

INTEGRATED PVT SYSTEM

GEN₂O

FROM POWERPANEL



MAKE OUR **ENERGY REVOLUTION** YOUR NEXT SYSTEM SOLUTION

**..with breakthrough solar + storage technology
from PowerPanel, the emerging leader in the field**

PowerPanel's advanced Gen₂O Integrated PVT System—incorporating true hybrid, dual-stream solar electric/thermal technology—is designed to solve energy supply challenges around the globe, in applications ranging from high-end hospitality to remote off-grid operations. Through the successful integration of several new, breakthrough technologies, it's the ideal solution for *your* next energy challenge as well.

POWERPANEL™
HYBRID SOLAR THERMAL ENERGY & STORAGE



powerpanel.com



IT'S THE MOST INTELLIGENT ENERGY INTEGRATION OF THE DECADE



The first technological breakthrough is a patented, hybrid PV+Thermal panel that harnesses two solar energy streams—electricity and heat-- to produce both solar electricity and hot water from a single PVT module, **with 4X the energy output of a typical PV module** by itself. In performance and output, the PVT module design represents the greatest leap achieved in solar energy generation since the first demonstrations of the solar electricity module itself over four generations ago.

The second breakthrough is an equally advanced Thermal liquid storage tank, made from sections of advanced engineered thermoplastics instead of conventional steel. They're lightweight and easy to install on a roof, **impervious to corrosion, and superior in insulation.**

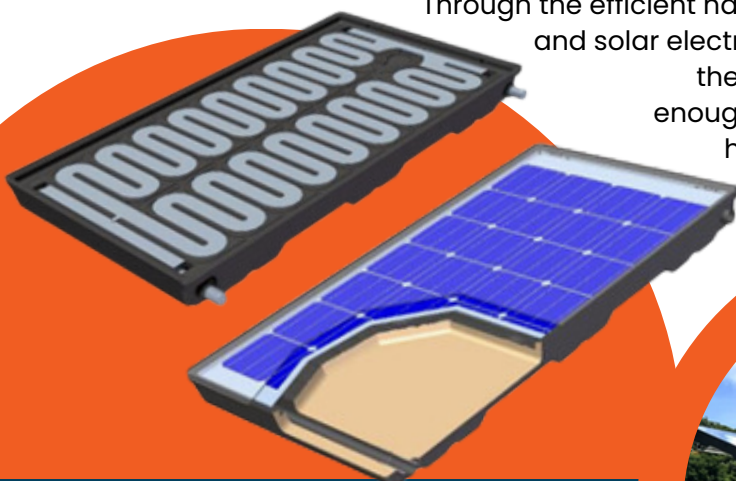
Combined in the Integrated System, these technologies can supply a large facility-- hospital, laundry, hotel and apartment complex, even a large-scale commercial greenhouse-- with enough hot water to support the entire operation at a fraction of the cost of utility power. And all by using renewable energy from the sun.

Over the long term a Gen₂O Integrated System will "pencil out" to be more cost effective than any other energy production and storage scheme—dramatically so once Federal and other qualifying incentives are factored into the investment. PowerPanel's Gen₂O system fully qualifies for both the Federal Income Tax Credit (ITC) and Rural Energy for America Program (REAP) benefits because it's made in the U.S.A, making it an ideal solution for "Green Infrastructure" projects.

Proven by a 4X increase in energy output and made possible by new, patented technologies from PowerPanel—the company at the forefront of the next generation of hybrid energy systems.

