CONSUMPTION AND SAVINGS POTENTIAL

OF THE FRONIUS OHMPILOT

Version 1 02/2018

Solar Energy

GENERAL INFORMATION

The Fronius Ohmpilot is a consumption regulator designed to use excess solar power to heat water, for example. Thanks to the continuously adjustable regulation from 0 to 9 kW, surplus PV current can be put to highly efficient use and fed to suitable consumers in the household.

The Fronius Ohmpilot is primarily used to intelligently control heating elements for providing hot water in boilers and buffer storage tanks.

Additional application options for the Fronius Ohmpilot include:

- Infrared heating
- Heated towel rails
- Electric heating
- …

This document explains the functions of the Fronius Ohmpilot and compares them with other heat sources and energy management functions.
The savings potential and potential for increasing self-consumption when using the Fronius Ohmpilot will be described in this document on the basis of 7 examples.

FUNCTIONS

Continuous regulator

- The Fronius Ohmpilot can continuously operate the heating element between 0 and 9 kW. A 3-phase connection is required for this. A maximum output of 3 kW per phase is available.

power range	phase 1	phase 2	phase 3
0 - 3 kW	0 - 3 kW adjustable	-	-
3 - 6 kW	0 - 3 kW adjustable	3 kW fixed	-
6 - 9 kW	0 - 3 kW adjustable	3 kW fixed	3 kW fixed

Two heat sources

- The primary heat source could be a 3 kW heating element installed in a boiler, with a 3 kW heating element in a heating tank providing the secondary heat source. The Fronius Ohmpilot can continuously actuate these in a variable manner one after the other.
- A heat pump could also be used as a secondary heat source. This would then be triggered when there is too much surplus, or in order to guarantee a minimum temperature.
- Other heat sources such as gas, oil or pellets may also be actuated.
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Legionella prevention

- When the legionella prevention system is activated, the hot water is heated to 60 °C at a set interval.

Adapting the day curve

- This function ensures that the user-specified temperature is not undershot.
- When insufficient surplus power is available, power from the grid is used to maintain the minimum temperature.
- Alternatively, another heat source, such as a gas, oil or pellet heater, will be triggered.

Temperature limitation

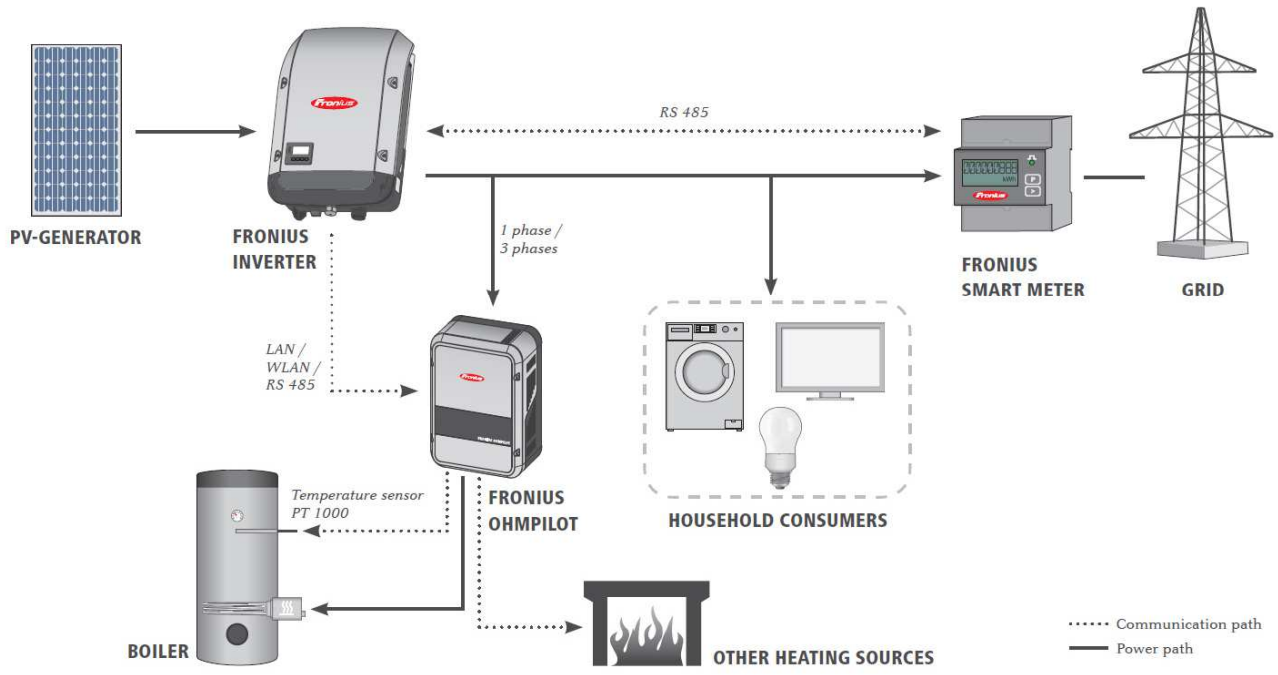
- If the heating element does not have an adjustable thermostat, this function can be used to limit the temperature.
- A PT1000 temperature sensor is required in the buffer storage tank for this.

