

# POWER+ GENERATOR

**GENERATE UP TO 125 KWE FROM LOW TEMPERATURE HEAT**

*MAXIMIZE EFFICIENCY WHILE MINIMIZING COSTS*



HEAT SOURCES

FLUID: 70 - 150°C

GASEOUS: GREATER THAN 150°C

**UPCYCLING WASTE HEAT INTO CLEAN ELECTRICITY.  
THE FUTURE OF ENERGY EFFICIENCY.**



# PRODUCT OVERVIEW

ElectraTherm's Power+ Generator uses the Organic Rankine Cycle (ORC) along with proprietary technologies to convert sources of low temperature heat and waste heat - such as jacket water and exhaust gases - into usable power (plus up to 85°C hot water in CHP applications) with no additional emissions or fuel consumption. With units available in the 75 kW and 125 kW sizes, the Power+ Generator is ideal for small to mid-scale applications. With a 250 kW model in development coupled with the units' scalable design, any size operation now has the ability to upcycle their heat into power using our industry-leading ORC systems. Both Power+ Generator models are available standalone or as a system package that includes a liquid loop radiator and cold water pump. Higher temperature heat sources such as exhaust gases or thermal oils require an additional heat exchanger.

Utilizing heat loads for ORC power generation also significantly reduces the cooling load, which can lead to the system serving as a radiator / cooling tower alternative. Customers achieve a range of financial and environmental benefits through increased energy efficiency, reduced cooling costs, and reduction in emissions through the offset of grid power using onsite sustainable baseload heat to power generation.



**4400B / 4400B+**

GENERATE UP TO 75 KWE

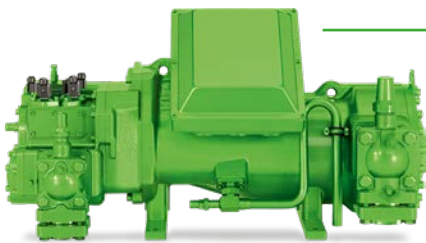
- // The 4400B is ideal for heat sources up to 116°C.
- // The 4400B+ is ideal for heat sources up to 150°C.
- // Weight: 3,290 kg
- // Dimensions: 2.4m x 2.0m x 2.3m (W\*L\*H)



**6500B / 6500B+**

GENERATE UP TO 125 KWE

- // The 6500B is ideal for heat sources up to 132°C.
- // The 6500B+ is ideal for heat sources up to 150°C.
- // Weight: 4,273 kg
- // Dimensions: 2.0m x 3.3m x 2.5m (W\*L\*H)



All ElectraTherm ORC systems are powered by BITZER's semi hermetic, twin screw expander. This allows ElectraTherm's ORC process to utilize much more variable heat sources than leading turbine technologies thanks to greater transient operation that allows for "wet" dual-phase flow and greater turndown ratios allowing for continuous power generation when dealing with inconsistent thermal input.



## CUSTOM SOLUTIONS ENGINEERED JUST FOR YOU

We at ElectraTherm know that every project is specific, therefore every project requires a specific solution. Our team of engineers and technicians are at your full disposal to identify the best solution that fits your needs. We individually analyze your site conditions and the environment to determine which ORC product is right for you.

Unsure of the thermal energy available or where to start? Our analysts will assist you from initial interest to final implementation, and beyond. ElectraTherm will be standing by throughout the product life cycle to ensure smooth and seamless operation.

## FLEXIBLE OPERATION

### FAST START

#### FAST START

After installation and configuration, the system is set by default to go from “off” to full load in 60 seconds. Depending on site conditions this time can be turned down to as little as 15 seconds. This is the only point the system will consume power that is not its own.

### FULL LOAD

#### FULL LOAD

At full output our heat recovery systems boost efficiency as much as 10% with no additional fuel consumption. This amounts to an extremely low levelized cost of electricity, making the system a great sustainable asset for any size operation. Our units are modular, scalable, and mobile so you can use them however, whenever, and wherever you need to.

