

D.T2.5.1 REGIONAL STRATEGY

CZECH REPUBLIC

Project Title: REEF 2W—Increased renewable energy and energy efficiency by integrating, combining and empowering urban wastewater and organic waste management systems

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PURPOSE AND SCOPE

This regional strategy for the Czech Republic reflects the local specifics in the field of renewable energy production and targets ways how to quickly improve energy efficiency in urban wastewater treatment (at the level of the public wastewater treatment plants) and organic waste management.

A set of actions is presented in the following material that takes in account all the experiences gathered within the preparation and start-up of this project. The major part of these particular experiences leads to a reformulation of the original assumptions and to an improved validity and probability of the realisation of measures in the field of energy self-sufficiency.

Having all this in mind, the major benefit of the material is linked to potential utilisation of the findings and tools generated within this project. The discussions with competent authorities revealed that authorities are eager to work with simple or rather simplified tools that enable them to set-up priorities for funding.

This major objective is however still far away from being completed, thus the major part of the strategy aims to help the competent authorities (mainly the department of waste at Ministry of Environment, Energy Regulation Office (ERÚ) and Ministry of Industry to support both promotion and funding of the projects that have served as REEF 2W demonstration projects. This can only be done by active promotion by both Vysoká škola chemicko-technologická (UCT Prague) and VEOLIA ČESKÁ REPUBLIKA.

PURPOSE (REEF 2W)

The purpose of the project REEF 2W in the Czech Republic is to enable and speed up preparation of energy positive projects on the border of water and waste businesses with the help of regional authorities. The demonstrated benefits in the pilot case shall help the authorities (among which we count mainly the Ministry of Environment) to support technically (legislation part) and financially (direct/indirect funding) similar projects and to benchmark water2energy activities in the REEF 2W tool, developed by the project team. Workshops and seminars with governmental participation are essential to inspire and support the tools and knowledge developed in REEF 2W.

PROBLEM STATEMENT

The Czech Republic is positioned in the middle of continental Europe and faces serious impacts of global climate change, including among others a rapid depletion of water resources thus causing as an effect problems to the energy production sector, which is heavily reliant upon water resources. The national guidance, developed by Ministry of Environment "The Strategic Framework for Sustainable Development¹" includes a number of measures that need to be taken into account in order to prevent worsening of the current situation and to adapt to the inevitable changes. Proposed environmental measures, identified in this framework document are also reflected in another key legislative act published in 2019 by the Czech government is the "Strategic Framework Czech Republic 2030²". Among others, the most relevant objectives of this project are "achieving sustainable consumption and production of energy" and "create a sustainable transport". The pilot of biomethane-to-transport unit at Prague WWTP is exactly in between these two conceptual objectives.

TARGET GROUP

¹ Available at www.mzp.cz

² Available at www.vlada.cz



This regional strategy targets water companies (municipal and private) as potential investors into the technology assessed and verified by this project. The strategic importance of the ministries and other state organisations is not underestimated and the strategy includes "how" to address and engage important authorities - the principal one is the Ministry of Environment but other important authority is the Ministry of Industry. Also, NGOs and professional associations are necessary players and the strategy counts with them as additional carriers of information and inspiration to achieve the REEF 2W objectives. The most appropriate tool in this engagement process is the shared free SW tool with automatic calculations coupled with real case study catalogue to empower potential clients to go for the proposed solutions.

SCOPE

REEF 2W targets all areas of the public water sector, governed by the professional association SOVAK ČR³. This association deals with all integrated legal regulations, technical standards using work of sections, commissions and committees in which the Energy commission plays an important role, where well-qualified specialists prepare professional source materials for the association Board but also for relevant ministries, including among others Ministry of Environment. The advantage is that using the common actions, seminars, committee meetings etc. of the association, the speed of project information uptake is significantly improved.

TIME FRAME/HORIZON

The time frame of the strategy is 5 years, following the project start at mid 2017. In fact the existing national strategies (mentioned above), count with the final

