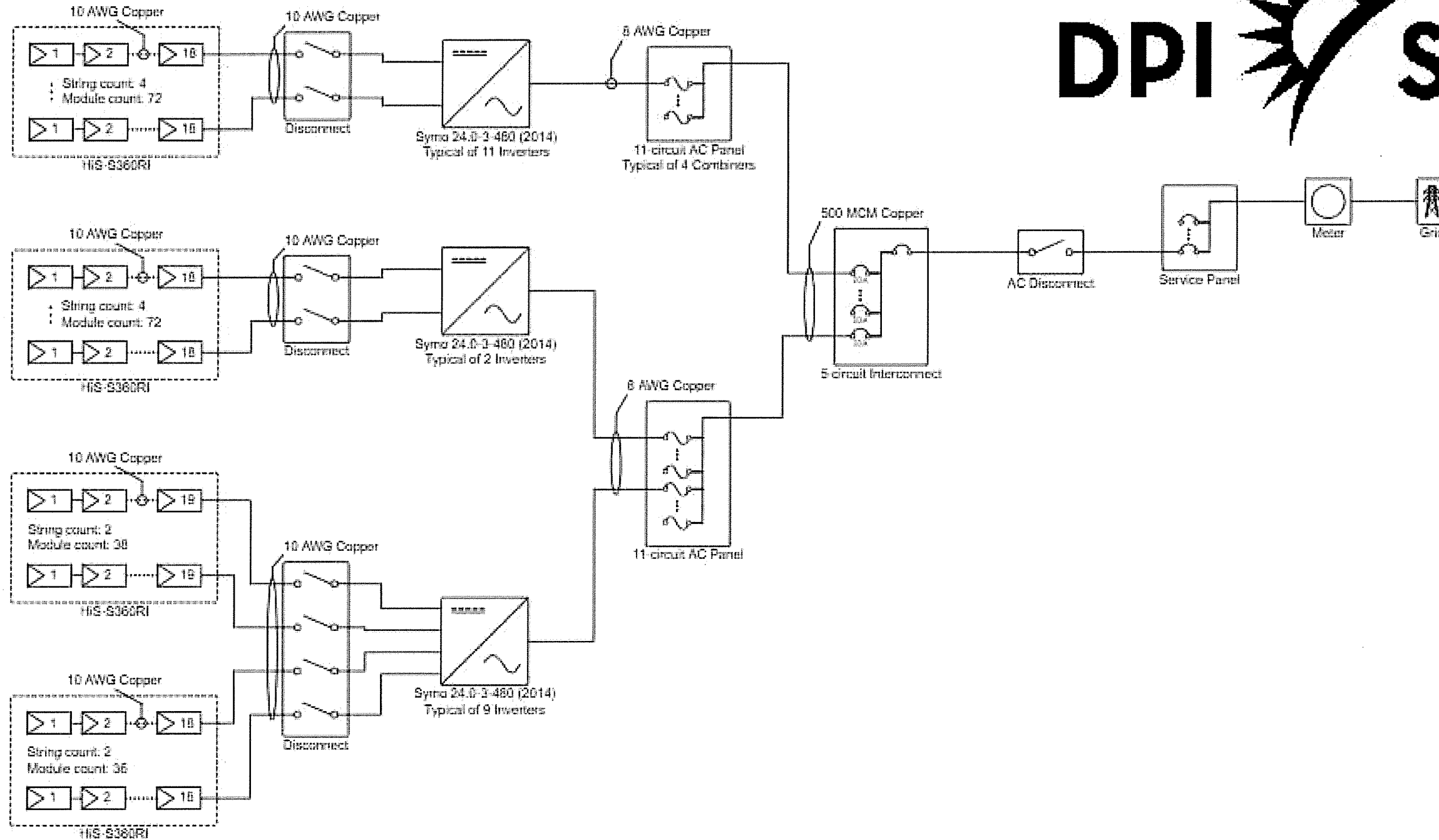
Lifecycle Savings	Investment*	Annual Savings	Simple Payback (yrs.)
\$1,871,733	\$85,500	\$97,862	0.9
		IRR**	NPV**
		114%	\$1,060,382
		Fleet Diesel Savings <small>(total gallons / year)</small>	Electricity <small>kWh / year</small>
		23,892	167,244

Electric standby equipment Life: 20 years



* Net investment and payback after application of incentives.

** NPV & IRR shown before application of incentives (if applicable).



Module Specifications		Inverter Specifications		Photovoltaic AC Disconnect Label: AC Output Current: 1587.75 Amps AC Output Voltage: 480 Volts
3978x Hyundai HiS-S360RI		55x Fronius Symo 24.0-3-480 (2014)		
STC Rating	360 W	Max AC Power Rating	24 kW	
V _{mp}	36.14 V	Max Input Voltage	1,000 V	
I _{mp}	9.2 A	Min AC Power Rating	200 W	
V _{oc}	47.44 V	Min Input Voltage	200 V	
I _{sc}	9.78 A			

Electrical Diagram: Total Installed kW: 1,432kW
 Inverters 1-46: 72 Modules HiS-S360RI = 25.92kW (each)
 Inverters 47-55: 74 Modules HiS-S360RI = 26.64kW (each)

DPI Specialty Foods - Northwest, Solar Project
 12360 S.W. Leveton Dr.
 Tualatin, OR 97062

Drawing/Contractor Info:
 DPI Solar, CCB 185494 / C1255
 20345 SW Pacific Hwy, #103
 Sherwood, OR 97140

Sheet No:
 E-100

JUN 13, 2018, 12:19 AM

PROJECT TITLE: DPI SPECIALTY FOODS | UNIRAC DESIGN W/NEARMAP OVERLAY | 1
PROJECT ID: 148D3C78

Name:	None	Designed by	josh@dpsolar.com
Address:	None	ROOFMOUNT DT	
City, State:	Tualatin, OR, 97062	4139 - 360 Watt Panels	
Module:	Hyundai HiS-S360RI	87299 ft ²	
	360 Watts	1490.0 kW	

ENGINEERING REPORT

- ONLY FOR JURISDICTIONS THAT REQUIRE CALIFORNIA SEAOC PV-1 DESIGN: This array may exceed maximum dimensions for seismic forces. Your array is 46 rows by 33 columns and the maximum allowable per SEAOC PV-1 is 25 rows by 20 columns. Contact Unirac Engineering Services at info@unirac.com for more information about building this design.

Plan review

Average PSF:	3.51 lbs/ft²
Total weight on roof:	306202 lbs
- Bay weight:	32927 lbs
- Module weight:	209020 lbs
- Ballast weight:	64256 lbs
- Max Bay Load (Dead):	123 lbs
Loads Used for Design	
- Building Code:	ASCE 7-10
- Wind Speed:	110 mph
- Ground Snow Load:	20 psf
- Seismic (Ss):	1.20
- Elevation:	150 ft
- Wind Exposure:	B
Loads Determined by Zip	
- City, State:	Tualatin, OR
- Wind Speed:	110 mph
	Special Wind Region
- Ground Snow Load:	10 psf

Inspection

Product:	ROOFMOUNT DT
Module Manufacturer:	Hyundai
Model:	HiS-S360RI
Module Watts:	360 watts
Module Length:	77.17 "
Module Width:	39.29 "
Module Thickness:	1.58 "
Module Weight:	50.50 lbs
Ballast Block (CMU) Weight:	32 lbs
Max Blocks per Valley Bay:	2
Max Blocks per Ridge Bay:	5
Building Height:	40 ft
Roof Type:	Mineral Cap
Parapet Height:	None

WORKSPACE 1

Average PSF:	3.51 lbs/ft ²
Total Number of Modules:	4139
Total KW:	1490.0 KW
Total Area:	87299 ft ²
Total weight on roof:	306202 lbs
- Bay weight:	32927 lbs
- Module weight:	209020 lbs
- Ballast weight:	64256 lbs

Minimum Seismic Separation (Unattached Arrays) *	
- Array to Array:	6 in
- To Obstruction or Parapet:	13 in
- To Roof Edge (no Parapet):	19 in
Max Array (Seismic) (For Unattached Arrays) *	
- NS Rows:	25
- EW Columns:	20

**In jurisdictions that follow SEAOC PV-1 methodology.*

SATELLITE VIEW





JUN 13, 2018, 12:19 AM

PROJECT TITLE: DPI SPECIALTY FOODS | UNIRAC DESIGN W/NEARMAP OVERLAY | 1
PROJECT ID: 148D3C78

Name: None

Designed by
josh@dpisolar.com

Address: None

ROOFMOUNT DT

City, State: Tualatin, OR, 97062

4139 - 360 Watt Panels

Module: Hyundai HiS-S360RI

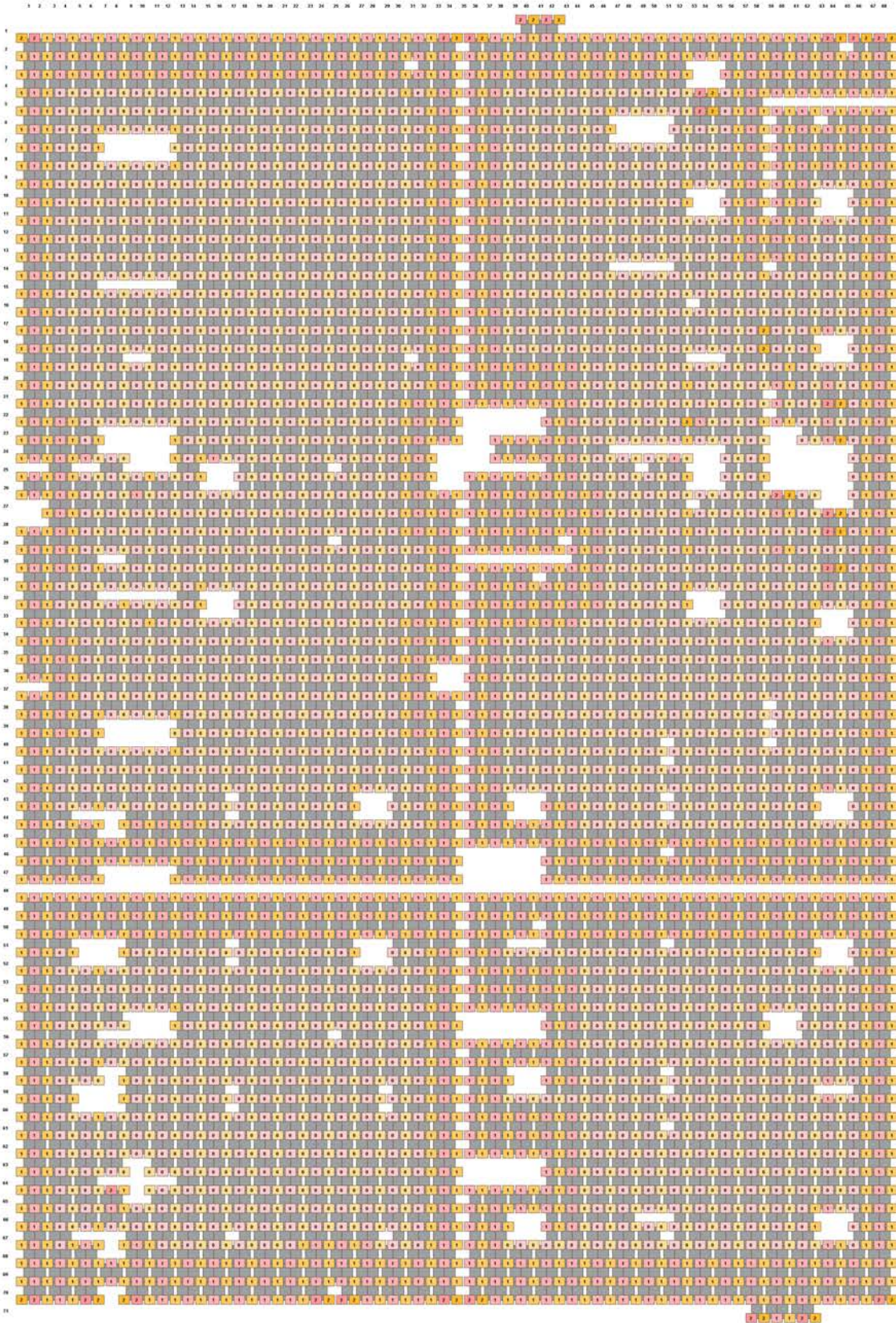
87299 ft²

360 Watts

1490.0 kW

INSTALLATION AND DESIGN PLAN

LAYOUT WORKSPACE 1



- 1 VALLEY BAY(S) OF BLOCKS
- 2 PEAK BAY(S) OF BLOCKS
- 3 SUPPLEMENTAL BAY(S) OF BLOCKS

Note: Blocks above with values greater than 4 require extra ballast bays. The proper number of bays are provided in the Bill of Materials. The installer must install these extra bays as near to the indicated location as possible.

Layout Dimensions

NS Dimension: ~458.0 ft

EW Dimension:

~248.6 ft

Row	Modules	Bays	Ballast Blocks (CMU)	Ballast Weight
1	3	4	8	256
2	66	69	81	2592
3	63	69	69	2208
4	64	67	67	2144
5	57	69	27	864
6	60	69	27	864
7	55	65	25	800
8	60	64	23	736
9	66	69	23	736
10	60	69	19	608
11	60	65	19	608
12	67	69	19	608
13	67	69	18	576
14	61	69	18	576
15	61	69	13	416
16	66	69	12	384
17	67	69	12	384
18	64	69	16	512
19	58	67	15	480
20	67	69	19	608
21	66	69	22	704
22	60	69	25	800
23	52	63	23	736
24	41	60	26	832
25	36	54	24	768
26	52	57	24	768
27	61	67	29	928
28	65	67	29	928
29	65	69	29	928
30	57	69	25	800
31	66	69	27	864
32	55	69	23	736
33	58	65	24	768
34	64	67	22	704
35	67	69	17	544
36	65	69	16	512
37	63	67	14	448
38	66	69	16	512

39	60	69	18	576
40	59	64	17	544
41	66	69	13	416
42	67	69	12	384
43	56	69	15	480
44	52	63	19	608
45	65	68	28	896
46	60	69	69	2208
47	55	63	63	2016
48	0	58	58	1856
49	67	69	69	2208
50	66	69	69	2208
51	52	69	69	2208
52	56	62	16	512
53	67	69	20	640
54	67	69	18	576
55	54	69	20	640
56	51	58	14	448
57	67	69	18	576
58	61	69	19	608
59	54	66	18	576
60	61	66	15	480
61	66	69	19	608
62	67	69	18	576
63	59	69	18	576
64	55	62	12	384
65	65	68	21	672
66	58	69	22	704
67	54	65	18	576
68	65	68	26	832
69	67	69	69	2208
70	64	69	69	2208
71	5	68	84	2688
72	5	6	10	320

Education Plan Outline

I. Trades Education, Transportation Non-profit Partners

a. Oregon Tradeswomen.

Oregon Tradeswomen is dedicated to promoting success for women in the trades through education, leadership, and mentorship. Founded in 1989 as a small support group led by four tradeswomen (an elevator constructor, two carpenters and an operating engineer), the organization was reorganized as Oregon Tradeswomen, a 501 (c)(3) non-profit, in 1999. Oregon Tradeswomen was founded on the principles that women deserve and can attain economic self-sufficiency through pursuing careers in the building, mechanical, electrical, and utility trades while helping and encouraging the trades industry build up a diverse workforce.



b. Constructing Hope

Constructing Hope means that we are in the business of rebuilding the lives of people in our community by encouraging self-sufficiency through skills training and education in the construction industry.



c. Portland Youth Builders

The mission of Portland Youth Builders is to support young people who are committed to changing their lives to become self-sufficient, contributing members of the workforce and their community



d. FORTH

Forth opened its doors as Drive Oregon in 2011, when the first mass-market electric vehicles were just coming to showrooms and "self-driving cars" were a science fiction fantasy. In 2017, after six years of advancing electric transportation-- and major changes in technology-- they

became Forth. The growing vision includes a range of smart mobility approaches, a larger team, and new partners.



- II. Partner participation
 - a. Trades nonprofits will be involved onsite for two week periods receiving training and executing portions of the installation under supervision. We anticipate at least 3 members from each organization working for two week periods at \$25/hour. Any partner worker on site will be under supervision of DPI Solar and it's associated licensed electricians. DPI Solar is a training agent for IBEW local 48. All safety equipment and training for such equipment will be reviewed on a daily basis and strictly enforced. Proposed project is on a flat roof, will include fall protection, safety barriers and 100% supervision.
 - b. Partner organizations will be featured in media events, press releases and educational displays to further their missions and public visibility. Each partner organization will also receive a \$10,000 donation. We hope to inspire the community at large with this project to further interest in trades careers that benefit the local economy and community.

- III. Community Education & PGE Green Future Recognition
 - a. Signage
 - i. Display on 124th Ave with Project Facts. DPI Specialty Foods has wall space located alongside 124th Ave, a busy road connecting Tualatin Sherwood Road and Highway 99. Pending approval form the city of Tualatin signage will be added to this wall with facts regarding the project.
 - ii. Educational wraps on trailers. Five trailers will be wrapped with details about Green Source funded RDF award, project facts, images, and partnering non-profit organizations.
 - iii. Crew shirts. Crew members, including participating partners will receive long sleeve shirts with project facts.
 - b. Onsite Monitoring Kiosk
 - i. Television set up in reception area with live monitoring, general messaging and project facts.
 - c. Media and Publications

- i. I heart radio campaign. DPI Solar already has radio advertising in place and will run ads informing the public of project facts and details about Green Source RDF award.
 - ii. Press releases to Tualatin Life, Portland Tribune, The Times of Tigard Tualatin featuring Green source funding, non profit partners and general messaging.
 - d. Celebrations and Events.
 - i. Ribbon cutting media event with iHeart Radio and Mark Mason. At 1.43Mw this installation will be the largest in the city of Tualatin. Upon completion DPI Solar will organize a media ribbon cutting event in which the project shall be commissioned. Project partners will be in attendance and available for interviews, photos etc.
 - ii. FORTH roadmap conference project site tour showcase June 2019. Sold out in 2017, with over 600 participants, the Roadmap Conference is the nation's largest most advanced annual conference on electric and smart mobility. Forth is pleased to showcase this leading-edge project to show replicability next year when industry, utility, and government leaders visit Portland for the Roadmap Conference.
 - e. Website information
 - i. DPI Specialty foods will feature information on their website about Green source funding, non-profit partners, live production data and project facts.

IV. General Messaging and project facts

- a. Project 25 year impact total 64,004,812kWh
- b. Impact equivalent to *
 - i. Emissions from 52,115,393 pounds of coal or 260 Railcars.
 - ii. Carbon sequestered by 1,234,476 million trees
- c. Recognition of PGE Green Future & Nonprofit partners
 - i. Funded in part by PGE Green Future
 - ii. In Partnership with Oregon Tradeswomen, Constructing Hope and Portland Youth Builders. Empowering future trades people to power tomorrow.
 - iii. In partnership with FORTH

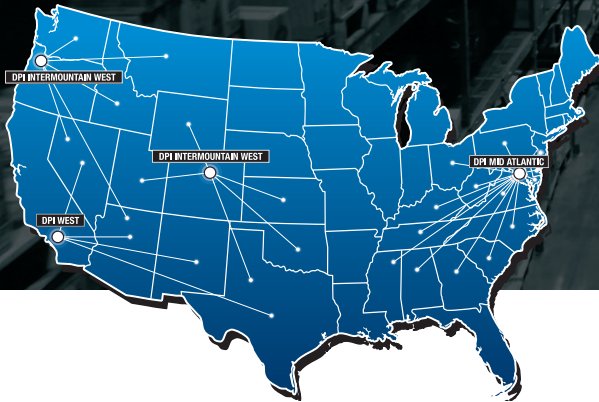
*based on EPA Equivalencies Calculator

Example of a conceptual trailer wrap to showcase educational elements of the project. Specific design will be developed by project team in the future.

DPI Specialty Foods

Over the past years we have worked hard to re-tool our division headquarters to become more energy efficient. Saving not only dollars but resources locally and nationally.

Baltimore | Denver | Portland | Los Angeles



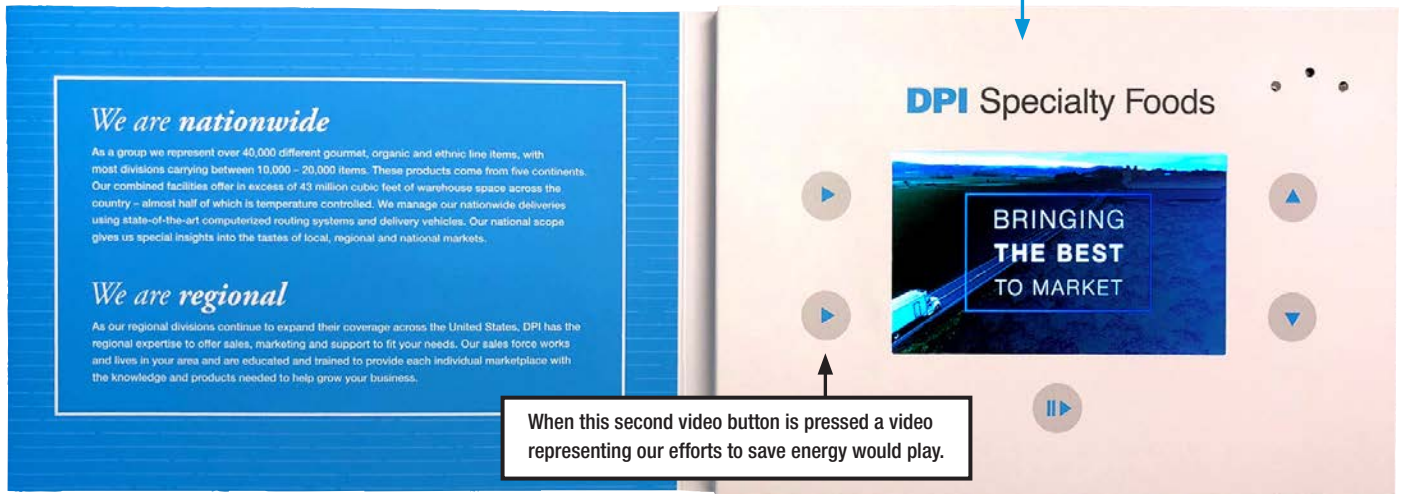
Video Brochure Cover



DPI Specialty Foods is a national distributor of specialty products. Our physical locations are in Portland Oregon, Ontario California, Denver Colorado and Baltimore Maryland. Our reach of distribution spans the US. Over the past years we have worked hard to re-tool our division headquarters to become more energy efficient. Saving not only dollars but resources locally and nationally.

Our Marketing Department has recently completed a video project with the aim of promoting our people, products and expertise in the purchasing, warehousing, delivering and marketing of specialty food products.

Brochure opens to display a full color, high resolution video



Pictured above: Our Marketing Department has recently completed a video project with the aim of promoting our people, products and expertise in the purchasing, warehousing, delivering and marketing of specialty food products. As a tool our plan would be to add to this project a visual representation of the efforts that the Northwest Division has made to save energy. This would potentially encourage other business like ours to follow the path of a more environmentally resourceful option to doing business today. Our efforts in terms of new more energy efficient lighting in both our internal offices and warehouses has been a tremendous savings.

The Northwest (Portland Oregon) division has just completed a warehouse dock enclosure project, refrigeration control and monitoring program and the installation of new freezer and cooler doors. (Northwest Division 250,000 square feet in total including 40,000 square feet of freezer space, 50,000 square feet of refrigerated storage space and 40,000 square feet of refrigerated product staging areas).

As we budget today for tomorrows growth and savings within all of our divisions, having the ability to visually share these efforts even within our own organization will prove very useful. As we look to the future being involved in sharing our efforts and learning what others are doing and will do will benefit us all.

DPI Specialty Foods

- 1.51 Million kWh Solar Production
- 2.69 Million kWh in Energy Reduction
- Equivalent to planting 222 trees every day

1.43 MW Solar Power Plant

DPI

SOLAR

**A SPECIAL THANKS
TO OUR PARTNERS**



RENEWABLE
DEVELOPMENT
FUND  Energy



PRE-APPRENTICESHIP PROGRAM



Oregon Tradeswomen





Josh Kopczynski <josh@dpisolar.com>

Incentive Eligibility and Project Size Cap

3 messages

Matt Getchell <Matt.Getchell@energytrust.org>
To: "josh@dpisolar.com" <josh@dpisolar.com>

Wed, May 16, 2018 at 4:13 PM

Hi Josh, thanks for your inquiry.

Per our program requirements and current incentive rates, projects larger than the respective project size caps are not eligible for Energy Trust solar incentives. The current project size caps are 400 kW for projects located in Portland General Electric territory and 250 kW for projects located in Pacific Power territory.

Please let me know if you or any of your customers have further questions. Thank you.

Matt Getchell

Project Manager - Solar

Energy Trust of Oregon

421 SW Oak St., Suite 300, Portland, Oregon 97204

energytrust.org



+ Please consider the environment before printing this email.

This email is intended for its addressee(s) and may contain confidential information. If you receive this email in error, please notify me and delete it promptly. Thank you.

Josh Kopczynski <josh@dpisolar.com>
To: Matt Getchell <Matt.Getchell@energytrust.org>

Wed, May 16, 2018 at 4:45 PM

Thanks Matt
[Quoted text hidden]

Unirac Design w/Nearmap Overlay DPI Specialty Foods, 12360 Leveton Dr, Tualatin, OR 97062

Shading Heatmap



Shading by Field Segment

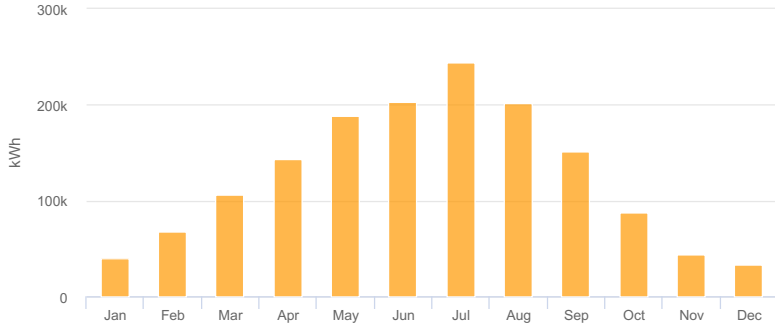
Description	Tilt	Azimuth	Modules	Nameplate	Shaded Irradiance	AC Energy	TOF ²	Solar Access	TSRF ²
1	10.0°	181.4°	3,978	1.43 MWp	1,295.1kWh/m ²	1.51 GWh ¹	85.8%	97.9%	84.0%
» subarray 1	10.0°	91.4°	1,987	715.3 kWp	1,289.3kWh/m ²	752.3 MWh ¹	85.4%	97.9%	83.6%
» subarray 2	10.0°	271.4°	1,991	716.8 kWp	1,300.9kWh/m ²	758.7 MWh ¹	86.2%	97.9%	84.4%
Totals, weighted by kWp			3,978	1.43 MWp	1,295.1kWh/m²	1.51 GWh	85.8%	97.9%	84.0%

¹ approximate, varies based on inverter performance
² based on location Optimal POA Irradiance of 1,541.4kWh/m² at 35.5° tilt and 182.9° azimuth

Solar Access by Month

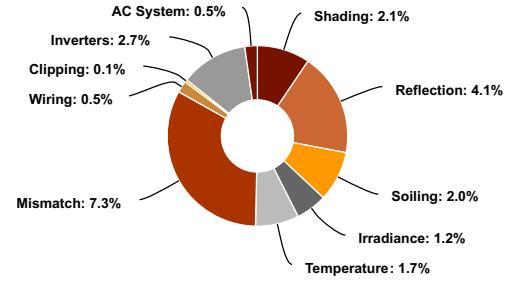
Description	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	96%	97%	98%	98%	99%	99%	98%	98%	97%	97%	97%	97%
Solar Access, weighted by kWp	96.4%	96.5%	97.9%	98.4%	98.8%	98.6%	98.2%	97.9%	97.2%	97.1%	96.5%	96.7%
AC Power (kWh)	40,392.0	67,831.0	105,568.1	143,611.9	188,693.7	202,847.7	244,320.9	202,221.9	151,651.4	87,358.9	43,329.0	33,120.3

Monthly Production

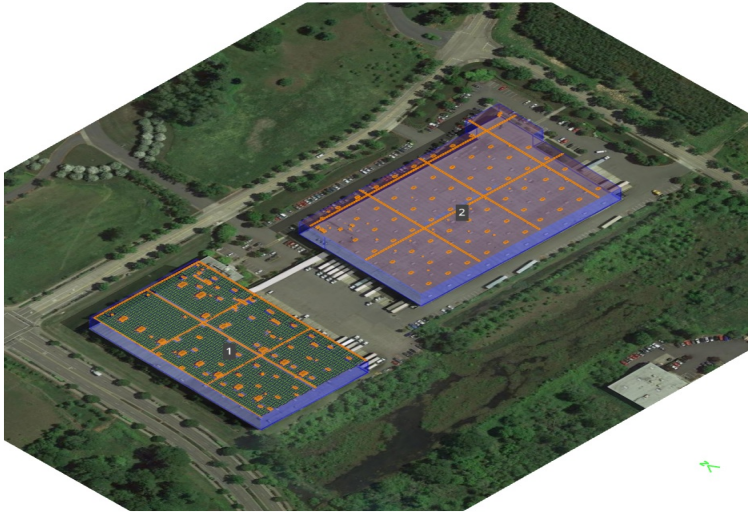


Month	GHI (kWh/m ²)	POA (kWh/m ²)	Shaded (kWh/m ²)	Nameplate (kWh)	Grid (kWh)
January	36.8	36.7	35.3	46,227.6	40,392.0
February	60.0	59.7	57.6	76,028.2	67,831.0
March	90.3	89.9	88.0	117,877.4	105,568.1
April	122.4	121.9	119.9	161,355.8	143,611.9
May	160.2	159.6	157.6	213,295.8	188,693.7
June	176.2	175.6	173.2	234,685.6	202,847.7
July	217.3	216.1	212.2	288,658.8	244,320.9
August	181.0	180.0	176.2	238,907.3	202,221.9
September	136.4	135.9	132.0	177,658.8	151,651.4
October	78.3	77.9	75.7	100,744.9	87,358.9
November	39.9	39.7	38.3	50,258.5	43,329.0
December	30.1	29.9	28.9	37,793.4	33,120.3

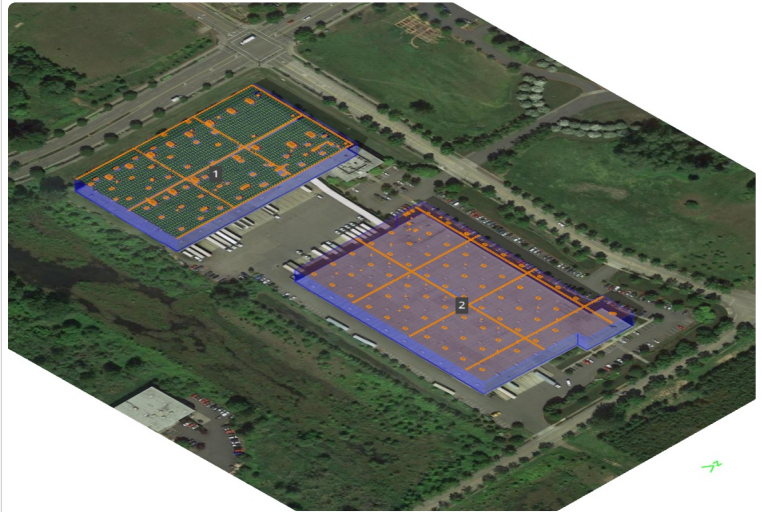
Sources of System Loss



Southwestern Angle



Southeastern Angle



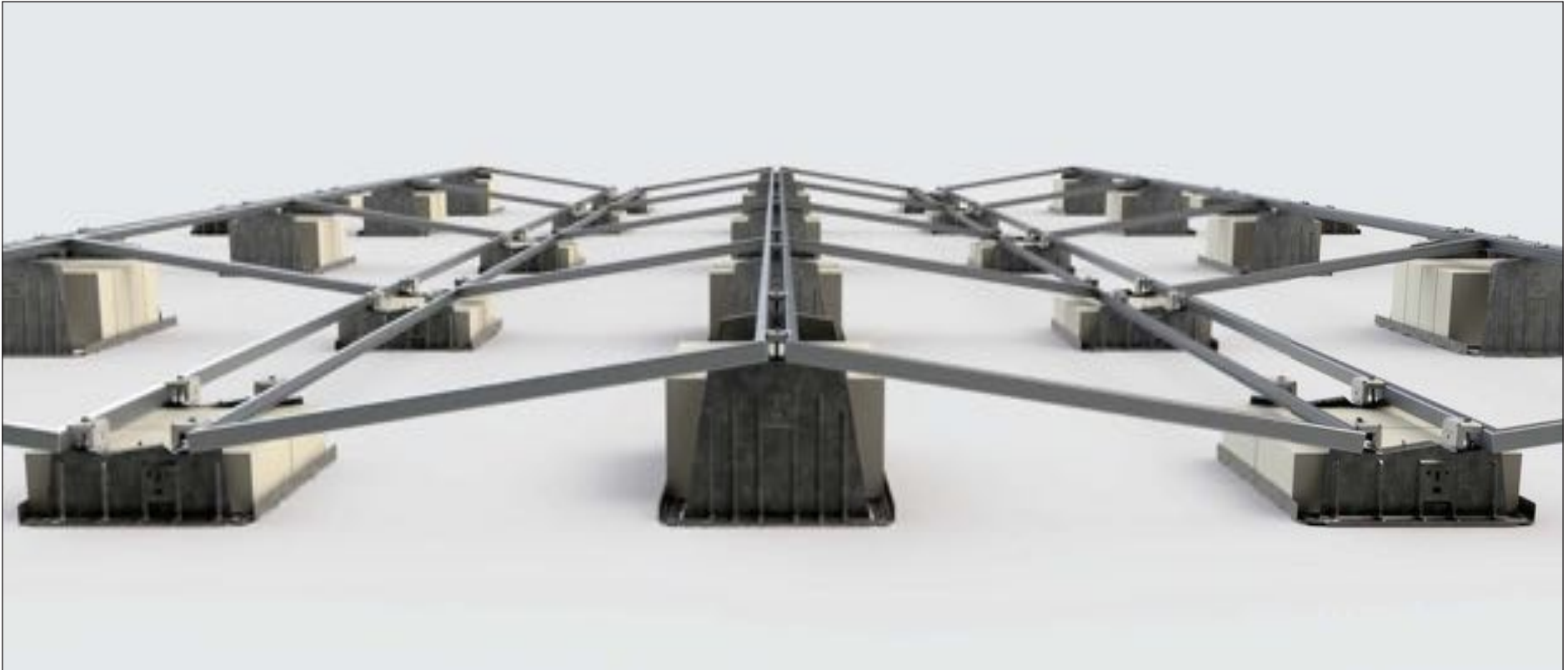


TABLE OF CONTENTS:

Tools & Specifications
 System Components
 System Level Fire Code Compliance
 Locate Array & Place Bays
 Place Ballast
 Place Modules & Attach Clamps
 Attach Clamps
 Module Installation & Wire Management
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 Bonding & Grounding System Certification
 Bonding & Grounding Electrical Diagram
 Temporary Bonding Procedures
Installation Supplement
 Ballast Bay(s) Roof Attachment
 Microinverter Install & Wire Mgmt.

