On the path to energy self-sufficiency

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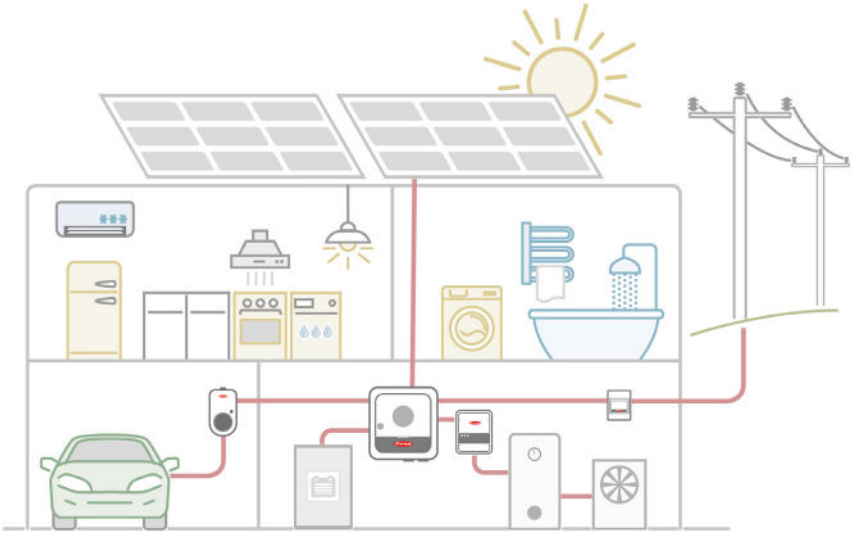
Rising energy prices show just how important it is to become self-sufficient. To achieve this, the separate energy sectors of electricity, heating, cooling and mobility need to be considered from a holistic point of view.

Our goal is to achieve 24 hours of sun. Specifically, this means generating, storing, distributing and consuming energy from solar power cost-efficiently and intelligently. Solutions that optimally bring together the different energy sectors are essential to this. The 'Energy sector integration' is mapped at Fronius via the 'Fronius energy flow management'.

The following example illustrates why energy sector integration is so important.

A 9 kWp photovoltaic system generates approximately 9,000 kWh of electricity per year. A self-consumption[1] rate of 36% results in 5,800 kWh of excess current per year. This can be fed into the grid for a low price, equivalent to driving approximately 34,000 km in an electric vehicle (e-Golf) or generating 102,000 liters of hot water (Δ 50°C).

Fronius Ohmpilot



Components house

Fronius energy flow management

Fronius energy flow management comprises four areas: generating, storing, distributing and using energy.

Generating energy

Self-generated energy should come from a renewable energy source. In addition to solar power, or photovoltaics, this also includes wind, water or a combined heat and power plant. Inverters that offer versatile and flexible solutions are required for optimal solar energy generation. Fronius offers both pure PV inverters, 1-phase or 3-phase, from 3 to 100 kW as well as hybrid inverters for storage connection such as the Fronius Primo GEN24 Plus, 1-phase, 3 – 6 kW, and the Fronius Symo GEN24 Plus, 3-phase, 3 – 10 kW. Producers for other renewable energy sources can be integrated into the Fronius system via an AC coupling.

A Fronius System Partner with end customers

Storing energy

The energy that is generated can be consumed directly or the excess can be stored in different ways and used at a later point in time. A distinction is made here between short-term, e.g., batteries, or seasonal energy storage devices, e.g., hydrogen. Fronius solutions for storing electrical energy in household batteries are implemented directly by the PV modules, or DC coupling, by means of a high-voltage battery, e.g., BYD Premium battery HVS/HVM.

In addition to electrical storage, Fronius also offers solutions for thermal storage with the Fronius Ohmpilot. This enables the PV excess to be supplied to all ohmic consumers. In addition to storing the energy via an electric heating element for hot water preparation, infinitely adjustable up to 9kW, the energy can also be supplied to an infrared heater.

Distributing energy

For a meaningful distribution of energy, it is necessary to analyze the consumption in advance. Fronius offers the Solar.web online tool for this, in which all energy flows such as generation and consumption are displayed. On this basis, the consumers with the greatest energy requirements can be filtered out and prioritized. This makes it possible to optimally distribute the energy generated, e.g. to battery, e-vehicle, heat pump, e-boiler, e-heating.

The Fronius Wattpilot offers another option for power distribution. With the help of the charging box, an e-vehicle can be charged with up to 22 kW on the AC side, or 230/400 V using excess PV. The seamless interaction between the individual Fronius components is a huge advantage over other systems: The self-generated solar power from the solar system is primarily used for the electronic devices in the household. Once all devices are supplied with PV energy, the excess electricity is used to charge the electric vehicle. If there is still more solar power available, this is fed into the public grid and the applicable feed-in tariff is applied.