³ www.sovak.cz



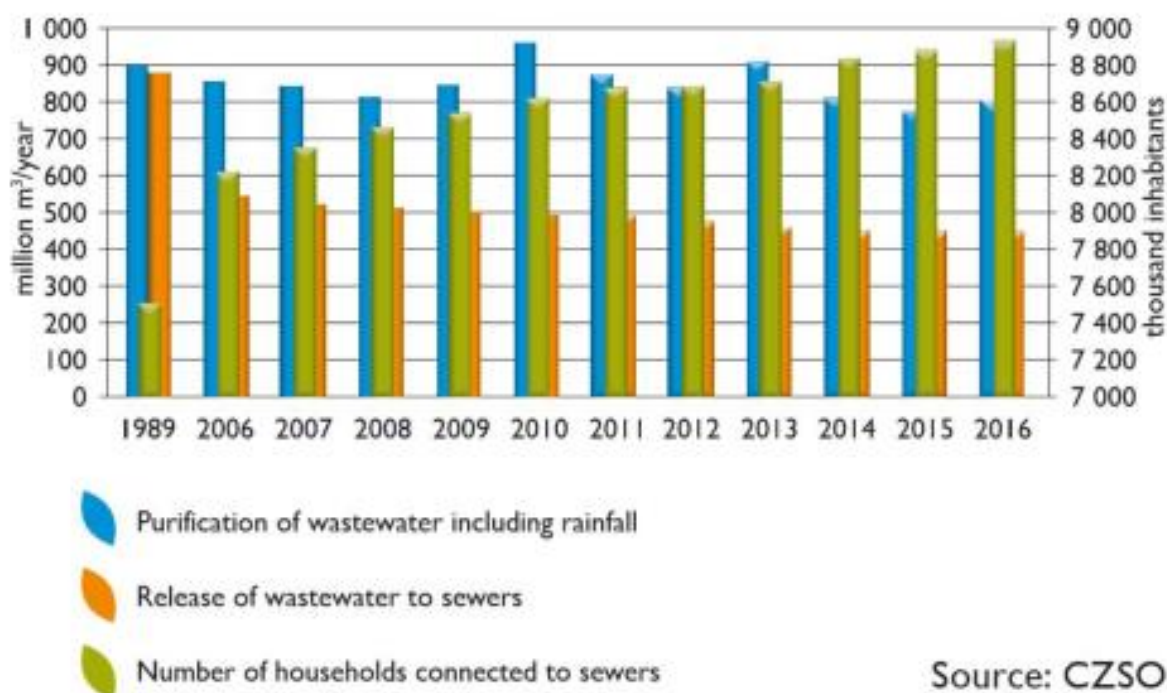
2030 horizon. The individual steps on the CZ national level of this project, however, target shorter period.

OTHERS

The pilots, selected for the Czech Republic, reflect the long term experience of anaerobic sludge treatment at municipal wastewater treatment plants (WWTPs) and the expertise of both ICT Prague and Veolia in this field. Additionally, the sludge2energy project/pilot in Zlín was added to the scope to emphasise the general move on the sludge and energy markets. The only problem of the project implementation is a very slow process of the pilot implementation, hindered by an extensive and overregulated state environment.

BACKGROUND

The Czech water sector has experienced a significant growth in the connection rate to the public water/sewer system over the last three decades as illustrated below.



The growth in the wastewater collection and treatment rate caused as a side effect a significant draught on the resources (energy, chemicals...) to sustain a high quality treatment. Energy balance of wastewater treatment plants started to be more and more significant with the growth in tariffs that started to be close to the socially acceptable rates.

GENERAL FACTS

The Czech Republic is a fully developed country with a complex wastewater infrastructure ranging from small to large WWTPs, mostly of high industrial standard. Almost all inhabitants in communities larger than 500 are connected to sewer systems that treat their wastewater.

Waste management is not as well developed. Almost all household waste is collected but the main disposal route is via landfill sites. The Czech Republic has a goal to reduce landfilling and establish new sites for waste managing - MBT plants, incineration plants etc.



As for the Energy transition and the role of the solid waste and wastewater sector: Most of mid-sized WWTPs in Czech Republic use anaerobic digestion with biogas production for WWTP sludge stabilisation. Biogas is used for heat and electricity production in combined heat and power plants (CHPs), but the produced amount of renewable energy is limited and produced energy is used mainly for the WWTP itself. The use of waste in WWTP technology is very limited in Czech Republic. Only a small amount of liquid waste is used as co-substrate in WWTP anaerobic digesters. There is no WWTP with waste processing technology.

REEF2W APPROACH AND SOLUTIONS

The REEF 2W technologies are mainly focused to energy production and possible energy savings. The energy is produced through anaerobic digestion in WWTPs in form of biogas, which can be transformed into thermal or electric energy. In addition, the REEF 2W concept provides ways to increase energy production (biogas) or converting the biogas produced into more energy-dense biomethane.

EXTERNAL ANALYSIS

The national energy targets in the concept of sustainable development are guided by the strategic documents mentioned in chapter 1.2. The Strategic framework of sustainable development defines as Priority 2.2 "Ensuring national energy security and improving the energy and raw-material intensity of the economy". To this objective, a list of actions is attached with the monitoring system using the parameter of energy intensity over national GDP. This has been heavily criticised as production and the relevant GDP in CZ still depends on energy-intensive manufacturing than intellectual production. The greatest potential for energy savings is in the energy sector, households, the tertiary sector (services), industry (including public water&wastewater utilities), transport, and agriculture.

