

Wastewater can produce instead of consume energy

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Municipal wastewater contains the equivalent of 12 power plants' worth of energy. But Europe's wastewater plants consume instead of produce energy. The EU "PowerStep" project shows this can be changed.

Municipal wastewater in Europe today contains the equivalent of 87,500 GWh of energy per year in its organic matter. That's 12 power plants' worth of energy. Instead of producing this however, sewage treatment currently consumes more than two power plants' worth of energy each year. It's often the single biggest electricity expense for municipalities, accounting for more than a fifth of their power bills.

“PowerStep” is a three-year, €5-million project funded by the EU’s flagship [Horizon 2020](#) research programme that aims to transform wastewater treatment plants from net power consumers into net power producers. It has tested – at industrial scale – innovations that decrease the energy consumption and increase the energy production of these plants. This is possible at a cost similar to conventional sewage treatment whilst maintaining or even improving the quality of the treated water, the consortium behind the project says in a [short report](#) for EU policymakers issued on 23 March.

The consortium is made up of 15 partners from seven European countries. Led by the KompetenzZentrum Wasser Berlin (KWB – Berlin Centre of Competence for Water), an international centre for applied water research, its backers also include the German Environment Ministry, French company Veolia and the Technical University of Vienna.

Sewage to biogas to fuel

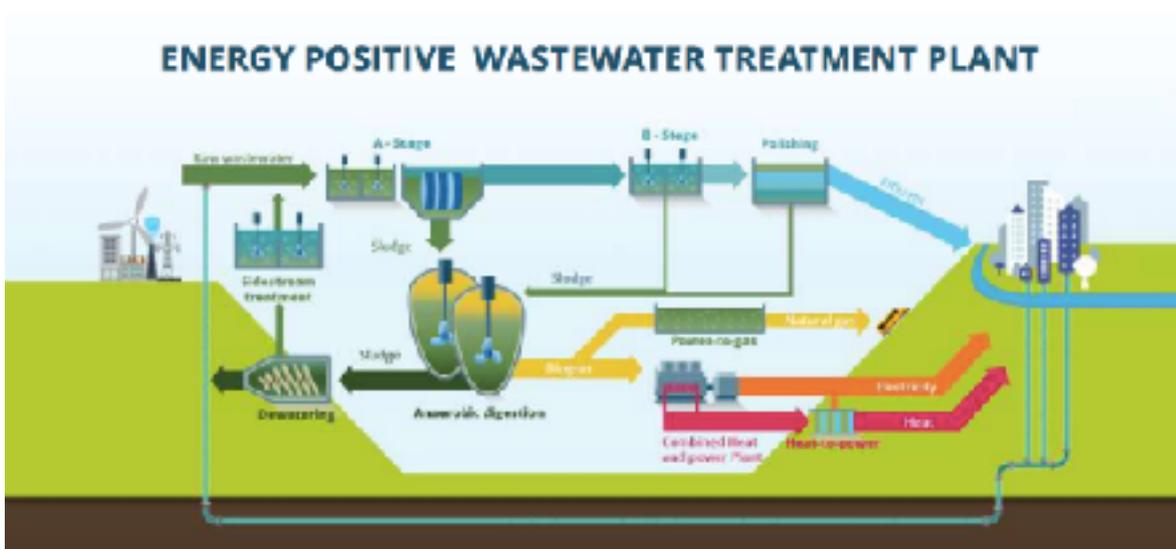
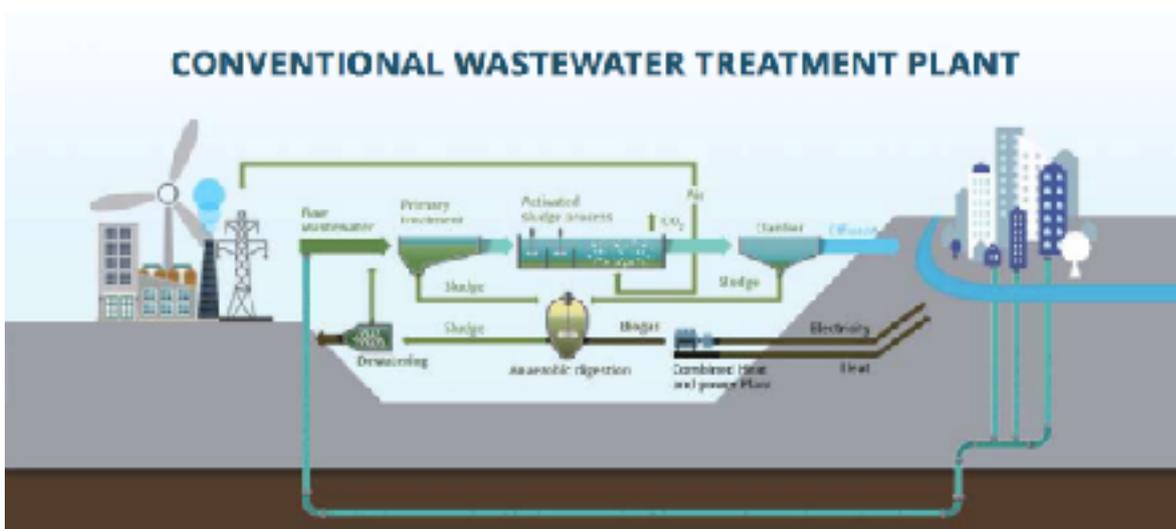
In essence, the PowerStep concept is based on the extraction of more organic matter from wastewater to turn into biogas. It does this through more efficient “primary treatment”. That biogas can either be used to power the plant itself or upgraded and fed into the grid as biomethane for use in heating or cooling, or transport (see Figure below). PowerStep is applicable to large or very large plants (>100,000 population equivalent), both existing and new.