APPLICATION EXAMPLES (CONDITIONS)

Fronius Ohmpilot as a continuous regulator for a heating element

In these examples, the Fronius Ohmpilot is always used as a continuous regulator for a heating element. The heating element is located in the boiler, meaning that only the savings potential during the production of hot water is taken into consideration.

CONFIGURATION SCHEME



The prerequisites for this are:

- Fronius inverters with integrated Fronius Datamanager 2.0 or a third party inverter with a Fronius Datamanager Box 2.0
- Fronius Smart Meter
- Buffer storage tank for hot water
- Heating element in buffer storage thanks

Assumptions for example calculations:

- Typical 4 person household with approx. 7kWh hot water consumption per day.
- Boiler with approx. 400 litre capacity
- A PV system with approx. 5 kWp
- The above means that the Ohmpilot can cover:
  - 100% of the hot water consumption for around 180 days a year.
  - 50 % of the hot water consumption for around 100 days a year.

APPLICATION EXAMPLES WITHOUT EXISTING SELF-CONSUMPTION OPTIMISATION

Comparison of combustion heaters with solar power and the Fronius Ohmpilot

Currently, gas/oil/pellet heating is installed that also heats the water. However, enough solar power would be generated in the summer months to cover the hot water consumption. Therefore, the heating system was upgraded with the Fronius Ohmpilot. This resulted in the following advantages:

1. Gas heating for hot water production

Without Fronius Ohmpilot:
- / Gas consumption for hot water approx. 3000 kWh

With Fronius Ohmpilot:
- / Potential for cogeneration of electricity and heating
- / Saving of approx. 1800 kWh of gas p.a.
- / Increases level of self-sufficiency in hot water production by 60 % p.a.
- / Increases self-consumption by + 48 % p.a.
- / Saves operating hours and more than 180 on/off cycles p.a.

→ Extends the service life of the heater
- / Triggers gas heating if no PV surplus is available

2. Oil heating for hot water production

Without Fronius Ohmpilot:
- / Heating oil consumption for hot water approx. 300 litres

With Fronius Ohmpilot:
- / Potential for cogeneration of electricity and heating
- / Saving of 180 litres of heating oil p.a.
- / Increases self-sufficiency in hot water production by 60 % p.a.
- / Increases self-consumption by + 48 % p.a.
- / Saves operating hours and more than 180 on/off cycles p.a.

→ Extends the service life of the heater
- / Triggers oil heating if no PV surplus is available

3. Pellet heating for hot water production

Without Fronius Ohmpilot:
- / Approx. 610 kg of pellets required for hot water

With Fronius Ohmpilot:
- / Potential for cogeneration of electricity and heating
- / Saving of 380 kg of pellets p.a.
- / Increases self-sufficiency in hot water production by 64 % p.a.
- / Increases self-consumption by + 48 % p.a.
- / Saves operating hours and more than 180 on/off cycles p.a.

