Name of the technology: 3.2 Biogas from sewage sludge

Stage of development:

Widely used technologies (the technology is used by many actors on global/EU level).

Technical application:

Typical applications to produce electricity and thermal energy.

Short summary (up to 200 characters):

Biological wastewater treatment plant (WWTP) as a facility for removal of mainly organic pollution from wastewaters that represents an important energy source.

Municipal WWTPs generate sludge as a by-product of physical, chemical and biological processes applied during wastewater treatment.

The energy present in sludge is utilized in anaerobic digestion (AD). Digestion leads to the formation of biogas, rich in methane that can be recovered and used as an energy source. The volume of biogas produced during the digestion process can fluctuate over a wide range.

Biogas applications:

- production of heat;
- electricity;
- generation/co-generation;
- use as vehicle fuel;
- possibly production of chemicals.

Justification – why was this technology selected (up to 500 characters).

The high potential of biogas production in WWTPs can inspire operators to use sludge and other organic substrates more intensively for biogas production and its energy utilization. In order to increase the biogas production from sludge produced in WWTPs (if limited) external sources of organic materials can be considered.

Ways to higher biogas production:

- higher amount of treated sludge
- sludge pre-treatment to enhance anaerobic biodegradability
- optimization of the digestion technology

The range of used external sources of organic materials is wide and most used materials in municipal WWTPs are, as follows:

- Food industry intermediate products (waste and inconvenient raw materials, low-quality food;
- Industrial intermediate products and wastes (chemical industry, treatment of organic materials;
- Wastes from restaurants, expired food;
- Green municipal waste, wastes from markets;
- Separately collected organic wastes from inhabitants;
- Wastes from animal husbandry, slaughter-houses.

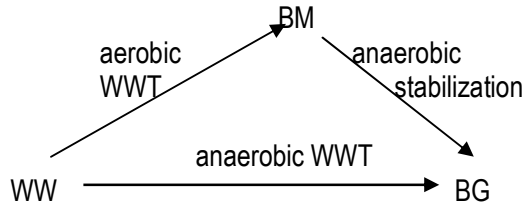
Characteristics (up to 500 characters):

The sewage from WWTP generally involves three stages: primary, secondary and tertiary treatment.

- Primary treatment consists of temporarily holding the sewage in a quiescent basin where heavy solids can settle to the bottom while oil, grease and lighter solids float to the surface. The settled and floating materials are removed and the remaining liquid may be discharged or subjected to secondary treatment.

- Secondary treatment removes dissolved and suspended biological matter. Secondary treatment is typically performed by indigenous, water-borne micro-organisms in a managed habitat. Secondary treatment may require a separation process to remove the micro-organisms from the treated water prior to discharge or tertiary treatment.
- Tertiary treatment - sometimes; defined as anything more than primary and secondary treatment in order to allow rejection into a highly sensitive or fragile ecosystem.

Transformation of pollution into biogas in WWTP:



Impact on the economy (up to 1000 characters):
The technology is mature and proven. Main impact is on environment benefits: reduction GHG emissions, reduced odours.

Combined heat and electricity production from biogas is mostly applied in Europe (subsidized electricity from renewable sources).

Global development (up to 1000 characters):
The global trends such as climate change are driving the increased adoption of renewable energy sources in general, whereas the price volatility, supply issues and environmental hazards of fossil fuel production are about to accelerate the pace in the investments of non-fossil fuels production in particular. Biogas, the most sustainable of bio fuels and biogas production WWTP is in a starting point of an exponential market growth curve.

There are currently some barriers in developing efficient and environmental friendly ways to convert waste activated sludge to biogas, as clean, renewable fuel for multiple utilizations., such as: specific strategies, lack of long term subsidies. As good example "the German model": Germany the biogas market leader runs half of Europe's 9,000 biogas plants.