The project’s promoters argue that their plants can contribute to each of the Energy Union’s five pillars – energy security, a fully integrated internal energy market, energy efficiency, climate action, and research, innovation and competitiveness in clean energy technologies. They want renewable energy from sewage to be explicitly incentivised by the EU’s climate and energy framework for 2030.

Energy neutrality can and should be the benchmark for large wastewater treatment plants, the PowerStep team says. Several existing plants show that this is possible. Yet these plants often rely

on external fuels (e.g. sludge from other plants) or on-site renewables production (e.g. wind or solar PV) to accomplish this. PowerStep showcases “state-of-the-art+” plants that can either power themselves or feed surplus (upgraded) biogas into the gas grid.

Biogas from sewage has some particular advantages. Unlike other forms of bioenergy, it does not compete for land. Unlike solar and wind, it is dispatchable. There is also plenty of it. Sewage sludge accounted for just under a tenth (9%) of the 15 mtoe of biogas produced from waste in Europe in 2014. Only a tenth of biogas too is currently upgraded into biomethane for direct use in transport or injection into the gas grid. With an ever stronger [push for green gas](#) however, expect this to grow (until now, nearly two-thirds of biogas has gone into power production).



From project to product

PowerStep's final conference is scheduled for 16-17 May at the [IFAT Trade Fair](#) in Munich, Germany, which is billed as the world's leading trade fair for environmental technologies. With the project coming to a close, the consortium has drawn up a list of asks to policymakers, to help implement their innovation across Europe:

1. The EU should recognise that biogas from sewage has a **lower environmental footprint** than other forms of biogas and biofuels. This should be reflected in national renewables support schemes and energy taxes i.e. biogas from sewage should get **“the highest possible levels of public support and financing”**.
2. Green public procurement (GPP) [criteria](#) for wastewater treatment plants should be extended to **promote energy neutral or energy positive plants** (today they only promote energy efficiency). That said, wastewater treatment plants should always first be made as efficient as possible, and only then upgraded to become energy producers. The consortium recommends that access to EU regional development funds is made **contingent on energy efficiency investments**, including in wastewater treatment plants.
3. PowerStep needs **power-to-gas (P2G) to be defined as a form of energy storage**. Wastewater treatment plants do P2G when they use power from the grid to upgrade biogas to biomethane. Like other forms of P2G, this is a way of storing energy that can support the further deployment of variable renewables like wind and sun power. The European Commission opens the door to P2G in its power market redesign proposals in the [Clean Energy Package](#), but this still needs to be approved by MEPs and Member States.

Separately, in a [waste-to-energy paper](#) in January 2017, the Commission identified the upgrade of biogas to biomethane as the best way of increasing the energy efficiency of anaerobic digestion.

The biggest challenge of all however, says the PowerStep consortium, is attracting the interest of EU energy policymakers in the first place. Wastewater treatment plants are not part of a country's energy infrastructure. They have to date been a more natural fit with the [circular economy](#) – another major EU initiative – as recovery points for nutrients alongside clean water. But with the circular and low-carbon economy agendas increasingly aligned, wastewater treatment plants are in a sweet spot that could tick a lot of boxes for EU policymakers.

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