→ Extends the service life of the heater
- / Triggers pellet heating if no PV surplus is available

4. Electric boiler for heating water

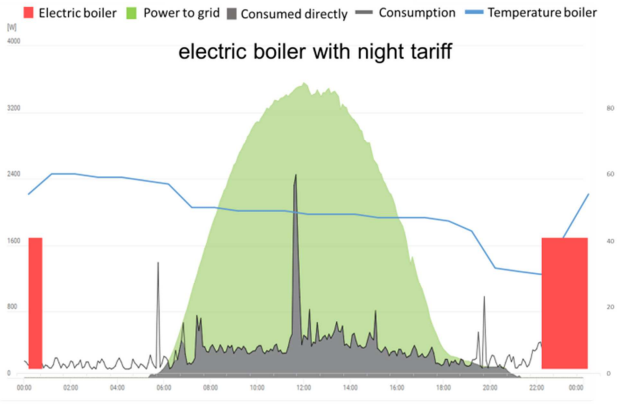
The existing system consists of an electric boiler RUNNING on off-peak electricity.

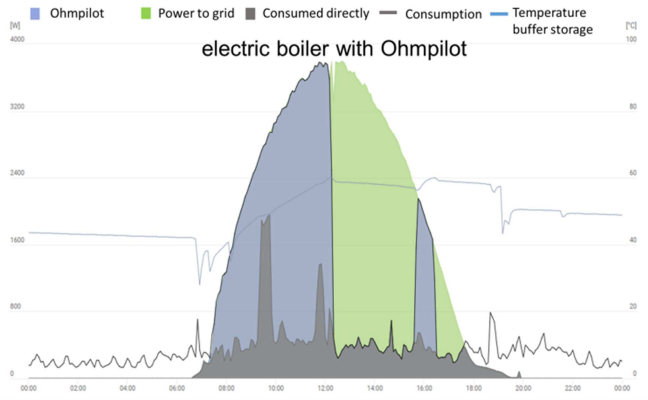
Example day with electric boiler:

/ Water is heated from 22:00 to 02:00.

Example day with electric boiler and Fronius Ohmpilot:

/ The total surplus is used in a continuously variable manner from 06:00 onwards.
/ At around 12:00 the set maximum temperature is reached.
/ The hot water temperature falls and by around 16:00 the available surplus is consumed until the maximum temperature is reached again.





/ Increase in self-consumption 0 %

/ Increase in self-consumption of 11.3 kWh
/ Increase in self-consumption of + 42 %

Summary:

Without Fronius Ohmpilot:

/ Electricity sourced from the grid for hot water 2600 kWh p.a.

With Fronius Ohmpilot:

/ Electricity sourced from the grid: Saving of approx. 1610 kWh p.a.
/ Increases self-sufficiency in hot water production by 62 % p.a.
/ Increases self-consumption by + 48 % p.a.

EXAMPLEAPPLICATIONS WITH EXISTING SELF CONSUMPTION OPTIMISATION

5. Heat pump with Smart Grid Ready On/Off Function (3 kW electric)

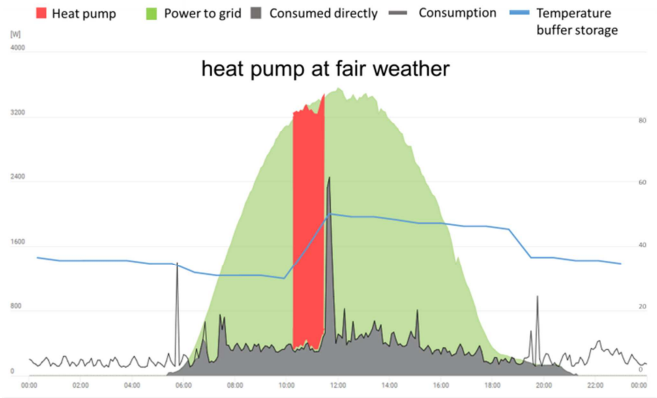
A heat pump that can be switched on and off using a Smart Grid input has been installed. This is actuated by the load management output integrated into the Fronius inverter or using an external control mechanism.