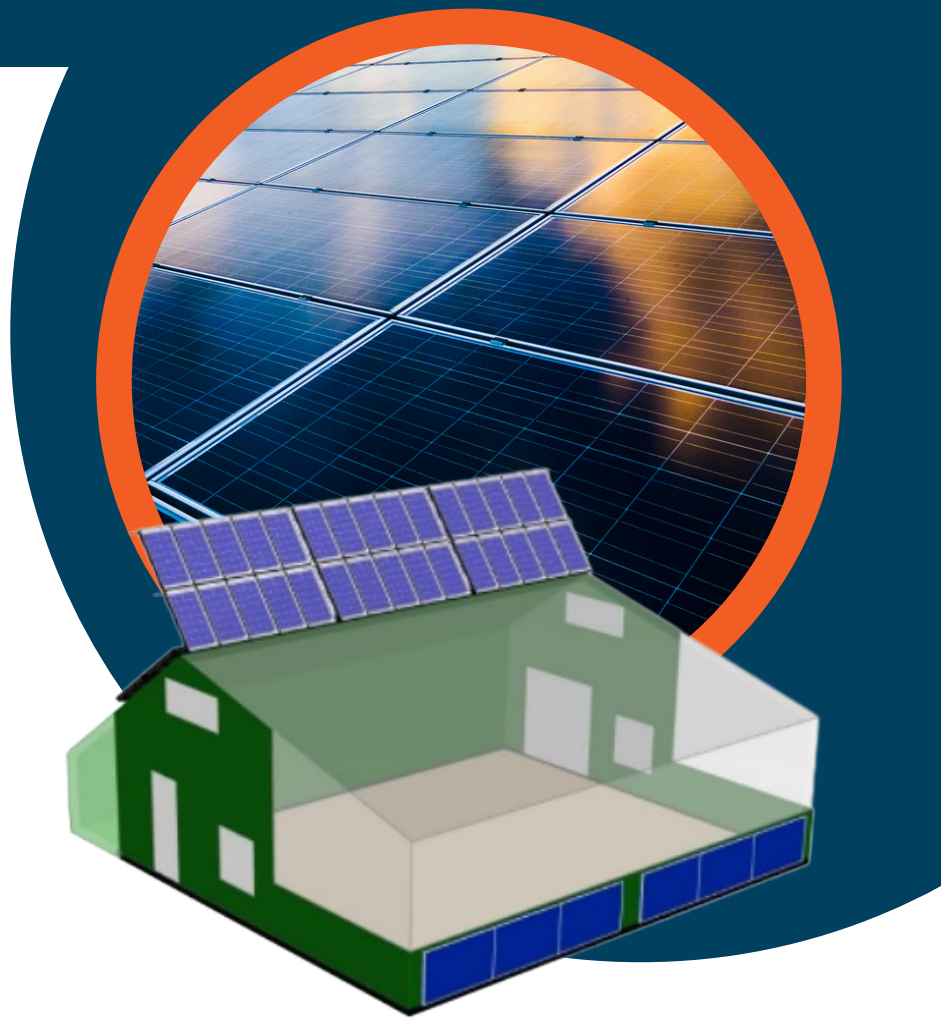
With GEN₂O Energy technology, "E" also means Efficiency, Economic and Environmental advantages

Through the efficient harnessing of two solar energy streams—solar thermal and solar electric-- to both heat hot water and generate electricity, the PowerPanel Gen₂O Integrated System can produce enough energy to meet the needs of an entire health care, hospitality, commercial, institutional, agricultural and dairy, or any other type of facility requiring an ample supply of hot water on-site.



Patented *True Hybrid* Dual-Stream design encapsulates a PV/solar electric panel and a PV/solar thermal collector in a single module, for a 4X increase in energy output

- **More efficient and effective**— PowerPanel’s hybrid PV/T technology produces over 4X the energy output than either solar PV/electric or solar thermal generation methods by themselves
- **More cost effective**— a PowerPanel Gen₂O Integrated System can, in many applications, reduce or even eliminate the need for utility power for hot water heating. And, it qualifies for all Federal and local tax incentives
- **Easy to install**— the Thermal Storage Tank unit is made entirely of engineered advanced plastics. It’s lightweight and ideal for rooftop installations
- **Durable, built for the long term**—unlike conventional steel tanks the Thermal Tank’s EPP engineered plastic foam construction will never corrode
- **Off-Grid Version**—for applications and locations where grid electrical power is either unreliable or unavailable, and/or the water supply is in question as well. Includes an on-board Water Filtration System as well as a complete Battery Energy Storage System (BESS)—an ideal solution for operations in remote areas and under challenging conditions



A commercial greenhouse design using PowerPanel’s Gen₂O Integrated system for heating the entire premises. PowerPanel’s technology is ideal for effectively power generation in “smart agriculture” applications, especially in colder latitudes where conventional heating systems are more cost-prohibitive