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GENERAL NOTES:

Refer to construction drawings for project specific details. Construction drawings have precedence over these installation guidelines.

TECHNICAL SPECIFICATIONS:

Material Types: 16G ASTM A653 GR50 Steel
G235 Galvanization

Hardware: Stainless Steel

Bonding and Grounding: UL2703 Listed Continuous Bonding Path.

TOOLS REQUIRED OR RECOMMENDED FOR LAYOUT, ATTACHMENTS & INSTALLATION:

- Drill (**Do Not Use An Impact Driver**)
- 7/16" Socket
- Torque Wrench
- Tape Measure
- Chalk Reel
- Optional Spacers (See Diagram - Page Right)

GENERAL HARDWARE:

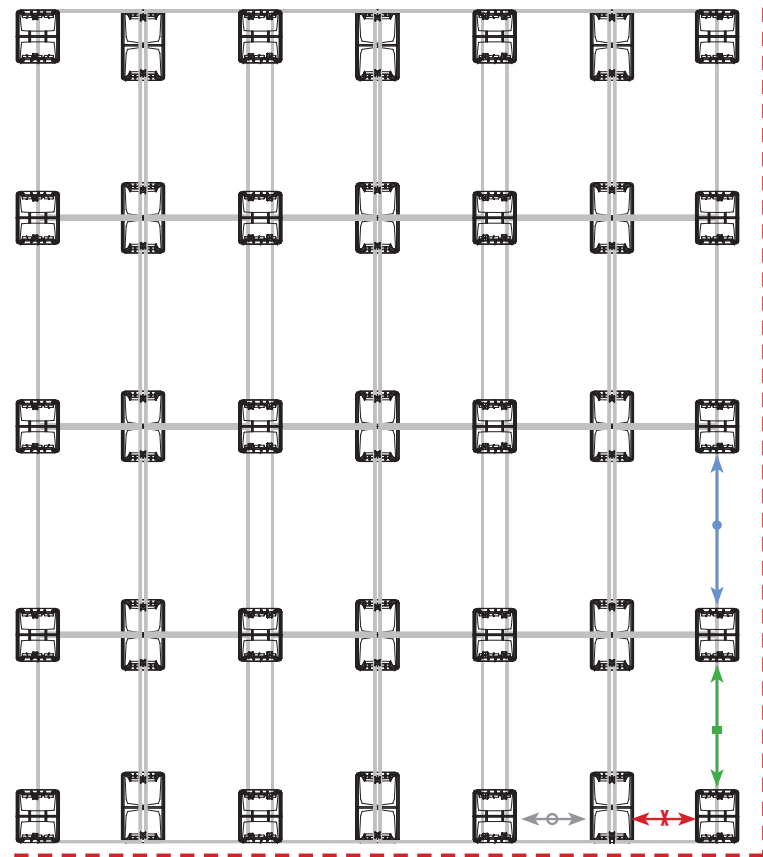
- 1/4-20 X 2 1/2" Hex Head Bolt - Module Clamps
- 1/4-20 Stainless Steel U-Nuts

SAFETY:





All applicable OSHA safety guidelines should be observed when working on a PV installation job site. The installation and handling of PV solar modules, electrical installation and PV racking systems involves handling components with potentially sharp metal edges. Rules regarding the use of gloves and other personal protective equipment should be observed.

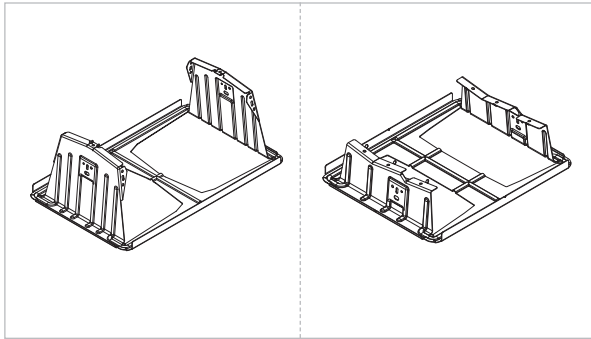
LAYOUT ASSISTANCE TOOL:

RM DT		Equations (Inches)	Project Specs (Spacing Inches)	
			Module Length (IN)	Module Width (IN)
1	Perimeter Column Spacing	$(\text{Module Length})+(\text{Gap Spacing})-19.7$		
2	Column Spacing	$(\text{Module Length})+(\text{Gap Spacing}/2)-29.55$		
3	E/W Edge Row Spacing	$0.996*(\text{Module Width})-15.74$		
4	Row Spacing	$0.996*(\text{Module Width})-11.25$		

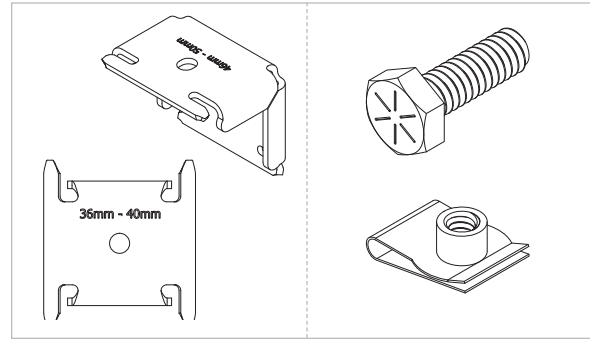


SPACERS - OPTIONAL

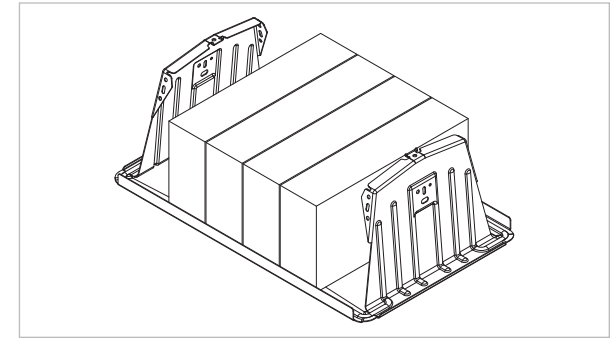
- PERIMETER COLUMN SPACER 
- COLUMN SPACER 
- E/W EDGE ROW SPACER 
- ROW SPACER 



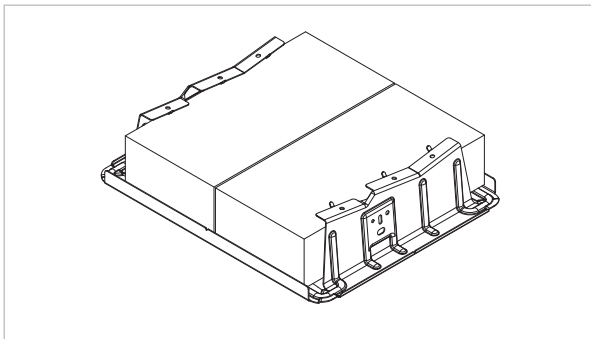
BALLAST BAY: The Ballast Bay is constructed of a high strength low alloy G235 Galvanized Steel. This system has a modular design that allows for easy installation around roof obstructions and accommodates roof undulations. The Ballast Bays are designed to nest within each other to optimize shipping logistics.
NOTE: Systems installed on PVC roofs require ballast bays with pre-installed Santoprene pads.



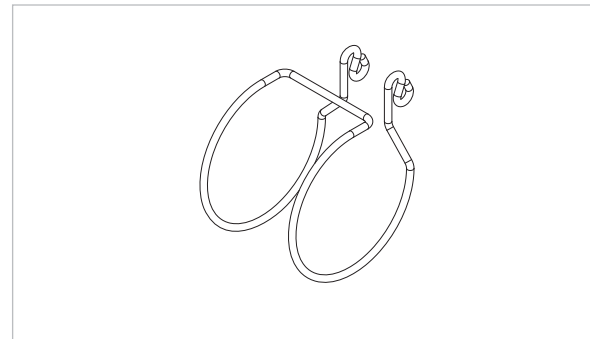
CLAMP & HARDWARE: The Module Clamp is made of Stainless Steel and can be used with module frame heights indicated on the clamp. The clamps are a portion of the UL2703 Listed system when installed according to this installation guide. A 1/4-20 stainless steel bolt and u-nut are the associated hardware for installing clamps.



RIDGE BALLAST BLOCK: The Ridge ballast bay can fit up to 5 standard 4"x8"x16" solid concrete cap blocks. Block weight can range from 26 – 38 lbs and shall meet ASTM C1491 requirements for freeze thaw durability. Verify your block weights before using the Unirac U-builder online design tool

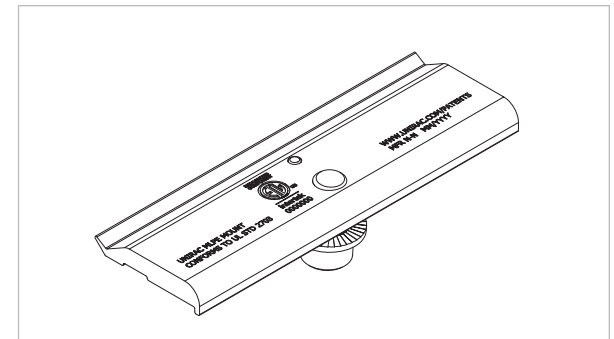


VALLEY BALLAST BLOCK: The Valley ballast bay can fit up to 2 standard 4"x8"x16" solid concrete cap blocks. Block weight can range from 26 – 38 lbs and shall meet ASTM C1491 requirements for freeze thaw durability. Verify your block weights before using the Unirac U-builder online design tool.



OPTIONAL WIRE MANAGEMENT: Custom Unirac wire clip along with mounting options for various off the shelf wire management clips.

NOTE: All conduit and wire ways should be grounded & bonded per the (NEC) National Electric Code.



OPTIONAL MICROINVERTER MOUNTING: Microinverter / Power optimizer bracket, see page B for additional instructions.

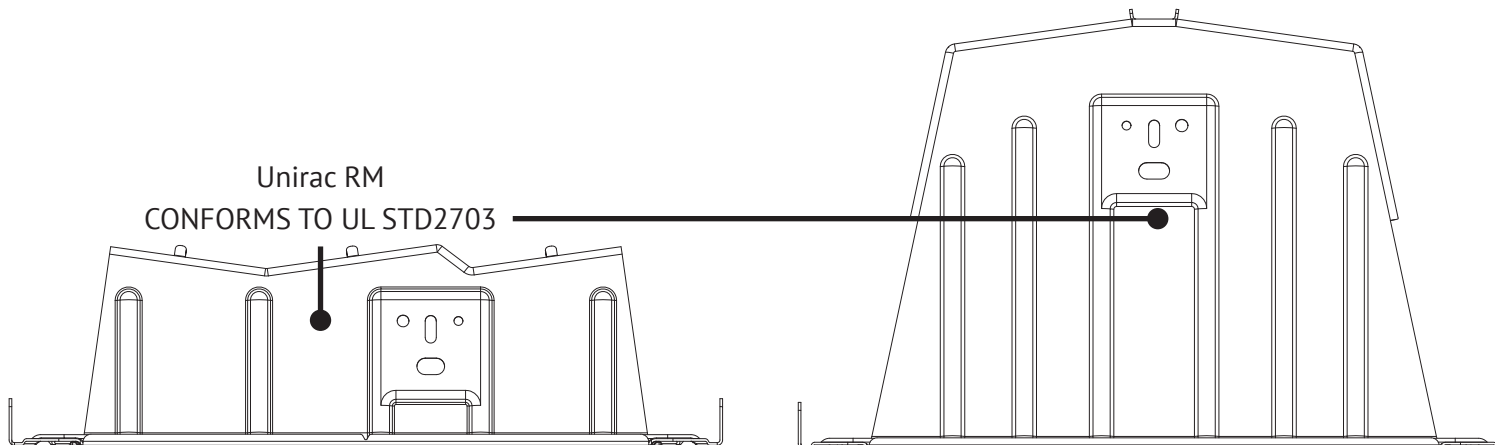
SYSTEM LEVEL FIRE CLASSIFICATION: The system fire class rating is only valid when the installation is conducted in accordance with the assembly instructions contained in this manual. RM ROOFMOUNT has been classified to the system level fire portion of UL1703. It has achieved Class A performance for low sloped roofs when used in conjunction with type 1 and type 2 module constructions. Please see the specific conditions below for mounting details required to maintain the Class A fire rating. Minimum and maximum roof slopes are restricted through the system design and layout rules. The fire classification rating is only valid on roof pitches less than 2:12 (slopes < 2 inches per foot, or 9.5 degrees).

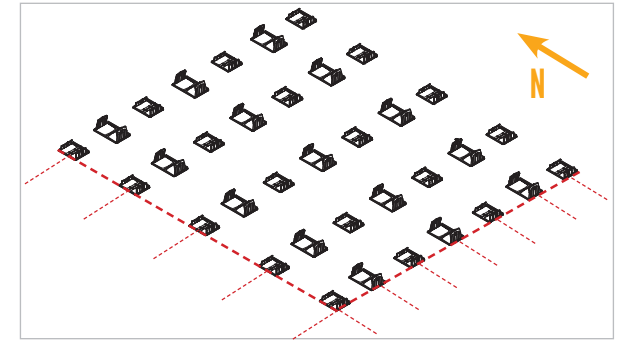
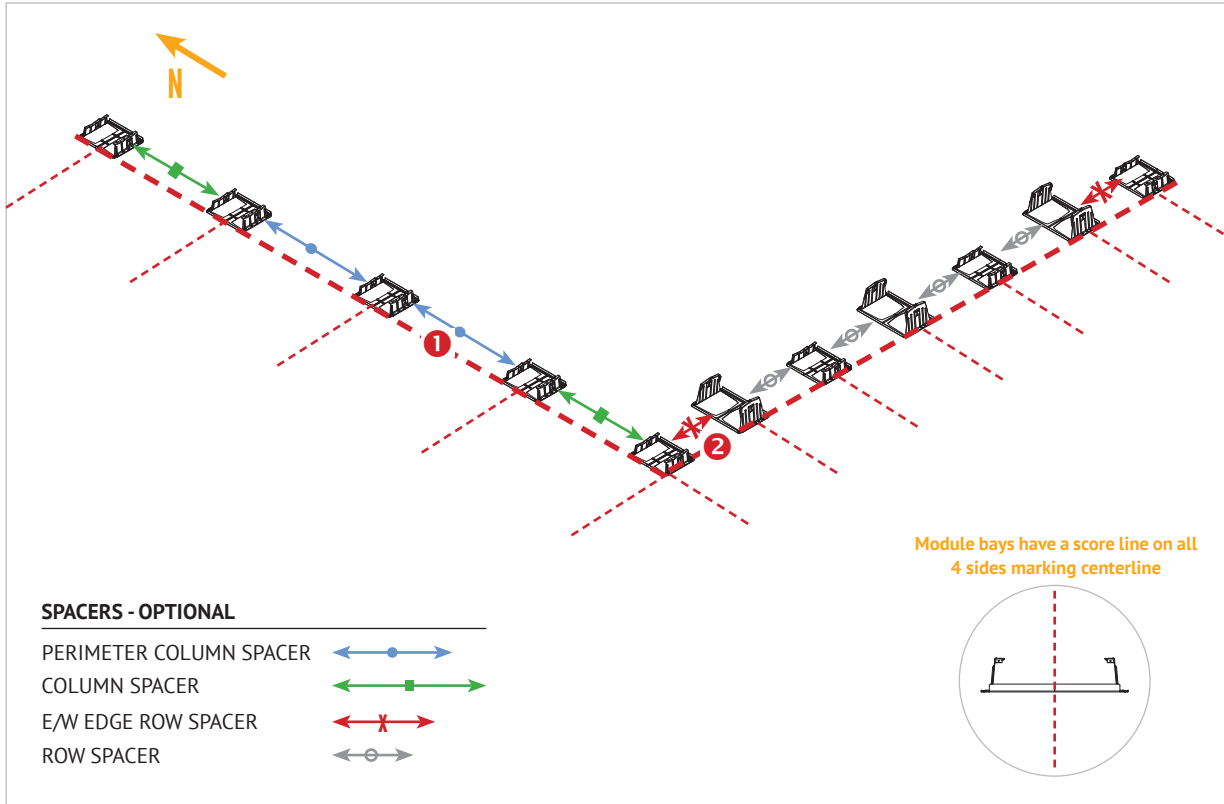
NOTE: Type I or Type II information is generally located on back of modules or through manufacturers documentation. Some building codes and fire codes require minimum clearances around such installations, and the installer should check local building code requirements for compliance.

Module Type	System level Fire Rating	Mitigation
Type 1	Class A	None Required / No Limitations
Type 2	Class A	None Required / No Limitations

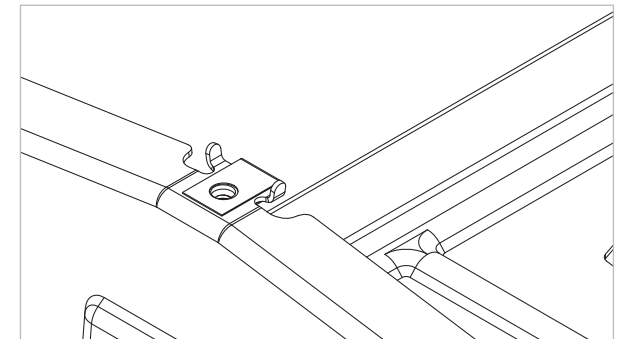
TYPE 1 / TYPE 2 CLASS A FIRE RATING MOUNTING ORIENTATION

Unirac RM Dual tilt has achieved Class A system level fire performance for type 1 and type 2 module constructions. There are no provisions necessary in order to meet Class A requirements for this product.





FILL IN BAYS



INSTALL U-NUT It is recommended to install u-nuts prior to placing ballast blocks & modules on the bays.

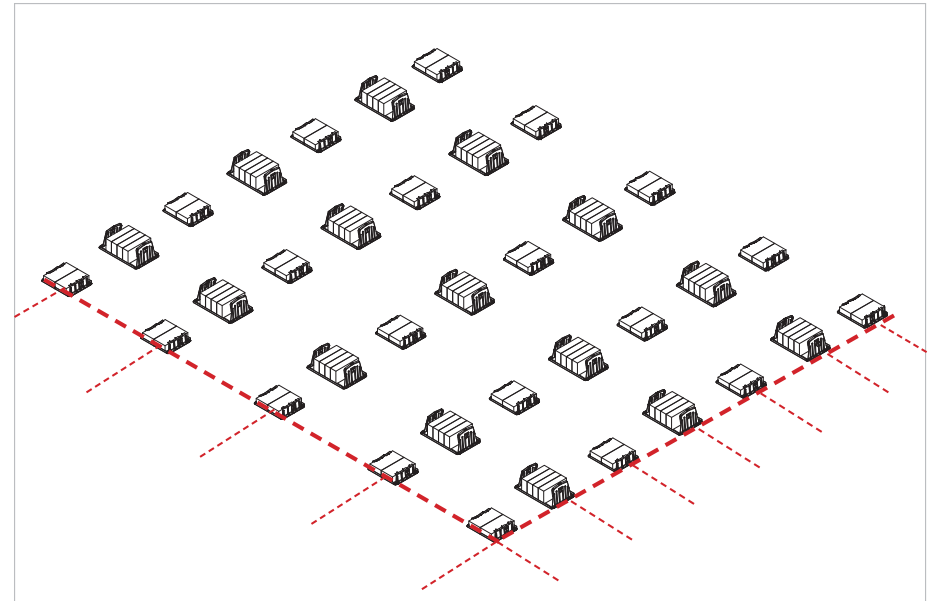
NOTE: U-NUT - Single Use Only - Do not re-torque once fully seated

1 2 SNAP WEST PERIMETER CHALK LINE, THEN NORTH OR SOUTH PERIMETER CHALK LINE. As best practice, mark lines on perimeter chalk lines to locate center of bays

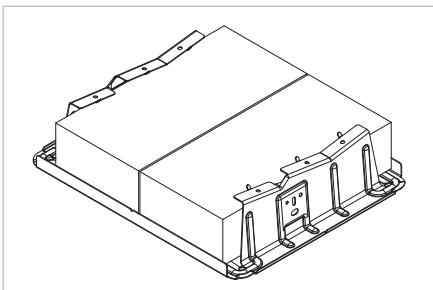
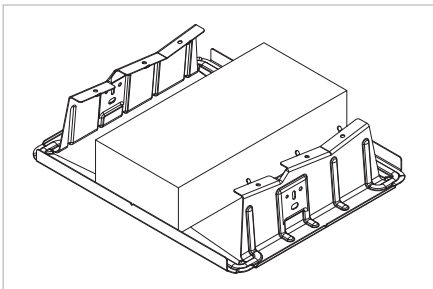
PLACE WEST PERIMETER BAYS FIRST, THEN NORTH OR SOUTH PERIMETER BAYS. If slip sheets are required, place per manufacturer recommendations.

NOTE: Custom spacers can be made to aid in the placement of bays on the roof. See page 1.

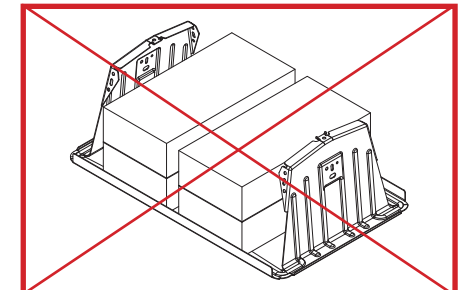
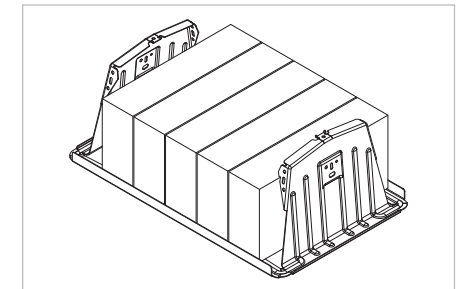
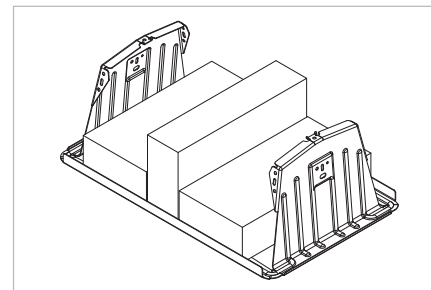
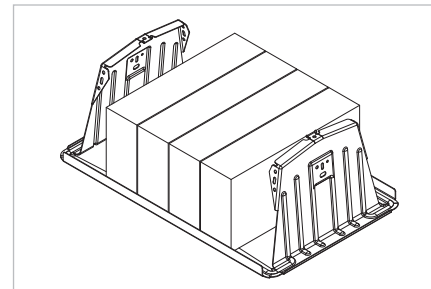
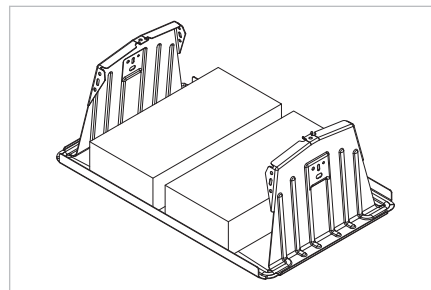
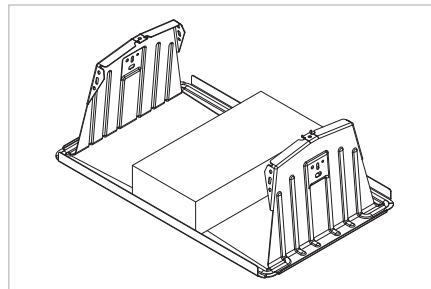
PLACE ALL BALLAST: A maximum of 2 ballasts can be placed in valley bay, and up to 5 ballasts can be placed in the ridge. Site specific ballast calculations should be created for each individual project in accordance with the U-Builder design software. This system has been rated for the mechanical load provisions of UL2703. In addition, it has been designed and tested to comply with the more rigorous requirements of SEAOC PV1, PV2 and ASCE 7.

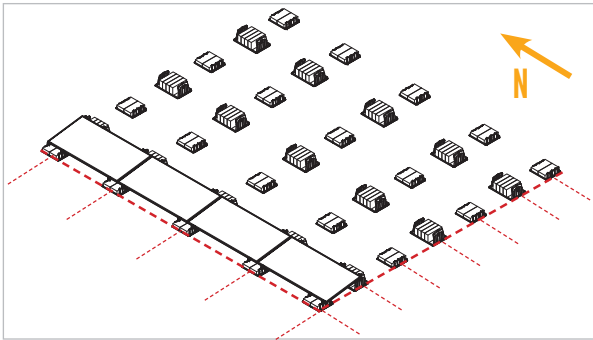


VALLEY BALLAST BLOCK OPTIONS:



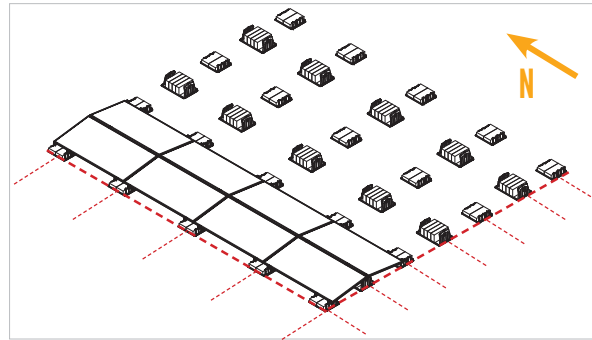
RIDGE BALLAST BLOCK OPTIONS:





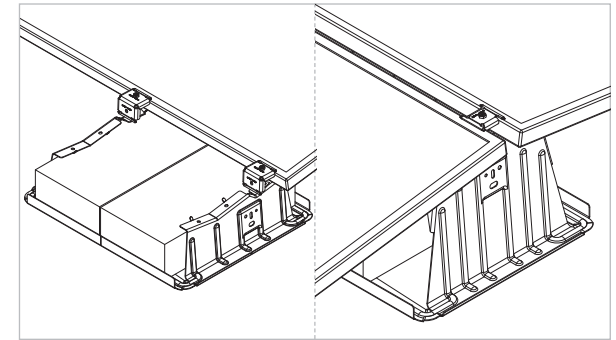
WESTERN EDGE MODULE PLACEMENT. Tabs on valley and ridge bay provide mechanical stop and aid in proper spacing at ridge. Rows of modules must be wired together at this time. See page 8 for wire management options.

NOTE: Modules may be placed on bays without immediate installation of clamps. Column Spacing: 1 inch maximum gap between modules / ¼ inch minimum gap between modules.



EAST OR WEST EDGE MODULE PLACEMENT. Rows of modules must be wired together at this time. See page 8 for wire management options.

NOTE: Clamps should be installed for each East/West pair of rows after wiring has been completed.