Example day with only a heat pump in good weather:

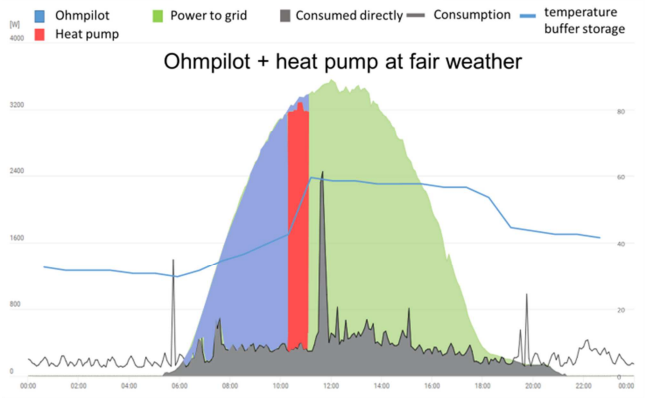
- The heat pump is triggered if more than 3 kW is fed back into the grid. This usually happens at around 10:25.
- At around 11:25 a large household consumer is turned on and therefore the heat pump is turned off.
- Since the heat pump cut-in conditions are no longer fulfilled (hot water temperature too high) the pump will not switch itself on again, even if there is a surplus available.

Example day with Fronius Ohmpilot and heat pump in good weather:

- The total surplus is used in a continuously variable manner from 06:00 onwards.
- At around 10:25 the Fronius Ohmpilot heat pump is triggered, because a total surplus of 3 kW is available.
- Any further surplus is used by the Fronius Ohmpilot from then on.
- At around 11:00 the required maximum temperature is reached → The Fronius Ohmpilot turns the heat pump and the heating element off.



- Increase in self-consumption of 3 kWh
- Increase in self-consumption of + 10 %



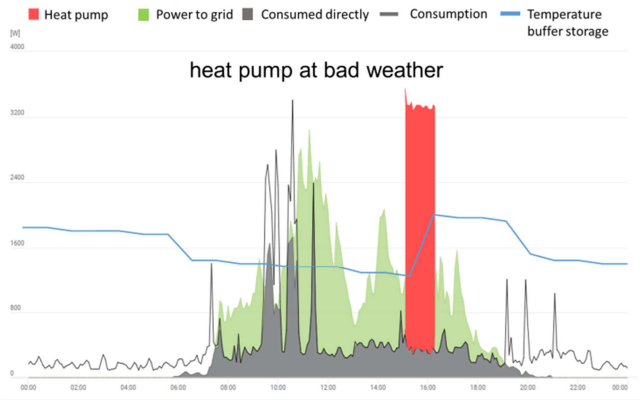
- Increase in self-consumption of 8.7 kWh
- Increase in self-consumption of + 30 %

Example day with only a heat pump in poor weather conditions:

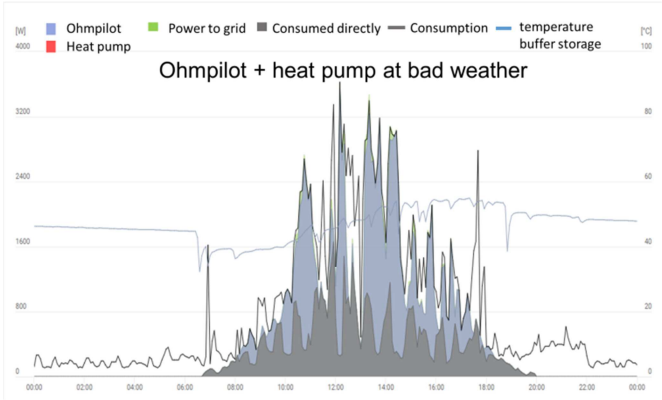
/ The heat pump is triggered for one hour between 15:00 and 16:00 as per the set minimum running time. Power is also sourced from the grid.

Example day with Fronius Ohmpilot and heat pump in poor weather conditions:

/ The total surplus is used in a continuously variable manner from 06:00 onwards.
/ The heat pump is not triggered at any time,
  / because there is never a surplus of 3 kW available
  / and sufficient surplus is available to cover the hot water consumption.



