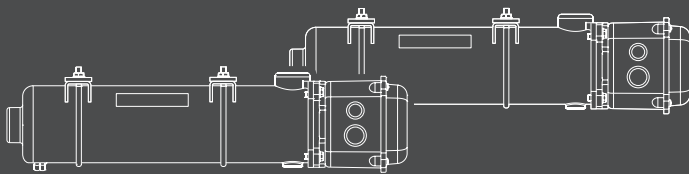


## Efficiency is Everything

Carbon footprint reduction is a key component of clean building sustainability efforts. Engine heaters on standby generators are an untapped source for energy efficiency. With a retrofit of Hotstart's CVC High Efficiency Engine Heater, end-users can see reduction in energy draw by up to 70% through the use of variable speed air-source heat pump technology.

## Existing Heaters

Reliable redundancy is achieved by plumbing the CVC in series with the existing engine heaters installed by the genset OEM. These resistance heaters work in tandem with the CVC through fully integrated and programmed controls, assuring gensets are properly heated at any ambient temperature. Each testing enclosure contained four Hotstart CL 4kW thermosiphon heaters, two per generator.



## CL

Wattage:  
4,000 W (4 kW)  
Circulation Method:  
Thermosiphon (Convection)  
Set Temperature:  
32 °C (on) / 38 °C (off)

## CVC

Heat Capacity:  
Up to 10 kW  
GenSet:  
1 MW and larger  
Refrigerant:  
HFC-32  
Total FLA:  
Up to 20A



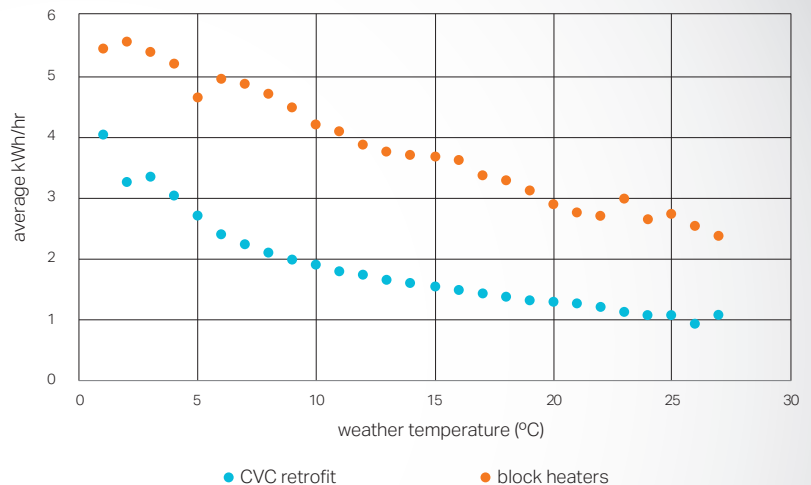
## Testing

Two identical generator enclosures at the site were selected to act as control and test environments for data capture. Both contained two Perkins 4012 engines. Each engine had two 4kW OEM heaters installed with an adjustable temperature controller.

Enclosure A served as the control environment with an engine setpoint of 32 °C (on) / 38 °C (off). Internal enclosure temperature and energy usage data was captured for both engines from May to October 2023.

Enclosure B served as the test environment. The CVC was plumbed in series with the existing engine heaters and served as the primary heater. An additional heat exchanger was included to deliver heated coolant to both engines during the same testing period. The CVC temperature setpoint was slightly higher than Enclosure A at 40 °C (on) / 42 °C (off) per engine manufacturer recommendations.

Enclosure average kWh/hr relative to outside temperature



## Energy Analysis

The CVC engine heater consumed on average 2 kWh/hr at 9 °C versus 4.5 kWh/hr for the existing heaters during the testing period. Based on this data annualized for a year and weather data for Leeds-Bradford Airport, UK, the CVC is expected to provide an estimated annual savings of 19,000 kWh or 48% of the block heaters energy usage, a significant energy savings while maintaining the engine at a higher temperature for compliance with manufacturer recommendations.

	Heat Pump	Block heaters	Savings
Model predicted kWh consumed based on TMY-2022 (EGNM)	20,700 kWh	39,800 kWh	19,000 kWh (48%)