Using energy

Optimum storage and use of energy requires intelligent load management. This refers to the active control of power consumption. The possibilities are numerous. If, for example, there are several ohmic loads in the home, the Fronius Ohmpilot can prioritize these. If several Wattpilot charging stations are in use, e.g., in the case of a company fleet, Fronius EMIL provides an intelligent charging management solution for exactly this application. The electric vehicles are thus optimally integrated into the energy management system. The digital outputs on the Fronius inverters also make it possible to control intelligent loads. These have several open interfaces for the

Wattpilot, Bad Wimsbach, Austria

Storage inspection

simple integration of heat pumps, charging solutions for electric vehicles, smart home systems and further applications.

Storage

In order to become energy self-sufficient, the generated energy must be stored.

Short-term storage

Battery storage systems are used for short-term storage from day to night. Fronius offers a 'DC-coupled' system for this, with which a compatible high-voltage energy storage device, e.g., from BYD, is coupled on the PV side. This makes it possible to store the PV energy directly, i.e., without having to convert it, which makes the system highly efficient. This has also been confirmed by a comparative study carried out by HTW Berlin, the Energy Storage Auditor. In a comparison between different energy storage systems, the 1-phase and 3-phase Fronius energy storage systems have achieved top rankings for the last three years.

Emergency power mode

Another advantage of the Fronius energy storage system is the emergency power supply, which allows the 1-phase or 3-phase loads to continue to be operated in the event of a grid failure. The power is supplied by the battery or directly by the PV system. Fronius Multi Flow Technology also makes it possible to recharge the battery in a backup power situation.

The supply of the entire household in the event of a power failure - including 3-phase consumers such as an electric cooker or heat pump, is also known as 'full backup' at Fronius. This is best combined with a battery.

For anyone wishing to start with something smaller, the Fronius GEN24 Plus also offers a special basic backup power option, the 'PV Point'. Here, the inverter directly controls one socket in the home, which is supplied with power in a backup power situation. This option is a cost-effective solution if only one power source is required and additional installations in the control box, as would be the case with 'Full Backup', are to be avoided.

Mobility

The company also offers a wide range of solutions for the mobility industry. With the Fronius Wattpilot, an electric vehicle can be automatically charged in the event of a PV excess. The system is available in two designs: the mobile Wattpilot GO and the permanently installed Wattpilot Home. If there is insufficient PV excess, it is also possible to charge automatically with a flexible energy tariff from below an adjustable price limit.

The Fronius EMIL is an intelligent charging management solution for fleets of electric vehicles. It was developed for commercial and industrial customers. The power supply to the vehicles is intelligent and user-based and is individually tailored to the overall operational power consumption.

What is possible with energy sector integration?

With the optimum integration of the electricity, heating, cooling and mobility sectors, not only costs but also more than 50 percent of energy can be saved.

To summarize, energy sector integration is an important driver of the energy revolution. Systems need to become simpler and smarter in order for energy sectors to be integrated as simply as possible. The energy transition should not be seen as a hurdle, but as an opportunity.

100% electrification in a private household

Consumption of a four-person household (diesel vehicle and gas heating) in kWh	Consumption of a four-person household (electric vehicle, heat pump and Ohmpilot) in kWh
Gas heating	>50% energy savings
E-charge	>50% energy savings
Vehicle (diesel)	E-charge
	E-vehicle

[1] without load management or storage

www.fronius.com/solar-energy

Solar Energy Business Unit

Founded in 1992, the Fronius Solar Energy Business Unit (BU) celebrates its 30th anniversary this year. Under the motto 'Energize your life.' we develop innovative solutions that enable solar energy to be generated, stored, distributed and consumed cost-effectively and intelligently. Fronius Solar Energy makes it possible to use the sun 24 hours a day, paving the way for a future worth living in, in which renewable energies cover 100 percent of the world's energy needs. Our solutions are sustainably developed and produced entirely in Europe, predominantly in Austria. Fronius Solar Energy is represented worldwide by 26 subsidiaries and to date can point to a total output of more than 25 gigawatts of installed inverters. Sales are handled by a global competence network of installation, service and distribution partners.

About Fronius International GmbH

Fronius International is an Austrian family-owned company with headquarters in Pettenbach and other locations in Wels, Thalheim, Steinhaus and Sattledt. Founded in 1945 as a regional one-man business, Fronius is now a global player with more than 5,660 employees worldwide, active in the fields of welding technology, photovoltaics and battery charging technology. Exports account for 92 percent of sales and are achieved with 36 international Fronius companies and sales partners in more than 60 countries. With innovative products and services and 1,321 active patents, Fronius is one of the innovation leaders on the world market.