While the preferred use of domestic energy within the energy mix is positively reflected in the Czech Republic's energy import dependence, which is relatively

favourable in energy terms (about 45 % of energy source consumption by contrast to almost 60 % in EU-15), it is structurally unbalanced. The dependence on oil, gas and nuclear fuel imports is virtually 100 %.

WASTE MANAGEMENT REGULATION

The Czech legislation defines WWTPs as a public infrastructure that serve to treat municipal/industrial wastewater so there is no legal requirement for a special “permit” for waste processing/management and development/operation is governed by the Water Act 254/2001 Coll. only. If there is a special step to treat other waste than public/industrial wastewater (normal/concentrated) the WWTP has to fully respect the requirements of waste legislation (Act. No 185/2001). In addition, the facility or its part shall be classified and approved in line with the waste legislation requirements. This change can be an issue because in some cases, despite minimum technological changes, EIA process and territorial planning has to be respected.

Sludge classification: by Czech legislation WWTP Sludge has own waste category with specific limits for further handling and utilisation. For improved facility with waste processing, the change of output waste/product category can occur and further handling should be strictly limited.

WWTP Sludge (both stabilised and non-stabilised) is categorized as no 190805 “Sludges produced by municipal waste water treatment” by Czech waste catalogue that is specified by the Government order No. 93/2016. These sludges can be utilised as “stabilised sludge” to agriculture according to Government order 437/2016 or disposed as waste or bio-waste. Most of sludges are utilised in agriculture.

By transforming WWTPs to complex systems with other bio-waste input, there is the possibility to change the output sludge classification to category 190604 “Anaerobic digestion of municipal wastes products” or 190606 “Anaerobic digestion of vegetable and animal by-products residual material”. These wastes have to be processed with different technologies with very limited use in agriculture.

For wastes that contains animal by-products, such as waste from gastro, it is necessary to implement the veterinary legislation, especially HACCP ((Hazard Analysis and Critical Control Points) and others.

For anaerobic digestion, gastro waste and slaughterhouse/ meat waste is interesting. Veterinary legislative specified some requirements for waste processing plants:

According to Act EP 1069/2009 (chapter 29) all processing plants for animal by-products (including gastro waste) have to achieve HACCP standards.

ENERGY REGULATION

It is difficult to predict future prices for renewable energy in the Czech Republic, as there are no longer government guarantees/subsidies for the operation of new renewable energy installations (e.g. green bonuses). For existing installations, the bonuses are reduced or completely withdrawn once the investment breakpoint is reached (the complete payback of initial investment). As a result, there are currently no bonuses for new biomethane projects or other renewable electricity projects and the current subsidy policy for heat utilisation is becoming more complicated.

Existing WWTPs with anaerobic digestion have as common utilisation of biogas CHP units with gas engines. Until 2013, there was a system of guaranteed prices of produced electricity from biogas and price of electricity in place for a minimum of 15 years of operation. This was encouraging for the development of renewable energy production. After 2013, all subsidies for a new project were stopped and no future programme or subsidy policy for renewables was specified. In addition, many limitations were set for existing projects, such as limitations for heat utilisation. In this specific case, the authority for energy regulations has specified efficient heat utilisation. Furthermore, a compensation institute for existing projects was established. After 10 years of operation, projects were inspected and if there is too much profit, the operator has to reward some part of the subsidies. All this led to the fact that all new renewable energy projects in Czech Republic were stopped after year 2013.



TECHNOLOGY BARRIER

Anaerobic digestion (AD) is a common method for sludge processing at most mid-sized to large sized WWTP in Czech Republic (more than 50000 PE capacity).

AD units have been usually designed with concrete or steel tanks (1980 – 1990). Furthermore, the mixing was done by biogas blowers and the heating externally by heat exchanger (desk type mostly). This design is very unsuitable for solid waste processing and there is possible to input only liquid wastes.

For waste processing, it is necessary to build the complete new technology of input objects (sorting, shredding, storage, feeding), but also to complete the new reactor technology. For this case, it is better to build a complete new waste processing site. In Czech conditions the mentioned barriers are not compensated sufficiently by higher biogas production, therefore the integration of sludge and municipal biowaste is not attractive enough.

WASTE AMOUNT BARRIER

Due to the inhabitant's structure in the Czech Republic, there are many small cities and villages. Therefore, bio-waste production is divided. In addition, in past years, many subsidies went to the construction of small and mid-sized compost plants. A significant amount of bio-waste is collected only in larger cities.