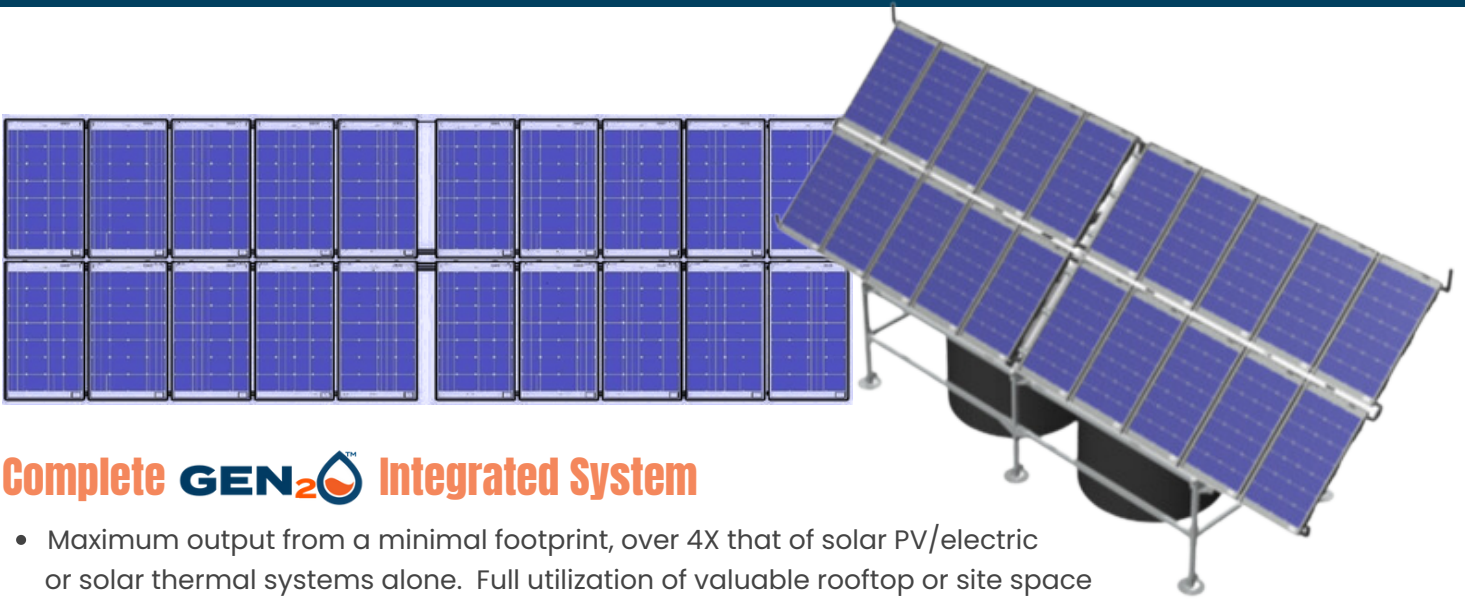
AltEnergy magazine, May 2024

“PowerPanel’s Gen₂O Thermal Storage Tank scraps the concept of the traditional steel tank, replacing it with durable, safe, stable and recyclable thermoplastics. The result is a lightweight, secure, and rapidly-deployable thermal storage solution that can be set up in minutes and lasts for decades.”

PV magazine, April 2024

“PowerPanel is taking a different approach: that of combining simple, safe, and easy to manage hot water with advanced thermoplastic technology and architecture—eliminating both the issues with old-fashioned steel tanks and the inherent risks of the newer exotic, inorganic thermal storage schemes... The adaptable materials that form the Tank cover the range of thermal applications, enabling either hot or cold storage from 200°F to as low as -25°F.”