/ Increase in self-consumption of 1 kWh
/ Increase in self-consumption of + 6.8 %



/ Increase in self-consumption of 7.32 kWh
/ Increase in self-consumption of + 54 %

Summary:

Without Fronius Ohmpilot:

/ Sources electricity from the grid when PV output is unreliable (cloudy weather)
/ When the weather conditions are poor, the heat pump must be actuated for at least the minimum running time. → Sourcing electricity from the grid
/ Little increase in self-consumption
/ The size of the PV system and the electric output of the heat pump must be matched

With Fronius Ohmpilot:

/ Relatively small surpluses are consumed using the heating element in a continuously variable manner
/ When the surplus is large, the more efficient heat pump is actuated
/ Additional surpluses are then used by the Fronius Ohmpilot
/ High self-consumption even in poor weather conditions
/ Fewer on/off cycles
  → Protection of the compressor
  → Lengthens service life of the heat pump

6. Heating element on/off (3 kW electric)

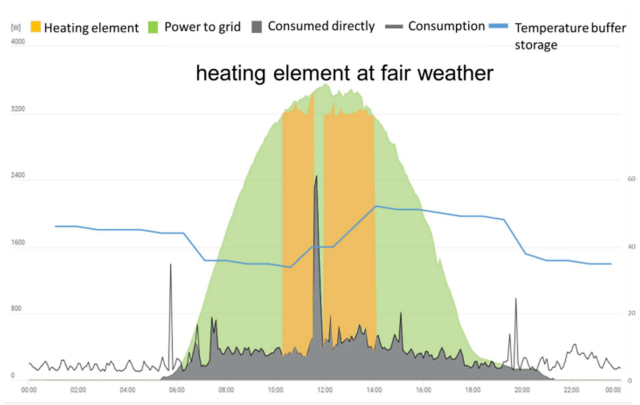
The existing heating element is actuated using the load management output integrated into the Fronius inverter or using an external control mechanism.

Example day with only a heating element in good weather:

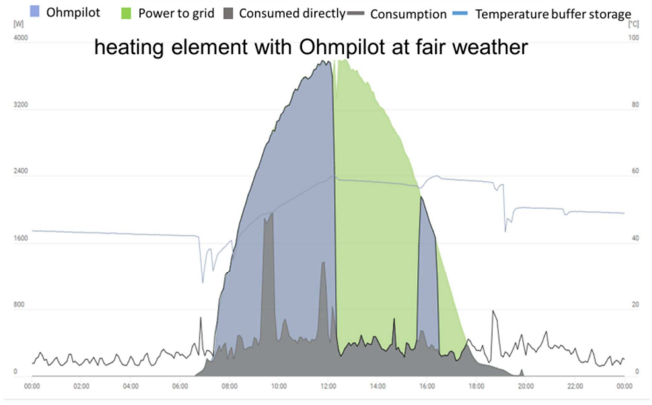
/ The heating element is actuated if more than 3 kW is fed back into the grid. This usually happens at around 10:25.
/ At around 11:25 a large household consumer is turned on and therefore the heating element is turned off.
/ The heating element is actuated again until there is no longer a surplus of 3 kW available.

Example day with a heating element and Fronius Ohmpilot in good weather:

/ The total surplus is used in a continuously variable manner from 06:00 onwards.
/ At around 12:00 the set maximum temperature is reached.
/ The hot water temperature falls and by around 16:00 the available surplus is consumed until the maximum temperature is reached again.



/ Increase in self-consumption of 8.5 kWh
/ Increase in self-consumption of + 29 %



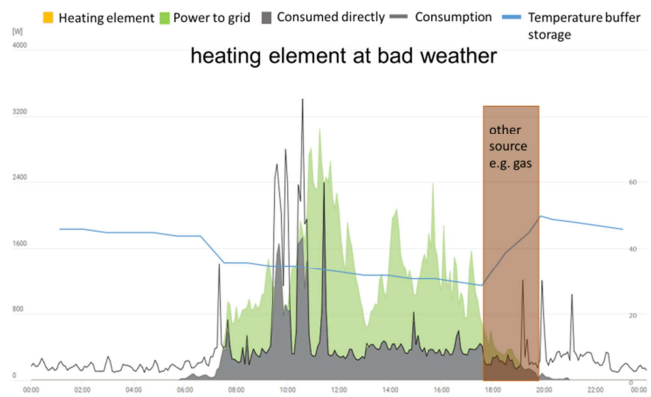
/ Increase in self-consumption of 11.3 kWh
/ Increase in self-consumption of + 42 %

