

Syndicat pour l'épuration des eaux usées de Saint-Imier et environs, WWTP Villeret

## Energy autonomy with solar and biogas plant

The Office for Water and Waste of the Canton of Berne obliges the operators of wastewater treatment plants (WWTP) to comply with the discharge conditions for treated wastewater into water bodies even in the event of a power failure. Therefore, the operators of the WWTP must install an emergency power supply that can guarantee the operation of the essential plant components.

WWTP Villeret, which treats the wastewater of around 12,000 population equivalents in the municipalities of Renan, Sonvilier, Saint-Imier and Villeret, had to rebuild its electrical systems so that it could disconnect its combined heat and power plant, which runs on sewage and biogas, from the public grid and start it on battery power in emergency operation. Emergency load operation is controlled via the process control system.



The electrical circuits were partly renewed and supplemented by emergency operation decoupled from the public grid.

### Gas engine as emergency generator

WWTP Villeret's gas-fired combined heat and power plant can generate heat for warming the sewage sludge on the one hand and produce electrical energy on the other. What is special about this is that this gas engine is being used as an emergency power generator. Around 100 m<sup>3</sup> of the total gas reserve of 500 m<sup>3</sup> is reserved for emergency operation - enough to generate 35 kW of electrical power for four hours and thus operate the

most important elements of the plant. For a further 44 hours, the 35 kW output can be generated from biogas obtained from waste oil, stored specially for this purpose.

The process control system was expanded accordingly and now, in state of emergency operation, it distributes the existing performance specifically to the individual elements of the plant, whereby it particularly considers the needs of the biological stage. To make this emergency operation possible at all, the main electrical fuse had to be replaced. Instead of the previous mere on/off operation, the new main fuse can also automatically set the entire WWTP to emergency operation and thus decouple it from the public network.

At the same time, measures to improve normal operation were also examined in order to derive the greatest possible benefit from the installation and conversion work and the financial resources already required. This resulted in the need for a higher degree of self-sufficiency with electrical energy, which led to the construction of a photovoltaic system and a larger gas storage facility.

### Self-sufficiency increased significantly

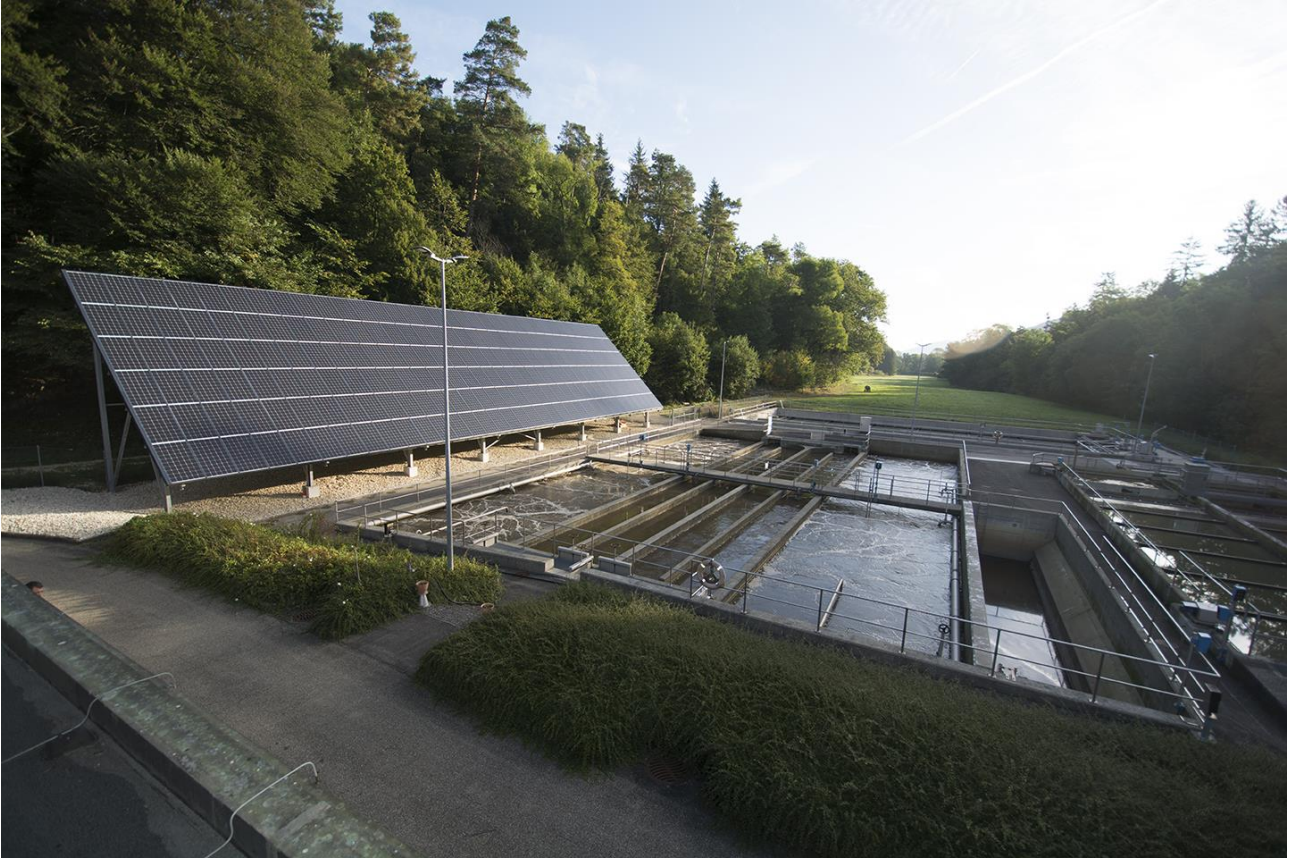
WWTP Villeret had a gasometer with a capacity of 170 m<sup>3</sup> for storing the sewage gas. However, the storage capacity reached its limits because in 2011, the WWTP decided to accept food waste from restaurants and cheese dairies and is thus producing biogas. By 2017, the increase in total gas production was around 65 per cent.

In order to increase flexibility and thus enable more efficient operation, an additional gas tank with an operating pressure of 10 bar was installed, which triples the total storage volume. This allows production fluctuations in biogas to be easily absorbed.



The additional gas tank triples the storage volume and thus creates greater flexibility. The antenna is used for lightning protection.

The new photovoltaic system was designed to generate at least 10 percent of the operating energy even under bad weather conditions. Particularly under sunny and cool weather conditions, however, it generates so much energy that the combined heat and power plant has to be cut back. Because for economic reasons it is the top priority to consume the self-generated electricity itself.



The new photovoltaic system is designed to cover at least 10 percent of the electricity consumption of the WWTP even in bad weather.

Today, WWTP Villeret meets an average of 75 percent of its total electricity needs from gas and photovoltaics. This share could even be increased if the combined heat and power unit and the photovoltaic system could always work optimally coordinated together. However, on the one hand, it would not be possible to react to every passing cloud in real time and, on the other hand, the gas engine would suffer from switching on and off too frequently.