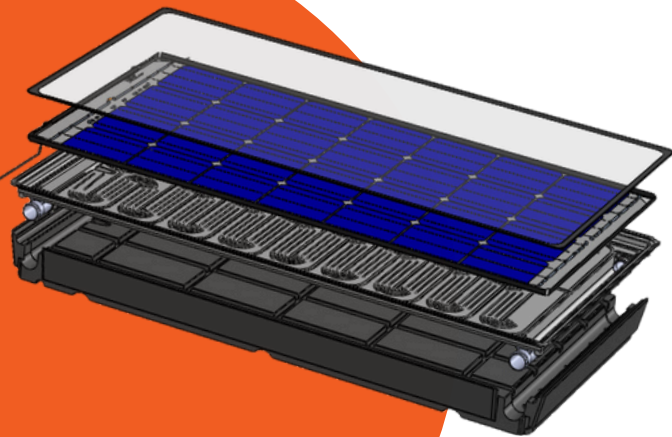


Complete **GEN₂O** Integrated System

- Maximum output from a minimal footprint, over 4X that of solar PV/electric or solar thermal systems alone. Full utilization of valuable rooftop or site space
- A scalable system with custom expandable arrays, from from 8-20 PV/T modules. Thermal Tanks can be added and “cascaded” to increase storage
- Self-contained energy generation—produces sufficient electricity to power on-board pumps, external heat pumps, and other water management components without the use of grid electricity. Can also be grid-tied for flexibility
- Off-Grid version is complete with all the necessary solar/PV balance-of-system components, including inverter, charge controller and storage batteries. Can operate 24/7 and during inclement weather with reduced insolation
- High and low latitude racking options available, for use in any location
- Made-in-U.S.A—qualifies for all Federal and local incentives Ideal for “Green Infrastructure” projects

PhotoVoltaic/Thermal (PV/T) hybrid energy panel

- Peak power density is over 4X greater than a PV panel alone can produce
- Glazed outer shell is manufactured using a glass-reinforced plastic material and injected with a high-temperature rated PUR foam made by BASF, with the liquid flow channels for heat collection molded into the enclosure’s structure itself
- PV-generating insert (blue layer) is also encapsulated into the shell. Because the molded-in liquid flow channels both collect solar heat and cool the PV layer they support, the *true hybrid* dual-energy stream PVT single module is superior in efficiency to conventional PV/solar-only panels at generating electricity
- Patented technology, exclusively from PowerPanel