Example day with only a heating element in poor weather conditions:

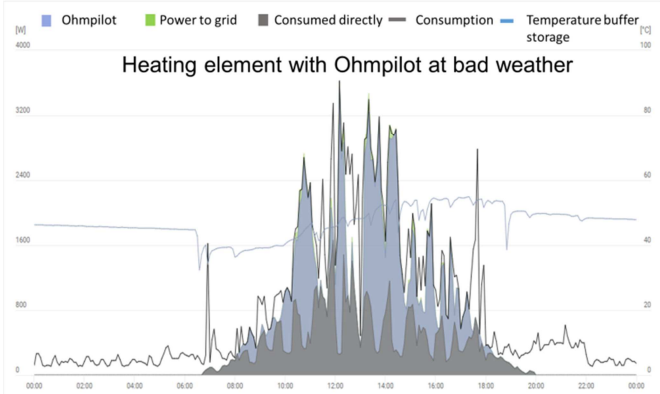
/ The heating element not actuated at any point, because there is never a surplus of 3 kW available.
/ By around 18:00 the temperature has fallen below the minimum, the water is heated by an external source such as gas-fired heating.

Example day with a heating element and Fronius Ohmpilot in poor weather conditions:

/ The total surplus is used in a continuously variable manner from 06:00 onwards.



/ No increase in self-consumption



/ Increase in self-consumption of 7.32 kWh
/ Increase in self-consumption of + 54 %

Summary:

Without Fronius Ohmpilot:
- / The size of the PV system and electric output of the heating element must be matched
- / On cloudy days, no 3kW surplus
  → heating element is not actuated
  → external heat source required (e.g. gas)

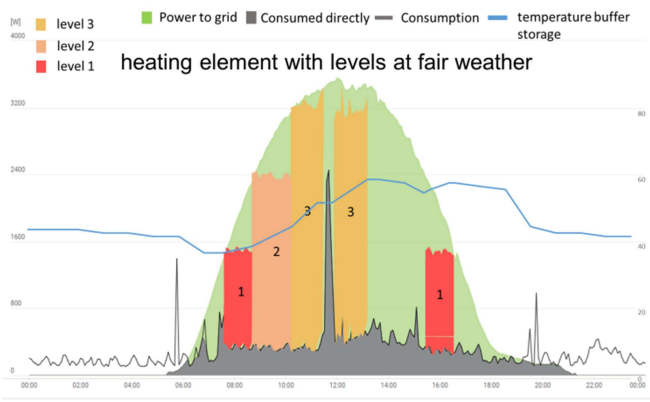
With Fronius Ohmpilot:
- / The size of the PV system and electric output of the heating element do not need to be matched
- / High self-consumption even in poor weather conditions

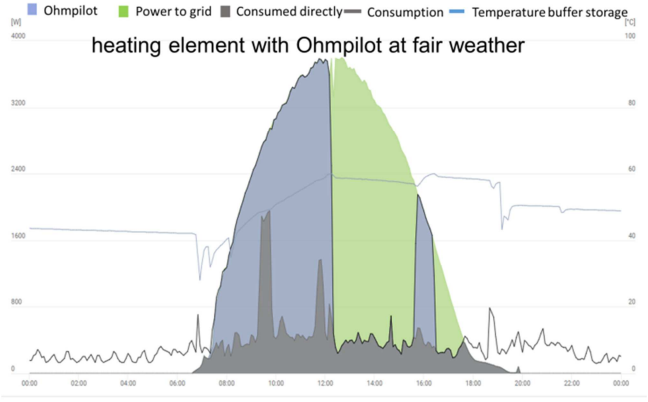
7. Continuously regulated heating element (e.g. 1,2,3 kW)

A three phase heating element with outputs of 1, 2 and 3 kW. This is operated using an external control mechanism.

