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Evaluation of the French biomethane production from WWTP sludge

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The objective of the study is to consider the potential of biomethane that can be fed into the French natural gas grid from Waste Water Treatment Plant (WWTP) in 2020 and in 2050.

France - except its overseas territories - has 19,521 active wastewater treatment plants (Portal Sanitation, 2014) out of which 85 currently have an anaerobic digestion plant for sludge treatment (2014).

The study determines the entire theoretical methanogenic potential from all French waste water treatment plants estimated at **2.13 TWh / year**.

To estimate more precisely the number and location of WWT plants liable to digest sludge for biomethane injection into the grid, the approach used in this study has been to determine the breakeven points of the wastewater treatment plants classified into 5 different biogas chain configurations. The different ways of biogas production and recovery have also been taken into account (100 % injection or mixed valorwisation cases)

It is considered that a case is profitable if the internal rate of return is at least at 10 % (compared to a reference case), after taxes.

This approach is characterized by:

- **a literature review** of technical and economic characteristics of various treatments found at a WWTP, including anaerobic digestion and biogas recovery,
- **a return of experience** and collect of opinions from various experts in the field of sanitation,
- **a technical and economic analysis** of the various defined cases in relation to a reference case (without anaerobic digestion plant).

Based on the technical and economic assumptions adopted, the study concludes the following thresholds profitability:

► **60,000 Population Equivalent (PE)** for a WWT plant with a new AD plant, upgrading biogas and feed-in biomethane unit, compared to the reference case without anaerobic digestion plant,
► **45,000 PE** for a WWT plant with upgrading biogas and feed-in biomethane unit and with an AD plant existing over 15 years,
► **100,000 to 150,000 PE** for a WWTP with an anaerobic digestion plant over 15 years and a recovery of a part of the biogas by CHP and bio methane feed-in (double recovery),
► **Around 250,000 PE** for the valorisation of the biogas by CHP compared to the reference case without anaerobic digestion plant.

Below those thresholds, the use of sludge treated by co-digestion in territorial AD plants may be considered depending on local opportunities.

Thus, the technical and economic biomethane potential of the French sludge treatment plants of more than 60,000 PE represents a resource of 1.25 TWh / year in 2014. The plants between 5,000 and 60,000 PE eligible for sludge digestion in territorial anaerobic digestion units would represent an energy feedstock of 0.58 TWh / year.

For 2020 and 2050, the real biomethane potential which can be fed into the grid, was estimated using different scenarios to take into account the technical, economic and regulatory requirements that may affect the development of the sector.

The results of the study indicate the following potentials for production of biomethane for injection on the French natural gas grid from the sludge of wastewater treatment plants and other sludge treated by co-digestion in territorial AD plants:

► **In 2020: 0.06 to 0.57 TWh / year,**
► **In 2050: 0.60 to 1.81 TWh / year.**