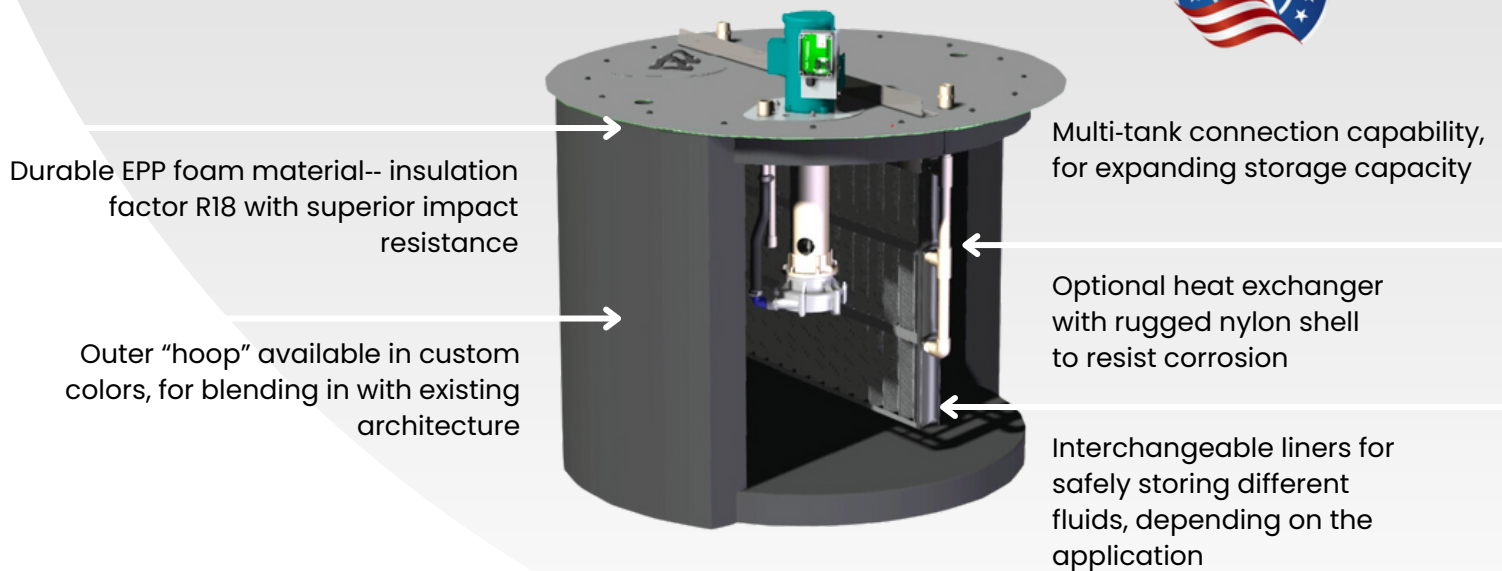


HVAC & Plumbing Product News, August 2024

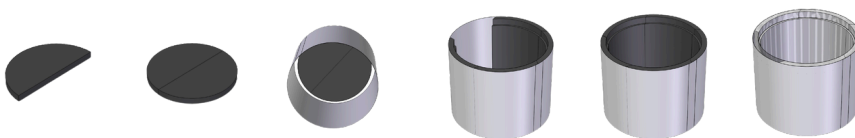
“PowerPanel’s NEW Gen₂O Thermal Tank is a departure from the steel types of tanks commonly used to store hot water... made from lightweight, modular ‘building block’ sections of expanded polypropylene foam. While much lighter in weight, it provides up to twice the insulation capability at a fraction of the energy storage costs of tanks made from conventional materials. A Gen₂O Thermal Tank will lose just a little over 3.6°F of heat over a 24-hour period.”

Thermal Tank

- Made from lightweight, modular “building block” sections of Expanded Polypropylene (EPP) foam—an engineered thermoplastic material. Impervious to the rust and corrosion common with steel tanks. Especially ideal for locations with RO (reverse osmosis) water
- Tank capacities start at 350 gallons/1,350 liters
- Stores hot or cold fluids, from -25°F to +200°F
- Superior insulation—loses only 2°C / 3.6°F of heat over a 24-hour period. Retains heat at night and under low solar conditions
- Motorized pump module using durable Noryl plastic
- Tank designed to accommodate multiple options, including heat exchanger
- Patented technology, exclusively from PowerPanel



SIMPLE ASSEMBLY- SETS UP IN LESS THAN 10 MINUTES; CAN BE EASILY TRANSPORTED AND HANDLED ON-SITE



EPP foam pieces are inserted into a durable “hoop”, made from lightweight, durable corrosion-resistant and recyclable

The foam sectional pieces form an insulated tank inside the hoop, and are completed within a customizable liner for different fluids

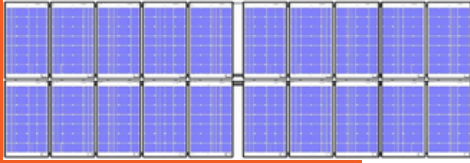
The final tank with hardware and options installed. The entire process takes less than 15 minutes and can easily be handled by two people. The empty tank weighs just a little over 100 lbs for easy transport, handling and set-up



Scan QR Code to watch the Lunch & Learn video on PowerPanel’s breakthrough PV/T technology

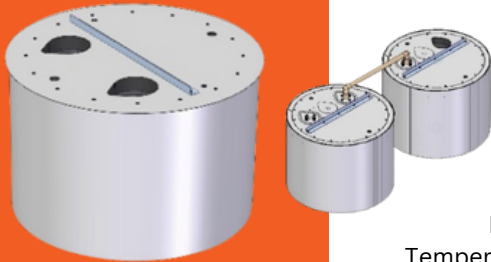
Integrated System Specifications (Grid-Tied & Off-Grid Versions)

PVT Array



Reference Assembly Number	PPRM0611.01
Electrical Generation DC peak at STC	2,700 Watts
PV Cell	HJT N type - 28 cells in series per module
Module Voc	19.1 Volts DC
Module Isc	9.38 Amps DC
Thermal Generation (peak Delta T = 0)	12,700 Watts
Module Intercept per ISO 9806	0.751
a 1 slope per ISO 9806	3.570 Watts per m ² °K

