Application Note

Heat Pump Control with the SolarEdge Home Load Controller

Version 1.2

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About

This Application Note describes how the Home Load Controller transforms a heat pump into thermal storage for excess solar energy and preserves battery life during a power outage.

Revision history

Version	Date	Description
1.2	February 2025	Updated content regarding SG ready
1.1	April 2024	Included the Home Load Controller.
1.0	March 2022	Initial release date.

Overview

Heat pumps can be adjusted to store electrical energy as heat and function as a thermal storage system. For heat pumps with onsite solar systems, excess PV generation can be stored as thermal energy for later usage. In addition, during a power outage, the heat pump can turn OFF automatically to preserve the battery's life.

Heat pumps can have solar control or Smart Grid ready (SG-ready) input. These inputs allow external signals to influence how the heat pump functions. For details, see the pump manufacturer's manual for the types of control input that you can integrate with the SolarEdge ecosystem.

Operation of the heat pump

A heat pump operates at a predefined temperature setpoint to heat/cool a space and/or heat water for household use. Heat pumps with a solar control input or a SG-Ready interface enable external signals to temporarily influence the predefined setpoints. This enables the heat pump to act as a thermal storage system for the duration of the signal. Each heat pump works differently — underlining the importance to refer to the heat pump technical manual for its capabilities and operation modes. Heat pumps can have predefined settings that increase the temperature of the room or the water heating by a preset percentage or temperature.

Configure the Home Load Controller with the heat pump

The Home Load Controller signals the heat pump to operate as a thermal storage system when excess solar power is available or to turn OFF during power outages. For installation details on the SolarEdge Home Load controller see the Home Load Controller Quick Installation Guide.

Best practices:

- Depending on the operation mode and settings of the heat pump, the Home Load Controller activates the pump's compressor, fan, and/or the resistive heating rod. This influences the average rated power consumption, and the minimum required ON time.

- During the commissioning process, you define the heat pump power rating to activate the heat pump when there is excess PV power.

- To avoid importing from the grid, define the power rating with 20% more than heat pump's maximum consumption.

- We recommend monitoring the heat pump's operation after connecting to the Home Load Controller to verify correct system parameters.

Increase heat pump consumption with solar power using a SG-Ready or digital control input

You can convert excess PV energy into thermal storage when you have a solar ready heat pump using a SG-Ready or digital control input. The Solar input is a single input contact while the heat pump's SG- Ready interface consists of two contact inputs, creating four possible operating modes.

SG-Ready heat pump operating modes

Operating mode	Relay configuration	Terminal connection	Description
OFF	ON/OFF	1:0	Heat pump is switched off.
Normal	OFF/OFF	0:0	Heat pump is working in normal mode without an external effect.
Recommended ON	OFF/ON	0:1	Heat pump is working in a recommended enhanced mode.
Forced ON	ON/ON	1:1	Heat pump must be switched ON.

To connect a control input:

Connect the Home Load Controller output to the heat pump's interface according to the manufacturer's instructions.

1. Connect the Home Load Controller's power to a power source.

2. Configure the Home Load Controller according to the following heat pump parameters:

Heat pump parameters

Parameter	Description
Load rating	When using 2-stage SG Ready, configure the two activation power levels according to the manufacturers instructions.
Minimum ON time	The minimum duration the heat pump should remain operating, even when no excess PV power is available. We recommend you define a set time of five minutes to prevent rapid ON/OFF cycles. For details, see the heat pump manufacturer's manual
Excess PV power	Enable Excess PV power. Allows the Home Load Controller to operate in excess PV mode

> **NOTE**
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> To ensure the optimal operating mode for the heat pump on SG-Ready Interface the Home Load Controller should switch between Normal and Recommended ON.