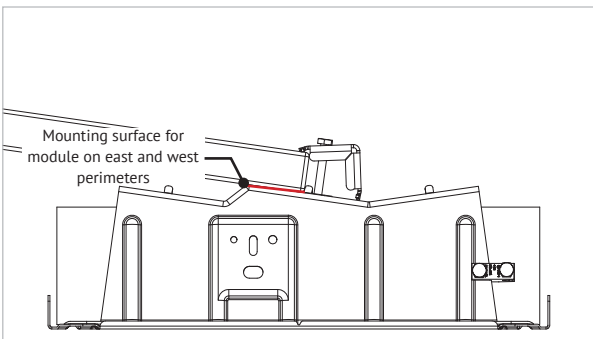


INSTALL CLAMPS

NOTE: U-NUT - Single Use Only - Do not re-torque once fully seated

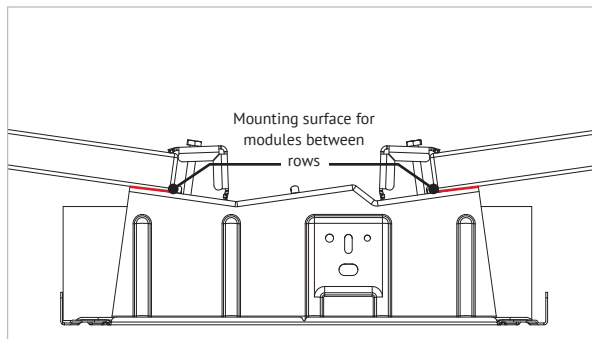
NOTE: CLAMP AND BOLT - Single Use Only - Do not re-torque once fully seated

TORQUE VALUE: 7FT-LBS MINIMUM to achieve UL2703 required clamp load



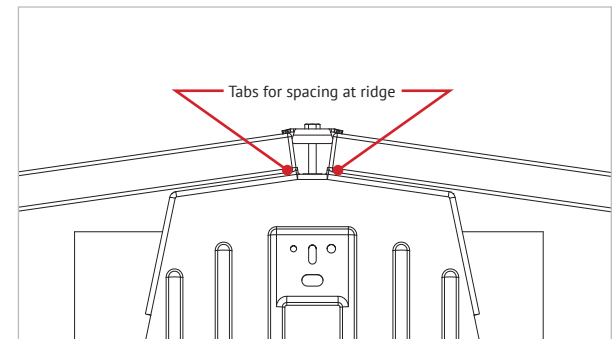
PROPER VALLEY BAY ORIENTATION AT EAST AND WEST PERIMETERS:

- Valley bays are designed to tuck up underneath the modules for east and west perimeters
- Bent tabs on all mounting surfaces act as a mechanical stop for the modules



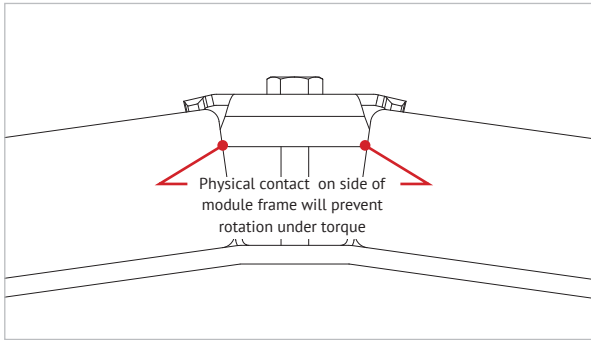
PROPER INTER-ROW SPACING:

- Inter row spacing at the valley is designed to provide an 8" space for walkways
- Bent tabs on all mounting surfaces act as a mechanical stop for the modules



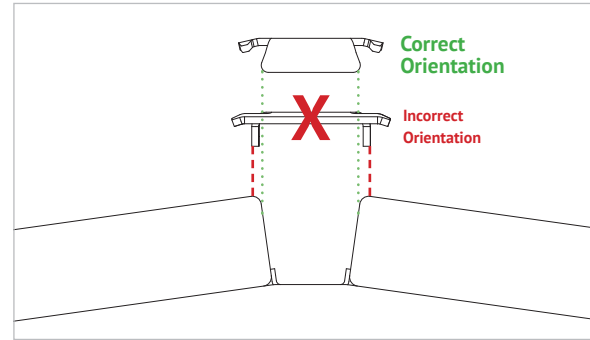
CLOSE UP MOUNTING AT RIDGE:

- Bent tabs on the mounting surfaces aid in setting the correct gap between modules at the ridge

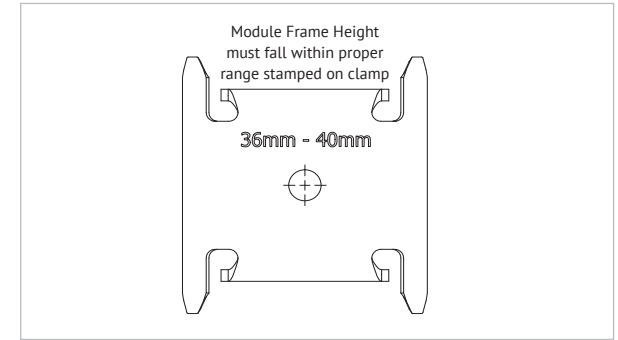


PROPER MID CLAMP INSTALLATION

- The top of the clamp is stamped for module frame height.
- Clamp should be firmly held against module frame while being torqued

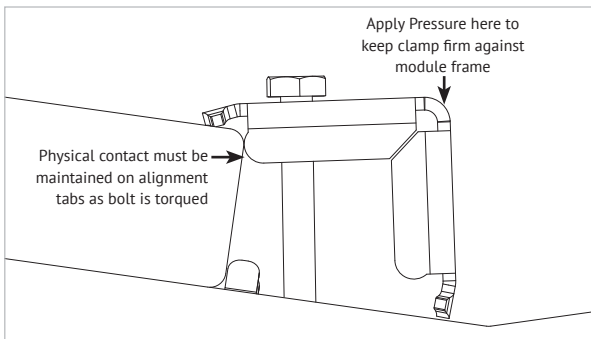


PROBLEM – CLAMP NOT ORIENTED CORRECTLY



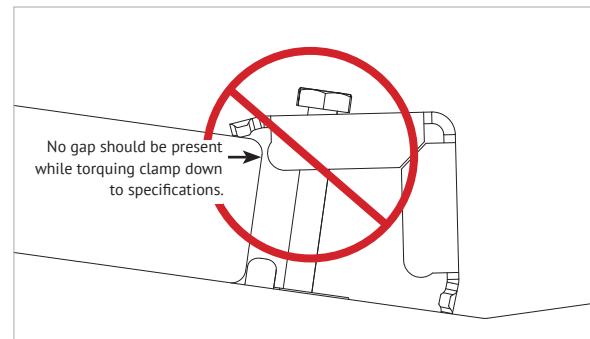
PROBLEM – NOT USING PROPER SIZE OF CLAMP FOR MODULE FRAME HEIGHT

- Double check the stamping on clamp to use the correct leg of clamp for module frame height
- The module height shall fall within the range shown on the top of the clamp



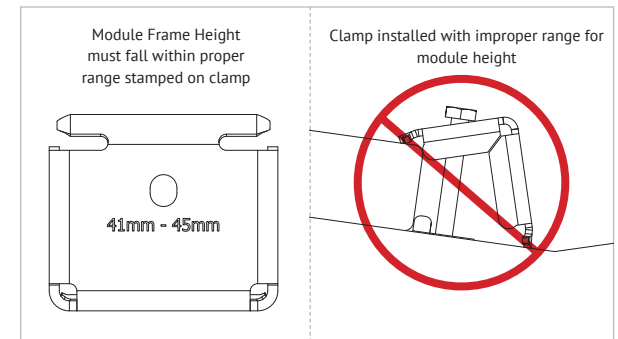
PROPER CLAMP INSTALLATION:

- Clamp is stamped for module frame height on each leg
- Clamp should be firmly held against module frame while being torqued



PROBLEM – CLAMP NOT SEATED AGAINST MODULE DURING TORQUING

- Clamp needs to be held securely against the module frame during torquing for proper installation



PROBLEM – NOT USING PROPER SIZE OF CLAMP FOR MODULE FRAME HEIGHT

- Double check the stamping on clamp to use the correct leg of clamp for module frame height
- The module height shall fall within the range shown on the top of the clamp
- Excessive angle on clamp will inhibit required clamp load on module

MECHANICAL LOAD TEST QUALIFICATION

The Unirac RM system has been tested to the mechanical load provisions of UL2703 and covers the following basic parameter(s):

- Tested loads: 25 psf up, 54 psf down
- Certification Loads: 16.7 psf up, 36 psf down, 5 psf down-slope

TESTED MODULE

Module Manufacturer	Model / Series
Hyundai	HIS-S325TI

ELECTRICAL BONDING & GROUNDING TEST MODULES: This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

VERIFIED COMPATIBLE MODULES:

Manufacture	Module Model / Series	Cells	Frame Height (MM)
Aleo	P18 & P19	60	35
Aleo	S18, S19, S59, & S79	60	50
AU Optronics	PM Series	60	40
AU Optronics	PM Series	72	40
Auxin	AXN6M610Txxx	60	40
Auxin	AXN6P610Txxx	60	40
Auxin	AXN6M612Txxx	72	40
Auxin	AXN6P612Txxx	72	40
Canadian Solar	CS5A-M & CS6P-M	60	40
Canadian Solar	CS6X-P, CS6U-P, & CS6U-M	72	40
Canadian Solar	CS6K-MS & CS6K-M	60	40
Canadian Solar	CS6K-P & CS6P-P	60	40
Canadian Solar	CS3U-P & CS3U-MS	72	40
Canadian Solar	CS3K-P & CS3K-MS	60	40
Centrosolar America	C-Series & E-Series	60/72	40
CertainTeed	CT2xxMxx-01	60	35
CertainTeed	CT2xxPxx-01	60	35
CertainTeed	CTxxxMxx-01	72	40
CertainTeed	CTxxxPxx-01	72	40
CertainTeed	CTxxxMxx-02	60/72	40
ET Solar	ETAC & ET Modules	60/72	40
Eco Solargy	Orion 1000 ECOxxx156P	60	40
Hanwha SolarOne	HSL 60 & HSL 72	60/72	40
Heliene	36M Series	36	40
Heliene	60M Series	60	40
Heliene	72M Series	72	40
Hyundai Heavy Industries	MG, TG, RG, & KG Series	60	35
Hyundai Heavy Industries	TI & RI Series	72	50
Hyundai Heavy Industries	MI, RI, KI, & TI Series	72	40
JA Solar	JAP6 60 & JAM6 60	60	40
JA Solar	JAP6 72 & JAM6 72	72	45

Manufacture	Module Model / Series	Cells	Frame Height (MM)
Jinko	JKMxxxM & JKMsxxxP	60	40
Jinko	JKMxxxPP & JKMSxxxPP	60	40
Jinko	JKMxxxP	72	40
Jinko	JKMSxxxP	60	40
Kyocera	KD-F Series	60	46
LG Electronics	MONO X	60	35
LG Electronics	MONO X 2	60	40
LG Electronics	MONO X Plus	60/72	40
LG Electronics	NeON 2/2 Black	60	40
LG Electronics	NeON 2	72	40/46
LG Electronics	NeON R/R Black (Black Contact)	60	40
LG Electronics	NeON 2 Bifacial	72	40
LG Electronics	MONO X	72	46
LG Electronics	NeON 2 AC	60	40
Mission Solar Energy	MSE MONO & MSE PERC	60/72	40
Mitsubishi	MJE Series	60	46
Mitsubishi	MLE Series	120	46
Phono Solar Tech.	Standard Modules	60	40
Phono Solar Tech.	Standard Modules	72	45
Panasonic	VBHNxxxSA15	96	35
Panasonic	VBHNxxxSA16	96	35
Panasonic	VBHNxxxKA01	96	35
Panasonic	VBHNxxxKA02	96	35
Q.Cells	Q.PLUS/PEAK/PRO - L G4.x	72	35
Q.Cells	B.LINE PLUS/PRO - L G4.x	72	35
Q.Cells	Q.PLUS L-G4.2/TAA	72	35
Q.Cells	Q.PRO L-G2 xxx	72	40/42
Q.Cells	Q.PLUS BFR G4.1	60	32
Q.Cells	Q.PRO BFR G4x	60	32
Q.Cells	Q.PEAK-G4.1	60	32
Q.Cells	Q.PEAK-G4.1/MAX	60	32

Manufacture	Module Model / Series	Cells	Frame Height (MM)
Q.Cells	Q.PEAK BLK G4.1	60	32
Q.Cells	Q.PRO/Q.PLUS G4	60	32
Q.Cells	Q.PEAK-G4.1/TAA	60	32
Q.Cells	Q.PEAK BLK G4.1/TAA	60	32
Q.Cells	Q.PLUS BFR G4.1/TAA	60	32
Q.Cells	Q.PLUS BFR G4.1/MAX	60	32
Q.Cells	B.LINE PLUS BFR G4.1	60	32
Q.Cells	B.LINE PRO BFR G4.1	60	32
Q.Cells	Q.PRO EC-G4.4	60	32
Q.Cells	Q.PEAK-G3 & G3.1	60	35
Q.Cells	Q.PEAK BLK G3 & G3.1	60	35
Q.Cells	Q.PLUS BFR G3.1	60	35
Q.Cells	Q.PLUS G3 & Q.PRO G3	60	35
REC	PEAK & ECO	60	38
REC	PE 72	72	45
Renesola	60 Cell Modules & Vitrus2	60/72	40
Sharp	ND-24CQJ & ND-25CQCS	60	46
Sharp	ND-Q235F4 & ND-F4Q300	60	46
Sharp	NU-SA	60	35
Sharp	NU-SC	72	40
Silfab	SLA-M/P	60	38
SolarWorld	Sunmodule Protect/Plus	60/72	33
Suniva	Optimus Series 60	60	35
Suniva	Optimus Series 72	72	38
Suniva	MV Series 60	60	40
Suniva	MV Series 72	72	46
Suntech	STP "XXX"	60	35
Suntech	STP "XXX"	72	40
Sun Edison/Flextronics	F-Series / FLEX FXS	60	35/50
Sun Edison/Flextronics	R-Series / FLEX FXS	72	35/50
SunPower	X-Series 72 & E-Series 72	72	46



ELECTRICAL BONDING & GROUNDING TEST MODULES: This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

VERIFIED COMPATIBLE MODULES (CONTINUED):

Manufacture	Module Model / Series	Cells	Frame Height (MM)
SunPower	X-Series 96 & E-Series 96	96	46
SunPower	P-Series	498	46
SunPower	Sig Black 72	72	46
SunPower	Sig Black 96	96	46
SunPower	AC	60	46
Trina	PA05, PD05, & DD05	60	35
Trina	PD14, PE14, & DD14	72	40
Yingli	YGE-U72	72	40
Yingli	Panda 60	60	40
Yingli	DS YGE 60 Cell Series	60	40
Yingli	DS YGE 60 Cell Series 2	60	35

Hyundai Limited Warranty for PV Modules (“Limited Warranty”)

Effective December 21, 2016

Customer Name	CED Greentech
Contract No.	
Date of Issue	December 21, 2016
Project Name (If Applicable)	General Distribution

The following warranty (“Limited Warranty”) is provided by Hyundai Heavy Industries Green Energy Co., Ltd. (“HYUNDAI”) in regards to the photovoltaic modules (“MODULE(S)”) supplied to the original end customer and subsequent owners at the original installation site (collectively referred to as “CUSTOMER”). The Warranties defined herein apply only to the MODULES which (a) are sold directly by HYUNDAI or through one of its authorized local distributors and (b) have a legible Hyundai Heavy Industries Green Energy Co., Ltd. logo and product serial number. The start date for all of the following warranties is the earlier of either: (i) the date of sale to the first CUSTOMER; or (ii) six (6) months after the dispatch of the MODULES from HYUNDAI’s factory or warehouse (“Warranty Start Date”). HYUNDAI reserves right to revise the terms of this Limited Warranty without prior notice.

1. Product Warranty

HYUNDAI warrants to the CUSTOMER that the MODULES supplied shall, for the duration of ten (10) years from the Warranty Start Date (“Product Warranty Period”), be free from defects in materials and workmanship under normal application, installation, use, and service conditions. If the MODULES fail to conform to this warranty during this Product Warranty Period, HYUNDAI will at its sole option, and subject to the terms of this Limited Warranty, either repair or replace the MODULES or refund the purchase price as paid by the CUSTOMER. The remedy set forth in this paragraph shall be the sole and exclusive remedy available to the CUSTOMER for any product defect, and shall not be available beyond the Product Warranty Period for any reason whatsoever.

2. Performance Warranty

- A. HYUNDAI warrants to the CUSTOMER that for a period of one (1) year from Warranty Start Date the actual power output of the MODULES will be no less than 97% of the Nominal Power* at STC**, as specified on the date of sale in HYUNDAI's product datasheet. From the second year, the actual power output will decline annually by no more than 0.7% for a period of remaining twenty-four (24) years, so that by the end of the twenty-fifth (25th) year, an actual output of at least 80.2% of the Nominal Power* at STC**, as specified on the date of sale in HYUNDAI's product datasheet will be achieved.

If the MODULES fail to reach the guaranteed power output levels set out above provided that such loss in power is verified by HYUNDAI, HYUNDAI will replace such loss in power, at its sole and absolute discretion, by either: (a) providing to the CUSTOMER additional MODULES to make up for such loss in power; or (b) repairing or replacing the defective MODULES; or (c) refunding the purchase price paid to HYUNDAI for the MODULE(S) (the "Purchase Price") while taking into account an annual depreciation of four (4) % of the Purchase Price.

- B. The remedies set forth in this clause shall be the sole and exclusive remedies provided for any performance deficiencies, and shall not be available beyond the aggregate specified Performance Warranty Periods for any reason whatsoever.

3. Exclusions and Limitations

- A. A warranty claim under any of the foregoing Warranties must be filed within the applicable warranty period.

- B. The Warranties do not apply to any MODULE, which in HYUNDAI's sole and absolute judgment, has been subjected to:

- Unreasonable use, operation, or maintenance (without limitation including accident, fire or other casualty, misuse, negligence, or incorrect wiring or use of suitable fuels, oils or chemicals);
- Any use or installation not in conformance with instructions furnished by HYUNDAI;
- Any defects occurring due to modifications or parts not authorized in writing or supplied by HYUNDAI, or because of improper storage or handling of the MODULES, including, without limitation damage caused by improper treatment, overloading, electro-chemical or electrical influences, or any other circumstances that may arise through no fault of HYUNDAI;
- Non-observance of HYUNDAI's installation-, user-, and maintenance instructions;
- Repair or modifications by someone other than an approved service technician of HYUNDAI; or

Headquarter

Bundang First Tower, 55, Bundang-ro,
Bundang-gu, Seongnam-si,
Gyeonggi-do 13591, Korea

Factory

313, Soi-ro,
Soi-myeon, Eumseong-gun,
Chungcheongbuk-do 27711, Korea

- Power failure surges, lighting, flood, fire, accidental breakage, industrial disputes affecting any third party, government regulations, civil riot or war, or any other event outside HYUNDAI's control.
- C. The Product Warranty and Performance Warranties shall be applied exclusively of one another. HYUNDAI, at its sole option and in its sole discretion, will decide whether the cause of the claim is applicable to the Product Warranty or any of the Performance Warranties.
- D. HYUNDAI will decide, at its sole and absolute option, whether to collect replaced MODULES or not. In the case HYUNDAI decides to collect all or some of the replaced MODULES, HYUNDAI will cover transportation costs for returning the MODULES. In the case HYUNDAI decides not to collect any replaced MODULES, HYUNDAI will not cover any transportation costs for returning the MODULES. In any case, HYUNDAI will not cover any of the costs associated with the installation, removal, reinstallation, discarding or packaging of the MODULES. If the collected MODULES are found not to be covered under these Warranties at HYUNDAI's sole and absolute judgement, CUSTOMER is obliged to cover all associated costs mentioned above.
- E. In the event that any model or make of MODULES for which a claim is made under either of the foregoing Warranties have been discontinued or materially altered, HYUNDAI reserves the right to replace the MODULES with any other module type that may be different in output, size, color or material.
- F. Any repaired or replaced MODULES under these Warranties will hold only the remaining warranty period applicable to the original MODULES.
- G. The Warranties provided under this Limited Warranty shall only extend to MODULES that have been installed within the U.S.

4. Severability

If any court or competent authority finds any clause or portion of any clause of this Limited Warranty invalid, illegal, or unenforceable, that portion will be deemed to be deleted only to the extent required, and the validity and enforceability of the rest of the Limited Warranty shall not be affected.

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Chungcheongbuk-do 27711, Korea

5. Force Majeure

HYUNDAI shall bear no responsibility or liability for the non-performance or delay of any duties or obligations arising out of this Limited Warranty due to natural disasters, industrial disputes, government regulations, civil riot or war, or any other event outside HYUNDAI's control that is not reasonably known or understood at the time of sale of the MODULES.

6. Liability

THE FOREGOING WARRANTIES AND REMEDIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, REPRESENTATIONS, OR CONDITIONS, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY, NONINFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE. HYUNDAI NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE, INSTALLATION, MAINTENANCE, OR USE OF THE GOODS. HYUNDAI SHALL BEAR NO RESPONSIBILITY OR LIABILITY WHATSOEVER FOR ANY DAMAGE OR INJURY TO PERSONS OR PROPERTY, OR FOR ANY OTHER LOSS OR INJURY RESULTING FROM ANY CAUSE WHATSOEVER ARISING OUT OF OR RELATED TO THE NEGLIGENT USE, MISUSE OR NEGLIGENT INSTALLATION OF THE MODULES. UNDER NO CIRCUMSTANCES SHALL HYUNDAI BE LIABLE FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE APPLICABLE MODULE(S), NOR FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES, HOWSOEVER CAUSED. LOSS OF USE, LOSS OF PROFITS, LOSS OF PRODUCTION AND LOSS OF REVENUES ARE SPECIFICALLY EXCLUDED.

*"Nominal Power" is the power in watt peak that a MODULE generates in its maximum power point.
**"STC(Standard Test Conditions)" is as follows: (a) light spectrum of AM 1.5, (b) an irradiation of 1,000 W/m² and (c) a cell temperature of 25 °C. The measurements must be carried out at HYUNDAI or an independent test institute agreed to by HYUNDAI in advance, in accordance with IEC60904 as tested at the junction box connectors per the calibration and testing standards of HYUNDAI. These measurements will be considered valid at the production date of the MODULES with an equipment tolerance of ±3%. HYUNDAI's calibration standards shall be in compliance with the standards applied by international institutions accredited for this purpose.

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HYUNDAI SOLAR MODULE

RI
SERIES

Multi-Crystalline Type

HiS-M310RI HiS-M315RI HiS-M320RI

Mono-Crystalline Type

HiS-S330RI HiS-S335RI HiS-S340RI HiS-S345RI
HiS-S350RI HiS-S355RI HiS-S360RI



72

Cells



For Commercial & Utility Applications



More Power Generation In Low Light

MADE IN KOREA

Hyundai Cell, Made in Korea



PERL Technology

PERL technology provides ultra-high efficiency with better performance in low irradiation. Maximizes installation capacity in limited space.



Low LID / PID

Both LID(Light Induced Degradation) and PID(Potential Induced Degradation) are strictly eliminated to ensure higher actual yield during lifetime.



Mechanical Strength

Tempered glass and reinforced frame design withstand rigorous weather conditions such as heavy snow and strong wind.



Reliable Warranty

Global brand with powerful financial strength provide reliable 25-year warranty.



Corrosion Resistant

Various tests under harsh environmental conditions such as ammonia and salt-mist passed.



UL / VDE Test Labs

Hyundai's R&D center is an accredited test laboratory of both UL and VDE.

Hyundai's Warranty Provisions

10 YEARS

- 10-Year Product Warranty
- On materials and workmanship

25 YEARS

- 25-Year Performance Warranty
- 90% of guaranteed min. power for 10 years
- 80% of guaranteed min. power for 25 years

About Hyundai Solar

Established in 1972, Hyundai Heavy Industries (HHI) is one of the most trusted names in the heavy industries sector with 48,000 employees and more than 40 Billion USD in annual sales (2015). As a global leader and innovator, Hyundai Heavy Industries is committed to building a future growth engine by developing and investing heavily in the field of renewable energy.

Started as a core business division of HHI, Hyundai Solar (Hyundai Heavy Industries Green Energy) now stands as an independent company and an affiliate of HHI as from December 2016. It is the largest and the longest standing PV cell and module manufacturer in South Korea with 800 MW of module production capacity. We have strong pride in providing high-quality solar PV products to more than 3,000 customers worldwide.

Certification



HYUNDAI
GREEN ENERGY

Electrical Characteristics

		Multi-Crystalline Module (HiS-M__RI)			Mono-Crystalline Module (HiS-S__RI)						
		310	315	320	330	335	340	345	350	355	360
Nominal Output (P _{mpp})	W	310	315	320	330	335	340	345	350	355	360
Open Circuit Voltage (V _{oc})	V	45.3	45.3	45.5	46.3	46.5	46.7	46.9	47.1	47.3	47.4
Short Circuit Current (I _{sc})	A	8.9	9.0	9.0	9.3	9.4	9.5	9.6	9.6	9.7	9.8
Voltage at P _{max} (V _{mpp})	V	36.0	36.2	36.4	38.0	38.2	38.4	38.6	38.7	38.9	39.1
Current at P _{max} (I _{mp})	A	8.6	8.7	8.8	8.7	8.8	8.9	9.0	9.0	9.1	9.2
Module Efficiency	%	15.8	16.1	16.4	16.9	17.1	17.4	17.6	17.9	18.1	18.4
Cell Type	-	6", multi-crystalline silicon			6", mono-crystalline silicon						
Maximum System Voltage	V	1,000			1,000						
Temperature coefficient of P _{max}	%/K	-0.41			-0.42						
Temperature coefficient of V _{oc}	%/K	-0.32			-0.30						
Temperature coefficient of I _{sc}	%/K	0.039			0.047						

*All data at STC (Standard Test Conditions). Above data may be changed without prior notice.

Mechanical Characteristics

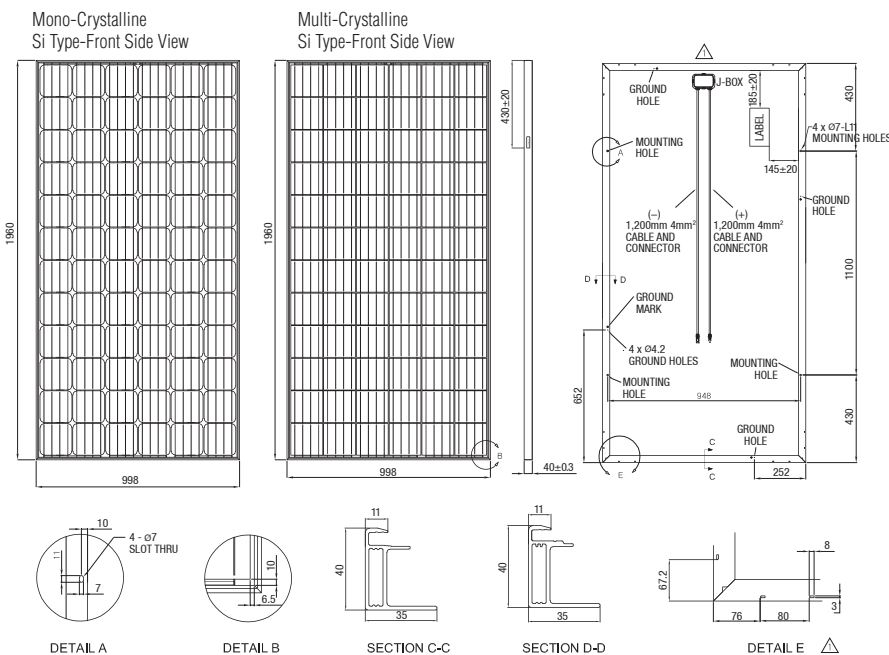
Dimensions	998 mm (39.29") (W) x 1,960 mm (77.17") (L) x 40 mm (1.57") (H)
Weight	Approx. 22.9 kg (50.5 lbs)
Solar Cells	72 cells in series (6 x 12 matrix) (Hyundai cell, Made in Korea)
Output Cables	4 mm ² (12AWG) cables with polarized weatherproof connectors, IEC certified (UL listed and UL 4703 certified), Length 1.2 m (47.2')
Junction Box	IP67, weatherproof, IEC certified (UL listed)
Bypass Diodes	3 bypass diodes to prevent power decrease by partial shade
Construction	Front : Anti-reflection coated glass, 3.2 mm (0.126") Encapsulant : EVA Back Sheet : Weatherproof film
Frame	Clear anodized aluminum alloy type 6063

Installation Safety Guide

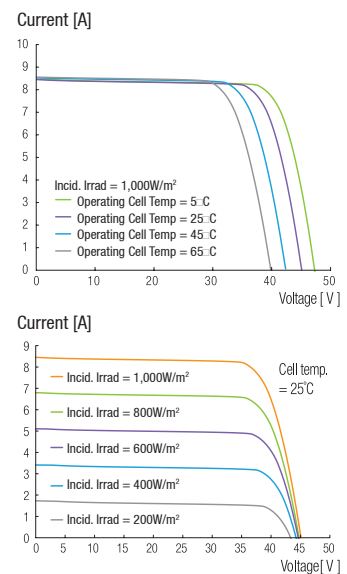
- Only qualified personnel should install or perform maintenance.
- Be aware of dangerous high DC voltage.
- Do not damage or scratch the rear surface of the module.
- Do not handle or install modules when they are wet.

Nominal Operating Cell Temperature	46°C ± 2
Operating Temperature	-40 – 85°C
Maximum System Voltage	DC 1,000 V (IEC) DC 1,000 V (UL)
Maximum Reverse Current	15A (Up to 350W) 20A (Above 355W)

Module Diagram (unit : mm)



I-V Curves



How to Maintain a Solar Panel

Purchase a solar panels cleaning kit. It should contain a liquid soap, a wiper, a small brush and in some cases another brush with a longer handle. In many ways, these items are similar to what you use to clean your car, so if you cannot purchase a cleaning kit that is specifically designed for cleaning solar panels then you can substitute it with your car cleaning equipment instead.

Mix the soap with water in a bucket. The amount that needs to be mixed should be mentioned on the bottle of liquid soap. Usually it is about the same proportion that you use when cleaning your car.

Dip the brush into the soap and water mixture and gently rub it over the solar panels. If you have the panels divided into smaller arrangements then you should be able to get the job done with a small handheld brush. However, for larger arrangements it can be difficult to reach the panels in the middle so you will need to use the brush with the longer handle

Wipe the solar panels with the wiper while the panels are still wet. At times, the wiper is attached at the back of the brush. It is important that you don't allow the soap to dry on the solar panels since this will block the amount of sunlight that they can absorb and make them inefficient.

Hire a professional solar panel cleaner if there are some areas of the panels that you are unable to clean. Sometimes it can be difficult to reach all the panels while in other cases you may have certain stains such as the stains of bird droppings that can be very difficult to clean. It is better to hire a professional than to risk damaging your solar panels.

- In essence, it is the thick glass exterior of the solar panels that need the most maintenance. The electrical components of the panels are sealed inside this thick glass and usually remain quite well protected throughout the life of the solar panel.
- The US Department of Energy suggests that you should anticipate spending about 8 to 16 hours per year to maintain a solar panel system. Solar panel cleaning should be done 4 times annually or at least once thoroughly every year. Solar panel maintenance should be performed more regularly in dusty areas or on buildings that are surrounded with foliage.



SHIFTING THE LIMITS

FRONIUS SYMO



/ Field serviceable



/ SnapINverter mounting system



/ Wireless monitoring



/ Design flexibility



/ Arc Fault Circuit Interruption



Boasting power categories from 10 to 24 kW, the transformerless Fronius Symo is the ideal compact three-phase inverter for commercial applications. Its dual maximum power point tracking, high maximum system voltage, wide input voltage range and unrestricted use indoors and out, ensures maximum flexibility in PV system design. As a member of the new SnapINverter family, the Fronius Symo features the SnapINverter mounting system, allowing for secure and convenient installation and field servicing.

Industry-leading features now come standard with the Fronius Symo, including: arc fault protection, integrated wireless monitoring, and SunSpec Modbus interfaces for seamless monitoring and datalogging via Fronius' online and mobile platform, Fronius Solar.web. This makes the Fronius Symo one of the most communicative, efficient and streamlined inverters on the market.

TECHNICAL DATA FRONIUS SYMO, ALL SIZES

GENERAL DATA	STANDARD WITH ALL FRONIUS SYMO MODELS
Dimensions (width x height x depth)	20.1 x 28.5 x 8.9 in. / 51.1 x 72.4 x 22.6 cm
Degree of protection	NEMA 4X
Night time consumption	< 1 W
Inverter topology	Transformerless
Cooling	Variable speed fan
Installation	Indoor and outdoor installation
Ambient operating temperature range	-40 F to 140 F (-40 to 60 C)
Permitted humidity	0 - 100 % (non-condensing)
DC connection terminals	6 x DC+ and 6 x DC- screw terminals for copper (solid / stranded / fine stranded) or aluminum (solid / stranded)
AC connection terminals	Screw terminals 14-6 AWG
Certificates and compliance with standards (Except Symo 15.0 208 V)	UL 1741-2010, UL1998 (for functions: AFCI and isolation monitoring), IEEE 1547-2003, IEEE 1547.1-2008, ANSI/IEEE C62.41, FCC Part 15 A & B, NEC Article 690, C22. 2 No. 107.1-01 (September 2001), UL1699B Issue 2 -2013, CSA TIL M-07 Issue 1 -2013
Certificates and compliance with standards (Symo 15.0 208 V)	UL 1741-2015, UL1998 (for functions: AFCI, RCMU and isolation monitoring), IEEE 1547-2003, IEEE 1547.1-2003, ANSI/IEEE C62.41, FCC Part 15 A & B, NEC 2014 Article 690, C22. 2 No. 107.1-01 (September 2001), UL1699B Issue 2 -2013, CSA TIL M-07 Issue 1 -2013

PROTECTIVE DEVICES	STANDARD WITH ALL FRONIUS SYMO MODELS
AFCI & 2014 NEC Compliant	Yes
DC disconnect	Yes
DC reverse polarity protection	Yes
Ground Fault Protection with Isolation Monitor Interrupter	Yes

INTERFACES	AVAILABILITY	AVAILABLE WITH ALL FRONIUS SYMO MODELS
USB (A socket)	Standard	Datalogging and inverter update via USB
2 x RS422 (RJ45 socket)	Standard	Fronius Solar Net, interface protocol
Wi-Fi/Ethernet/Serial/ Datalogger and webserver	Optional	Wireless standard 802.11 b/g/n / Fronius Solar.web, SunSpec Modbus TCP, JSON / SunSpec Modbus RTU
6 inputs and 4 digital I/Os	Optional	Load management; signaling, multipurpose I/O

TECHNICAL DATA FRONIUS SYMO (10.0-3 208/240, 12.0-3 208/240, 10.0-3 480, 12.5-3 480, 15.0-3 208)

GENERAL DATA		10.0-3 208/240	12.0-3 208/240	10.0-3 480	12.5-3 480	15.0-3 208
Weight		91.9 lbs. / 41.7 kg		76.7 lbs. / 34.8 kg		78.3 lbs. / 35.5 kg

INPUT DATA		10.0-3 208/240	12.0-3 208/240	10.0-3 480	12.5-3 480	15.0-3 208
Max. permitted PV power		15.00 kW	18.00 kW	15.00 kW	18.75 kW	22.50 kW
Max. usable input current (MPPT 1/MPPT 2)		25.0 A / 16.5 A		50.0 A		50.0 A
Max. usable input current total (MPPT 1 + MPPT 2)		41.5 A		75.0 A		75.0 A
Max. admissible input current (MPPT 1/MPPT 2)		37.5 A / 24.8 A		75.0 A (1 MPPT)		75.0 A
Max. admissible input current total (MPPT 1 + MPPT 2)		62.2 A	62.2 A	62.2 A	62.2 A	75.0 A (1 MPPT)
Integrated DC string fuse holders <i>Must be specified when ordering</i>		None	None	None	None	Integrated: 6- and 6+
MPP voltage range		300 - 500 V		300 - 800 V	350 - 800 V	325 - 850 V
Operating voltage range		200 - 600 V		200 - 1,000 V		325 - 1,000 V
Max. input voltage		600 V		1,000 V		
Nominal input voltage		208 V	350 V	350 V	N/A	N/A
		240 V	370 V	370 V	N/A	N/A
		480 V	N/A	N/A	675 V	685 V
Admissible conductor size DC		AWG 14 - AWG 6 copper direct, AWG 6 aluminium direct, AWG 4 copper or aluminium with input combiner				
Number of MPPT		2				1

OUTPUT DATA		10.0-3 208/240	12.0-3 208/240	10.0-3 480	12.5-3 480	15.0-3 208
Max. output power		208 V	9,995 VA	11,995 VA	N/A	N/A
		240 V	9,995 VA	11,995 VA	N/A	N/A
		480 V	N/A	N/A	9,995 VA	12,495 VA
Max. output fault current / Duration		43.1 A RMS / 158.4 ms	43.1 A RMS / 158.4 ms	43.1 A RMS / 158.4 ms	43.1 A RMS / 158.4 ms	67.7 A RMS / 153.0 ms
Max. continuous output current		208 V	27.7 A	33.3 A	N/A	N/A
		240 V	24.0 A	28.9 A	N/A	N/A
		480 V	N/A	N/A	12.0 A	15.0 A
Recommended OCPD/AC breaker size		208 V	35 A	45 A	N/A	N/A
		240 V	30 A	40 A	N/A	N/A
		480 V	N/A	N/A	15 A	20 A
Max. efficiency		97.0 %		97.0 %	98.1 %	98.1 %
CEC efficiency		208 V	96.5 %	96.5 %	N/A	N/A
		240 V	96.5 %	96.5 %	N/A	N/A
		480 V	N/A	N/A	96.5 %	97.0 %
Admissible conductor size AC		AWG 14 - AWG 6				
Grid connection		208 / 240 V	208 / 240 V	480 V Delta +N**		208 V
Frequency		60 Hz				
Total harmonic distortion		< 1.75 %				< 3.5%
Power factor		0 - 1 ind./cap.				