### VARYING LOAD

#### VARYING LOAD

The ability to automatically load-follow allows you to leave the machine unattended, confident that it will continue operation as long as there is hot water. This opens up opportunities across industries that may have heat but an inconsistent flow.

### LOW LOAD

#### LOW LOAD

Another benefit of using a twin screw expander is the ability to produce electricity from low-temperature sources previously seen as uneconomical for power generation. While a heat source may not provide enough thermal energy for maximum output, any heat upcycled into clean electricity is energy not wasted.

### FAST STOP

#### FAST STOP

When site conditions become too volatile or the hot water source is suddenly cut off, the unit will perform an emergency stop. Unlike other ORC solutions on the market that breakdown and become bricked when fluctuations occur repeatedly, ElectraTherm’s solutions are built to withstand abrupt changes in conditions.

The system’s ability to operate remotely gives you peace of mind knowing the machine will automatically perform day-to-day, year-to-year with minimal disruptions.

# POWER+ GENERATOR SPECIFICATIONS

## 4400B // 4400B+ PARAMETERS

Heat Sources	Liquid: 70 - 150°C Gaseous: Over 150°C*
Thermal Input	4400B: 380 - 1050 kWth 4400B+: 380 - 1450 kWth
Hot Water Inlet Temp // Flow Rate: 3 - 15 l/s	4400B: 70 - 116°C 4400B+: 70 - 150°C
Cold Water Inlet Temp // Flow Rate: 6 - 18 l/s	Inlet Range: 4 - 65°C
Heat Rejected	4400B: 380 - 980 kWth 4400B+: 380 - 1365 kWth
Electrical Output	Up to 75 kWe**
Ambient Operation	0 - 38°C***
Minimum Temp Differential	27°C
Liquid Loop Radiator (LLR)	Approach to ambient air: 11°C

## 6500B // 6500B+ PARAMETERS

Heat Sources	Liquid: 70 - 150°C Gaseous: Over 150°C*
Thermal Input	6500B: 400 - 1700 kWth 6500B+: 400 - 2200 kWth
Hot Water Inlet Temp // Flow Rate: 3 - 25 l/s	6500B: 70 - 132°C 6500B+: 70 - 150°C
Cold Water Inlet Temp // Flow Rate: 9 - 26 l/s	Inlet Range: 4 - 65°C
Heat Rejected	6500B: 400 - 1600 kWth 6500B+: 400 - 2000 kWth
Electrical Output	Up to 125 kWe**
Ambient Operation	0 - 48°C***
Minimum Temp Differential	27°C
Liquid Loop Radiator (LLR)	Approach to ambient air: 13°C

\*Higher temperature heat sources require an additional heat exchanger.

\*\*Output depends on the inlet temperatures, the differential, and flow rate.

\*\*\*Extreme environments may require additional equipment.

## DESIGN ATTRIBUTES

Working Fluid	R245fa (Pentafluoropropane)*
Working Fluid Quantity	4400B (200 kg) // 4400B+ (200 kg) 6500B (200 kg) // 6500B+ (250 kg)
Refrigerant Plumbing	Built to ASME and CE standards
Power Block	BITZER Semi-Hermetic Twin-Screw Expander
Generator	Grid-tied Induction (Brushless Construction, Asynchronous)
Heat Exchangers	Compact, brazed plate construction
Controls	Custom programmable logic controller
Remote Monitoring	Machine accessible with included VPN router
Operation	Designed for unattended operation
Grid Protective Relay	External additional GPR interface included
Cabinet	NEMA 3R outdoor rated // IP 54 compliant
Sound Pressure (@ 1 Meter)	78 dBa // Attenuated Option: < 70 dBa
Power Factor Correction	Load and site dependent - from 0.9 to 1
Total Harmonic Distortion	< 3%
Emissions Profile	Zero (closed binary cycle)
Design Life	20 years

\*R245fa is a non-flammable and non ozone-depleting working fluid.