Thermal Storage Tanks



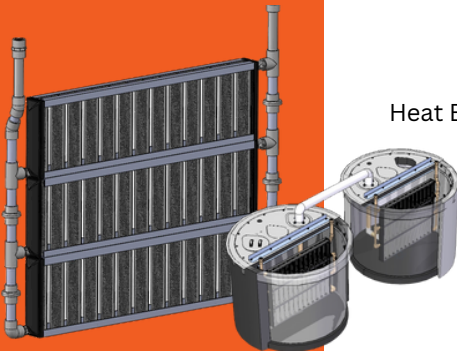
Reference part number	PPTS0115.03
Multi-Tank Connection reference part number	PPTS0123.02
Storage volume	350 gallons (1,350 liters)
Diameter	60 inches (1.524 m)
Overall height	49.6 inches (1.259 m)
Weight (no fluid)	114 lbs (51.5 kgs)
Weight (filled with water)	3,089 lbs (1,402 kgs)
Floor Loading (filled with water)	157.4 lbs per sq ft (769 kgs per m ²)
Energy storage per °C temperature	1.56 kWh (5,353 BTU)
Energy Storage @ 35°F C Temp Delta	54.6 kWh (186,350 BTU)
Temperature loss- 24 hour (free convection)	2.1°C (3.8°F)

Pump Module and Controls



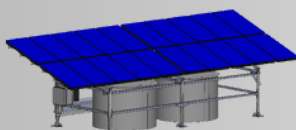
Pump Module - Reference Part Number	PPPL0001.06
Motor (standard)	1/2 hp washdown, 90 VDC
Pump Head Material	Noryl Plastic
Performance (water)	35 gallons/minute at 30 foot head height
Level Sensor	Float type- Hall effect
Temperature Sensor	NTC (Negative Temp Coefficient)
Weight	22 kgs (48 lbs)
Thermal Control	Embedded WiFi-enabled microprocessor
Control Type	Differential Temperature
Monitoring Type	Web based MQTT architecture
Power Supply (Moto)	120 to 240 VAC; to 48 VDC
Power Supply (Controller)	48 VDC to 12 VDC

Heat Exchanger



Heat Exchanger reference part number	PPPL0484.02
Type	Immersive, 8 bar
Body construction	Nylon plastic
Plumbing construction	1 inch SCHD 80 CPVC pipe & fittings
Heat Exchanger Connection (inlet and outlet)	1 inch female tapered pipe
Heat transfer rate (SI)	38 kW @ 28 liter per minute flow
Heat transfer rate (Imperial)	130,000 BTU per hour @ 7.4 GPM
Maximum flow rate	233 liters per minute (60 GPM)
Operating Pressure	5.5 Bar (80 psi)
Minimum operating temperature	-40°C (-40°F)
Maximum operating temperature	121°C (250°F)
Weight	9 kgs (20 lbs)

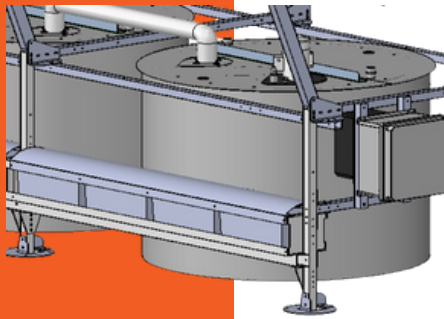
Power Output Specifications-- Standard & Customized Systems



Modules	PV Peak Electrical (kW DC)	Peak Thermal (kW)	Total Power (kW)
20	2.7	12.4	15.01
200	27.0	123.6	150.6
400	54.0	247.2	301.2

Off-Grid Version Adds:

Battery Energy Storage System



System	Two 48 VDC battery banks, with DC charge controller and 3,000 Watt AC inverter (120 VAC -60 Hz)
Storage Battery Type	Eight AGM 12 Volt Total system storage = 20 kWh @ 24 hours withdraw
Charge Control Inverter	Morningstar TS-MPPT-45; 45A, 48VDC OutBack Power FXR3048A, output: 3.2 kW continuous, 6 kW peak
Control Box	Master battery to inverter switch. 40A breaker switch; USB charge ports
Cabling	100-foot, 12-gauge extension cable

Water: Filtration & Distribution



Water Filtration Module reference part number	PPPL0532.02
Primary Filter	5 micron sediment
Secondary Filter	5 micron activated carbon
UV Sterilization	Wyckomar UV250
UV Dosage	40 mJ/cm ² @ 4.2 GPM (15.9 LPM)
Water Intake Pump	12 VDC - 9 ADC stainless well pump
Pump Output	4 GPM (15.1 LPM)
Pump Hose	1/2 inch PEX tubing
Water Distribution Pump	12 VDC pressure demand
Pump Output	6 GPM (22.71 LPM)
Distribution Hoses	Three; 100 foot high purity 3/4 in hoses
Hose Connections	3/4 inch garden hose thread