**+N for sensing purposes - no current carrying conductor.

TECHNICAL DATA FRONIUS SYMO (15.0-3 480, 17.5-3 480, 20.0-3 480, 22.7-3 480, 24.0-3 480)

GENERAL DATA		15.0-3 480	17.5-3 480	20.0-3 480	22.7-3 480	24.0-3 480
Weight		95.7 lbs. / 43.4 kg				
INPUT DATA		15.0-3 480	17.5-3 480	20.0-3 480	22.7-3 480	24.0-3 480
Max. permitted PV power		22.50 kW	26.25 kW	30.00 kW	34.09 kW	36.00 kW
Max. usable input current (MPPT 1/MPPT 2)		33.0 A / 25.0 A				
Max. usable input current total (MPPT 1 + MPPT 2)		51 A				
Max. admissible input current (MPPT 1/MPPT 2)		49.5 A / 37.5 A				
Max. admissible input current total (MPPT 1 + MPPT 2)		76.5 A	76.5 A	76.5 A	76.5 A	76.5 A
Integrated DC string fuse holders <i>Must be specified when ordering</i>		Optional: 6- and 6+	Optional: 6- and 6+	Optional: 6- and 6+	Optional: 6- and 6+	Optional: 6- and 6+
MPP voltage range		350 - 800 V	400 - 800 V	450 - 800 V	500 - 800 V	500 - 800 V
Operating voltage range		200 - 1,000 V				
Max. input voltage		1,000 V				
Nominal input voltage		208 V	N/A	N/A	N/A	N/A
		240 V	N/A	N/A	N/A	N/A
		480 V	685 V	695 V	710 V	720 V
Admissible conductor size DC		AWG 14 - AWG 6 copper direct, AWG 6 aluminium direct, AWG 4 copper or aluminium with input combiner				
Number of MPPT		2				
OUTPUT DATA		15.0-3 480	17.5-3 480	20.0-3 480	22.7-3 480	24.0-3 480
Max. output power		208 V	N/A	N/A	N/A	N/A
		240 V	N/A	N/A	N/A	N/A
		480 V	14,995 VA	17,495 VA	19,995 VA	23,995 VA
Max. output fault current / Duration		30.9 A RMS / 150.4 ms	30.9 A RMS / 150.4 ms	30.9 A RMS / 150.4 ms	30.9 A RMS / 150.4 ms	30.9 A RMS / 150.4 ms
Max. continuous output current		208 V	N/A	N/A	N/A	N/A
		240 V	N/A	N/A	N/A	N/A
		480 V	18.0 A	21.0 A	24.0 A	28.9 A
Recommended OCPD/AC breaker size		208 V	N/A	N/A	N/A	N/A
		240 V	N/A	N/A	N/A	N/A
		480 V	25 A	30 A	30 A	40 A
Max. efficiency		98.0 %				
CEC efficiency		208 V	N/A	N/A	N/A	N/A
		240 V	N/A	N/A	N/A	N/A
		480 V	97.0 %	97.5 %	97.5 %	97.5 %
Admissible conductor size AC		AWG 14 - AWG 6				
Grid connection		480 V Delta +N**				
Frequency		60 Hz				
Total harmonic distortion		< 1.75 %				
Power factor		0 - 1 ind./cap.				

**+N for sensing purposes - no current carrying conductor.

LIMITED WARRANTY CONDITIONS FOR FRONIUS INVERTERS, FRONIUS RAPID SHUTDOWN BOXES, FRONIUS SMART METER AND THE FRONIUS DATAMANAGER

FOR THE FRONIUS WARRANTY AND FRONIUS WARRANTY PLUS

(Valid from: 01/06/2018)

Fronius International GmbH ("Fronius") grants a limited warranty (referred to herein as either the "Fronius Warranty" or "Fronius Warranty Plus" as is applicable to the Warranty Product, as defined herein) for the Fronius Warranty Products.

For more information about the Fronius Warranty please visit: www.fronius.com/solar/warranty-usa

Warranty Products

This warranty applies exclusively to Fronius inverters, Fronius Shutdown Boxes, Fronius Smart Meter and Fronius Datamanagers (individually, the "Warrantied Product") and only to the extent that these products are first installed in the United States of America and uniquely identified by their serial number for the Warranty Period as defined below. Fuses and other wearing parts are excluded from the warranty together with other components of the photovoltaic system as well as system add-ons, components for system monitoring and data communication, accessories and pre-production devices.

Warranty holder

Only the owner of the Warranty Product is entitled to exercise the terms and conditions herein stated. No other person or entity holds a right or claim under these warranty terms and conditions. Warranty Product that has had a proper change in ownership, which can be evidenced with documentation, will be eligible to receive warranty benefits under these terms and conditions.

Warranty claim

A warranty claim exists in the event that a Warranty Product has a defect in materials and workmanship for which Fronius is responsible within the Warranty Period.

Warranty exclusions

The warranty does not apply if

- / the fault is the result of improper installation, operation, commissioning or transport; failure to comply with the installation, preventive maintenance and/or operating instructions; insufficient ventilation; work performed on the Warranty Product by a third party not authorised by Fronius; failure to heed the safety rules, operating instructions and installation standards; modifications; unauthorized repair, normal wear and tear; force majeure (storm, lightning, overvoltage, fire, etc.); external causes such as accidents, abuse or other actions or events beyond Fronius Reasonable care;
- / the fault has been caused by another component in the warranty holder's photovoltaic system;
- / Fronius could not identify a fault upon examination of the product;
- / the damage does not impair the function of the Fronius inverter ("cosmetic flaws"); or
- / the full purchase price of the Warranty Product has still not been paid to Fronius;
- / Fronius Product which has been disassembled and rebuilt, excluding refurbished units which are provided by Fronius under Warranty terms.

Warranty services

Fronius grants the Fronius Warranty Plus, as described below, to the original purchaser for a period of ten years from shipment from the Fronius factory.

/ Fronius Warranty

- Material warranty: Fronius will not cover any removal and installation costs, labour costs, transport costs or costs for any other service. Fronius will provide the relevant replacement part or a replacement device. The warranty holder does not have to pay for the replacement part. In the event of replacement with an equivalent replacement device, Fronius will charge for the labour costs (time) of repairing the original device.
- Service: Fronius will not pay the labour costs for removing and installing the replacement part or replacement device, or costs for any other service.
- Transport: Fronius will not pay any shipping and transport costs incurred in relation to the Material and Service under this Fronius Warranty

/ Fronius Warranty Plus

- Material: Fronius will provide a replacement part or an equivalent replacement device at no cost to the warranty holder.
- Service: Fronius will pay the labour costs for removing and installing the replacement part or replacement device, provided this work is undertaken by Fronius or a third party approved by Fronius. Due to technological progress, the replacement part or replacement



device provided may not be compatible with the system monitoring or other components installed on-site (e.g. Fronius DATCOM). Costs incurred as a result of any incompatibility are not part of this warranty service and will not be paid by Fronius. Other costs, such as travel expenses, installation costs, customs duties, etc., will not be paid by Fronius. These services do not include modifications to the existing photovoltaic system of the warranty holder, the warranty holder's building wiring or other devices. The warranty holder must provide unrestricted access to the device(s) affected and provide all necessary equipment to comply with any applicable health and safety regulations free of charge.

- **Transport:** Fronius will pay any national shipping and transport costs incurred which are approved by Fronius in relation to the Material and Service described above under this Fronius Warranty Plus, as necessary. Any requested express delivery costs will not be paid by Fronius.

Warranty Period

The Warranty Period for all levels of warranty begins when the Warranty Product is shipped by Fronius and lasts for the period as described below, depending on the Warranty Product and whether the warranty is a Fronius Warranty or a Fronius Warranty Plus. The precise expiration date of the warranty for the specific Warranty Product can be checked by entering the serial number at www.solarweb.com. Fronius may change the availability of this limited warranty at Fronius' discretion, but any changes will not be retroactive.

Where parts or devices are replaced, the remaining warranty period is transferred to the replacement part or replacement device. This transfer will be registered by Fronius automatically and the warranty holder will not receive a new certificate.

Overview of Warranty Product, warranty service and warranty period:

	String inverters (wall-mounted)	Central inverters (floor-mounted)	Fronius Rapid Shutdown Box (Single / Multi)	Fronius Smart Meter	Fronius Datamanager
Warranty services from shipment from Fronius factory	Fronius Warranty Plus	Fronius Warranty Plus	Fronius Warranty Plus	Fronius Warranty	Fronius Warranty Plus
Warranty services from shipment from Fronius factory	10 years	5 years	5 years	5 years	Is covered by the warranty period of the inverter in which the Datamanager has been installed.
Warranty extension can be purchased from your installer within 30 months of shipment from the Fronius factory	Fronius Warranty or Fronius Warranty Plus / to 15, 20 years	Fronius Warranty or Fronius Warranty Plus / to 10, 15, 20 years	Fronius Warranty / to 10 years	No warranty extension possible	Is covered by the warranty period of the inverter in which the Datamanager has been installed.

Making a claim under the warranty, return of parts and devices – to be observed without exception:

In the event of a warranty claim, the warranty holder must first notify the installer of the Warranty Claim, who will then submit the claim to Fronius.

In the event of a warranty claim Fronius must verify the validity of the claim, as this is the only way to ensure that the warranty services can be provided. Warranty claims must be accompanied with the purchase invoice, the serial number of the Warranty Product, the commissioning report (handover date, commissioning date, report from the power supply company) and, where necessary, proof of payment of the warranty extension fee.

The warranty holder must return parts or devices in the original packaging or equivalent. If the faulty part or device is not received by Fronius within 60 days of Fronius providing instructions to the warranty holder, the warranty holder will be charged for the part/device at the current price for such new part/device. Faulty parts and devices returned to Fronius become the property of Fronius upon receipt; until they are received, Fronius retains ownership of the corresponding replacement parts and devices.

It is the responsibility of the warranty holder to substantiate the warranty claim and show that the conditions are met. Fronius reserves the right to inspect the original installation site and request such additional information as it deems necessary.

A claim for compensation cannot be made for energy of any type or nature.

Other legal information

SELLER DISCLAIMS ALL IMPLIED WARRANTIES AND SIMILAR OBLIGATIONS (OTHER THAN THAT THE WARRANTY PRODUCT WILL BE NEW AND GOOD TITLE) INCLUDING BUT NOT LIMITED TO THOSE OF FITNESS FOR A PARTICULAR PURPOSE, AND MERCHANTABILITY, WHETHER OTHERWISE ARISING BY LAW, CUSTOM, USAGE, TRADE PRACTICE, COURSE OF DEALING, OR COURSE OF PERFORMANCE. There are no warranties which extend beyond those express warranties contained in the limited warranty. Warranty holder affirms that it has not relied upon Fronius' skill nor judgment to select or furnish the Warranty Products for any particular purpose beyond the specific express warranties in the limited warranty. Fronius does not warrant the Warranty Product will comply with the requirements of any safety or environmental code or regulation of any federal, state, municipality or other jurisdiction



SHIFTING THE LIMITS

beyond the specific express warranties in the limited warranty. Fronius does not warrant that the Warranty Product will operate with any accessories or within any system not sold under the limited warranty and Fronius' warranty is limited to the operation of the Warranty Product in a stand-alone mode. Some countries, states, or provinces do not allow the exclusion or limitation of implied warranties or the limitation of incidental or consequential damages for certain products supplied to consumers, or the limitation of liability for personal injury, so such limitations and exclusions may be limited in their application to an end user and others. When the implied warranties are not allowed to be excluded in their entirety, they will be limited to the duration of the applicable written warranty. The warranty gives the warranty holder specific legal rights and such warranty holder may also have other rights, which may vary depending on local law.

FRONIUS' RESPONSIBILITY FOR DEFECTIVE PRODUCTS IS LIMITED TO REPAIR OR REPLACEMENT AS DESCRIBED HEREIN.

THE REMEDIES DESCRIBED ABOVE ARE THE WARRANTY HOLDER'S SOLE AND EXCLUSIVE REMEDIES AND FRONIUS' ENTIRE LIABILITY FOR ANY BREACH OF THIS LIMITED WARRANTY. FRONIUS' LIABILITY SHALL UNDER NO CIRCUMSTANCES EXCEED THE ACTUAL AMOUNT PAID BY WARRANTY HOLDER FOR THE DEFECTIVE PRODUCT, NOR SHALL FRONIUS UNDER ANY CIRCUMSTANCES BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL OR PUNITIVE DAMAGES OR LOSSES, WHETHER DIRECT OR INDIRECT, INCLUDING, BUT NOT LIMITED TO, CLAIMS RELATING TO PERSONAL INJURY OR LOSS OF LIFE.

ROOFMOUNT



MANUFACTURER'S LIMITED PRODUCT WARRANTY

Unirac, Inc., ("Unirac") warrants to the buyer ("Buyer") at the original installation site ("Site") that any of the **ROOFMOUNT** components designed and manufactured by Unirac and installed at the Site ("Product") shall be free from defects in material and workmanship which substantially impair their ability to perform their intended function, as referenced in the Unirac Product Information, for a period of twenty five (25) years – from the earlier of 1) the date the installation of the Product at the Site is substantially complete, or 2) 120 days after the purchase of the Product by the original Buyer of the Product ("Warranty Period").

WARRANTY TRANSFERENCE

Buyer may transfer this Warranty to subsequent Site owners, or if original Buyer is a contractor to the Site owner, so long as the transferee agrees to the terms of the Limited Warranty as if it were the Buyer. Proof of purchase is required for any warranty claim.

WARRANTY LIMITATIONS

This Limited Warranty covers only the Product, and not PV modules, electrical components and or wiring used in conjunction with the Product or any other materials not provided by Unirac. Goods which may be sold by Unirac, but which are not designed or manufactured by Unirac are not warranted by Unirac, are sold only with the warranties, if any, of the original manufacturers thereof. This Limited Warranty does not cover damage to the Product that occurs during its shipment, storage, installation or use, or from force majeure acts including fire, flood, earthquake, storm, hurricane or other natural disaster, war, terrorist activities, acts of foreign enemies and criminal acts. This Limited Warranty does not cover damages or problems caused by the connection to or use of alternative materials not purchased from Unirac Price List. This Limited Warranty shall be void if A) installation of the Product is not performed in accordance with the Unirac Product Information, B) if the Product has been modified, repaired, or reworked in a manner not previously authorized by Unirac in writing, or C) the Product is installed in an environment for which it was not designed, each as determined by Unirac in its sole discretion.

WARRANTY CLAIMS

If, within the Warranty Period, the Product shall be proven at Unirac's sole discretion to be nonconforming, then Unirac shall repair or provide a replacement for the nonconforming Product, or any nonconforming part thereof, at Unirac's option. Any such repair or replacement does not cause the beginning of new warranty terms, nor shall the Warranty Period of this Limited Warranty be extended. Unirac's aggregate liability for all warranty claims shall not exceed the original Purchase Price of the nonconforming Product. Buyer shall bear all costs of shipment or transportation related to the repair or replacement of the nonconforming product. Such repair or replacement shall be Buyer's sole remedy and shall fulfill all of Unirac's obligations with respect to the Product and all warranty claims.

EXCEPT FOR THE LIMITED WARRANTY EXPRESSED ABOVE, UNIRAC MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND WHATSOEVER AND HEREBY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, COURSE OF DEALING AND USAGE OF TRADE.

UNIRAC SHALL NOT BE LIABLE FOR LOSS OF USE, REVENUE OR PROFIT, OR FOR DIRECT, INDIRECT, SPECIAL, PUNITIVE, LIQUIDATED, INCIDENTAL OR CONSEQUENTIAL DAMAGES, OR FOR ANY OTHER LOSS OR COST OF A SIMILAR TYPE, OR FOR CLAIMS BY BUYER FOR DAMAGES OF BUYER'S CUSTOMERS, CLAIMS OF THIRD PARTIES OR INJURY TO PERSONS OR PROPERTY ARISING OUT OF ANY DEFECT OR NONCONFORMITY IN THE PRODUCT COVERED BY THIS WARRANTY, EVEN IF CAUSED BY THE NEGLIGENCE OF UNIRAC. ALL SUCH DAMAGES AND EXPENSES ARE HEREBY EXCLUDED.

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**LEARN MORE WITH
OUR HOW-TO VIDEOS**

www.youtube.com/FroniusSolar

Fronius Symo

10.0-3 208-240

12.0-3 208-240

10.0-3 480

12.5-3 480

15.0-3 480

15.0-3 208

17.5-3 480

20.0-3 480

22.7-3 480

24.0-3 480

EN-US

Operating Instructions

Inverter for grid-connected photo-voltaic systems

ES

Manual de instrucciones

Inversores para instalaciones foto-voltaicas acopladas a la red

FR

Instructions de service

Onduleur pour installations photo-voltaïques connectées au réseau



Dear reader,

Introduction

Thank you for the trust you have placed in our company and congratulations on buying this high-quality Fronius product. These instructions will help you familiarize yourself with the product. Reading the instructions carefully will enable you to learn about the many different features your Fronius product has to offer. This will allow you to make full use of its advantages.

Please also note the safety rules to ensure greater safety when using the product. Careful handling of the product will repay you with years of safe and reliable operation. These are essential prerequisites for excellent results.

Explanation of Safety Instructions



DANGER! Indicates an immediate danger. Death or serious injury may result if appropriate precautions are not taken.



WARNING! Indicates a possibly dangerous situation. Death or serious injury may result if appropriate precautions are not taken.



CAUTION! Indicates a situation where damage or injury could occur. Minor injury or damage to property may result if appropriate precautions are not taken.



NOTE! Indicates the possibility of flawed results and damage to the equipment.

IMPORTANT! Indicates tips for correct operation and other particularly useful information. It does not indicate a potentially damaging or dangerous situation.

If you see any of the symbols depicted in the "Safety Rules," special care is required.

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Safety rules

General



The device has been manufactured using state-of-the-art technology and according to recognized safety standards. If used incorrectly or misused, however, it can cause

- injury or death to the operator or a third party
- damage to the device and other material assets belonging to the operating company
- inefficient operation of the equipment

All persons involved in start-up operation, maintenance and servicing for the device must

- be suitably qualified
- have knowledge of and experience in dealing with electrical installations and
- have completely read and followed these operating instructions

The operating instructions must always be at hand wherever the device is being used. In addition to the operating instructions, all applicable local rules and regulations regarding accident prevention and environmental protection must also be followed.

All safety and danger notices on the device

- must be kept in a legible state
- must not be damaged/marked
- must not be removed
- must not be covered, pasted or painted over

The terminals can reach high temperatures.



Only operate the device when all protection devices are fully functional. If the protection devices are not fully functional, there is a risk of

- injury or death to the operator or a third party
- damage to the device and other material assets belonging to the operating company
- inefficient operation of the device

Safety devices that are not fully functional must be repaired by an authorized specialist before the device is turned on.

Never bypass or disable protection devices.

For the location of the safety and danger notices on the device, refer to the section headed "General" in the operating instructions for the device.

Any equipment malfunctions which might impair safety must be remedied immediately before the device is turned on.

Your personal safety is at stake!

Environmental Conditions



Operation or storage of the device outside the stipulated area will be deemed as "not in accordance with the intended purpose." The manufacturer is not responsible for any damages resulting from unintended use.

For exact information on permitted environmental conditions, please refer to the "Technical data" in the operating instructions.

Qualified Service Engineers



The servicing information contained in these operating instructions is intended only for the use of qualified service engineers. An electric shock can be fatal. Do not carry out any actions other than those described in the documentation. This also applies to qualified personnel.



All cables and leads must be secured, undamaged, insulated, and adequately dimensioned. Loose connections, scorched, damaged, or under-dimensioned cables and leads must be repaired immediately by an authorized specialist.



Maintenance and repair work must only be carried out by authorized personnel.

It is impossible to guarantee that externally procured parts are designed and manufactured to meet the demands made on them, or that they satisfy safety requirements. Use only original spare parts (also applies to standard parts).

Do not carry out any alterations, installations, or modifications to the device without first obtaining the manufacturer's permission.

Components that are not in perfect condition must be changed immediately.

Data Regarding Noise Emission Values



The cooling of the device takes place via an electronic temperature control system at the lowest possible noise level and depends on the power used, ambient temperature and the soiling level of the device, etc.

It is not possible to provide a workplace-related emission value for this device, because the actual sound pressure level is heavily influenced by the installation situation, the power quality, the surrounding walls and the properties of the room in general.

EMC Measures



In certain cases, even though a device complies with the standard limit values for emissions, it may affect the application area for which it was designed (e.g., when there is sensitive equipment at the same location, or if the site where the device is installed is close to either radio or television receivers). If this is the case, then the operator is obliged to take appropriate action to rectify the situation.

Safety symbols



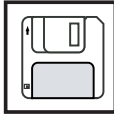
Devices marked with the CSA test mark satisfy the requirements of the relevant standards for Canada and the USA.

Disposal



Dispose of in accordance with the applicable national and local regulations.

Backup



The user is responsible for backing up any changes made to the factory settings. The manufacturer accepts no liability for any deleted personal settings.

Copyright

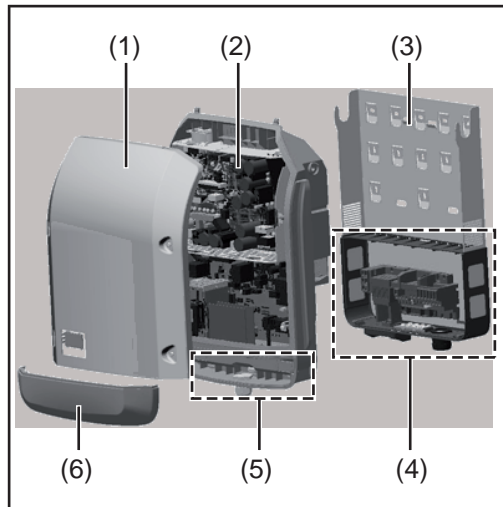


Copyright of these operating instructions remains with the manufacturer.

Text and illustrations are technically correct at the time of going to print. The right to make modifications is reserved. The contents of the operating instructions shall not provide the basis for any claims whatsoever on the part of the purchaser. If you have any suggestions for improvement, or can point out any mistakes that you have found in the operating instructions, we will be most grateful for your comments.

General

Device Concept



Unit Design:

- (1) Housing cover
- (2) Inverter
- (3) Mounting bracket
- (4) Connection area including DC main switch
- (5) Data communication area
- (6) Data communication cover

The inverter transforms the direct current generated by the solar modules into alternating current. This alternating current is fed into the public grid and synchronized with the grid voltage that is used there.

The inverter has been designed exclusively for use in grid-connected photovoltaic systems. It cannot generate electric power independently of the grid.

The inverter provides maximum safety during installation and operation thanks to its design and function.

The inverter automatically monitors the public power grid. Whenever conditions in the power grid are inconsistent with standard conditions (e.g., grid switch-off, interruption), your inverter will immediately stop operating and interrupt the supply of power into the grid. Grid monitoring involves monitoring of voltage, frequency, and islanding conditions.

The inverter is fully automatic. As soon as there is enough energy from the solar modules after the sun rises, the inverter starts grid monitoring. When there is sufficient sunlight, the inverter starts grid power feed operation.

The inverter works so that the maximum possible output power is taken from the solar modules.

As soon as the available energy for the grid power feed becomes insufficient, the inverter completely disconnects the power electronics from the grid and ceases operation. All settings and recorded data are saved.

If the temperature of the inverter becomes too hot, the inverter reduces the current output power automatically as a protective measure.

Excessive inverter temperatures may be caused by high ambient temperatures or insufficient heat dissipation (e.g., when installed in switch cabinets lacking appropriate heat dissipation measures).

Intended Use

The solar inverter is designed exclusively to convert direct current from solar modules into alternating current and feed this power into the public grid.

The following are deemed not to be in conformity with its intended purpose:

- utilization for any other purpose, or in any other manner
- alterations to the inverter that are not expressly recommended by Fronius
- installation of components that are not expressly recommended or sold by Fronius.

The manufacturer is not responsible for any damage resulting from improper use.

All warranty claims are considered void in such cases.

Proper use also means

- carefully reading and obeying all the instructions and safety and danger notices in the operating instructions
- carrying out all the specified inspection and servicing work
- installation as per operating instructions.

When configuring the photovoltaic system, make sure that all photovoltaic system components are operating completely within their permitted operating range.

All measures recommended by the solar module manufacturer for maintaining solar module properties must be followed.

Utility company regulations regarding grid power feed must be followed.

Information on "Field Adjustable Trip Points" and "Advanced Grid Features"

The inverter is equipped with field adjustable trip points and advanced grid features. For further information, please contact Fronius technical support at the following e-mail address: pv-us-support@fronius.com.

FCC / RSS Compliance



FCC

This device corresponds to the limit values for a digital device of class B in accordance with Part 15 of the FCC regulations. The limit values should provide adequate protection against harmful interference in homes. This device creates and uses high frequency energy and can interfere with radio communications when not used in accordance with the instructions. However, there is no guarantee against interference occurring in a particular installation.

If this device interferes with radio or television reception when turning the device on and off, it is recommended that the user solve this with one or more of the following measures:

- adjust or reposition the receiving antenna
- increase the distance between the device and the receiver
- connect the device to another circuit, which does not include the receiver
- for further support, please contact the retailer or an experienced radio/TV technician.

Industry Canada RSS

The device corresponds to the license-free Industry Canada RSS standards. Operation is subject to the following conditions:

- (1) The device may not cause harmful interference
- (2) The device must accept any interference received, including interference that may cause undesired operation.

Isolation Monitor/ Interrupter, Insulation Monitoring

The inverter is fitted with the following safety functions as required by UL 1741 and the National Electrical Code:

Isolation Monitor / Interrupter (IMI)

The inverter controls the insulation resistance before connecting to the grid. If the insulation resistance drops below a certain level, no connection to the grid is established. While energy is fed into the grid, the automatic leakage current monitoring is carried out. If a defined leakage current value is exceeded, the inverter is disconnected from the grid.

Insulation monitoring

In photovoltaic systems with ungrounded solar modules, the inverter checks the resistance between the photovoltaic system's positive or negative pole and the ground potential. In the case of a short circuit between the DC+ or DC- cable and the ground (e.g., due to poorly insulated DC cables or faulty solar modules) the inverter disconnects from the grid.

Arc Detector / Interrupter

The inverter has an integrated arc detector / interrupter, which detects and deletes serial arcs.

A serial arc may occur after the following example errors or situations:

- poorly connected DC plug
- defective solar module connection sockets
- high resistance solder connections between the cells of a solar module
- incorrect cable connected to the input terminal of an inverter
- defective DC cables that allow a connection to the ground.

If an arc is detected, the power is shut down and the grid power feed operation is interrupted. A status code appears on the display.

The status code on the display must be reset manually before the grid power feed operation can be resumed.

The power shut down also deletes the serial arc.



NOTE! Power optimizers for solar modules or data transfer via DC cables (PLC – Power Line Communication) in the PV system can compromise the correct function of the arc detector / interrupter.

When using such components, it is the responsibility of the system installer to ensure that the arc detector / interrupter functions correctly. Contact Fronius Technical Support for further information.

Warning Notices Affixed to the Device

There are warning notices and safety symbols on and in the inverter. These warning notices and safety symbols must not be removed or painted over. They warn against incorrect operation, as this may result in serious injury and damage.



Safety Symbols:



Risk of serious injury and damage due to incorrect operation



Do not use the functions described here until you have fully read and understood the following documents:

- These operating instructions
- all the operating instructions for the system components of the photovoltaic system, especially the safety rules



Dangerous electrical voltage



Wait for the capacitors to discharge.

Text of the Warning Notices:

WARNING!

Risk of electric shock! Non-insulated inverter

Do not remove the cover. The device does not contain any user-serviceable parts. Maintenance work must be carried out by a trained service technician.

Both AC and DC voltage sources terminate inside this device. Each circuit must be turned off before carrying out maintenance work.

Wenn das Solarmodul-Feld Licht ausgesetzt wird, liefert dieses eine Gleichspannung an dieses Gerät.

Gefahr eines elektrischen Schlages durch in Kondensatoren gespeicherte Energie. Deckel nicht entfernen, bevor nach Abschalten aller Versorgungsquellen 5 Minuten vergangen sind.

Ungeserdetes System: Die DC Leitungen dieses Photovoltaiksystems sind nicht geerdet und können stromführend sein.


Information on Dummy Devices

A dummy device should not be connected to a photovoltaic system for real operation and may only be used for demonstration purposes.

IMPORTANT! When using a dummy device, you should never connect a live DC cable to the DC connection sockets.

You may connect live cables or cable pieces for demonstration purposes.

Dummy devices can be recognized by their device rating plate:

 www.fronius.com	AC nominal operating voltage	480 V
	AC operating voltage range	422-528 V
Model No.	AC maximum continuous output current	28.9 A
Part No.	AC maximum continuous output power	24000 VA
Ser. No.	AC nominal output power at 40°C (104°F)	24000 VA
	AC nominal output power at 60°C (140°F)	20000 VA
This device complies with UL1741 and FCC 15 Class B. This utility interactive inverter is transformerless. Admissible ambient temperature: -40...60°C (-40...140°F) Enclosure Type 4X	AC output power factor	0 - 1 ind. / cap.
	AC nominal operating frequency	60 Hz / 3 phase
	AC operating frequency range	59.3 - 60.5 Hz
	DC operating voltage range	500 - 800 V
	DC maximum system voltage	1000 V
	DC maximum continuous current (MPP1/MPP2)	33.0 A / 25.0 A

Example: Dummy device rating plate

String Fuses

Only applies to device type Fronius Symo 15.0-3 208 and device types Fronius Symo 15.0-3 480 / 20.0-3 480 / 22.7-3 480 / 24.0-3 480 with the "Ecofuse" option:

The use of string fuses in the Fronius Symo provides additional fuse protection for solar modules.

The maximum short circuit current I_{SC} , the maximum module backfeed current I_R and the specification of the maximum string fuse value in the module data sheet of the respective solar module are decisive factors in the protection of the solar module.

The maximum short circuit current I_{SC} per terminal is 15 A.

The string fuse release current can be set to greater than 15 A if required.