## 4400B // 4400B+ OPTIMIZATIONS

Conditions	High Temp Low Flow	Low Temp High Flow	CHP
Hot Water Temp (°C)	150	132	150
Cold Water Temp (°C)	25	25	60
Flow Rate (l/s)	4	11	10
Output (kWe)	75	75	75
Thermal Output (°C)	0	0	85

## 6500B // 6500B+ OPTIMIZATIONS

Conditions	High Temp Low Flow	Low Temp High Flow	CHP
Hot Water Temp (°C)	150	136	150
Cold Water Temp (°C)	25	25	62
Flow Rate (l/s)	7	23	23
Output (kWe)	125	125	125
Thermal Output (°C)	0	0	85

## GOOD FOR BUSINESS

### SIMPLE



The simple and flexible nature of our ORC solutions allow them to be adjusted to fit the needs of any application. A robust, modular, and scalable design allows the system to be easily integrated into existing processes while allowing for future adjustments. Able to successfully operate at partial loads with varying conditions also means that the system will produce electricity even when your processes are not at full capacity.

### RELIABLE



Every ElectraTherm product goes through a rigorous testing process at our world-class R&D test facility to ensure absolute reliability. Our technicians and dedicated global partners offer full support for any issues you may encounter throughout the product lifecycle.

### PROFITABLE



Our systems use existing heat as fuel, keeping operating costs minimal. ElectraTherm converts this heat into clean electricity, ready immediately. This increases total energy efficiency - up to 10% - while substantially reducing energy consumption. Our offerings may also qualify for local sustainability incentives as well as enabling micro-grid functionality in remote regions.

### SUSTAINABLE



Over 50% of energy used in power generation and industrial processes is lost as heat - making this heat an enormous source of renewable energy. Increasing energy efficiency by upcycling this waste heat into emission-free electricity is the single easiest way to mitigate emissions and achieve sustainability goals.

## FACTORS THAT MAKE A SUCCESSFUL APPLICATION

### HEAT

**The amount of heat available is the largest factor in determining if a heat source is viable for ORC heat recovery. While heat sources as low as 70°C can be used, heat sources above 90°C are considered ideal. Other variables that play a role in determining output are the flow rate and hot/cold water temperature differential.**

### RUN HOURS

**The more time an application is operational, the more heat there is available to convert into electricity. There are 8760 hours in a year and suitable applications will experience 80% up-time, however applications with 90% up-time offer the best economics.**

### COST OF POWER

**Installing an ElectraTherm ORC heat recovery system comes with several benefits, from reduced carbon footprint to increased efficiency. However the most tangible benefit realized is the value of electricity produced. Ideal projects have electrical costs greater than \$0.10/kWh.**

## ...AND THE PLANET

Corporate environmental responsibility, or a company's duties to minimize their carbon footprint and to abstain from damaging natural environments, has become increasingly more important in today's modern age. While it will take decades to achieve the sustainability goals set by nations around the globe - there are steps to be taken today that over time will make a large impact. The simplest of these steps is converting heat into electricity through an ORC. This increases fuel efficiency, thus reducing fossil fuel consumption and emissions. Additionally, the ORC process offsets the cooling load 70-100%, leading to significant energy savings and the potential for the system to serve as a radiator / cooling tower alternative. The system also has the ability to capture gas that would otherwise be flared and generate power. Boosting energy efficiency with ElectraTherm is practical, profitable, and improves your bottom line as well as the environment.

### WHAT ONLY 5 POWER+ GENERATORS COULD DO FOR YOU...\*



#### CLEAN ELECTRICITY PRODUCED

The clean power generated is equivalent to the emission offset of 620 homes' electricity use annually, or 140,000 cylinders of propane used for backyard barbeques.



