Interreg CENTRAL EUROPE
European Union European Regional Development Fund
REEF 2W

TAKING COOPERATION FORWARD

O.T3.2 FIVE FEASIBILITY STUDIES FOR AS MANY REEF 2W DEMONSTRATION PILOTS

Conducted by KWB

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ENEA
Italian National Agency for New Technologies, Energy and Sustainable Economic Development

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UNIVERSITY OF CHEMISTRY AND TECHNOLOGY PRAGUE

REGIONALNA ENERGETSKA AGENCIJA SJEVEROZAPADNE HRVATSKE

Reinhaltungsverband Trattnachtal
Biogas Trattnachtal GmbH

KOMPETENZZENTRUM Wasser Berlin

OUTPUT FACT SHEET

Pilot actions (including investment, if applicable)

Version 2

Project index number and acronym	CE946 REEF 2W
Lead partner	UCT
Output number and title	OT3.2 Five feasibility studies for as many REEF 2W demonstration pilots
Investment number and title (if applicable)	-
Responsible partner (PP name and number)	KWB, PP05
Project website	https://www.interreg-central.eu/Content.Node/REEF-2W.html
Delivery date	31.03.2020

Summary description of the pilot action (including investment, if applicable) explaining its experimental nature and demonstration character

The wastewater treatment plant (WWTP) Schönerlinde is run by Berlin's water and wastewater company (Berliner Wasserbetriebe – BWB), which provides 3.7 million people in Berlin and Brandenburg with drinking water and is responsible for the collection and treatment of wastewater. The wastewater in the WWTP is treated by mechanical and biological processes with biological phosphate elimination in combination with nitrification and denitrification. The sewage sludge is digested in digesters with mesophilic digesting at approx. 35°C and subsequently drained in centrifuges. The produced biogas is stored in two gas containers and used for drying the sewage sludge, for heating purposes and for power generation.

The integrated approach envisioned in REEF 2W encompasses a wide range of technological steps and processes. The REEF 2W technologies are used to increase the biogas yield through hydrolysis and to convert biogas into bio-methane. Additionally, facilities will be installed that take lower-value electricity from the grid in order to turn it into hydrogen, which will be used together with carbon dioxide from biogas upgrading to generate additional bio-methane. The following technologies are considered in the Berlin case study:

Thermal Hydrolysis

The new pilot site will incorporate a thermal hydrolysis stage that will receive part or all of the separated sludge from the primary clarifiers to increase the biogas yield during anaerobic digestion and reduce the overall digestate.

Biogas Upgrading

A biogas upgrading unit will receive the biogas produced during anaerobic digestion and upgrade it into bio-methane. Even when upgrading the full biogas stream, only a small footprint is generated.

Electrolysis Unit

The electrolysis unit will use electrical energy from the grid during low demand times or during surplus of renewable energies and will produce a stream of hydrogen. The inevitably simultaneously formed oxygen stream will be fed into the biological treatment of the wastewater or will be used for the prospective ozonisation step as fourth treatment stage.

Grid Injection

Both the hydrogen produced in the electrolysis stage and the carbon dioxide stream from biogas upgrading will be injected into a biological methanation unit, which will produce high-quality bio-methane. The vessel and its accessories have only a small footprint.

Additionally, a grid injection site and required pipelines will be installed. This site will be owned and operated by the grid owner who will also be responsible for calorific adjustment, odoration, compression and pressure control.

The hydrolysis stage and biogas upgrading module will be independently operated and toggled on or off. The CO_2 produced by the biogas upgrading process will be further used in the methanation stage to produce methane out of H_2. Unlike H_2, methane can be injected into the public grid.

NUTS region(s) concerned by the pilot action (relevant NUTS level)

Country (NUTS 1) DE
Region (NUTS 2) DE30, Berlin
Sub-region (NUTS 3) DE300, Berlin

Investment costs (EUR), if applicable

no estimates are available

Expected impact and benefits of the pilot action for the concerned territory and target groups and leverage of additional funds (if applicable)