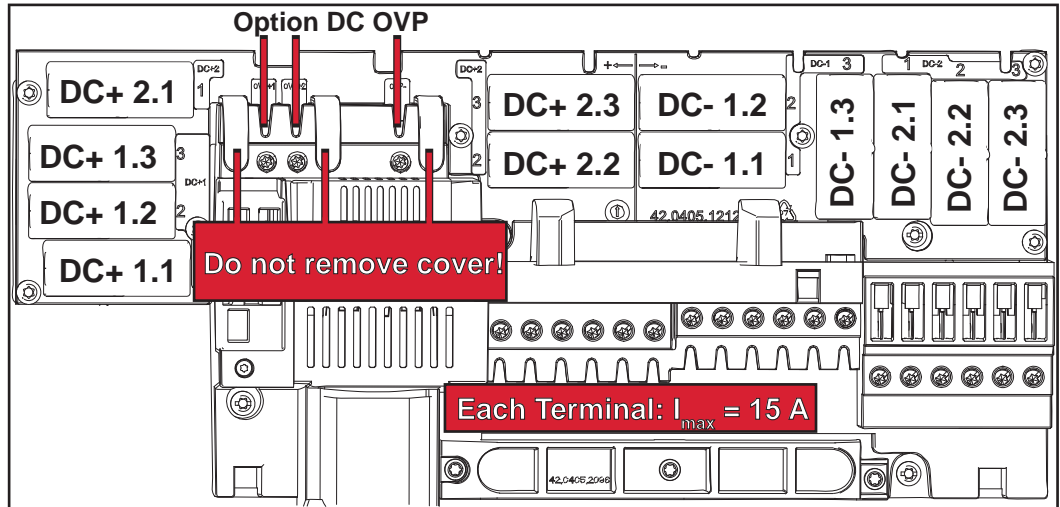
If the inverter is being operated with an external string collection box, the DC connector kit (item numbers 42,0201,4479 and 42,0201,4480) must be used. In this case the solar modules are externally protected in the string collection box and the metal bolts should be used in the inverter.

National regulations regarding fuse protection must be observed. The electrician performing the installation is responsible for choosing the right string fuses.



NOTE! To prevent a risk of fire, faulty fuses must only be replaced by new equivalent fuses.

The inverter is delivered with metal bolts as standard.



Criteria for the Proper Selection of String Fuses

The following criteria must be met for each solar module string when using fuse protection:

- $I_N > 1.8 \times I_{SC}$
- $I_N < 2.4 \times I_{SC}$
- $U_N \geq \text{max. input voltage of inverter being used}$
- Fuse dimensions: Diameter 10 x 38 mm

- I_N Nominal current of the fuse
- I_{SC} Short circuit current for standard test conditions (STC) according to solar module data sheet
- V_N Nominal voltage of the fuse



NOTE! The nominal current value of the fuse must not exceed the maximum fuse protection value specified in the solar module manufacturer's data sheet. If a maximum fuse protection value is not specified, please request it from the solar module manufacturer.

Data Communication and Solar Net

Fronius Solar Net and Data Interface

Fronius developed Solar Net to make these system add-ons flexible and capable of being used in a wide variety of different applications. Fronius Solar Net is a data network that enables several inverters to be linked to the system add-ons.

Fronius Solar Net is a bus system with ring topology. Just one suitable cable is enough to provide communication between one or more inverter connected to Fronius Solar Net and a system add-on.

Different system add-ons are automatically recognized by Fronius Solar Net.

In order to distinguish between several identical system add-ons, each one must be assigned a unique number.

In order to clearly define each inverter in Fronius Solar Net, each inverter must also be assigned an individual number.

You can assign individual numbers as per the "SETUP Menu" section in this manual.

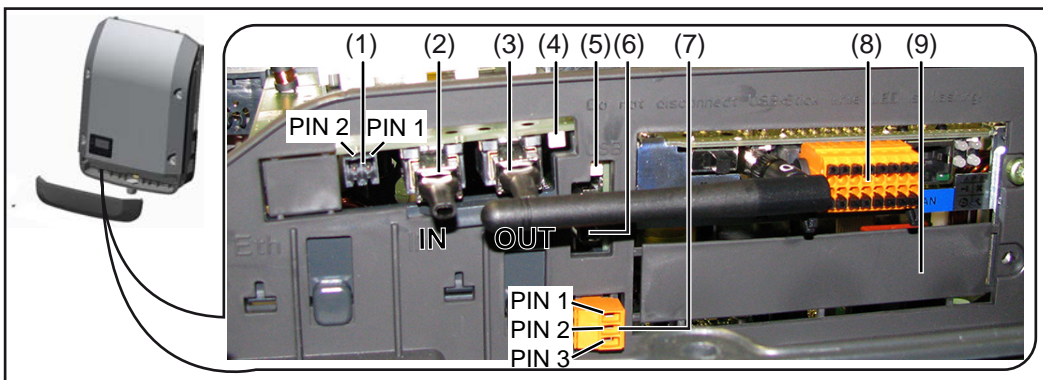
More detailed information on individual system upgrades can be found in the relevant operating instructions or on the internet at <http://www.fronius.com>

More detailed information on cabling DATCOM components can be found at



→ <http://www.fronius.com/QR-link/4204101938>

Data Communication Area



Depending on the version, the inverter can be fitted with the Fronius Datamanager plug-in card.

Item	Description
(1)	<p>Switchable multifunctional power interface. For a more detailed explanation, see the section entitled "Explanation of Multifunctional Power Interface" which follows</p> <p>Use the 2-pin mating connector supplied with the inverter to connect to the multifunctional power interface.</p>
(2)	Fronius Solar Net/interface protocol IN connection
(3)	<p>Fronius Solar Net/interface protocol OUT connection</p> <p>Fronius Solar Net/interface protocol input and output for connecting to other DATCOM components (e.g., inverter, Fronius Sensor Box, etc.)</p> <p>When networking several DATCOM components, a termination plug must be placed on each free IN and/or OUT connection of a DATCOM component. Two termination plugs are supplied with inverters with Fronius Datamanager.</p>
(4)	<p>Fronius Solar Net LED</p> <p>indicates whether a power supply is available for Fronius Solar Net</p>
(5)	<p>Data transfer LED</p> <p>flashes when accessing the USB flash drive. The USB flash drive must not be removed during this time.</p>
(6)	<p>USB A socket</p> <p>for connecting a USB flash drive with a maximum size of 65 x 30 mm (2.6 x 2.1 in.)</p> <p>The USB flash drive can act as a data logger for an inverter. The USB flash drive is not part of the scope of supply for the inverter.</p>
(7)	<p>Floating switch contact with mating connector</p> <p>max. 250 V AC / 4 A AC max. 30 V DC / 1 A DC max. 1.5 mm² (AWG 16) cable cross section</p> <p>Pin 1 = NO contact (Normally Open) Pin 2 = root (Common) Pin 3 = NC contact (Normally Closed)</p> <p>Use the mating connector supplied with the inverter to connect to the floating switch contact.</p>
(8)	<p>Fronius Datamanager with WLAN antenna</p> <p>or</p> <p>cover for option card slot</p>
(9)	Cover for option card slot

Explanation of Multifunctional Power Interface

Different switching variants can be connected to the multifunctional power interface. These variants cannot be operated at the same time, however. For example, if an S0 counter is connected to the multifunctional power interface, a signal contact for overvoltage protection cannot be connected, and vice versa.

Pin 1 = measurement input: max. 20 mA, 100 ohm measurement resistor (apparent ohmic resistance)

Pin 2 = max. short circuit current 15 mA, max. open circuit voltage 16 V DC or GND

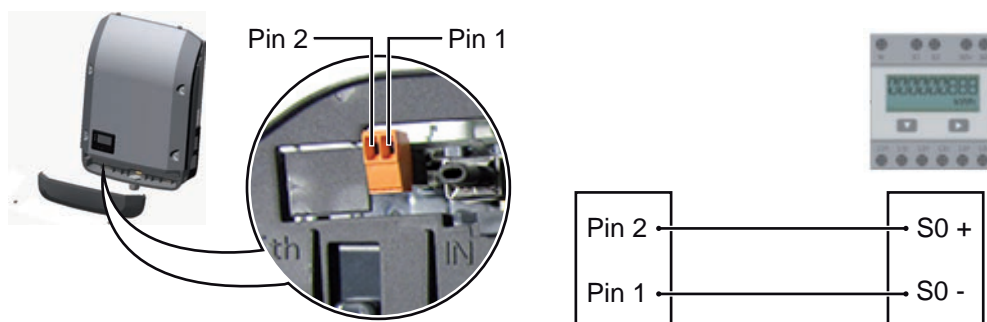
Switching Variant 1: Signal Contact for Overvoltage Protection

The DC SPD (surge protection device) option issues a warning or error on the display, depending on the setting in the basic menu. More detailed information on the DC SPD option can be found in the installation instructions.

Switching Variant 2: S0 Counter

A counter for recording self-consumption per S0 can be connected directly to the inverter. This S0 counter can be placed at the feed-in point or in the consumption branch. A dynamic power reduction can be set under the menu subitem UC Editor in the settings on the Fronius Datamanager website (see Fronius Datamanager operating instructions at www.fronius.com/QR-link/4204260173EA).

IMPORTANT! Connecting an S0 counter to the inverter may require an inverter firmware update.



- Requirements for the S0 counter:
- Must meet standard IEC 62053-31 Class B
 - Max. voltage: 15 V DC
 - Max. current when ON: 15 mA
 - Min. current when ON: 2 mA
 - Max. current when OFF: 0.15 mA

Recommended max. impulse rate of S0 counter:

PV power kWp [kW]	Max. impulse rate per kWp
30	1000
20	2000
10	5000
≤ 5.5	10000

"Solar Net" LED Description

"Solar Net" LED Lights Up:

Power supply for data communication within the Fronius Solar Net/Interface Protocol is OK.

"Solar Net" LED Flashes Briefly Every 5 Seconds:

Data communication error in Fronius Solar Net:

- Overcurrent (current flow > 3 A, e.g., due to a short circuit in Fronius Solar Net Ring)
- Undervoltage (not a short circuit, voltage in Fronius Solar Net < 6.5 V, e.g., when too many DATCOM components are connected to Fronius Solar Net and electrical supply is insufficient)

In this case an additional energy supply to one of the DATCOM components via an external power supply is required.

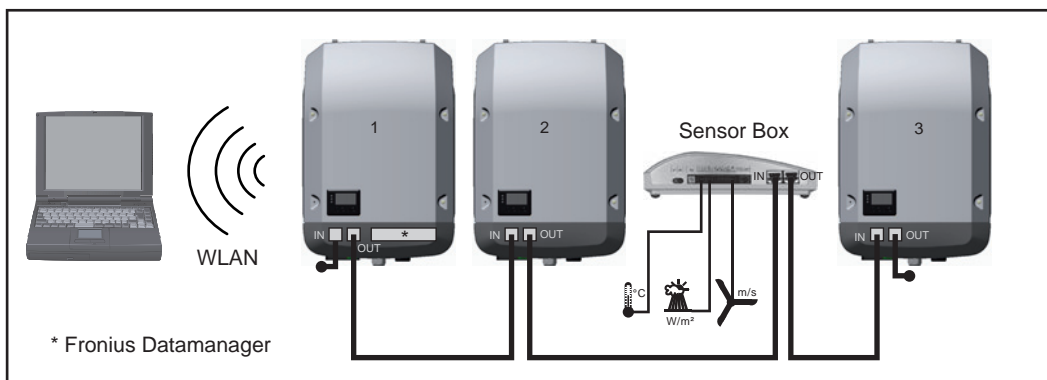
Check other DATCOM components for errors in order to identify an existing undervoltage.

After a shutdown due to overcurrent or undervoltage, the inverter tries to restore the energy supply in the Fronius Solar Net every 5 seconds so long as there is an error, for example.

Once the error has been corrected, power is restored to Fronius Solar Net within 5 seconds.

Example

Logging and archiving inverter and sensor data using a Fronius Datamanager and Fronius Sensor Box:



Data network with three inverters and one Fronius Sensor Box:

- inverter 1 with Fronius Datamanager
- inverter 2 and 3 without Fronius Datamanager

● = termination plug

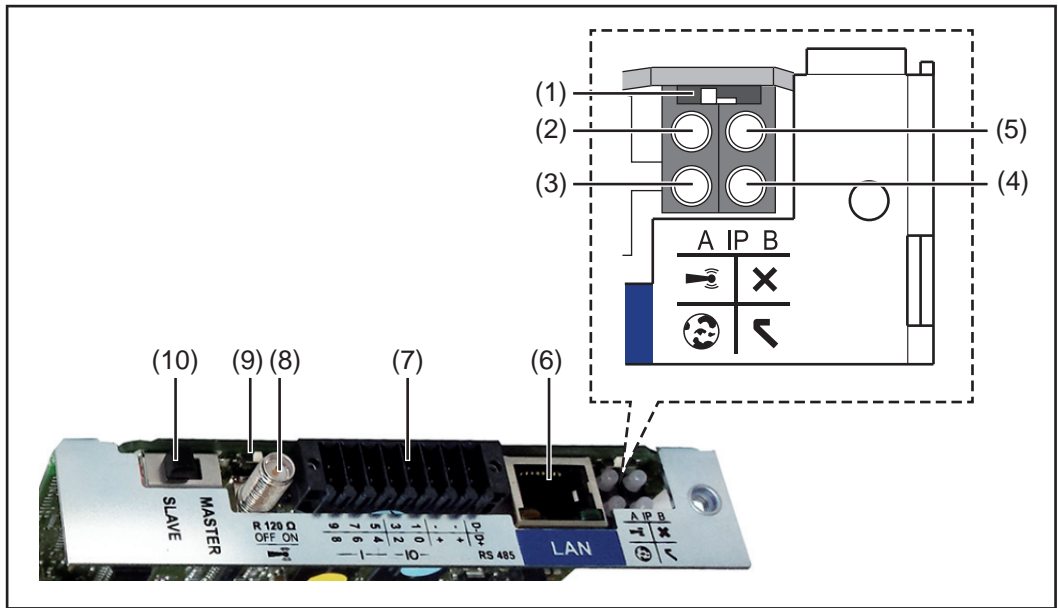
External communication (Fronius Solar Net) takes place in the inverter via the data communication area. The data communication area has two RS-422 interfaces: an input and an output. RJ45 plug connectors are used to establish the connection.

IMPORTANT! Only one master Fronius Datamanager is permitted per Fronius Solar Net Ring. Additional Fronius Datamanager slaves can be switched or removed (see section entitled "Controls and Indicators on Fronius Datamanager 2.0").

Unused option card slots can be closed by replacing the cover (item number 42,0405,2094), or an inverter without Fronius Datamanager (light version) can be used.

Fronius Datamanager 2.0

Controls, Connections, and Indicators on the Fronius Datamanager



No. Function

(1) IP switch

For changing the IP address:

Switch position **A**

Specified IP address and opening the WLAN Access Point

Fronius Datamanager 2.0 uses fixed IP address 169.254.0.180 for a direct connection to a PC via LAN.

If the IP switch is set to position A, an Access Point for a direct WLAN connection to Fronius Datamanager 2.0 is also opened.

Access data for this Access Point:

Network name: FRONIUS_240.XXXXXX

Key: 12345678

Fronius Datamanager 2.0 can be accessed:

- via DNS name "http://datamanager"
- via IP address 169.254.0.180 for the LAN interface
- via IP address 192.168.250.181 for the WLAN Access Point

Switch position **B**

Assigned IP address

Fronius Datamanager 2.0 operates using an assigned IP address (factory setting DHCP dynamic).

The IP address can be set at the Fronius Datamanager 2.0 website.

No. Function**Int./ext. power supply**

- GND
- + U_{int}/U_{ext}
Output for internal voltage 12.8 V
or
input for external supply voltage
> 12.8–24 V DC (+ 20%)

Digital inputs: 0–3, 4–9

Voltage level: low = min. 0 V – max. 1.8 V; high = min. 3 V – max. 24 V DC (+ 20%)
Input currents: dependent on input voltage; input resistance = 46 kOhm

Digital outputs: 0–3

Switching capacity when supplied by the Fronius Datamanager 2.0 plug-in card:
3.2 W in total for all 4 digital outputs

Switching capacity when supplied by an external power supply with min. 12.8 – max. 24 V DC (+ 20%), connected to U_{int}/U_{ext} and GND: 1 A, 12.8–24 V DC (depending on the external power supply) per digital output

The connection to the I/Os is made via the supplied mating connector.

(8) Antenna plug

For screwing on the WLAN antenna

(9) Modbus termination switch (for Modbus RTU)

Internal bus termination with 120-ohm resistance (yes/no)

Switch in position "on": Termination resistance of 120 ohm active
Switch in position "off": No termination resistance active



IMPORTANT! The termination resistance must be active for the first and last device in an RS-485 bus.

(10) Fronius Solar Net master/slave switch

For switching between master and slave mode within a Fronius Solar Net ring

IMPORTANT! All LEDs on the Fronius Datamanager 2.0 plug-in card are off in slave mode.

Fronius Datamanager at Night or when there is Insufficient DC Voltage

The night mode parameters in the Setup menu item Display Settings are set to OFF as the factory setting.

For this reason the Fronius Datamanager is not available at night or when there is insufficient DC voltage.

To activate the Fronius Datamanager anyway, switch the inverter on and off again on the AC side and press any key on the inverter display within 90 seconds.

Refer also to chapters "The Setup Menu Items" and "Display Settings" (Night Mode).

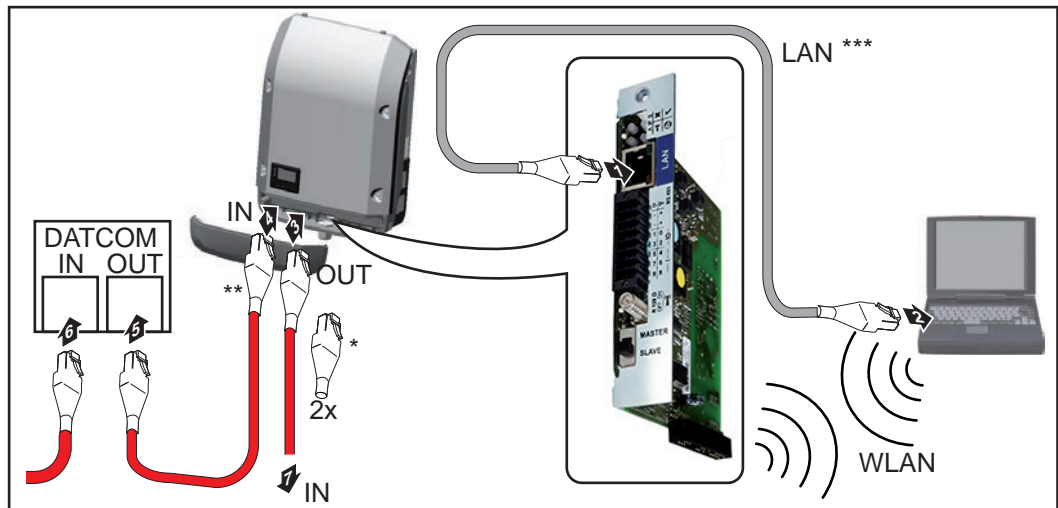
Safety



CAUTION! DATCOM components and/or the PC/laptop may be seriously damaged if the Ethernet or Fronius Solar Net cables are connected incorrectly to the Fronius Datamanager 2.0.

- The Ethernet cable should only be inserted into the LAN connection socket (colored blue).
- The Fronius Solar Net cable should only be inserted into the Fronius Solar Net IN connection socket (colored red).

Installing Inverters with Fronius Datamanager 2.0 in Fronius Solar Net



- * Fronius Solar Net termination plug, if only one inverter with Fronius Datamanager 2.0 is linked to a PC
- ** Fronius Solar Net cable, if an inverter with Fronius Datamanager 2.0 is linked to a PC and other DATCOM components
- *** A LAN cable is not included in the scope of supply

Connection between Fronius Datamanager 2.0 and PC via LAN or WLAN

- 1 Insert and lay the Ethernet cable in the inverter like a data communication cable in accordance with the operating instructions for the inverter
- 2 Insert the Ethernet cable into the LAN connection socket
- 3 Insert the Ethernet cable into the PC/laptop or into a suitable network connection socket
- 4 If only one inverter with Fronius Datamanager 2.0 is being linked to a PC:
Insert the Fronius Solar Net termination plug into the Fronius Solar Net IN and Solar Net OUT connection sockets

If other DATCOM components are connected to the network, besides the inverter with Fronius Datamanager 2.0:

Insert the Fronius Solar Net cable into the Fronius Solar Net IN connection socket of Fronius Datamanager 2.0

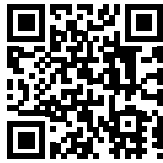
- 5 Connect the other DATCOM components

IMPORTANT! A Fronius Solar Net termination plug must be inserted into the empty Solar Net connection sockets of the last DATCOM component.

Starting Up for the First Time



NOTE! The Fronius Solar.web App makes starting Fronius Datamanager 2.0 for the first time significantly easier. The Fronius Solar.web App is available in the relevant app store.



- To start Fronius Datamanager 2.0 for the first time,
- the Fronius Datamanager 2.0 plug-in card must be installed in the inverter, or
 - there must be a Fronius Datamanager Box 2.0 in the Fronius Solar Net ring.

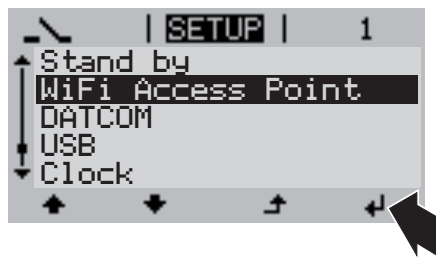
IMPORTANT! To establish a connection to Fronius Datamanager 2.0, the end device in question (e.g., laptop, tablet) must be configured as follows:

- "Obtain an IP address automatically (DHCP)" must be activated



NOTE! If the photovoltaic system only has one inverter, the following work steps 1 and 2 can be skipped. Start the process with work step 3 in this case.

- 1 Connect the inverters with Fronius Datamanager 2.0 or Fronius Datamanager Box 2.0 in Fronius Solar Net
- 2 When networking several inverters in Solar Net:
Set the Fronius Solar Net master/slave switch on the Fronius Datamanager 2.0 plug-in card correctly
 - One inverter with Fronius Datamanager 2.0 = master
 - All other inverters with Fronius Datamanager 2.0 = slave (the LEDs on the Fronius Datamanager 2.0 plug-in cards are off)
- 3 Switch the inverters to service mode
 - Activate the WIFI Access Point via the setup menu of the inverter



The inverter establishes the WLAN Access Point. The WLAN Access Point stays open for one hour.

Installation via Solar.web App

- 4 Download Fronius Solar.web App



- 5 Run Fronius Solar.web App

Installation via Web Browser

- 4 Connect the end device to the WLAN Access Point

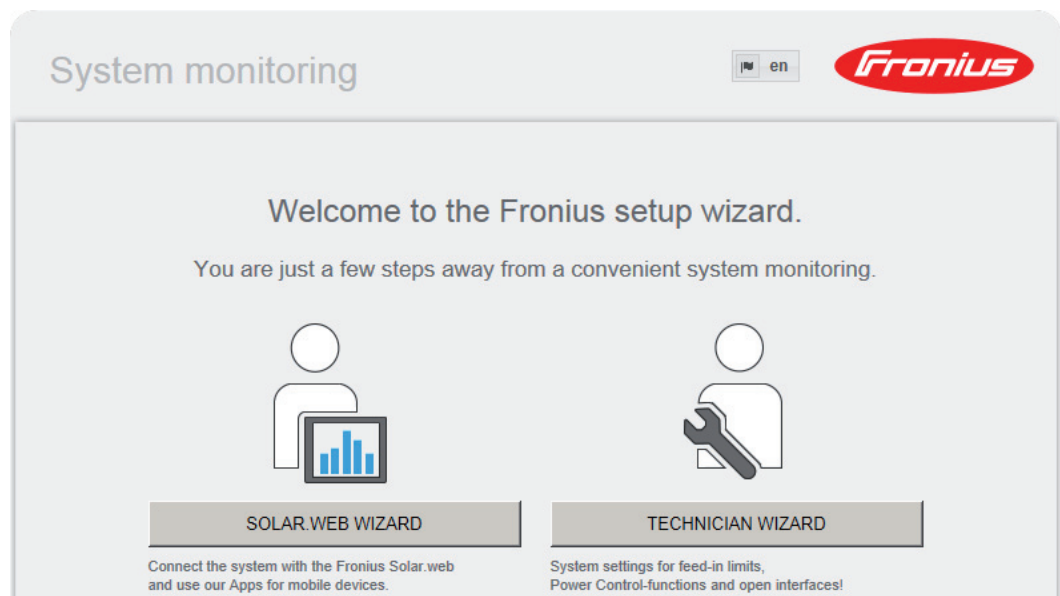
SSID = FRONIUS_240.xxxxx (5–8 digits)

- Search for a network with the name "FRONIUS_240.xxxxx"
- Establish a connection to this network
- Enter password 12345678

(or connect end device and inverter via Ethernet cable)

- 5 Enter in the browser:
<http://datamanager>
or
192.168.250.181 (IP address for WLAN connection)
or
169.254.0.180 (IP address for LAN connection)

The start page of the Setup wizard appears.



The Technician Wizard is designed for the installer and includes standard-specific settings. Running the Technician Wizard is optional.

If the Technician Wizard is run, it is essential to note down the assigned service password. This service password is required to configure the UC Editor menu item.

If the Technician Wizard is not run, no specifications for power reduction are set.

The Solar Web Wizard must be run.

- 6 Run the Solar Web Wizard and follow the instructions

The Fronius Solar.web start page appears.

or

The Fronius Datamanager 2.0 website opens.

- 7 If necessary, run the Technician Wizard and follow the instructions

More Detailed Information on Fronius Datamanager 2.0

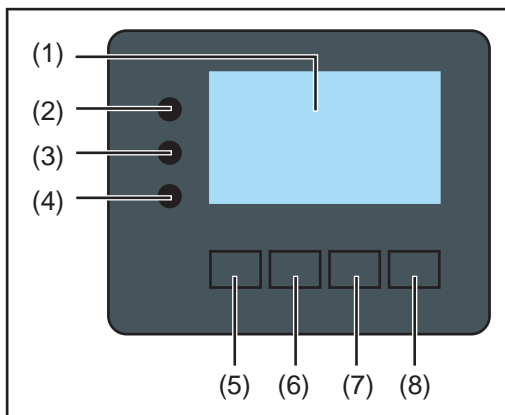
More detailed information on Fronius Datamanager 2.0 and other start-up options can be found at:



→ <http://www.fronius.com/QR-link/4204260191EA>

Keys and symbols

Controls and Indicators



Item	Description
(1)	Display for displaying values, settings and menus

Control and Status LEDs

(2)	General Status LED lights up: <ul style="list-style-type: none">- When a status code is shown on the display (red for error, orange for warning)- When grid power feed operation is interrupted- During troubleshooting (the inverter is waiting to be reset or for an error to be corrected)
(3)	Startup LED (orange) lights up: <ul style="list-style-type: none">- When the inverter enters the automatic startup or self test phase (as soon as the solar modules yield sufficient power output after sunrise)- When the inverter has been set to standby operation in the Setup menu (= manual shutoff of operation)- When the inverter software is updated
(4)	Operating status LED (green) lights up: <ul style="list-style-type: none">- When the photovoltaic system is functioning without error after the automatic start-up phase of the inverter- As long as grid power feed operation is active

Function Keys - Each Has a Different Function Depending on the Selection:

(5)	"Left/Up" key for navigating left and up
(6)	"Down/Right" key for navigating down and right
(7)	"Menu/Esc" key for switching to the menu level to exit the Setup menu
(8)	"Enter" key for confirming a selection

The keys have capacitive function. Contact with water may affect the function of the keys. For optimal function, wipe the keys dry with a cloth if necessary.

Display

Power for the display comes from the AC grid voltage. The display can be available all day long depending on the setting in the Setup menu.

IMPORTANT! The inverter display is not a calibrated measuring instrument. Slight deviation from the utility company meter is intrinsic to the system. A calibrated meter is required to make calculations for the utility company.

NOW	Menu item
AC Output Power	Parameter declaration
1759 W	Display of values, units and status codes
↑ ↓ ↵	Function key functions

Display area, display mode

Energy-Manager (**) Inv. no. Save symbol USB conn.(***)	
SETUP 1 [E] [ψ]	Menu item
Standby	Previous menu items
WiFi Access Point	Currently selected menu item
[DATCOM]	Next menu items
USB	
Relay	
(*) ↑ ↓ ↵ ↶ ↷	Function key functions

Display area, setup mode

- (*) Scroll bars
- (**) The Energy Manager symbol is displayed, if the Energy Manager function has been activated
- (***) WR no. = Inverter
DATCOM number,
Store icon – appears briefly when set values are stored,
USB connection – appears if a USB flash drive has been inserted

Navigation in the Menu Level

Activating Display Illumination

1 Press any key.

The display illumination is activated.

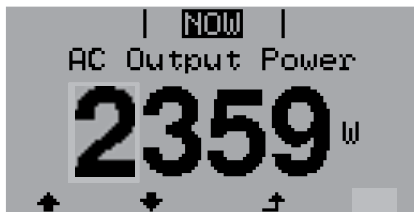
The SETUP menu item offers the choice between a permanently lit or permanently dark display under "Display Settings."

Automatic Deactivation of Display Illumination / Switching to the "NOW" Display Mode

If no key is pressed for 2 minutes:

- the display illumination turns off automatically and the inverter switches to the "NOW" display mode (if the display illumination is set to automatic)
- the inverter can be switched to the "NOW" display mode from any menu level, except for the "Standby" menu item
- the current output power is displayed.

Accessing the Menu Level



1 Press the "Menu" key



The display switches to the menu level.



2 Use the "left" or "right" keys to select your preferred menu item



3 Press the "Enter" key to access the desired menu item

Menu Items

- **NOW** displays real-time values
- **LOG** displays recorded data from the current day, current calendar year, and since the inverter was started for the first time
- **GRAPH** daily characteristic curve graphically represents the course of the output power during the day. The time axis is automatically scaled. Press the "Back" key to close the display
- **SETUP** displays the Setup menu
- **INFO** provides information on the device and the software

Values Displayed in the NOW Menu

Output power (W) - depending on the device type (MultiString), two output power values (PV1/PV2) are displayed after the Enter key is pressed

AC reactive power (VAr)

Grid voltage (V)

Output current (A)

Grid frequency (Hz)

Solar voltage (V) - from U PV1 and U PV2, if there is one

Solar current (V) - from I PV1 and I PV2, if there is one

Fronius Eco: The total current from both measuring channels is displayed. Both channels are shown separately in SolarWeb.

Time/date - time and date on the inverter or in the Fronius Solar Net Ring

**Values Displayed
in the LOG Menu
Item**

Output energy (kWh/MWh)

energy supplied during the monitored period

Due to the variety of different monitoring systems, there can be deviations between the readings of other metering instruments and the readings from the inverter. For determining the energy supplied to the grid, only the readings of the calibrated meter supplied by the electric utility company are relevant.

Maximum output power (W)

highest power of feeding into the grid during the monitored period

Yield

money earned during the monitored period (set currency and rate in Setup menu)

As was the case for the output energy, readings may differ from those of other instruments.

Section "Setup Menu" section describes how to set the currency and rate for the energy supplied.

The factory setting depends on the respective country-specific setup.

Maximum grid voltage (V)

highest reading of grid voltage during the monitored period

Maximum solar voltage (V)

highest reading of solar voltage during the monitored period

Operating hours

indicates how long the inverter has been operating (HH:MM).

IMPORTANT! The time must be set correctly for day and year values to be displayed properly.

The SETUP menu item

Presetting

Following commissioning, the inverter is preconfigured according to the country setup.

The SETUP menu item enables you to easily customize the inverter's preset parameters to your needs.

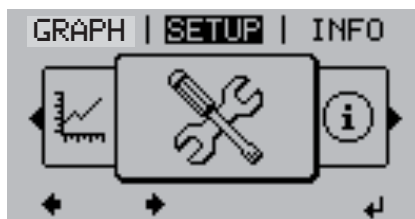
Software Updates



NOTE! Because of software updates, certain functions may be available for your device but not described in these operating instructions or vice versa. In addition, individual figures may also differ from the operating elements of your device. However, the function of these operating elements is identical.

Navigation in the SETUP Menu

Accessing the SETUP Menu

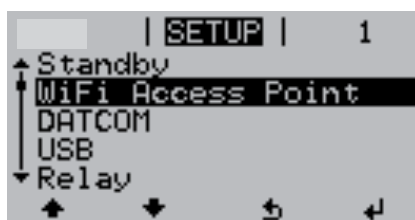


- 1 Use the left or right keys to select "SETUP" in the menu level
- 2 Press the "Enter" key



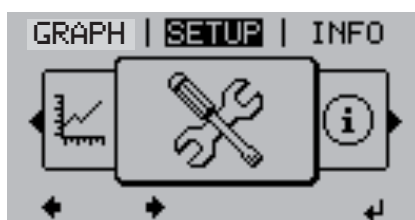
The first entry of the menu SETUP is displayed:
"Standby"

Scrolling between Entries



- 3 Scroll through the available entries using the up and down keys

Exiting an Entry



- 4 To exit an entry, press the "Back" key
The menu level is displayed

If no key is pressed for 2 minutes:

- The inverter switches to the "NOW" menu from anywhere within the menu level (with the exception of "Setup" menu entry "Standby")
- The display illumination turns off
- The current power of feeding in is displayed.