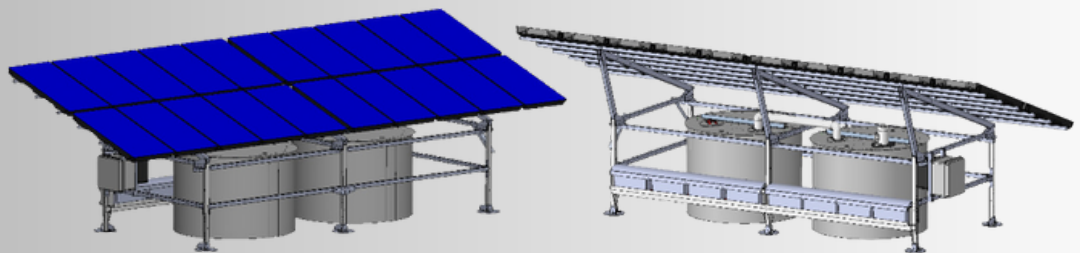
Optional content: Starlink satellite



Mounting	Intergrated on array structure
Antenna	Electronic Phased Array
Field of View	110°
Orientation	Software Assisted Manual Orienting
Weight	2.9 kg (6.4 lb), 3.2 kg (7 lb) with kickstand
Environmental Rating	IP67 Type 4
Operating Temperature	-30°C to 50°C (-22°F to 122°F)
Wind Speed	160 kph+ (100 mph+)
Snow Melt Capability	Up to 40 mm/hour (1.5 inches/hour)
Power Consumption	Average: 75 - 100 W

Weights & Dimensions Assembled (Complete System)

Off-Grid Version Shown



High latitude (W x H x D)	P291 inches x 136 inches x 88 inches
Installed footprint-High latitude	6.5m ² (177.5ft ²)
Low latitude (W x H x D)	291 inches x 101 inches x 95 inches
Installed footprint-Low latitude	18.6m ² (200ft ²)
Shipping, single unit (inches)	4 pallets; 41 x 58 x78 each, plus one 96 inch-long skid
Net Shipping Weight, Grid Tied Version	1,429 kg (3,150lbs)
Net Shipping Weight, Off-Grid Version	1,572 kg (3,466 lbs)

Success Story from Installations in the Field

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Bolongo Bay Beach Resort, U.S Virgin Islands

Struggling with some the highest electricity costs in the USA, the Bolongo Bay Beach Resort turned to PowerPanel for a more cost-effective alternative to utility power. PowerPanel's solution combined the Gen₂O Integrated System and optional Heat Pumps—along with ample hot water storage using 4 Thermal Tanks—to produce enough hot water to meet the resorts entire needs. The result: electricity costs effectively reduced of from 0.42 cents per kWh to 0.06 cents, with an anticipated “bottom line” savings for the resort of over \$9,000 a year.



BVQ Lofts, Cleveland, Ohio

A luxury apartment building in a renovated district consisting of 69 units, the location consumes over 1,200 gallons of hot water per day. PowePanel's Gen₂O Integrated System was augmented with enough Thermal Tank storage capacity for 2,100 gallons, ensuring that the facility has an ample, dependable supply of hot water day in/day out. With the Thermal Tank's superior insulation performance from its EPP thermoplastic construction, heat losses are held to just 2°C/3.8°F per day—delivering enough solar thermal autonomy to “ride out” extended periods of reduced sunlight due to weather conditions, especially during the Ohio winters.



Winward Passage Hotel, Saint Thomas, U.S. Virgin Islands

Another high-profile hospitality venue in the Caribbean that turned to PowerPanel's Gen₂O system to reduce their energy costs and improve conditions for their guests. Using a single-tank system, the facility is now saving approximately \$6,000 per year through over 10kW of peak thermal energy output generated and stored on-site—a dramatic return-on-investment.



North American Clean Energy magazine, December 2024

“The PV generated enables the [PowerPanel] system to function as its own self-contained ‘power plant’ to run the water and heat pumps, heat exchangers, and other devices that comprise a hot water production and delivery system. Such a system can supply an entire commercial facility with enough ‘net zero’ hot water to meet its entire needs.”



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