Example day with only a heating element in good weather:
- / The phases are switched on or off depending on the available surplus
- / At around 13:00 the set maximum temperature is reached.
- / The hot water temperature falls and by around 16:00 the available surplus is consumed until the maximum temperature is reached again.

Example day with a heating element and Fronius Ohmpilot in good weather:
- / The total surplus is used in a continuously variable manner from 06:00 onwards.
- / At around 12:00 the set maximum temperature is reached.
- / The hot water temperature falls and by around 16:00 the available surplus is consumed until the maximum temperature is reached again.





- / Increase in self-consumption of 11.3 kWh
- / Increase in self-consumption of + 42 %

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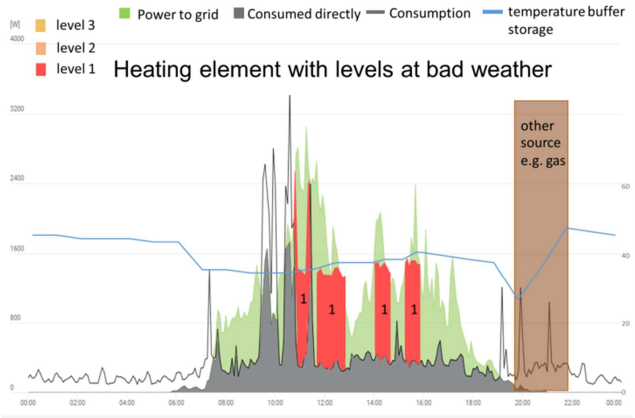
Example day with only a heating element in poor weather conditions:

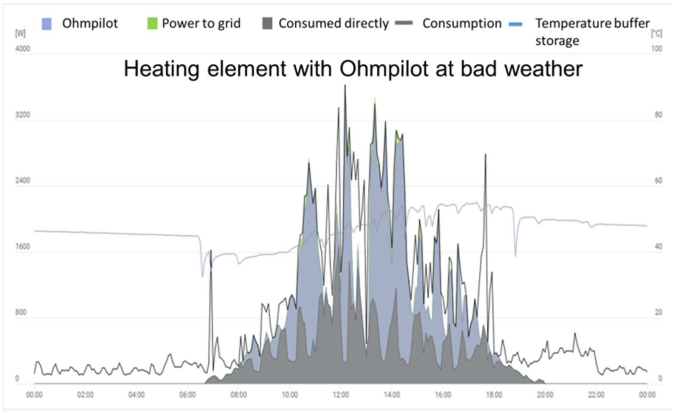
- Phase 1 of the heating element is actuated if 1 kW of surplus is available
- By around 20:00 the temperature has fallen below the minimum, the water is heated by an external source such as gas.

Example day with a heating element and Fronius Ohmpilot in poor weather conditions:

- The total surplus is used in a continuously variable manner from 06:00 onwards.



- Increase in self-consumption of 2.6 kWh
- Increase in self-consumption of + 17 %



- Increase in self-consumption of 7.32 kWh
- Increase in self-consumption of + 54 %

Summary:

Without Fronius Ohmpilot:

- In poor weather conditions there is only a small increase in self-consumption
- An external heat source is required (e.g. gas)

With Fronius Ohmpilot:

- High self-consumption even in poor weather conditions

CONCLUSION

- The example days show increases in self-consumption of + 30 % to + 54 %,
- Depending on the extent of immediate use, increases in self-consumption of + 70 % or higher are possible.
- Self-sufficiency in hot water production can be increased by + 60 % p.a.
- The Fronius Ohmpilot is able to cover the hot water consumption needs using continuously adjustable regulation, even on cloudy days.
- The service life of the available heat sources is increased since there are less on/off cycles and less cold-hot cycles.
- Reduces heat loss, rooms are not heated unnecessarily by waste heat from the burner and heating pipes.
- Additional savings are dependent on:
  - The price of energy for the available heat sources
  - The feed-in tariff for the energy generated

Troubleshooting: Please read instruction manual or call

Fronius International – Technical Support Hotline

+43 (0) 7242 241- 5670