**General Setup
Menu Item Settings**

- 1 Accessing the SETUP menu item
- 2 Use the "Up" and "Down" keys to select the desired menu item
▲ ▼
- 3 Press the "Enter" key
↵

The first digit of a value to be set flashes:

- 4 Use the "Up" and "Down" keys to select a value for the first digit
▲ ▼
- 5 Press the "Enter" key
↵

The second digit of the value flashes.

- 6 Repeat steps 4 and 5 until...

the entire value flashes.

- 7 Press the "Enter" key
↵
- 8 Repeat steps 4–6 for units or other values to be set until the unit or value to be set flashes.
- 9 Press the "Enter" key to save and apply the changes.
↵

Press the "Esc" key to discard the changes.
⬆

The currently selected item is displayed.

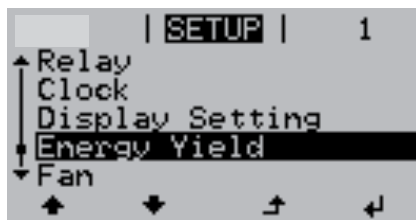
The available settings are displayed:

- 4 Use the "Up" and "Down" keys to select the desired setting.
▲ ▼
- 5 Press the "Enter" key to save and apply the selection.
↵

Press the "Esc" key to discard the selection.
⬆

The currently selected item is displayed.

Application Example: Setting the Feed-In Tariff



- ▲ ▼ 1 Select the Setup menu item "Energy yield"
- ↵ 2 Press the "Enter" key



- The overview of values that can be selected is displayed.
- ▲ ▼ 3 Use the "Up" or "Down" keys to select "Energy yield"
 - ↵ 4 Press the "Enter" key



The feed-in tariff is displayed.
The tens digit flashes.

+ - **5** Use the "Up" and "Down" keys to select a value for the tens digit.

↵ **6** Press the "Enter" key



The units digit flashes.

7 Repeat steps 5 and 6 for the units digit and for the three digits after the decimal point until ...



the set feed-in tariff flashes.

↵ **8** Press the "Enter" key



The feed-in tariff is applied; the overview of the values that can be set is displayed.

↑ **9** Press the "Esc" key



The Setup menu item "Energy yield" is shown.

Menu Items in the Setup Menu

Standby

Manual activation/deactivation of the standby mode

- No power is fed into the grid.
- The Startup LED lights up orange.
- In standby mode, no other menu item can be accessed or set in the menu level.
- The automatic switching to the "NOW" menu item after 2 minutes if no key is pressed is not activated.
- The Standby mode can only be deactivated manually by pressing the "Enter" key.
- Grid supply operation can be resumed at any time (deactivate "Standby").

Setting standby mode (manual shutoff for feeding energy into the grid):

1 Select the "Standby" item

2 Press the "Enter" key

The display alternates between "STANDBY" and "ENTER."

The Standby mode is now activated.

The Startup LED lights up orange.

Restoring the grid feed:

In Standby mode, the display alternates between "STANDBY" and "ENTER."

1 Press "Enter" to restore the grid power feed operation

The "Standby" item is displayed.

The inverter also switches to the Startup phase.

After the grid power feed operation is restored, the Operation Status LED lights up green.

WiFi Access Point

For activating / deactivating of the WiFi Access Point (e.g. to set a system monitoring)

Adjustment range

WiFi Access Point
[stopped]

Activate WiFi ?



To activate the WiFi Access Point press the Enter key.

WiFi Access Point
[active]

The SS-ID (SS) and the password (PW) are displayed.

Deactivate WiFi AP ?



To deactivate the WiFi Access Point press the Enter key.

WiFi Access Point
[not available]

Is displayed, when no system monitoring is present at the inverter.

DATCOM

Check of a data communication, entry of the inverter number, DATCOM night mode, protocol settings

Setting range Status / Inverter number / Protocol type

Status

Displays data communication available via Solar Net or an error that occurred in data communication

Inverter Number

Number setting (address) of the inverter in a setup where multiple solar inverters are linked together

Setting range 00 – 99 (00 = 100 inverter)

Factory setting 01

IMPORTANT! Each inverter must be assigned its own address when using multiple inverters in a data communications system.

Protocol type

Defines the communication protocol used to transmit data:

Setting range Solar Net / Interface Protocol *

Factory setting Solar Net

* The protocol type Interface Protocol only works without the Datamanager card. Available Datamanager cards must be removed from the inverter.

USB

Value settings when using a USB flash drive

Setting range Safely remove hardware / software update / logging interval

Safely remove hardware

To remove a USB flash drive from the USB A socket on the data communication rack without losing data.

The USB flash drive can be removed:

- When OK is displayed
- When the "Data Transfer" LED is no longer flashing or lit

Software Update

For updating inverter software using a USB flash drive.

Procedure:

- 1** Obtain the "froxxxxx.upd" update file
(e.g., at <http://www.fronius.com>; xxxxx stands for the respective version number)



NOTE! To ensure problem-free updates of inverter software, the USB flash drive should have no hidden partitions and no encryption (see the chapter "Suitable USB Flash Drives").

- 2** Save the update file to the highest data level of the USB flash drive.
- 3** Open the Data Communication Area
- 4** Insert the USB flash drive with the update file into the USB socket in the Data Communication Area

- 5 In the Setup menu, go to "USB" and select "Update Software"
- 6 Press the "Enter" key
- 7 Wait until the comparisons of the current software version on the inverter and the new software version are displayed:
 - 1 page: Recerbo software (LCD), key controller software (KEY), country setup version (Set)
 - 2 page: power module software
- 8 Press "Enter" at the end of each page

The inverter begins copying the data. "UPDATE" and the save progress (%) of the individual tests are displayed until the data for all electronic components has been copied.

Once the data has been copied, the inverter updates the required electronic components in succession.

"UPDATE", the affected component and the update progress (%) are displayed.


The inverter updates the display in the last step. The display remains dark for approx. 1 minute, the control and status LEDs flash.

Once the software update is complete, the inverter switches to the Startup phase and then to grid power feed operation. The USB flash drive can be removed.

Individual settings in the Setup menu are retained when the inverter software is updated.

Logging Interval

Activating/deactivating the logging function, as well as setting the logging interval

Unit	Minutes
Setting range	30 Min. / 20 Min. / 15 Min. / 10 Min. / 5 Min. / No Log
Factory setting	30 Min.
30 Min.	The logging interval is 30 minutes; new logging data is saved to the USB flash drive every 30 minutes.
20 Min.	
15 Min.	
10 Min.	
5 Min.	
No Log	No data is saved

IMPORTANT! The time must be set correctly in order for the logging function to work properly.

Relay

Activate Relay, Relay Settings, Relay Test

Setting range Relay Mode / Relay Test / Switch on Point* / Switch off Point*

* only shown if the 'E-manager' function has been activated under "Relay Mode."

Relay Mode

For selection of the various functions of the potential-free switching contact in the data communications area:

- Alarm function
- Active output
- Energy manager

Setting range ALL / Permanent / OFF / ON / E-manager

Factory setting ALL

Alarm function:

Permanent / Switches the potential-free switching contacts for continual and temporary service codes (e.g., brief interruption of grid power feed operation, a service code occurs a set number of times per day – can be set in the "BASIC" menu)
ALL:

Active output:

ON: The potential-free switching contact NO is switched on at all times while the inverter is operating (as long as the display lights up or appears)

OFF: The potential-free switching contact NO is switched off

Energy manager:

E-manager: You can find additional information on the "Energy manager" function in the "Energy Manager" section below

Relay test

Functional test to check if the potential-free switching contact works

Switch on point (only if "Energy manager" function is activated)

for setting the effective power limit from which the potential-free switching contact will be switched on

Factory setting 1000 W

Setting range Switch off point – max. power rating of the inverter / W / kW

Switch off point (only if the "Energy manager" function is activated)

for setting the effective power limit from which the potential-free switching contact will be switched off

Factory setting 500

Setting range 0 – switch on point / W / kW

**Energy Manager
(in Relay Menu
Item)**

The "Energy Manager" function can be used to trigger the potential-free switch contact so that it functions as an actuator.

A user connected to the potential-free switch contact can thus be controlled by assigning a power feed dependent switch-on or switch-off point.

The potential-free switch contact is switched off automatically:

- When no current is being fed into the public grid supply by the inverter
- When the inverter is switched manually to standby mode
- When there is an effective power assignment of 10% of the power rating
- When there is insufficient solar radiation

To activate the "Energy Manager" function, select "E-manager" and press the "Enter" key. When the "Energy Manager" function is activated, the "Energy Manager" icon is displayed at the top left of the display:



When potential-free NO switch contact is switched off (open contact)



When potential-free NO switch contact is switched on (closed contact)

To deactivate the "Energy Manager" function, select another function and press the "Enter" key.

Information on the Layout of the Switch-on and Switch-off Points

Insufficient difference between the switch-on point and the switch-off point or power fluctuations can cause frequent switching cycles.

To avoid excessive switching on and off, the difference between the switch-on and switch-off points should be at least 100–200 W.

When selecting the switch-off point, consider the power consumption of the connected user.

When selecting the switch-on point also bear in mind the weather conditions and the expected solar radiation.

Application Example

Switch-on point = 2000 W, switch-off point = 1800 W

If the inverter supplies 2000 W or more, the potential-free switch contact of the inverter is switched on.

If the inverter output sinks below 1800 W, the potential-free switch contact is switched off.

Possible applications:

Operation of a heat pump or air-conditioning system, using as much self-produced power as possible.

Time/Date

Setting the time, date and automatic adjustment for daylight saving time

Setting range

Set time / Set date / Time display format / Date display format / Daylight saving time

Set time

Setting the time (hh:mm:ss or hh:mm am/pm, depending on the setting under Time display format)

Set date

Setting the date (dd.mm.yyyy or mm/dd/yyyy, depending on the setting under Date display format)

Time display format

For specifying the format in which the time is displayed

Setting range

12 hrs / 24 hrs

Factory setting

depends on the country setup

Date display format

For specifying the format in which the date is displayed

Setting range

mm/dd/yyyy / dd.mm.yy

Factory setting

depends on the country setup

Daylight saving time

Activating/deactivating the automatic adjustment for daylight saving time

IMPORTANT! Only use the function for automatic daylight savings adjustment when there are no LAN or WLAN-compatible system components in a Fronius Solar Net Ring (e.g., Fronius Datalogger Web, Fronius Datamanager or Fronius Hybridmanager).

Setting range on/off

Factory setting on

IMPORTANT! The time and date must be set correctly for day and year values to be displayed properly.

Display Settings

Setting range Language / Night mode / Contrast / Illumination

Language

Setting the display language

Setting range German, English, French, Dutch, Italian, Spanish, Czech, Slovak, etc.

Night Mode

DATCOM night mode; controls DATCOM and display operation at night or when there is insufficient DC voltage available

Setting range AUTO / ON / OFF

Factory setting OFF

AUTO: DATCOM operation is constant as long as a Datalogger is connected to an active, uninterrupted Solar Net.
The display is dark during the night and can be activated by pressing any key.

ON: DATCOM operation is constant. The inverter provides 12 V constantly to supply Solar Net with power. The display is always active.

IMPORTANT! The power consumption of the inverter is increased at night to approximately 7 W when the DATCOM night mode is ON or on AUTO and Solar Net components are connected.

OFF: No DATCOM operation at night, the inverter requires no AC power to supply Solar Net.
The display is deactivated at night; the Fronius Datamanager is not available.

Contrast

set contrast on the display

Setting range 0–10

Factory setting 5

Since contrast depends on temperature, it may be necessary to adjust the "Contrast" menu item when environmental conditions change.

Illumination

Initial setting for display illumination

The "Illumination" menu item only applies to the display background illumination.

Setting range AUTO / ON / OFF

Factory setting AUTO

AUTO: The display illumination is activated by pressing any key. If no key is pressed for 2 minutes, the display backlight goes out.

ON: The display illumination will be permanently on when the inverter is active.

OFF: The display illumination will be permanently off.

Energy Yield

Setting

- the currency
- the feed-in tariff

Setting range Currency/Feed-in tariff

Currency

Currency setting

Setting range 3-digit, A-Z

Feed-in tariff

Charge rate setting for the energy fed into the grid

Setting range 2-digit, 3 decimal places

Factory setting (depends on the country setup)

Fan

for checking the fan functionality

Setting range Test fan 1 / Test fan 2 (depends on device)

- Use the "Up" and "Down" keys to select the desired fan
- Press the "Enter" key to start testing the selected fan
- The fan runs until the menu is exited by pressing the "Esc" key

Arc Detection

for checking arc detection/interruption

Setting range ArcDetector Status/Start Self-test

Arc.det. Status

displays the current status of arc detection/interruption

Start Self-test

self-test to check whether the inverter interrupts grid power feed operation when an arc is detected.

Test procedure:

- 1** Select "Arc Detection" in the Setup menu
- 2** Press the "Enter" key
- 3** Use the up and down keys to select "Start Self-test"
- 4** Press the "Enter" key

The self-test starts. The arc detection/interruption function simulates an arc and sends the corresponding signal to the inverter.
If the test is successful, the inverter disconnects from the grid and stops grid power feed operation.

The message "Self-test completed and Start AFCI" is shown on the display.

- 5** Confirm the indication by pressing the "Enter" key
-

The INFO menu item

Measured values	<p>PV Iso. Insulation resistance of the photovoltaic system</p> <p>U PV 1 / U PV 2 (U PV 2 is not available for Fronius Symo 15.0-3 208) Real-time DC voltage at the terminals, even if no energy is being fed in by the inverter (from first or second MPP Tracker)</p> <p>GVDPR Grid voltage-dependent power reduction</p> <p>Fan #1 Percentage value of fan target power</p>		
LT Status	<p>The status display of the last error that occurred in the inverter can be shown.</p> <p>IMPORTANT! Status codes 306 (Power low) and 307 (DC low) appear naturally every morning and evening due to low solar irradiance. These status codes are not the result of a fault.</p> <ul style="list-style-type: none"> - After pressing the "Enter" key, the power stage set status and the last error that occurred are displayed - Use the "up" and "down" keys to scroll through the list - Press the "Back" key to exit the status and error list 		
Grid Status	<p>The last 5 grid errors that occurred can be displayed:</p> <ul style="list-style-type: none"> - After pressing the "Enter" key, the last 5 grid errors that occurred are displayed - Use the "up" and "down" keys to scroll through the list - Press the "Back" key to exit the grid error display 		
RCMU	<p>RCMU = Residual Current Monitoring Unit</p> <p>The inverter is equipped with an RCMU according to Austrian standard ÖVE/ÖNORM E 8001-4-712. It monitors residual currents from the solar module to the inverter grid connection and disconnects the inverter from the grid when an improper residual current is detected. Additional residual current protection may be needed depending on the installation's protection system or the requirements of the utility company. In this case, use a type B residual current circuit breaker with a release current of at least 100 mA.</p>		
Device Information	<p>The device is used to display settings relevant to a utility company. The displayed values depend on the respective country setup or device-specific inverter settings.</p> <table border="0"> <tr> <td>Display range</td> <td>General / Country-specific setting / MPP Tracker / Grid monitoring / Grid voltage limits / Grid frequency limits / Q-mode / AC power limit / AC voltage derating / Fault ride through</td> </tr> </table>	Display range	General / Country-specific setting / MPP Tracker / Grid monitoring / Grid voltage limits / Grid frequency limits / Q-mode / AC power limit / AC voltage derating / Fault ride through
Display range	General / Country-specific setting / MPP Tracker / Grid monitoring / Grid voltage limits / Grid frequency limits / Q-mode / AC power limit / AC voltage derating / Fault ride through		

General:	Device type Fam. Serial number
Country-specific setting	Setup – set country setup Version – country setup version Group – inverter software update group
MPP Tracker:	Tracker 1 Tracker 2 (for Fronius Symo only, except Fronius Symo 15.0-3208)
Grid monitoring:	GMTi – startup time of the inverter in s GMTr – restart time in s after a grid error ULL – grid voltage average value over 10 minutes in V. LLTrip – detection time for long-term voltage monitoring
Grid voltage limits:	UILmax – upper inner grid voltage value in V UILmin – lower inner grid voltage value in V
Grid frequency limits:	FILmax – upper inner grid frequency value in Hz FILmin – lower inner grid frequency value in Hz
Q-Mode:	Currently set power factor (cos phi) (e.g., constant cos(phi)/constant Q/Q(U) characteristic/etc.)
AC power limit:	Max. P AC – manual power reduction
AC voltage derating:	Status – ON/OFF voltage-dependent power reduction GVDPR _e – threshold from which the voltage-dependent power reduction starts GVDPR _v – reduction gradient used to reduce the power, e.g., 10% per volt higher than the GVDPR _e threshold. Message – activates the sending of an info message via Solar Net
Fault Ride Through:	Status – default setting: OFF If the function is activated, the inverter does not switch off immediately when a short-term interruption to the AC voltage occurs (outside of the limits set by the grid supplier); instead it continues to supply power for a defined time. DB min – default setting: 90% "Dead Band Minimum" setting (%) DB max – default setting: 120% "Dead Band Maximum" setting (%) k-Fac. default setting: 0

Version

Display of version number and serial number of the PC boards installed in the inverter (e.g., for service purposes)

Display range

Display/Display Software/Integrity Checksum/Memory Card/
Memory Card #1/Power Stage/Power Stage Software/EMI Fil-
ter/Power Stage #3/Power Stage #4

Switching the key lock on and off

General

The inverter comes equipped with a 'Key lock' function.

When the 'Keylock' function is active, the Setup menu cannot be accessed, e.g., to protect against setup data being changed by accident.

You must enter code 12321 to activate / deactivate the 'Key lock' function.

Switching the Key Lock On and Off



- ↑ **1** Press the "Menu" key.

The menu level is displayed.

- 2** Press the unassigned "Menu / Esc" key 5 x.



In the "CODE" menu, the "Access Code" is displayed; the first digit flashes.



- + - **3** Enter code 12321: Use the "Up" and "Down" keys to select a value for the first digit of the code.

- ↵ **4** Press the "Enter" key.

The second digit flashes.



- 5** Repeat steps 3 and 4 for the second, third, fourth and fifth digit in the code until...

...the set code flashes.

- ↵ **6** Press the "Enter" key.

In the "LOCK" menu, the "Key lock" function is displayed.



- + - **7** Use the "Up" and "Down" keys to switch the key lock on or off:

ON = the key lock function is activated (the SETUP menu item cannot be accessed)

OFF = the key lock function is deactivated (the SETUP menu item can be accessed).

- ↵ **8** Press the "Enter" key.

USB Stick as a Data Logger and for Updating Inverter Software

USB Flash Drive as a Data Logger

A USB flash drive connected to the USB A socket can act as a data logger for an inverter.

Logging data saved to the USB flash drive can at any time

- be imported into the Fronius Solar.access software via the included FLD file,
- be viewed directly in third-party applications (e.g., Microsoft® Excel) via the included CSV file.

Older Excel versions (up to Excel 2007) have a row limit of 65536.

More detailed information on data on the USB flash drive, data amounts and memory capacity, and buffer memory can be found at



→ <http://www.fronius.com/QR-link/4204260202EA>

Suitable USB Sticks

Due to the number of USB sticks on the market, we cannot guarantee that every USB stick will be recognized by the inverter.

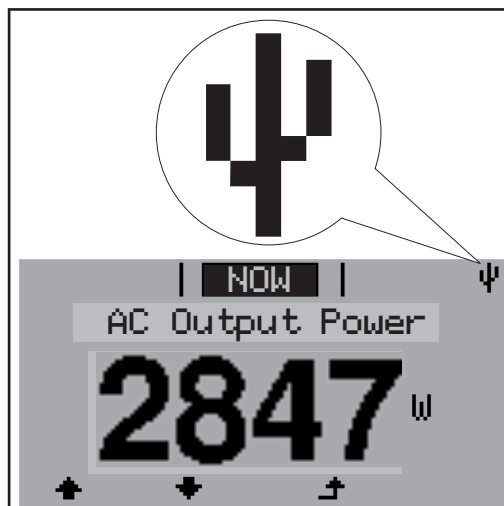
Fronius recommends using only certified, industrial USB sticks (look for the USB-IF logo).

The inverter supports USB sticks using the following file systems:

- FAT12
- FAT16
- FAT32

Fronius recommends that the USB stick only be used for recording logging data or for updating the inverter software. USB sticks should not contain any other data.

USB symbol on the inverter display, e.g., in the "NOW" display mode:



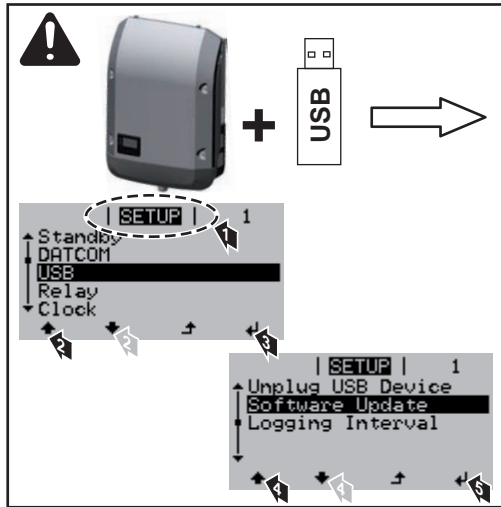
When the inverter recognizes a USB stick, the USB symbol will appear at the top right of the display.

When inserting the USB stick, make sure that the USB symbol is displayed (it may also be flashing).



NOTE! Please be aware that in outdoor applications the USB stick may only function in a limited temperature range. Make sure, for example, that the USB stick will also function at low temperatures for outdoor applications.

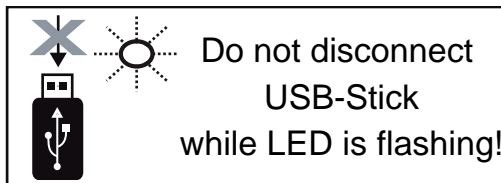
USB Flash Drive for Updating Inverter Software



The USB flash drive can be used even by end customers to update the software of the inverter. The update file is saved to the USB flash drive beforehand and transmitted from there to the inverter, and the update process is started through the Setup menu.

Removing the USB Stick

Safety information for removing a USB stick



IMPORTANT! To prevent a loss of data, the connected USB stick should only be removed under the following conditions:

- via the SETUP and "Safely remove USB / hardware" menu items
- when the "Data Transfer" LED is no longer flashing or illuminated.

The Basic menu

Accessing the Basic Menu



- ↑ **1** Press the "Menu" key

The menu level is displayed.

- 2** Press the unassigned "Menu/Esc" key 5 times.



In the "CODE" menu, the "Access Code" is displayed; the first digit flashes.

- + - **3** Enter code 22742: Use the up and down keys to select a value for the first digit

- ↵ **4** Press the "Enter" key

The second digit flashes.

- 5** Repeat steps 3 and 4 for the second, third, fourth, and fifth digit in the code until...

...the set code flashes.

- ↵ **6** Press the "Enter" key

The Basic menu is displayed.

- + - **7** Use the up and down keys to select the desired entry

- ↵ **8** Press the "Enter" key to edit the selected entry

- ↑ **9** Press "Esc" to exit the Basic menu

Basic Menu Entries

The Basic menu contains the following parameters important for the installation and operation of the inverter:

MPP Tracker 1 / MPP Tracker 2

- MPP Tracker 2: ON / OFF (for MultiMPP Tracker devices only, except Fronius Symo 15.0-3 208)
- DC operating mode: MPP AUTO / FIX / MPP USER
 - MPP AUTO: normal operating status; the inverter automatically searches for the optimal operating point
 - FIX: enter a fixed DC voltage used by the inverter
 - MPP USER: enter the lower MPP voltage from which the inverter searches for its optimal operating point
- Dynamic Peak Manager: ON/OFF
- Fixed voltage: enter the fixed voltage
- MPPT start voltage: enter the start voltage

USB Logbook

Activate or deactivate the function for saving all error messages to a USB flash drive
AUTO / OFF / ON

Signal Input

- Function: Ext Sig. / S0-Meter / OFF
for Ext Sig. function only:
 - Trigger type: Warning (warning shown on the display) / Ext. Stop (inverter is switched off)
 - Connection type: N/C (normally closed) / N/O (normally open)

SMS/Relay

- Event delay
For entering the delay time after which an SMS text message is sent or the relay should switch
900–86400 seconds
- Event counter:
For entering the number of events that lead to a signal:
10–255

Insulation Setting

- Insulation warning: ON/OFF
- Threshold warning: Enter a threshold value that would trigger a warning
- Threshold error: Enter a threshold value that would trigger an error (not available in all countries)

TOTAL Reset

Resets the max. and min. voltage values and the max. power of feeding in to zero in the LOG menu.

Once values are reset, this action cannot be undone.

To reset the values to zero, press the "Enter" key.

"CONFIRM" is displayed.

Press the "Enter" key again.

The values are reset and the menu is displayed

Status Diagnosis and Troubleshooting

Displaying Status Codes

Your inverter is equipped with a self diagnostic system that automatically identifies a large number of possible operation issues by itself and displays them on the screen. This enables you to know immediately if there are any malfunctions in the inverter, the photovoltaic system or any installation or operating errors.

Whenever the self diagnostic system has identified a particular issue, the respective status code is shown on the screen.

IMPORTANT! Status codes may sometimes appear briefly as a result of the control response from the inverter. If it subsequently continues to operate normally, there has not been a system error.

Total Failure of the Display

If the display remains dark for a long time after sunrise:

- Check the AC voltage at the inverter's connections: the AC voltage must be 208/220/240/440/480 V (+10%/-12%) depending on the grid.

Class 1 Status Codes

Status codes in class 1 are typically temporary. Their cause lies in the grid.

Example: the grid frequency is too high and the inverter is not permitted to feed energy into the grid because this would not comply with a standard. No device fault has occurred. The inverter will first respond by disconnecting from the grid. Then, the grid will be checked for the duration of the observation period stipulated. If, after the end of this period, no further defect is identified, your inverter resumes operating and feeding energy into the grid.

The GPIS soft start function is activated depending on the country setup: according to national guidelines, the output of the inverter increases continuously after a shutdown due to an AC error.

Code	Description	Behavior	Remedy
102	AC voltage too high		
103	AC voltage too low		
105	AC frequency too high	Grid conditions are being tested and as soon as they are again within the permissible range, the inverter will resume feeding power into the grid.	Check grid connections. If this status code keeps recurring, contact your system installer.
106	AC frequency too low		
107	No AC grid detected		
108	Stand alone operation detected		
112	RCMU error		

Class 2 Status Codes

Code	Description	Behavior	Remedy
212	Overvoltage on L1		
213	Undervoltage on L1		
222	Overvoltage on L2		
223	Undervoltage on L2		
232	Overvoltage on L3		
233	Undervoltage on L3		
240	Arc detected	The status code is displayed for approx. 4 seconds	-
241	Arc detected	Status code 241 is displayed immediately after 240. The inverter disconnects from the grid for safety reasons.	Before an inverter can be reset following a detected electric arc, check the entire affected photovoltaic system for damage. Reset the status code by pressing the "Enter" key.
242	Arc detected	Status code 242 is displayed immediately after status code 241 is reset.	Reset the status code by pressing the "Enter" key. The inverter restarts feeding energy into the grid. **)
245	Arc Detector self-test failed	The inverter disconnects from the grid.	Carry out AC reset; The test is repeated. *)
247	Arc Detector current sensor faulty	The inverter disconnects from the grid.	*)
249	Arc Detector faulty		

*) If status code persists: Contact a Fronius-trained service technician

***) Fault is corrected automatically. If this status code keeps recurring, contact your system installer

Class 3 Status Codes

Class 3 comprises status codes that may appear during feed-in operation and that do not cause a permanent interruption of the operation of feeding energy into the grid.

After automatic disconnection from the grid and waiting for its conditions to return to those stipulated, your inverter will try to resume feed-in operation.

Code	Description	Behavior	Remedy
301	Overcurrent (AC)	Short interruption of grid power feed operation.	
302	Overcurrent (DC)	The inverter returns to the startup phase.	*)
303	Overtemperature DC module	Short interruption of grid power feed operation.	
304	Overtemperature AC module	The inverter returns to the startup phase.	Purge cooling air openings and cooling elements; **)

Code	Description	Behavior	Remedy
305	No feed-in despite closed relay	Short interruption of grid power feed operation. The inverter returns to the startup phase.	**)
306	There is insufficient PV power for grid power feed operation	Short interruption of grid power feed operation. The inverter returns to the startup phase.	Wait for sufficient solar radiation; **)
307	DC low DC input voltage is too low for grid power feed operation	Short interruption of grid power feed operation. The inverter returns to the startup phase.	**)
IMPORTANT! Status codes 306 (Power low) and 307 (DC low) appear naturally every morning and evening due to low solar irradiance. These status codes are not the result of a fault.			
308	Intermediate circuit voltage too high	Short interruption of grid power feed operation. The inverter returns to the startup phase.	**)
309	DC input voltage MPPT1 too high		
311	DC strings polarity reversed		
313	DC input voltage MPPT2 too high		
314	Timeout current sensor calibration		
315	AC current sensor fault	Short interruption of grid power feed operation. The inverter returns to the startup phase.	*)
316	InterruptCheck fail		
325	Overtemperature in connection area		
326	Fan 1 error		
327	Fan 2 error		

*) If status code persists: Contact a Fronius-trained service technician

***) Fault is corrected automatically. If this status code keeps recurring, contact your system installer

Class 4 Status Codes

Class 4 status codes may require the intervention of a trained Fronius service technician.

Code	Description	Behavior	Remedy
401	Communication with power module is not possible		
406	AC module temperature sensor faulty (L1)	The inverter will automatically attempt to connect again and, if possible, resume feeding energy into the grid	*)
407	AC module temperature sensor faulty (L2)		
408	Direct component measured in the supply grid too high		
412	The "fixed voltage" setting has been selected instead of MPP voltage operation and the voltage is set to a value that is too low or too high.	-	**)
415	Safety cut-out triggered by option card or RECERBO	Inverter does not feed energy into the grid.	*)
416	No communication between power module and control unit	The inverter will automatically attempt to connect again and, if possible, resume feeding energy into the grid	*)

Code	Description	Behavior	Remedy
417	ID problem with hardware		
419	Unique ID conflict		
420	Communication with Hybridmanager is not possible	The inverter will automatically attempt to connect again and, if possible, resume feeding energy into the grid	Update inverter firmware; *)
421	Error HID range		
425	Communication with the power module is not possible		
426–428	Possible hardware defect		
431	Software problem	Inverter does not feed energy into the grid.	Carry out AC reset (switch automatic circuit breaker off and on); update inverter firmware; *)
436	Function incompatibility (one or more PC boards in the inverter are not compatible with each other, e.g., after PC board replacement)	The inverter will automatically attempt to connect again and, if possible, resume feeding energy into the grid	Update inverter firmware; *)
437	Power module problem		
438	Function incompatibility (one or more PC boards in the inverter are not compatible with each other, e.g., after PC board replacement)	The inverter will automatically attempt to connect again and, if possible, resume feeding energy into the grid	Update inverter firmware; *)
443	Intermediate circuit voltage too low or unsymmetrical	Inverter does not feed energy into the grid.	*)
445	- Compatibility error (e.g., due to a PC board replacement) - Invalid power module configuration	Inverter does not feed energy into the grid.	Update inverter firmware; *)
447	Insulation fault		
448	Neutral conductor not connected	Inverter does not feed energy into the grid.	*)
450	No guard found		
451	Memory error detected		
452	Communication error between processors	The inverter will automatically attempt to connect again and, if possible, resume feeding energy into the grid	*)
453	Grid voltage and power module do not match		
454	Grid frequency and power module do not match		
456	Anti-islanding function has stopped running properly		
457	Grid relay stuck or neutral conductor ground voltage too high	Inverter does not feed energy into the grid.	Check grounding (voltage of neutral conductor ground must be under 30 V); *)

Code	Description	Behavior	Remedy
458	Error during measuring signal detection		
459	Error during measuring signal detection for insulation test		
460	Reference voltage source for the digital signal processor (DSP) is operating outside of tolerances	Inverter does not feed energy into the grid.	*)
461	Error in DSP data memory		
462	Error in DC feed-in monitoring routine		
463	AC polarity reversed, AC connector plugged in incorrectly		
474	RCMU sensor faulty		
475	Insulation error (connection between solar module and grounding)	Inverter does not feed energy into the grid.	**)
476	Supply voltage for driver too low		
479	Intermediate circuit voltage relay switched off	The inverter will automatically attempt to connect again and, if possible, resume feeding energy into the grid	*)
480, 481	Function incompatibility (one or more PC boards in the inverter are not compatible with each other, e.g., after PC board replacement)	Inverter does not feed energy into the grid.	Update inverter firmware; *)
482	Setup interrupted after initial commissioning	Inverter does not feed energy into the grid.	Restart setup after AC reset (switch automatic circuit breaker off and on)
483	Voltage U_{DCfix} for MPP2 string is outside of valid range	Inverter does not feed energy into the grid.	Check MPP settings; *)
485	CAN transmission buffer is full	Inverter does not feed energy into the grid.	Carry out AC reset (switch automatic circuit breaker off and on); *)
489	Permanent overvoltage at intermediate circuit capacitor (status code 479 appears 5x one after the other)	Inverter does not feed energy into the grid.	*)

*) If status code persists: Contact a Fronius-trained service technician

***) If status code persists: Contact your system installer

Class 5 Status Codes

Class 5 status codes generally do not impair grid power feed operation, but can lead to limitations. They will be displayed until the status code is acknowledged by pressing a key (the inverter, however, continues working normally in the background).