#### CO2 ELIMINATED

By taking advantage of a resource you already have, you generate 4.8 GW of clean electricity and offset the equivalent of 3,400 metric tons of carbon dioxide annually.



#### CARS NOT DRIVEN

Your annual pollution offset is equivalent to taking 740 cars off the road, or reducing gasoline consumption by 385,000 gallons.



#### CARBON ABSORBED BY TREES









Your annual pollution offset is equivalent to the carbon sequestered by a 4,200-acre forest, or 160,000 mature trees.

SOURCE: EPA GREENHOUSE GAS EQUIVALENCIES

\*CALCULATIONS BASED ON (5) 6500B POWER+ GENERATORS GENERATING 110 KW NET EACH.



# HIGHLIGHTS

-  Zero emissions or fossil fuel requirements.
-  Closed-loop system with simple water and grid connections.
-  Reduce fuel consumption and emissions up to 10%.
-  Modular, scalable system that can be adjusted to fit changing needs.
-  Developed in cooperation with the Department of Energy.
-  Automated control system with remote monitoring and operating capabilities.
-  Allows dual-phase flow, is well suited for transient operation, and has industry-leading turndown ratios.
-  Low operating costs and qualifies for many sustainability incentives.

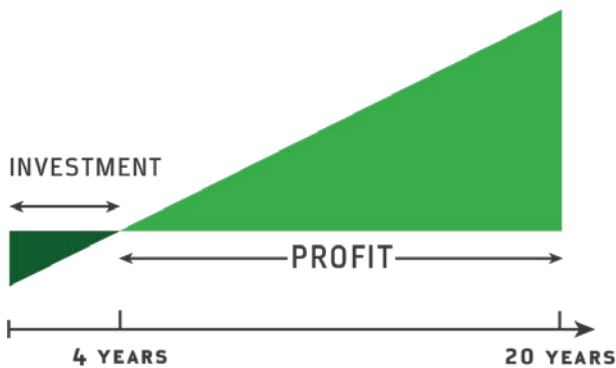


## CASE STUDY

- // 500 kW air compressor + 4400B
- // 8760 hours of operation annually
- // Power output: 45 kW
- // Annual power output: 394 MWh

## COST SAVINGS

- \$39,400 per year at \$0.10/kWh
- \$59,100 per year at \$0.15/kWh

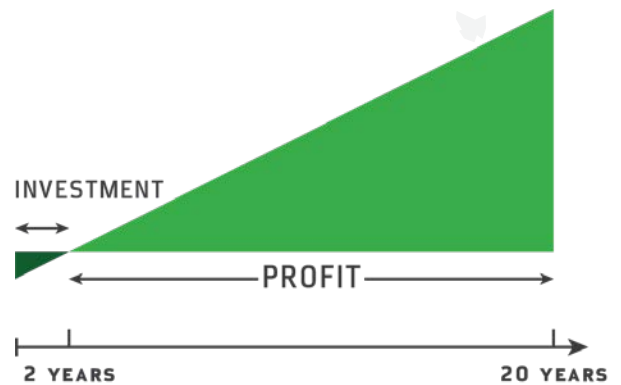


## CASE STUDY

- // 1.1 MW engine + 6500B
- // 8000 hours of operation annually
- // Power output: 110 kW
- // Annual power output: 880 MWh

## COST SAVINGS

- \$88,000 per year at \$0.10/kWh
- \$132,000 per year at \$0.15/kWh





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GOOD FOR BUSINESS.  
GOOD FOR THE PLANET.

## WHO WE ARE

ElectraTherm is a global leader in low temperature heat recovery using Organic Rankine Cycle technology. ElectraTherm has shipped over 100 ORC units to over 14 countries, achieving over 2,000,000 hours of operation. Being supported by BITZER, the world's largest independent manufacturer of compressors comprised of over 3,500 employees, allows the ElectraTherm team to continue developing waste heat recovery technology that is good for business and the planet.

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