Thus taking into consideration that:
- A feed-in tariff (FIT) ensures a reasonable payback time for investments (4-5 years)
- Existing natural gas network accepts upgraded biogas
- Larger, more centralized sites are being built
- Biogas as a transportation fuel is tax free

Milestones[1] *(List at least one milestone per year against which the progress towards the achievement of the local/regional 2020 targets can be measured)*

Given the scope of the roadmaps (municipally or regionally based) technological improvements that would require major research and development processes would tend to fall outside of the scope of these roadmaps. This does not necessarily mean that such technological improvements cannot be used as milestones, but that before any such technological improvements are stipulated in the milestones, the capacity of the municipal and/or regional stakeholders, and the capacity of the municipality/region to collaborate with external partners, should be carefully considered.

Milestones more likely to fall within the scope of this roadmap are those that are able to help measure desired changes in the deployment and/or wider usage of the previously identified key energy technologies or those that measure the effects of this changed deployment or usage (i.e. production of thermal energy (GWh); increase of thermal energy production (%); installed capacity (GW or m2); increase of installed capacity (%); CO2 reduction (t)).

Year	2015	2016	2017	2018	2019	2020
Milestones		**4 MWe installed capacity**				

The group assumed a hypothetical amount of 4 MWe of installed cogeneration biological wastewater treatment plant (WWTP) until 2020.
They assumed an installed capacity of 4 MWe in year 2016.

Financial Gaps

(List financially related challenges that need to be addressed in order to increase the uptake/wider usage of this technology)

1. **Lack of predictability when launching the financial instruments at national level.**
2. **Lack of institutional capacity of existing Programs Implementation Units (ESIF)**
3. **Overcompensation generated by beneficiaries receiving both state aid and subsidies for green certificates**
4. **High bureaucratic public procurement procedures**
5. **Lack of cooperation between public authorities and private investors.**

Policy Gaps

(List important policy gaps that prevent the uptake/wider usage of the key technology)

1. **Contradictions and major issues in promoting, developing, implementing and operating RES in terms of financial and legal environment**
2. **Lack of interest and active involvement on behalf of central governmental authorities – ministries and national regulatory bodies**
3. **Lack of interest from projects developers for disseminating, sharing experience, know-how and best practice**
4. **Lack of awareness-targeting actions meant to increase knowledge on legislative provisions, financial and technical solutions**
5. **Lack of institutional transparency and high bureaucratic public procurement procedures.**

Financial Instruments and Period of Implementation

(List all relevant financial instruments that can address the above financial gaps and will contribute to the uptake/wider usage of the key technology. Please add the start year and years of important developments for the financial instrument.)

1. **Support Actions for public-private partnership (PPP)**
2. **Support schemes for legal entities (reinvestment of profit)**

Policies and Period of Implementation

(List all relevant policies that can address the above policy gaps and will contribute to the uptake/wider usage of the key technology. Please add the start year and years of important developments for the policy.)

1. **Rising the level of importance and involvement of the local authorities**
2. **Restructuring of the state-owned enterprises for a better governance and financial management**
3. **Transposition of the new Public Procurement Directive as well as the ex-ante conditionality on Public Procurement for accessing EU Structural funds 2014÷2020**
4. **Increasing institutional capacity of existing Programs Implementation Units (for accessing ESIF 2014-2020) in order to assist from the early stages of the project and reduce project evaluation processes**

Stakeholders

(List all relevant stakeholders for the implementation of the policy and/or financial instrument above)

1. **Municipalities, administrations, ministries.**
2. **Building associations, corporations.**

Policy Recommendations

(*Relevant policies for this particular technology have already been identified above. This section aims to provide the steps needed for the practical implementation of the policies and financial instruments listed above.)*

1. **Identification of "Champions" that could be the motivated players in starting the public-private partnership (PPP).**
2. **Organise meetings to develop the public-private partnership (PPP).**
3. **Formally launch public-private partnership (PPP) and start procuring reciprocating engines at preferential prices.**