Code	Description	Behavior	Remedy
502	Insulation fault on solar modules	Warning message is shown on the display	**)
509	No feed-in within the last 24 hours	Warning message is shown on the display	Acknowledge status code; Check whether all conditions for problem-free grid power feed operation are met (e.g., whether solar modules are covered with snow); **)

Code	Description	Behavior	Remedy
515	No internal communication with filter	Warning message on the display	*)
516	Communication with memory unit not possible	Warning message of memory unit	*)
517	Power derating due to excessive temperature	A warning message is shown on the display when a power derating occurs	Purge cooling air openings and cooling elements if necessary; Error is corrected automatically; **)
518	Internal DSP malfunction	Warning message on the display	*)
519	Communication with memory unit not possible	Warning message of memory unit	*)
520	No feed-in within the last 24 hours from MPPT1	Warning message is shown on the display	Acknowledge status code; Check whether all conditions for problem-free grid power feed operation are met (e.g., whether solar modules are covered with snow); *)
522	DC low String 1	Warning message on the display	*)
523	DC low String 2		
558, 559	Function incompatibility (one or more PC boards in the inverter are not compatible with each other, e.g., after PC board replacement)	Warning message on the display	Update inverter firmware; *)
560	Power derating due to over-frequency	Displayed when grid frequency is too high; the power is reduced.	As soon as the grid frequency returns to the permissible range and the inverter is back to normal operation, the error is automatically corrected; **)
564	Function incompatibility (one or more PC boards in the inverter are not compatible with each other, e.g., after PC board replacement)	Warning message on the display	Update inverter firmware; *)
566	Arc Detector switched off (e.g., in the event of external arc monitoring)	This status code is displayed every day until the Arc Detector is reactivated.	No error! Confirm the status code by pressing the "Enter" key
572	Power limitation due to power module	Power is limited by the power module	*)
573	Undertemperature warning	Warning message on the display	*)
581	Setup "Special Purpose Utility-Interactive" (SPUI) is activated	The inverter is no longer compatible with the standards IEEE1547 and IEEE1574.1 because the islanding function is deactivated, frequency-dependent power reduction is activated, and the frequency and voltage limits are being changed	No error! Confirm the status code by pressing the "Enter" key

*) If status code persists: Contact a Fronius-trained service technician

**) If this status code keeps recurring, contact your system installer

Class 6 Status Codes Class 6 status codes may require the intervention of a trained Fronius service technician.

Code	Description	Behavior	Remedy
601	CAN bus is full	Inverter does not feed energy into the grid.	Update inverter firmware; *)
603	AC module temperature sensor faulty (L3)	The inverter will automatically attempt to connect again and, if possible, resume feeding energy into the grid	*)
604	DC module temperature sensor faulty		
607	RCMU fault	Inverter does not feed energy into the grid.	Reset the status code by pressing the "Enter" key. The inverter resumes feeding energy into the grid; if the status code keeps recurring, check the entire affected photovoltaic system for any damage; **)
608	Function incompatibility (one or more PC boards in the inverter are not compatible with each other, e.g., after PC board replacement)	Inverter does not feed energy into the grid.	Update inverter firmware; *)

*) If status code persists: Contact a Fronius-trained service technician

**) Fault is corrected automatically. If this status code keeps recurring, contact your system installer

Class 7 Status Codes Class 7 status codes concern the inverter control unit, configuration and data recording, and can directly or indirectly affect grid power feed operation.

Code	Description	Behavior	Remedy
701–704	Provides information about the internal processor status	Warning message on the display	*)
705	Conflict when setting the inverter number (e.g., number assigned twice)	-	Correct inverter number in the setup menu
706–716	Provides information about the internal processor status	Warning message on the display	*)
721	EEPROM was reinitialized	Warning message on the display	Acknowledge status code; *)
722–730	Provides information about the internal processor status	Warning message on the display	*)
731	Initialization error – USB flash drive is not supported	Warning message on the display	Check or replace USB flash drive Check the USB flash drive file system; *)
732	Initialization error – overcurrent at USB flash drive		
733	No USB flash drive inserted	Warning message on the display	Insert or check USB flash drive; *)

Code	Description	Behavior	Remedy
734	Update file is not detected or is not available	Warning message on the display	Check update file (e.g., for the proper file name *)
735	The update file does not match the device, the update file is too old	Warning message is shown on the display, update process is canceled	Check update file; if required, download the correct update file for the device (e.g., at http://www.fronius.com); *)
736	Write or read error occurred	Warning message on the display	Check the USB flash drive and the files on the USB flash drive or replace the USB flash drive. Remove the USB flash drive only when the "Data Transfer" LED is no longer flashing or lit.; *)
737	File could not be opened	Warning message on the display	Remove and reinsert the USB flash drive, check or replace the USB flash drive
738	Log file could not be saved (e.g., USB flash drive is write-protected or full)	Warning message on the display	Free up memory, remove write-protection; if required, check or replace USB flash drive; *)
740	Initialization error – error in USB flash drive file system	Warning message on the display	Check USB flash drive; reformat it on a PC to FAT12, FAT16 or FAT32
741	Error when recording logging data	Warning message on the display	Remove and reinsert the USB flash drive, check or replace the USB flash drive
743	Error occurred during the update	Warning message on the display	Repeat update process, check USB flash drive; *)
745	Update file defective	Warning message is shown on the display, update process is canceled	Download update file again; check or replace USB flash drive; *)
746	Error occurred during the update	Warning message is shown on the display, update process is canceled	Restart update after waiting 2 minutes; *)
751	Time lost	Warning message on the display	Reset the time and date on the inverter; *)
752	Real Time Clock module communication error		
753	Internal error: Real Time Clock module is in emergency mode	inaccurate time, time loss possible (grid power feed operation normal)	Reset the time and date on the inverter
754–755	Provides information about the internal processor status	Warning message on the display	*)
757	Hardware error in the Real Time Clock module	Error message on the display; the inverter does not feed current into the grid	*)
758	Internal error: Real Time Clock module is in emergency mode	inaccurate time, time loss possible (grid power feed operation normal)	Reset the time and date on the inverter
760	Internal hardware error	Error message on display	*)
761–765	Provides information about the internal processor status	Warning message on the display	*)
766	Emergency power limiter has been activated (max. 750 W)	Error message on display	*)

Code	Description	Behavior	Remedy
767	Provides information about the internal processor status		
768	Power limit different in the hardware modules	Warning message on the display	*)
772	Memory unit unavailable		
773	Software update group 0 (invalid country setup)		
775	PMC power stage set unavailable	Warning message on the display	Press the "Enter" key to confirm the error; *)
776	Invalid device type		
781–794	Provides information about the internal processor status	Warning message on the display	*)

*) If status code persists: Contact a Fronius-trained service technician

Class 10–12 Status Codes

1000–1299 – Gives information regarding the internal processor program status

Description

This is of no concern if the inverter is functioning without problems and it appears only in the "PS Status" setup parameter. In the event of an actual fault, this status code supports Fronius Technical Support in the failure analysis.

Customer Service

IMPORTANT! Please contact your Fronius dealer or a Fronius-trained service technician if

- an error appears frequently or for a long period of time
- an error appears that is not listed in the tables

Operation in dusty environments

When operating the inverter in extremely dusty environments: when necessary, clean the cooling elements and fan on the back of the inverter and the supply air openings in the mounting bracket using clean compressed air.

Technical Data

Fronius Symo	10.0-3 208-240	12.0-3 208-240
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Input Data

MPP voltage range	300–500 V DC
Input voltage range (at 1000 W/m ² /14°F in an open circuit)	200–600 V DC
Max. input current (MPP1/MPP2) (MPP1 + MPP2)	25.0/16.5 A 41.5 A
Max. short circuit current of solar modules (I _{SC PV}) (MPP1/MPP2)	37.5/24.8 A
Max. backfeed current from AC grid ¹⁾	0.0 A ²⁾

Output Data

Nominal output power (P _{nom})	9995 W	11,995 W	
Max. output power (+104°F)	9995 W	11,995 W	
Max. output power (+140°F)	at 208 V	8000 W	8000 W
	at 220 V	8600 W	8600 W
	at 240 V	8600 W	8600 W
Phases	3 ~ NPE		
Nominal grid voltage	at 208 V	120/208 V	
	at 220 V	127/220 V	
	at 240 V	120/240 V	
Operating range AC voltage	-12 to +10%		
Adjustment range for grid voltage	60–152 V/104–288 V		
Max. continuous output current at V _{nom}	at 208 V	27.7 A	33.3 A
	at 220 V	26.2 A	31.5 A
	at 240 V	24.0 A	28.9 A
AC overcurrent protection	at 208 V	35.0 A	45.0 A
	at 220 V	35.0 A	40.0 A
	at 240 V	30.0 A	40.0 A
Max. output residual current per duration	43.1 A/158.4 ms		
Nominal frequency	50/60 Hz		
Total harmonic distortion	< 1.5%	< 1.75%	
Power factor (cos phi)	0–1 ind./cap. ³⁾		

General Data

Maximum efficiency	97.00%		
CEC efficiency	at 208 V	96.50%	96.50%
	at 220 V		
	at 240 V	96.50%	96.50%
Cooling	Controlled forced-air ventilation		
Protection class	NEMA 4X		
Dimensions h x w x d	28.5 x 20.1 x 8.9 in. 725 x 510 x 225 mm		
Weight (full/lite version)	90.4/89.5 lbs. (41.0/40.6 kg)		
Permissible ambient temperature	-40°F to +140°F (-40°C to +60°C)		

Fronius Symo	10.0-3 208-240	12.0-3 208-240
Permissible storage temperature	-40°F to +158°F (-40°C to +70°C)	
Permissible humidity	0–100%	
Noise emission	65 dB(A) (ref. 1pW)	

Protection Devices

Reverse polarity protection	Integrated
Anti-islanding function	Integrated
Arc detection/interruption	Integrated
Photovoltaic insulation monitoring	Integrated
Overtemperature	Operating point shift/active cooling

- 1) The maximum current from the inverter to the solar modules if an error occurs on the inverter
- 2) Assured by electrical design of the inverter
- 3) ind. = inductive cap. = capacitive

Fronius Symo	10.0-3 480	12.5-3 480
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Input Data

MPP voltage range	300–800 V DC	350–800 V DC
Input voltage range (at 1000 W/m ² /14°F in an open circuit)	200–1000 V DC	
Max. input current (MPP1/MPP2) (MPP1 + MPP2)	25.0/16.5 A 41.5 A	
Max. short circuit current of solar modules (I _{SC PV}) (MPP1/MPP2)	37.5/24.8 A	
Max. backfeed current from AC grid ¹⁾	0.0 A ²⁾	

Output Data

Nominal output power (P _{nom})		9995 W	12,495 W
Max. output power (+104°F)		9995 W	12,495 W
Max. output power (+140°F)	at 440 V	3200 W	3200 W
	at 480 V	2900 W	2900 W
Phases		3 ~ NPE	
Nominal grid voltage	at 440 V	254 V/440 V	
	at 480 V	277 V/480 V	
Operating range AC voltage		-12 to +10%	
Adjustment range for grid voltage		127–322 V/220–558 V	
Max. continuous output current at V _{nom}	at 440 V	13.1 A	16.4 A
	at 480 V	12.0 A	15.0 A
AC overcurrent protection	at 440 V	20.0 A	25.0 A
	at 480 V	15.0 A	20.0 A
Max. output residual current per duration		43.1 A/158.4 ms	
Nominal frequency		50/60 Hz	
Total harmonic distortion		< 1.75%	< 1.5%
Power factor (cos phi)		0–1 ind./cap. ³⁾	

General Data

Maximum efficiency		98.10%	
CEC efficiency	at 440 V		
	at 480 V	96.50%	97.00%
Cooling		Controlled forced-air ventilation	
Protection class		NEMA 4X	
Dimensions h x w x d		28.5 x 20.1 x 8.9 in. 725 x 510 x 225 mm	
Weight (full/lite version)		76.7/75.07 lbs. (34.8/34.5 kg)	
Permissible ambient temperature		-40°F to +140°F (-40°C to +60°C)	
Permissible storage temperature		-40°F to +158°F (-40°C to +70°C)	
Permissible humidity		0–100%	
Noise emission		65 dB(A) (ref. 1pW)	

Protection Devices

Reverse polarity protection	Integrated
Anti-islanding function	Integrated
Arc detection/interruption	Integrated

Fronius Symo	10.0-3 480	12.5-3 480
Photovoltaic insulation monitoring	Integrated	
Overtemperature	Operating point shift/ active cooling	

- 1) The maximum current from the inverter to the solar modules if an error occurs on the inverter
- 2) Assured by electrical design of the inverter
- 3) ind. = inductive cap. = capacitive

Fronius Symo	15.0-3 208
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Input Data

MPP voltage range	at 208 V	325–850 V DC
	at 220 V	340–850 V DC
Input voltage range (at 1000 W/m ² /14°F in an open circuit)		325–1000 V DC
Max. input current	at 208 V	47.8 A
	at 220 V	45.7 A
Max. short circuit current of solar modules (I _{SC PV}) (MPP1/MPP2)		49.5/37.5 A
Max. backfeed current from AC grid ¹⁾		0.0 A ²⁾

Output Data

Nominal output power (P _{nom})		15,000 W
Max. output power (+104°F)		15,000 W
Max. output power (+140°F)		6600 W
Phases		3 ~ NPE
Nominal grid voltage	at 208 V	120 V/208 V
	at 220 V	127 V/220 V
Operating range AC voltage		-12 to +10%
Adjustment range for grid voltage	at 208 V	106–132 V/183–229 V
	at 220 V	112–140 V/194–242 V
Max. continuous output current at V _{nom}	at 208 V	41.6 A
	at 220 V	39.4 A
AC overcurrent protection	at 208 V	60 A
	at 220 V	50 A
Max. output residual current per duration		67.7 A/153 ms
Nominal frequency		60 Hz
Total harmonic distortion		< 3.5%
Power factor (cos phi)		0–1 ind./cap. ³⁾

General Data

Maximum efficiency	97.30%
CEC efficiency	96.50%
Cooling	Controlled forced-air ventilation
Protection class	NEMA 4X
Dimensions h x w x d	28.5 x 20.1 x 8.9 in. 725 x 510 x 225 mm
Weight	78.7 lbs. (35.7 kg)
Permissible ambient temperature	-40°F to +140°F (-40°C to +60°C)
Permissible storage temperature	-40°F to +158°F (-40°C to +70°C)
Permissible humidity	0–100%
Noise emission	72.5 dB(A) (ref. 1pW)

Protection Devices

Reverse polarity protection	Integrated
Anti-islanding function	Integrated
Arc detection/interruption	Integrated

Fronius Symo	15.0-3 208
Photovoltaic insulation monitoring	Integrated
Overtemperature	Operating point shift/ active cooling

- 1) The maximum current from the inverter to the solar modules if an error occurs on the inverter
- 2) Assured by electrical design of the inverter
- 3) ind. = inductive cap. = capacitive

Fronius Symo	15.0-3 480	17.5-3 480
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Input Data

MPP voltage range	350–800 V DC	400–800 V DC
Input voltage range (at 1000 W/m ² /14°F in an open circuit)	200–1000 V DC	
Max. input current (MPP1/MPP2) (MPP1 + MPP2)	33.0/25.0 A 51 A	
Max. short circuit current of solar modules (I _{SC PV}) (MPP1/MPP2)	49.5/37.5 A	
Max. backfeed current from AC grid ¹⁾	0.0 A ²⁾	

Output Data

Nominal output power (P _{nom})	14,995 W	17,495 W	
Max. output power (+104°F)	14,995 W	17,495 W	
Max. output power (+140°F)	at 440 V	12,200 W	12,200 W
	at 480 V	14,400 W	14,400 W
Phases	3 ~ NPE		
Nominal grid voltage	at 440 V	254 V/440 V	
	at 480 V	277 V/480 V	
Operating range AC voltage	-12 to +10%		
Adjustment range for grid voltage	127–322 V/220–558 V		
Max. continuous output current at V _{nom}	at 440 V	19.7 A	23.0 A
	at 480 V	18.0 A	21.0 A
AC overcurrent protection	at 440 V	25.0 A	30.0 A
	at 480 V	25.0 A	30.0 A
Max. output residual current per duration	30.9 A/150.4 ms		
Nominal frequency	50/60 Hz		
Total harmonic distortion	< 1.5%	< 1.25%	
Power factor (cos phi)	0–1 ind./cap. ³⁾		

General Data

Maximum efficiency	98.00%		
CEC efficiency	at 440 V		
	at 480 V	97.00%	97.50%
Cooling	Controlled forced-air ventilation		
Protection class	NEMA 4X		
Dimensions h x w x d	28.5 x 20.1 x 8.9 in. 725 x 510 x 225 mm		
Weight (full/lite version)	95.7/95.0 lbs. (43.4/43.1 kg)		
Permissible ambient temperature	-40°F to +140°F (-40°C to +60°C)		
Permissible storage temperature	-40°F to +158°F (-40°C to +70°C)		
Permissible humidity	0–100%		
Noise emission	65 dB(A) (ref. 1pW)		

Protection Devices

Reverse polarity protection	Integrated
Anti-islanding function	Integrated
Arc detection/interruption	Integrated

Fronius Symo	15.0-3 480	17.5-3 480
Photovoltaic insulation monitoring	Integrated	
Overtemperature	Operating point shift/ active cooling	

- 1) The maximum current from the inverter to the solar modules if an error occurs on the inverter
- 2) Assured by electrical design of the inverter
- 3) ind. = inductive cap. = capacitive

Fronius Symo	20.0-3 480	22.7-3 480
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Input Data

MPP voltage range	450–800 V DC	500–800 V DC
Input voltage range (at 1000 W/m ² /14°F in an open circuit)	200–1000 V DC	
Max. input current (MPP1/MPP2) (MPP1 + MPP2)	33.0/25.0 A 51 A	
Max. short circuit current of solar modules (I _{SC PV}) (MPP1/MPP2)	49.5/37.5 A	
Max. backfeed current from AC grid ¹⁾	0.0 A ²⁾	

Output Data

Nominal output power (P _{nom})	19,995 W	22,727 W	
Max. output power (+104°F)	19,995 W	22,727 W	
Max. output power (+140°F)	at 440 V	12,200 W	12,200 W
	at 480 V	14,400 W	14,400 W
Phases	3 ~ NPE		
Nominal grid voltage	at 440 V	254 V/440 V	
	at 480 V	277 V/480 V	
Operating range AC voltage	-12 to +10%		
Adjustment range for grid voltage	127–322 V/220–558 V		
Max. continuous output current at V _{nom}	at 440 V	26.2 A	29.8 A
	at 480 V	24.0 A	27.3 A
AC overcurrent protection	at 440 V	35.0 A	40.0 A
	at 480 V	30.0 A	35.0 A
Max. output residual current per duration	30.9 A/150.4 ms		
Nominal frequency	50/60 Hz		
Total harmonic distortion	< 1%	< 1.25%	
Power factor (cos phi)	0–1 ind./cap. ³⁾		

General Data

Maximum efficiency	98.00%		
CEC efficiency	at 440 V		
	at 480 V	97.50%	97.50%
Cooling	Controlled forced-air ventilation		
Protection class	NEMA 4X		
Dimensions h x w x d	28.5 x 20.1 x 8.9 in. 725 x 510 x 225 mm		
Weight (full/lite version)	95.7/95.0 lbs. (43.4/43.1 kg)		
Permissible ambient temperature	-40°F to +140°F (-40°C to +60°C)		
Permissible storage temperature	-40°F to +158°F (-40°C to +70°C)		
Permissible humidity	0–100%		
Noise emission	65 dB(A) (ref. 1pW)		

Protection Devices

Reverse polarity protection	Integrated
Anti-islanding function	Integrated
Arc detection/interruption	Integrated

Fronius Symo	20.0-3 480	22.7-3 480
Photovoltaic insulation monitoring	Integrated	
Overtemperature	Operating point shift/ active cooling	

- 1) The maximum current from the inverter to the solar modules if an error occurs on the inverter
- 2) Assured by electrical design of the inverter
- 3) ind. = inductive cap. = capacitive

Fronius Symo	24.0-3 480
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Input Data

MPP voltage range	500–800 V DC
Input voltage range (at 1000 W/m ² /14°F in an open circuit)	200–1000 V DC
Max. input current (MPP1/MPP2) (MPP1 + MPP2)	33.0/25.0 A 51 A
Max. short circuit current of solar modules (I _{SC PV}) (MPP1/MPP2)	49.5/37.5 A
Max. backfeed current from AC grid ¹⁾	0.0 A ²⁾

Output Data

Nominal output power (P _{nom})	23,995 W
Max. output power (+104°F)	23,995 W
Max. output power (+140°F)	at 480 V 14,400 W
Phases	3 ~ NPE
Nominal grid voltage	at 480 V 277 V/480 V
Operating range AC voltage	-12 to +10%
Adjustment range for grid voltage	127–322 V/220–558 V
Max. continuous output current at V _{nom}	at 480 V 28.9 A
AC overcurrent protection	at 480 V 40 A
Max. output residual current per duration	30.9 A/150.4 ms
Nominal frequency	50/60 Hz
Total harmonic distortion	< 1%
Power factor (cos phi)	0–1 ind./cap. ³⁾

General Data

Maximum efficiency	98.00%
CEC efficiency	at 480 V 97.50%
Cooling	Controlled forced-air ventilation
Protection class	NEMA 4X
Dimensions h x w x d	28.5 x 20.1 x 8.9 in. 725 x 510 x 225 mm
Weight (full/lite version)	95.7/95.0 lbs. (43.4/43.1 kg)
Permissible ambient temperature	-40°F to +140°F (-40°C to +60°C)
Permissible storage temperature	-40°F to +158°F (-40°C to +70°C)
Permissible humidity	0–100%
Noise emission	65 dB(A) (ref. 1pW)

Protection Devices

Reverse polarity protection	Integrated
Anti-islanding function	Integrated
Arc detection/interruption	Integrated
Photovoltaic insulation monitoring	Integrated
Overtemperature	Operating point shift/ active cooling

- 1) The maximum current from the inverter to the solar modules if an error occurs on the inverter
- 2) Assured by electrical design of the inverter
- 3) ind. = inductive cap. = capacitive

**Fronius Symo
Dummy**

Input Data

Nominal grid voltage	1 ~ NPE 120 V
Mains voltage tolerance	+10 / -12% ¹⁾
Nominal frequency	50–60 Hz ¹⁾

General Data

Protection class	NEMA 4X
Dimensions h x w x d	28.5 x 20.1 x 8.9 in. 725 x 510 x 225 mm
Weight	48.5 lbs. (22 kg)

**Explanation of
footnotes**

- 1) The values provided are standard values. If required, the inverter can be customized for a specific country.
 - 2) Depending on the country setup or device-specific settings (ind. = inductive; cap. = capacitive)
 - 3) PCC = interface to the public grid
 - 4) Maximum current from inverter to solar module when inverter is experiencing an error
 - 5) Assured by electrical design of the inverter
 - 6) Peak current when turning on the inverter
-

**Relevant stan-
dards and direc-
tives****Circuit for Preventing Stand Alone Operation**

The inverter has a permissible circuit for preventing stand alone operation.

Grid Failure

The standard measurement and safety procedures integrated into the inverter ensure that the power feed is immediately interrupted in the event of a grid failure (shut-off by the utility or damage to lines).

Terms and conditions of warranty and disposal

Fronius Manufacturer's Warranty

Detailed warranty terms and conditions specific to your country can be found online: www.fronius.com/solar/warranty

To take advantage of the full warranty duration for your newly installed Fronius inverter or accumulator, register your product at: www.solarweb.com.

Disposal

Should your inverter be replaced at some future date, Fronius will accept the obsolete equipment back and provide for its proper recycling.



7/17/2018

TO: **SYSTEM HOST: Beaverton Public Safety Center**
Francesca Gambetti
francesca@sojpdx.com

TRADE ALLY: Imagine Energy
Zach Parrott, z.parrott@imagineenergy.net

SUBJECT: Solar Development Assistance – Utility Grant Coversheet

POWERCLERK APPLICATION #: N/A
PROJECT NAME: Beaverton Public Safety Center Solar
SYSTEM OWNER: Francesca Gambetti, Beaverton Public Safety Center
SITE ADDRESS: 12500 SW Allen Blvd. Beaverton OR 97008

Congratulations! This letter is to notify you that Energy Trust has completed the design review of the proposed **302.00 kW** system referenced above with an estimated annual production of **306,470 kWh**. Based on the information provided at this time, the proposed system meets program requirements. The application has been processed and approved to pursue additional funding from a utility grant program and is eligible to receive an Energy Trust incentive as described below.

As of **7/17/2018** this project is eligible to receive an incentive amount of **\$37,500.00** for the system, subject to the terms and conditions of our **Form 220** agreement. A Funding Reservation Letter detailing the incentive reservation period will be issued separately.

Based on the information provided, this project will NOT receive tax benefits and has reported the financial details below:

Total Eligible Project Costs:	\$1,074,589.00
Reserved Energy Trust Incentive:	\$37,500.00
Net Eligible Project Cost:	\$1,037,089.00

Maximum Suggested Utility Grant Award Request*:	\$875,900.65

**Projects are most competitive if Total Funding Request (Energy Trust Incentive + Utility Grant Award) does not exceed 85% of Total Eligible Project Costs.*

In order to qualify for the incentive, the system must be installed and the installation verified by the Energy Trust Solar program during the Reservation Period. **Any revisions to the project proposal, system design, or funding sources must be reviewed and approved by both Energy Trust and the respective utility grant program.**

Please notify us immediately if you decide to cancel the project at any point during the Reservation Period. If you have any questions, please do not hesitate to contact program staff at 503.546.3611 or solar@energytrust.org.

Interconnection Analysis for DPI Specialty Foods Solar Project:

DPI Solar has conducted an on-site review of the current electrical infrastructure at DPI Specialty Foods.

The findings are:

- 1) The electrical service currently serving the property is sized at 2,000 Amps
- 2) The proposed solar installation will backfeed no more than 79.3% of the electrical buss capacity
- 3) The proposed system to be installed will interconnect as one of the NEC allowed six service disconnects for this property. All service disconnects are located in a central electrical utility room.
- 4) The current PGE meter is currently located in the central electrical utility room
- 5) PGE will have access to a utility accessible PV AC-Disconnect, located within 10' of the meter inside of this electrical room
- 6) Signage and a lock-box will be installed where requested by the PGE Metering department to allow access to the meter/PV AC-Disconnect 24 hours a day, Seven days per week
- 7) The signage required will have a map of the facility showing all relevant equipment, locations, access routes, and phone numbers in case of emergency
- 8) The transformers feeding the property are not currently sized to allow for 100% backfeed from this system. There will be a required transformer upgrade that will be engineered, designed, and installed by PGE's Service Department.
- 9) As this is a behind-the-meter installation, a Level-2 interconnection agreement has already been completed and is currently waiting for submission. The application fee for this interconnection application is \$1,483.

DPI Specialty Foods - Northwest

12360 S.W. Leveton Dr.

Tualatin, OR 97062

Tel: 503-612-8009

June 15, 2018

Dan Janosec

Project Manager, Renewable Development Fund

Portland General Electric

121 SW Salmon St.

Portland, OR 97204

Subject: Legal Good Standing

Dear Mr. Janosec,

I'm writing to confirm that DPI Specialty Foods has no legal disputes or pending litigation. Further, I can attest that there are no bankruptcy proceedings.

Sincerely,

DPI Specialty Foods



Joe Kemetz

Director of Operations

DPI Specialty Foods - Northwest

12360 S.W. Leveton Dr.

Tualatin, OR 97062

Tel: 503-612-8009

June 15, 2018

Dan Janosec

Project Manager, Renewable Development Fund

Portland General Electric

121 SW Salmon St.

Portland, OR 97204

Subject: Letter of Commitment for Renewable Development Fund (proposed project *Solar-powered Trailers at DPI Specialty Foods*)

Dear Dan,

Thank you for the opportunity to apply for funding from the Renewable Development Fund for the solar project at DPI Specialty Foods. DPI will incorporate a building-mounted solar array as proposed in our RDF application into another initiative to electrify our refrigerated trailers; collectively these two project elements comprise the *Solar-powered Trailers at DPI Specialty Foods*.

DPI is pleased to showcase the renewable solar array's generation to renewably power our electrified refrigerated trailers and about 50% of your total facility electric load. DPI has twelve (12) hybrid electric refrigerated trailers that will be powered by solar electricity instead of diesel during operation at our distribution center through the realization of this project. The RDF-supported solar on our building is part of our second phase rollout of an additional 12 refrigerated trailers, six (6) of which will add all-electric refrigerated trailers with solar panels on the trailer rooftops along with another six (6) hybrid electric trailers. This project showcases innovative integration of renewable power (solar) with electrified transportation.

We commit to implementing the solar project as proposed in our application to the Renewable Development Fund for funding to offset a portion of the solar array for our building and the educational components associated with the RDF-funded renewable project. DPI Specialty Foods will be funding the solar panels on electric trailers and the electric refrigerated trailers separately.

The Renewable Development Fund's investment in our proposed solar system has tremendous public benefit well beyond the typical renewable power generation aspects by replacing diesel fuel with electricity in goods movement. We will be partnering with Columbia Willamette Clean Cities Coalition, Forth, Oregon Environmental Council, and Neighbors for Clean Air to educate on solar renewable electricity to reduce greenhouse gases and criteria pollutants. Further, the contractor on our project, DPI Solar, is partnering with trade groups and nonprofits on training and workforce development to educate our upcoming workforce on career opportunities in the solar sector.

DPI Specialty Foods - Northwest

12360 S.W. Leveton Dr.

Tualatin, OR 97062

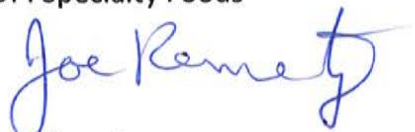
Tel: 503-612-8009

The Renewable Development Fund's investment in the solar aspect of our project is important to realize DPI's vision of solar electricity as DPI has already made a substantial investment in the electrified trailers and the electric infrastructure to support those electric trailers.

DPI Specialty Foods looks forward to partnering with Portland General Electric through the Renewable Development Fund.

Sincerely,

DPI Specialty Foods



Joe Kemetz

Director of Operations



June 8, 2018

Dan Janosec
Project Manager, Renewable Development Fund
Portland General Electric
121 SW Salmon St.
Portland, OR 97204

Subject: Letter of Support for *Solar-powered Trailers at DPI Specialty Foods*

Dear Dan,

Forth is pleased to offer this letter for the proposed project *Solar-powered Trailers at DPI Specialty Foods* to PGE's Renewable Development Fund. The proposed project is an innovative combination of renewable energy and transportation electrification.

Forth's involvement in the proposed *Solar-powered Trailers at DPI Specialty Foods* project will be a key element in the project's education plan; both locally and nationally. Forth will assist the project's education plan and we will help showcase the project in a site tour as part of the Roadmap 12 conference in June 2019.

The Roadmap Conference is the leading electric and smart mobility conference in the United States. Held each summer in the Pacific Northwest, Roadmap includes nearly 100 national and international speakers, dozens of exhibits, regional smart mobility tours, and high-energy interactive breakout sessions. With over 600 participants in 2017, Roadmap continues to be the premier forum to explore emerging industry trends and best practices with a diverse mix of industry, utility, and government leaders.

Forth is pleased to showcase this leading-edge project to show replicability next year when industry, utility, and government leaders visit Portland for the Roadmap Conference.

A handwritten signature in blue ink that reads 'Zach Henkin'. The signature is fluid and cursive, with a prominent 'Z' and 'H'.

Zach Henkin
Deputy Director, Forth



June 14, 2018

Dan Janosec
Project Manager, Renewable Development Fund
Portland General Electric
121 SW Salmon St.
Portland, OR 97204

RE: Letter of Support for *Solar-powered Trailers at DPI Specialty Foods*

Dear Dan,

Columbia-Willamette Clean Cities Coalition (CWCCC) supports the application to the Renewable Development Fund on the building-mounted solar array at DPI Specialty Foods. CWCCC's mission is to lead the nation in powering our highly efficient vehicles and equipment with domestically produced, low-carbon, sustainable fuels, resulting in: reduced reliance on foreign oil, a clean and healthy environment, and a vibrant local economy. Transportation electrification is one of many low-carbon fuels. Solar electricity as proposed in the food transportation sector is an innovative approach.