The pilot action includes several technologies that are relevant for the wastewater sector to optimize its energy performance. As shown in the Berlin case study, the biogas upgrading unit will receive the biogas produced during anaerobic digestion and upgrade it into biomethane. This biomethane can be injected into the public gas grid and thus replace fossil-based natural gas. The injected biomethane can be used in different sectors, such as industry, transport, energy as well as buildings. In this way, it can decrease the greenhouse gas emissions and thus plays an important role in the realization of the energy transition and the German climate goals according to COP 21.
Technologies, such as thermal hydrolysis, can increase the biogas yield during anaerobic digestion and reduce the overall digestate. Other technologies, such as power to gas, can achieve an important contribution to a sustainable energy supply through storage of renewable electricity in the form of green gas over longer periods of time.
Furthermore, the production and usage of biomethane reduce the import dependency of European countries on natural gas. In this sense, the pilot action will have an impact on national and European climate protection and is able to give various actors, from the wastewater sector itself to energy providers and private-sector investors, necessary information for planning. Therefore, the result of this project can accelerate the implementation of REEF 2W technologies at development stage through feasibility studies and potential analyses.
The pilot action has also demonstrated what role the wastewater-to-energy solutions could play in wastewater sector.

Sustainability of the pilot action results and transferability to other territories and stakeholders.

Sustainability is here defined as the degree to which the project outputs are further used by partners and other actors during the project period and beyond.

Throughout the program, the local project team conducted two workshops and several events (e.g. Brussel conference as well as Ecomondo) to discuss and demonstrate the project results of the Berlin case study. In the first workshop the benefits and advantages of the different REEF 2W technologies such as power to gas, thermal hydrolysis and biogas upgrading were presented to the public administrations and operators of WWTP. The second workshop was hosted to discuss the regional strategy for Berlin with relevant local actors, such as representatives from the Berlin Senate, the Berlin Water Utility (BWB) and the Federal Environment Agency. These workshops aimed to transfer the REEF 2W know-how to enterprises, local authorities and institutions in the wastewater sector. Especially, smaller and medium-sized wastewater utilities profit from actions and activities like this due to limited resources. The project team expects that the results communicated to partners, utilities and other participants during the training courses will be further disseminated through personal contacts. Therefore, the stockholders and other actors would profit from this study that provides necessary information for the implementation of wastewater-to-energy technologies and associated infrastructures.

The results of the Berlin case study are therefore not limited to Berlin, but can easily be transferred to other areas, even to the European level. For this purpose, the REEF 2W tool can be used to carry out a similar study for further WWTPs.

Lessons learned and added value of transnational cooperation of the pilot action implementation (including investment, if applicable)

The following lessons learned could be derived from the project activities conducted in Berlin:

- The impact of the regional activities at the different case studies depend highly on each country and its legal framework. Therefore, different results may be obtained for a similar REEF 2W technology in a different region.
- Cooperation and exchange become particularly critical, as local conditions differ between the countries. This proved to be particularly important when a common tool is developed.
- Research needs are greater when it comes to technology implementation at early planning and development stages

Contribution to/ compliance with:

- **relevant regulatory requirements**
- **sustainable development – environmental effects. In case of risk of negative effects, mitigation measures introduced**
- **horizontal principles such as equal opportunities and non-descrimination**

The dissemination of wastewater-to-energy systems is generally impeded by a wide range of different barriers, rather than a few single ones. Therefore, the pilot action helps to align different sectoral policy objectives with respect to the energy transition, and mobilize more political support and investments for wastewater-to-energy solutions. To achieve this vision, for example, the regional strategies were developed by the REEF 2W partners to identify how the regional government can support the WWTP operators to accelerate the implementation of wastewater-to-energy solutions and maximize the energy potential of WWTPs.

If the focus is laid on sustainable development and environmental effects, the wastewater-to-energy solutions can contribute to achieving targets concerning decarbonization and renewable energy production. Technologies such as heat pumps can play an important role in realizing the energy transition and the German climate goals.

References to relevant deliverables (e.g. pilot action report, studies), investment factsheet and web-links
If applicable, additional documentation, pictures or images to be provided as annex

The O.T 3.2 is closely related to five Feasibility studies described in D.T3.3.1 - D.T3.3.5. conducted in each project partners country.
The feasibility study (DT2.3.2) is an integral part of the project REEF2W.

Document describing general framework conditions for ISA (DT3.1.1)

Validated ISA procedure to be used in REEF 2W feasibility study (DT3.1.2)

Financial options analysis applied to the 5 pilot demonstration cases (DT3.2.1)

Feasibility study on generating a mix of energy outputs Berlin Centre of Competence (DT3.3.2)