CWCCC is one of nearly 100 Department of Energy (DOE) sponsored coalitions across the U.S. that help meet the objectives of improving air quality, developing regional economic opportunities, and reducing the use of petroleum fuels. CWCCC has developed an impressive network of public and private partners that rely on the coalition for information, expertise, and implementation of initiatives that improve quality of life and address environmental, energy, and economic concerns. CWCCC was founded in 1994.

CWCCC is committed as an educational partner to communicate through our network. For example, through US DOE's Alternative Fuels Data Center we recently had a case study published on electrification of transport refrigeration.¹

CWCCC is supporting DPI's second stage expansion to add an additional 12 electrified refrigerated trailers to the existing 12 electrified trailers in DPI's fleet. We urge the Renewable Development Fund to support DPI's project to install a solar system at DPI's Tualatin facility.

Sincerely,
Columbia Willamette Clean Cities Coalition
Executive Director
Brian Trice

A handwritten signature in black ink, appearing to read "B. Trice", written over a horizontal line.

¹ Electric Refrigeration Translates Fuel Burn into Savings for Nonprofit. US DOE Alternative Fuels Data Center, <https://www.afdc.energy.gov/case/3069>



June 15, 2018

Dan Janosec
Project Manager, Renewable Development Fund
Portland General Electric
121 SW Salmon St.
Portland, OR 97204

RE: Letter of Support for *Solar-powered Trailers at DPI Specialty Foods*

Dear Dan,

Neighbors for Clean Air (NCA) supports the DPI Specialty Foods application to the Renewable Development Fund. NCA understands and supports the proposed project's mission to lead the nation in powering our food transportation sector with highly efficient refrigerated trailers powered by renewable solar electricity. This fits well with NCA's mission to reduce harmful air pollution in Oregon by pursuing solutions that are co-created by a diverse and informed community working with businesses and government collaboratively. NCA supports the project *Solar-powered Trailers at DPI Specialty Foods* in their goal showcase and accelerate the adoption of electrification in the food transport ation sector, as well maximize opportunities to reduce diesel particulate pollution in the Portland Metro area and surrounding high population regions.

NCA has supported multiple projects like the *Solar-powered Trailers at DPI Specialty Foods* project by collaborating with industry. Partnerships like this ensures NCA delivers on its commitment to address the wide-spread problem of diesel particulates in Oregon, which is the deadliest air contaminant in the state. Currently, according to EPA's assessment, 460 deaths a year in Oregon are attributed to diesel particulate matter, and 17 counties have levels of diesel particulate matter that are associated with elevated cancer risk to residents. And specifically, neighborhoods in Portland with higher percentages of minority populations are exposed to diesel pollution at 2-3 times higher than other communities. NCA has worked collaboratively with industry for almost five years to address these impacts both locally and regionally, to protect the health and well-being of the neighbors and its workforce.

We have heard from community members that they support electrification, and further that they want to make sure that the electricity mix is as clean as possible to get the greatest lifecycle emission reduction benefits. To support the educational goals of this project, NCA will provide DPI Specialty Foods with assistance to effectively engage with community and educate on the benefits of this investment by the Renewable Development Fund.

The demonstration and deployment of solar-powered refrigerated trailers at DPI Specialty Foods serves as a showcase for clean transportation using solar electricity, NCA urges PGE to support the proposed project.

Sincerely,

A handwritten signature in cursive script that reads 'Mary S. Peveto'.

Mary Peveto
President, Neighbors for Clean Air



June 14, 2018

Dan Janosec
Project Manager, Renewable Development Fund
Portland General Electric
121 SW Salmon St.
Portland, OR 97204

RE: Letter of Support for *Solar-powered Trailers at DPI Specialty Foods*

Dear Dan,

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Columbia Willamette Clean Cities Coalition
Executive Director
Brian Trice

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¹ Electric Refrigeration Translates Fuel Burn into Savings for Nonprofit. US DOE Alternative Fuels Data Center, <https://www.afdc.energy.gov/case/3069>

CASE STUDY

Reducing Idling in Refrigerated Trailers



Refrigerated trailers deliver food to grocery stores, restaurants and more, keeping our food fresh and safe. But to keep their cargo cool, these trailer refrigeration units often spend hours idling every day—emitting greenhouse gases, harming air quality and making a lot of noise.

Nationwide, idling wastes more than 1 billion gallons of fuel every year. To reduce these harmful emissions, Forth partnered with CleanFuture and TREC at Portland State University to help refrigerated fleets upgrade to a cleaner, quieter and less expensive energy source than diesel.



ALTERNATIVES TO IDLING

Thanks to advances in technology, refrigerated trucks and trailers no longer have to keep their engines on to keep their refrigerators running. Instead, electrified parking spaces and plug-in electric refrigeration units can provide the power they need for electric standby refrigeration.



Plug it in: Electric-powered transport refrigeration units (called eTRUs) and electric plugs at distribution centers and other idling hotspots allow trucks to turn off diesel engines.



Quiet time: Unlike rumbling diesel engines, electric refrigeration is whisper quiet, reducing noise pollution at the distribution centers and in the neighborhood.



Emit no more: Electric standby refrigeration means no local emissions while cooling on grid electricity. And since most electricity in the Pacific Northwest comes from renewable sources, it's a win-win for the environment.



Save money: The cost of electricity is lower and more stable than diesel, quickly offsetting the investment in new equipment. Converted trucks and trailers also require less maintenance and have a higher resale value.

HOW IT WORKED

The project ran in Oregon from 2015 to 2017, providing free technical assistance and guidance to 19 refrigerated fleet operators, many with multiple distribution centers or manufacturing locations in the West. Together we:



Assesed how much fuel each fleet was using—and wasting—using monitoring equipment installed on trucks.



Identified opportunities and recommended strategies to reduce fuel usage and waste, improve fleet operations, extend the life of the trucks and reduce costs.



Organized workshops and advised fleet managers on the impact of idling and the benefits of upgrading their fleets.



Supported fleet managers in installing new electric systems, including recommending grant funding and tax incentives for financing.

RESULTS

As of July 2017, four of the 19 participants had already upgraded to electric transport refrigeration systems with electrified parking spaces, and several others are planning to make the switch in the next three years. After learning about the advantages of electrifying transport refrigeration, all but one company showed at least some interest in upgrading.

The study also revealed that fleet managers tend to underestimate how much time refrigeration units on trailers and trucks spent idling and overestimate the costs of the improvements. Typically, switching to electric refrigeration reduces operating costs by 40 to 70 percent.



Savings over the course of the project totaled \$2.3 million

WHAT'S NEXT?

We're actively working to encourage businesses and cities to invest in idle reduction technologies for cleaner air, less noise and lower costs.

States can incentivize these technologies using Volkswagen Environmental Mitigation funds, or other funding designed to reduce diesel emissions. Electric utilities can also encourage and incentivize fleets to plug in. This project was supported by a grant from the EPA's Region 10 Pollution Prevention Program, and work of TREC at Portland State University and CleanFuture.

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May 29, 2018

Electric Refrigeration Translates Fuel Burn into Savings for Nonprofit

“Once fleets learn about idle-reduction technologies and best practices, it’s usually an easy decision for them to make a change in their operations.”

Brian Trice, Columbia-Willamette Clean Cities coordinator

When parked, it’s a common practice for operators of refrigerated trucks and trailers, also known as reefers, to maintain proper temperatures by idling the auxiliary diesel generator in their transport refrigeration units (TRUs). But just because it’s commonplace, doesn’t make it cost-effective—or healthy for the surrounding area.

That’s why Portland, Oregon-based Meals on Wheels People—which provides meals for seniors in the Portland metropolitan area—now powers the TRUs in its fleet with electricity. Thanks to guidance Meals on Wheels People received from the Columbia-Willamette Clean Cities Coalition (CWCCC), the nonprofit’s trucks now leave the

loading dock early each morning to deliver food to regional outlets, then rely on electrified parking spaces when they return in the middle of the day to restock for afternoon deliveries. Meals on Wheels People has substantially reduced operating costs and emissions since switching its fleet—all while ensuring its cargo stays at the desired temperature.

As an added bonus, employees who work in the dock area and adjacent offices, as well as nearby businesses and residences, say they have noticed fewer exhaust fumes and enjoy a quieter operation overall.

"More than 20 refrigerated fleets are participating in our technical assistance project, which received support from an Environmental Protection Agency Pollution Prevention Program grant," said Brian Trice, CWCCC coordinator. "Once fleets learn about idle-reduction technologies and best practices, it’s usually an easy decision for them to make a change in their operations."

CWCCC is working in partnership with a variety of its coalition members—such as CleanFuture, Shorepower Technologies, Portland State University, Transportation Research Education Center, and Forth (previously called Drive Oregon)—to promote electrified idle reduction in refrigerated fleets. With support from the coalition’s joint technical assistance project, four other fleets in the region have implemented TRU idle-reduction projects, and many more fleets are in the process of evaluating their options.

The choice to install electrified parking was clear for Meals on Wheels People after its Green Team reviewed an idling analysis, which laid out the financial and environmental benefits of moving to electricity. The analysis was conducted by CleanFuture as part of CWCCC’s technical assistance project.

"Few fleet operators realize how much fuel is wasted in parked reefers that could be saved with shore power electricity," said John Thornton, president of CleanFuture.

CleanFuture has found that it’s common to find a delivery fleet’s TRU idling about 40%-50% of the time while parked at distribution centers.

"Idling refrigerated trucks and trailers while they are parked is unfortunately an accepted status quo," Thornton said. "We’re working to share information and identify cost savings in each fleet’s operation. Electric TRUs, combined with electrified parking spaces, are a win-win because they provide a cost-effective and healthier solution overall."



Project at a Glance

Alternative Fuel: Electricity

Technology: Plug-in electric transportation refrigeration units

Motivation: Cost savings, air quality, idle reduction, noise reduction

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- [Electricity Fuel Basics](#)
- [Electric Vehicle Charging Station Locations](#)
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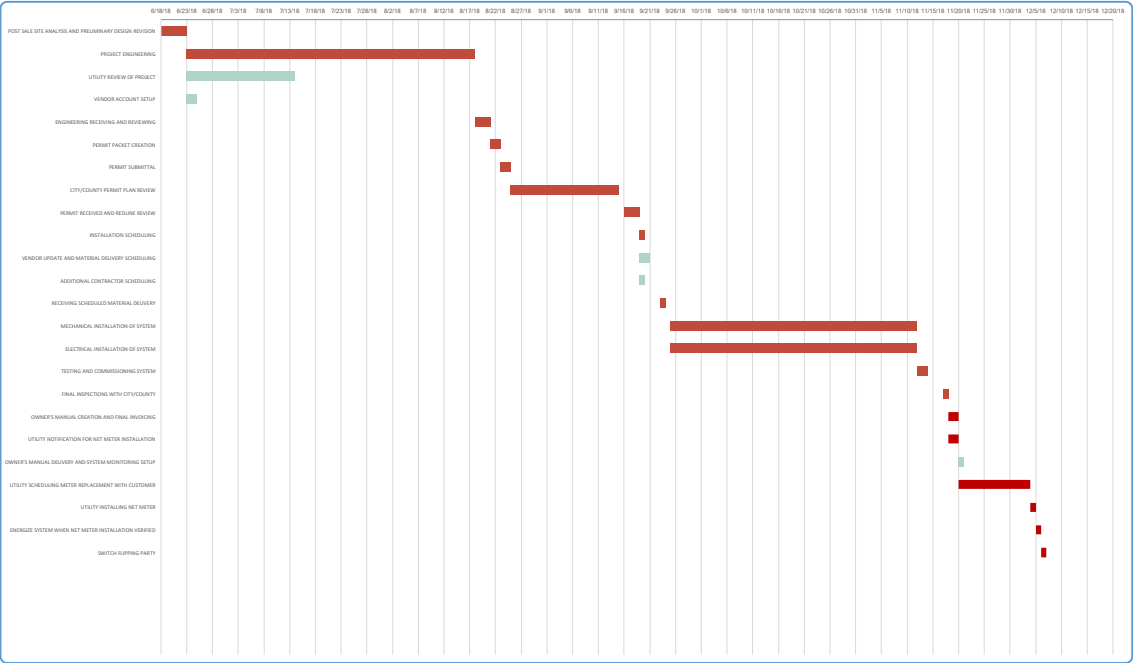


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Task Name	Start Date	End Date	Duration (Days)	Days Complete	Days Remaining	Percent Complete
SCHEDULING POST SALE SITE ANALYSIS	6/17/18	6/19/18	2	0.00	2.00	-100%
POST SALE SITE ANALYSIS AND PRELIMINARY DESIGN REVISION	6/18/18	6/23/18	5	0.00	5.00	0%
PROJECT ENGINEERING	6/23/18	9/18/18	56	0.00	56.00	0%
UTILITY REVIEW OF PROJECT	6/23/18	7/14/18	21	0.00	21.00	0%
VENDOR ACCOUNT SETUP	6/23/18	6/25/18	2	0.00	2.00	0%
ENGINEERING RECEIVING AND REVIEWING	8/16/18	8/21/18	5	0.00	5.00	0%
PERMIT PACKET CREATION	8/21/18	8/23/18	2	0.00	2.00	0%
PERMIT SUBMITTAL	8/23/18	9/25/18	2	0.00	2.00	0%
CITY/COUNTY PERMIT PLAN REVIEW	8/25/18	9/15/18	21	0.00	21.00	100%
PERMIT RECEIVED AND REDLINE REVIEW	9/16/18	9/19/18	3	0.00	3.00	0%
INSTALLATION SCHEDULING	9/19/18	9/20/18	1	0.00	1.00	0%
VENDOR UPDATE AND MATERIAL DELIVERY SCHEDULING	9/19/18	9/21/18	2	0.00	2.00	0%
ADDITIONAL CONTRACTOR SCHEDULING	9/19/18	9/20/18	1	0.00	1.00	0%
RECEIVING SCHEDULED MATERIAL DELIVERY	9/23/18	9/24/18	1	0.00	1.00	100%
MECHANICAL INSTALLATION OF SYSTEM	9/25/18	11/12/18	48	0.00	48.00	0%
ELECTRICAL INSTALLATION OF SYSTEM	9/25/18	11/12/18	48	0.00	48.00	0%
TESTING AND COMMISSIONING SYSTEM	11/12/18	11/14/18	2	0.00	2.00	0%
FINAL INSPECTIONS WITH CITY/COUNTY	11/17/18	11/18/18	1	0.00	1.00	0%
OWNER'S MANUAL CREATION AND FINAL INVOICING	11/18/18	11/20/18	2	0.00	2.00	0%
UTILITY NOTIFICATION FOR NET METER INSTALLATION	11/18/18	11/20/18	2	0.00	2.00	200%
OWNER'S MANUAL DELIVERY AND SYSTEM MONITORING SETUP	11/20/18	11/23/18	3	0.00	3.00	100%
UTILITY SCHEDULING METER REPLACEMENT WITH CUSTOMER	11/20/18	12/4/18	14	0.00	14.00	300%
UTILITY INSTALLING NET METER	12/4/18	12/5/18	1	0.00	1.00	400%
ENERGIZE SYSTEM WHEN NET METER INSTALLATION VERIFIED	12/5/18	12/6/18	1	0.00	1.00	300%
SWITCH FLIPPING PARTY	12/6/18	12/7/18	1	0.00	1.00	400%

Start Date in Number Form **41269.00** Use this number for the Minimum Bound of the Horizontal Axis to set the beginning of the chart.



Key: █ Calculated Cell █ Manual Entry Cell
 These cells will be automatically calculated based on the inputs on other cells. These cells require manual input on the calculated cells have data to work with.

█ CRITICAL TASK
█ NON CRITICAL TASK

DPI SOLAR PROJECT REFERENCES

OREGON ZOO, Public Client
Asian Elephant Habitat
Jim Mitchell
Jim.mitchell@oregonzoo.org
4001 SW Canyon Road, Portland OR 97221
(503) 914-6025

DPI Solar responded to Invitation to Bid and was selected for project through a competitive process. The project installation was 30.24 kW at a cost of \$113,400 and secured \$39,312 in Energy Trust funding.



Essential Wholesale, Private Client

Diane Humke
diane@ewlnatural.com
2211 NW Nicolai St
503-708-8579

This installation was a 127.185 kW installation in 2015 at a cost of \$426,070 with \$137,538 in Energy Trust funding and \$95,000 from the Department of Energy R.E.D. Grant.



Woodburn Fast Serv Inc Chevron, Private Client

Robert & Mary Barman
rjbarman@aol.com
111 SE 3rd Ave Suite F Hillsboro, OR 97123
(503) 407-3864

47.84 kW installation for Woodburn Fast Serv Inc Chevron. Project cost was \$216,000. Energy Trust funding paid for \$47,840 and customers net cost was \$168,160. DPI Solar consulted with clients about applying for Renewable Energy Development Grant with the Department of Energy but it was determined not to be a good fit for the grant.



Dynamic Power Innovation Balance Sheet Comparison

	Total			
	As of May 31, 2018	As of Dec 31, 2017	As of Dec 31, 2016	As of Dec 31, 2015
ASSETS				
Current Assets				
Bank Accounts				
10010 Chase Checking/DPI	86,407	100,280	45,924	120,325
Total Bank Accounts	\$ 86,407	\$ 100,280	\$ 45,924	\$ 120,325
Total Current Assets	\$ 86,407	\$ 100,280	\$ 45,924	\$ 102,036
Fixed Assets				
14010 Machinery & Equipment	1,778	1,778	1,778	1,778
14020 Vehicles	85,108	85,108	85,108	85,108
14030 Office Equipment	(73,605)	(73,605)	(69,855)	(62,855)
Total Fixed Assets	\$ 13,281	\$ 13,281	\$ 17,031	\$ 24,031
TOTAL ASSETS	\$ 99,688	\$ 113,561	\$ 62,955	\$ 126,067
LIABILITIES AND EQUITY				
Liabilities				
Current Liabilities				
Credit Cards				
Chase Ink Business Preferred	8,815	7,993	-	-
Total Credit Cards	\$ 8,815	\$ 7,993	\$ -	\$ -
Other Current Liabilities				
22010 Note Payable - Dee Kopczyński	71,954	71,954	71,954	71,954
24000 Payroll Liabilities	3,832	3,832	2,331	1,085
Total Other Current Liabilities	\$ 75,786	\$ 75,786	\$ 74,285	\$ 73,039
Total Current Liabilities	\$ 84,601	\$ 83,779	\$ 74,285	\$ 73,039
Total Liabilities	\$ 84,601	\$ 83,779	\$ 74,285	\$ 73,039
Equity				
30010 Retained Earnings	29,782	(40,496)	14,165	35,540
31010 Owner's Draw	(129,062)	(137,500)	(251,000)	(155,900)
Net Income	114,367	207,778	225,505	173,387
Total Equity	\$ 15,087	\$ 29,782	\$ (11,330)	\$ 53,027
TOTAL LIABILITIES AND EQUITY	\$ 99,688	\$ 113,561	\$ 62,955	\$ 126,067

Cash Basis

Dynamic Power Innovation Profit and Loss Comparison

	Total			
	Jan - May 2018	Jan - Dec 2017	Jan - Dec 2016	Jan - Dec 2015
Income				
40010 Solar Sales	1,156,315	1,618,309	1,321,490	1,130,956
Total Income	\$ 1,156,315	\$ 1,618,309	\$ 1,321,490	\$ 1,130,956
Cost of Goods Sold				
50000 DIRECT PROJECT EXPENSES				
51000 DIRECT LABOR EXPENSES	92,097	144,885	119,750	101,101
52000 Job Parts	649,220	838,133	668,675	596,725
53000 Subcontractors	3,493	67,515	3,810	3,196
54000 Automobile Expense	8,422	11,810	9,332	9,152
55000 Equipment Rental	1,934	2,851	2,246	1,082
56000 OTHER PROJECT COSTS	17,906	24,110	18,862	14,375
Total 50000 DIRECT PROJECT EXPENSES	\$ 773,072	\$ 1,089,304	\$ 822,675	\$ 725,631
60000 INDIRECT EXPENSES				
61000 INDIRECT PAYROLL EXPENSES	500	10,750	9,910	8,777
63000 Repairs and Maintenance	3,533	4,435	4,096	3,910
64000 Tools & Equipment under \$500	-	9,170	3,012	2,295
65000 Shop Supplies	25	13,325	8,815	8,400
Total 60000 INDIRECT EXPENSES	\$ 4,058	\$ 37,680	\$ 25,833	\$ 23,382
Total Cost of Goods Sold	\$ 777,130	\$ 1,126,984	\$ 848,508	\$ 749,013
Gross Profit	\$ 379,185	\$ 491,325	\$ 472,982	\$ 381,943
Expenses				
70000 GENERAL& ADMINISTRATIVE				
71000 G & A PAYROLL EXPENSES	10,100	67,510	48,910	33,975
72000 Rent	12,715	13,800	12,575	11,955
73000 Supplies and Materials	10	2,195	2,217	1,925
73020 Insurance	5,904	8,810	6,850	4,910
73050 Utilities	4,553	5,454	5,111	3,975
74000 Telephone	535	809	690	605
74050 Parking	175	511	215	310
75000 Taxes	45,704	41,520	39,015	38,855
75050 Postage and Deliver	690	901	705	910
75080 Bank Service Charge	850	1,237	901	610
76000 Legal	13,306	18,991	10,215	11,075
76050 Travel	2,931	4,060	3,970	3,110
77000 Reimbursement	97	168	-	197
77050 Office Expense	3,017	4,281	3,919	1,995
77080 Credit Card Fee	-	3,275	2,055	1,099
78000 Meals and Entertainment	36,041	10,975	12,750	9,075
78050 Dues and Subscriptions	24,112	30,395	27,607	23,710
79000 Miscellaneous Expenses	38	2,510	1,855	1,039
Total 70000 GENERAL& ADMINISTRATIVE	\$ 160,778	\$ 217,402	\$ 179,560	\$ 149,330
80000 SALES AND MARKETING				
81000 SALES&MARKETING PAYROLL EXPENSE	976	8,950	5,585	4,005
82000 Advertising & Promotion	42,568	39,750	49,105	41,725
82010 Internet	50	1,805	1,305	1,161
83000 Sales Commission	5,491	7,810	6,105	5,915

Total 80000 SALES AND MARKETING	\$ 49,085	\$ 58,315	\$ 62,100	\$ 52,806
Automobile Expenseo	5,050	6,125	4,495	5,150
Payroll Expenses	49,905	1,815	1,322	1,095
Total Expenses	\$ 54,955	\$ 7,940	\$ 5,817	\$ 6,245
Net Operating Income	\$ 114,367	\$ 207,668	\$ 225,505	\$ 173,562
Other Income				
91000 Other Miscellaneous Income	-	110	-	175
Total Other Income	\$ -	\$ 110	\$ -	\$ 175
Net Other Income	\$ -	\$ 110	\$ -	\$ (175)
Net Income	\$ 114,367	\$ 207,778	\$ 225,505	\$ 173,387

Cash Basis

DPI Specialty Foods - Northwest

12360 S.W. Leveton Dr.

Tualatin, OR 97062

Tel: 503-612-8009

June 15, 2018

Dan Janosec

Project Manager, Renewable Development Fund

Portland General Electric

121 SW Salmon St.

Portland, OR 97204

Site Owner Project Acknowledgement / Site Control

Dear Mr. Janosec,

I'm writing in accordance with your program requirement to confirm that DPI Specialty Foods is the property owner for 12360 S. W. Leveton Drive, Tualatin, OR 97062

DPI Specialty Foods will allow PGE and its customers and guests access to our facility at least two tours each year, subject to 30 days' notice by PGE for up to 10 years. DPI welcomes the opportunity to showcase the project *Solar-powered Trailers at DPI Specialty Foods*.

Sincerely,

DPI Specialty Foods



Joe Kemetz

Director of Operations



DOTec CORP.

CUSTOMIZED ENGINEERING SOLUTIONS

August 31, 2016

To: Unirac, Inc.
1411 Broadway Blvd NE
Albuquerque, MN 87102-1545

Attn: Engineering Department,

Re: Engineering Certification for Unirac's RM5 and RMDT Roof Mounted Ballasted PV Panel Support System Design Methodology and U-Builder

DOTec Engineering has reviewed and certified Unirac's RM5 (5 degree tilt ballasted PV racking) and RMDT (Dual tilt ballasted PV racking). Both racking options support the PV panels and are ballasted with concrete blocks, as required to resist wind loading. Wind uplift loads are resisted directly by the ballast weight and wind deflectors. Lateral forces, both wind and seismic, are resisted by friction between ballast bays and the roof surface. The ballast requirements are determined using the Unirac online U-builder design assistant tool. The U-Builder covers a wide range of system configurations and load combinations, which allows the user to customize the input to match the specific project conditions. The RWDI wind tunnel test results and the Unirac ballasted design methodology have been reviewed and have determined that it is rational and in compliance with the structural requirements of the following reference documents:

- I. ASCE/SEI 7-05 & ASCE/SEI 7-10 – Minimum Design Loads for Buildings and other Structures
- II. International Building Code, 2009 & 2012 Editions (IBC)
- III. Steel Construction Manual, 13th Ed., American Institute of Steel Construction
- IV. RWDI Wind Pressure Study Report #160097
- V. Maffei Unirac Peer Review Letter & Report (Dated July 11, 2016)

The RWDI wind tunnel report has been reviewed by Maffei Structural Engineering (Oakland, CA) to satisfy SEAOC (Structural Engineers Association of California) peer review requirements.

This letter certifies that the structural calculations contained within Unirac's U-Builder, on-line design tool are in compliance with the above Codes. This certification excludes any connections to the building structures and/or the effects on the building structure components.

Please call if you have any questions or concerns.

Sincerely,

Dr. Ildefonso "Al" Gonzalez, P.E. PhD
Oregon # 85747PE
DOTec Engineering, Inc.
St. Charles, MO



Unirac Design w/Nearmap Overlay DPI Specialty Foods, 12360 Leveton Dr, Tualatin, OR 97062

Shading Heatmap



Shading by Field Segment

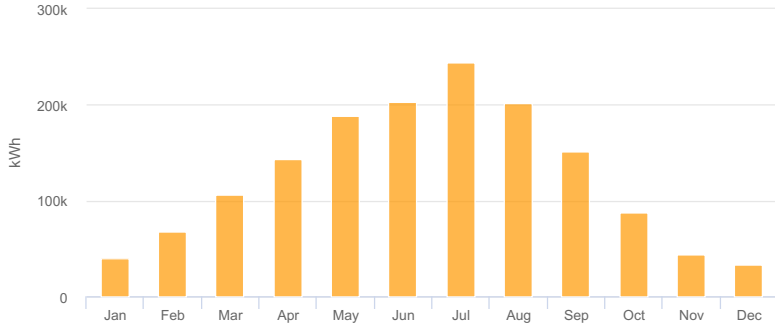
Description	Tilt	Azimuth	Modules	Nameplate	Shaded Irradiance	AC Energy	TOF ²	Solar Access	TSRF ²
1	10.0°	181.4°	3,978	1.43 MWp	1,295.1kWh/m ²	1.51 GWh ¹	85.8%	97.9%	84.0%
» subarray 1	10.0°	91.4°	1,987	715.3 kWp	1,289.3kWh/m ²	752.3 MWh ¹	85.4%	97.9%	83.6%
» subarray 2	10.0°	271.4°	1,991	716.8 kWp	1,300.9kWh/m ²	758.7 MWh ¹	86.2%	97.9%	84.4%
Totals, weighted by kWp			3,978	1.43 MWp	1,295.1kWh/m²	1.51 GWh	85.8%	97.9%	84.0%

¹ approximate, varies based on inverter performance
² based on location Optimal POA Irradiance of 1,541.4kWh/m² at 35.5° tilt and 182.9° azimuth

Solar Access by Month

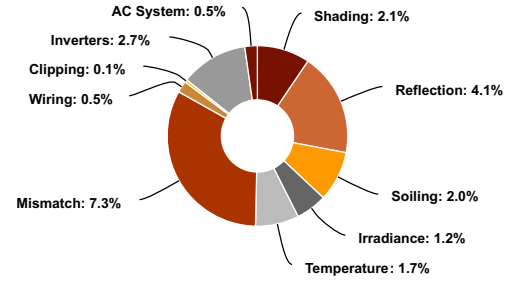
Description	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	96%	97%	98%	98%	99%	99%	98%	98%	97%	97%	97%	97%
Solar Access, weighted by kWp	96.4%	96.5%	97.9%	98.4%	98.8%	98.6%	98.2%	97.9%	97.2%	97.1%	96.5%	96.7%
AC Power (kWh)	40,392.0	67,831.0	105,568.1	143,611.9	188,693.7	202,847.7	244,320.9	202,221.9	151,651.4	87,358.9	43,329.0	33,120.3

Monthly Production

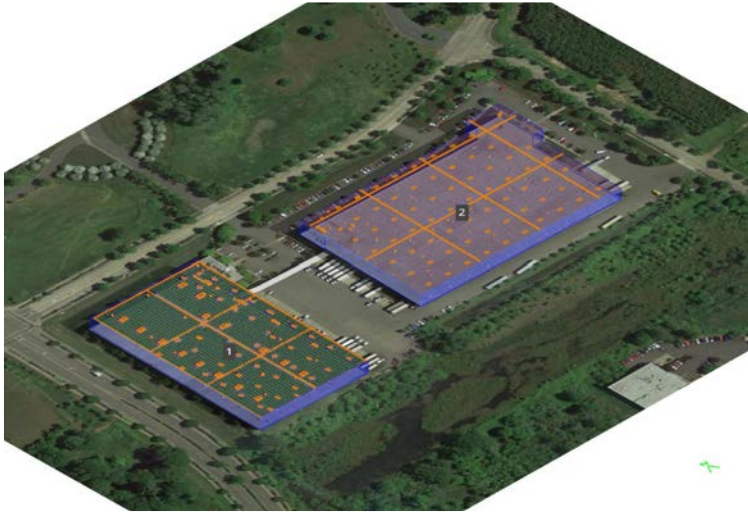


Month	GHI (kWh/m ²)	POA (kWh/m ²)	Shaded (kWh/m ²)	Nameplate (kWh)	Grid (kWh)
January	36.8	36.7	35.3	46,227.6	40,392.0
February	60.0	59.7	57.6	76,028.2	67,831.0
March	90.3	89.9	88.0	117,877.4	105,568.1
April	122.4	121.9	119.9	161,355.8	143,611.9
May	160.2	159.6	157.6	213,295.8	188,693.7
June	176.2	175.6	173.2	234,685.6	202,847.7
July	217.3	216.1	212.2	288,658.8	244,320.9
August	181.0	180.0	176.2	238,907.3	202,221.9
September	136.4	135.9	132.0	177,658.8	151,651.4
October	78.3	77.9	75.7	100,744.9	87,358.9
November	39.9	39.7	38.3	50,258.5	43,329.0
December	30.1	29.9	28.9	37,793.4	33,120.3

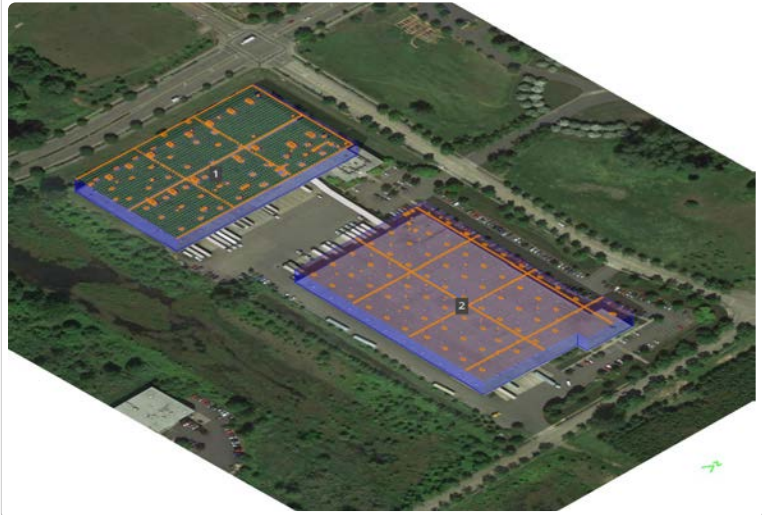
Sources of System Loss



Southwestern Angle



Southeastern Angle



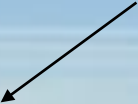
**DPI SPECIALTY FOODS
SITE PHOTOS**



Solar installation site panorama



Mt Hood



Rooftop view, great for kiosk photos.

Electrical equipment room