INTERNAL ANALYSIS

In order to achieve the specified targets, a strong alliance among the research body (ICT Prague), commercial and application partner (VEOLIA), and local authorities (Ministry of Environment) has to be forged. The tool used is the contract that gives all entities the right to tangible benefits of the cooperation.

Principal financing of the pilots is on the side of VEOLIA, while the Ministry of the Environment shall provide future funds/boosts for model replications. ICT Prague represents an ideal platform for sharing a more detailed analysis of particular applications.

Another tool that enables a quick and efficient sharing of the created values in the form of information packages/pilot methodologies etc. is the platform of training that targets both professionals and public.

METHODOLOGY

STRATEGIC FRAMEWORK

This strategy relies upon the principles and logic of the Norton and Kaplan strategic management approach. A detailed derivation of measures is not required for this strategy.

STAKEHOLDER ENGAGEMENT

The development and success of this strategy generally depends on the involvement of the regional authority and the good teamwork among the project partners. The interactions and success of transferring the pilot solutions shall be fostered by an intensive run of seminars/trainings and by using an excel tool developed by the Ministry of Environment.

STEP 1: VISION, GOAL AND OBJECTIVE SETTING – WHAT ARE WE AIMING FOR?

VISION

The vision of the strategy is a clear propagation of the principles of energy positive concepts at the level of water utilities using the platform of the SOVAK association as well as Ministry of Environment propagation by inclusion of the benchmarking and evaluation tool in the evaluation framework of the Operation programme Environment 2021-2027 (Cohesion funding with inclusion of sustainable energy projects).

GOAL

The pilots (Prague/Zlín) are not supposed to have a significant impact on climate change mitigation, but rather an educational effect.

On another level, VEOLIA shall use the results of the Prague pilot to demonstrate the potential for reducing the CO₂ footprint in the operation of the WWTP of Prague.

OBJECTIVES

Prague biomethane vision: Step I: pilot project, REEF 2W project, capacity 1.150.000 m³ of raw biogas per year.

The current biogas production at the WWTP: 18.066.974 m³/year. All biogas could be upgraded to biomethane that can be used for city transport, due to the good location of the WWTP location. About 10,800,000 m³ of biomethane can be produced at the central WWTP site and distributed to the grid or directly to refuelling stations. About 30700 t of CO₂ can be saved in public transport. There is also significant lowering of various emissions from city transport by switching from diesel to bioCNG.

For the city of Prague, it is possible to operate about 30 % of the total number of public buses by biomethane from the Prague WWTP (total amount 1170 buses, of which 343 are available to operate with biomethane).

Another objective is to increase energy efficiency. Currently, only electricity from CHP is used with an efficiency of about 40 %. The usage of biomethane is considered as more efficient.

- I. Energy flexibilisation - Prague city can lower fossil fuel consumption in public transport and part of city transport is fuelled by local source.



STEP II: STRATEGY FORMULATION – HOW ARE WE IMPLEMENTING OUR STRATEGY?

STRATEGIC AREA WITH ACTIONS

In this section, different actions are discussed to achieve the pre-defined objectives. Actions areas that are considered are for example: finance, collaboration, framework conditions, etc.

STRATEGIC AREA I - CAPACITY BUILDING

Problem statement: To ensure the sustainability of research results after the project has ended including their further development and application is challenging.

Aim of action: Capacity building measures strengthen the REEF 2W approach by disseminating project results including skills, knowledge and tools. Furthermore, solid waste and wastewater treatment utilities will be enabled to achieve their energy targets.

Strategic Action I: Trainings are offered to create experts.

Strategic Action II: A register of experts trained within the REEF 2W project will be published on a web based platform. These experts will have qualified technical and financial competences enabling them to consult and coach operators of waste or wastewater treatment plants that are interested in implementing REEF 2W solutions.

Strategic Action III: public relations, convincing public opinion about project importance, to generate general demand for the project, to convince residents in the area of interest about the necessity of the project, including an explanation of the potential impacts on the area (increase in waste prices, local emissions from technology and waste transport, etc.).

Strategic action IV: introduction of sorting of bio-waste, setting up logistics and education of inhabitants

Strategic action V: preparing the site (in some areas, this is simply impossible for spatial reasons). Addressing the legislative authorization process within the



existing framework. Includes: obtaining permits (construction, waste management, integrated permit), change of land use plans, completion of infrastructure - waste collection routes, increase of sludge for disposal or recovery

Strategic action VI: implementation of new technology and improvement of technologies (existing WWTPs are unsuitable for bio-waste processing - bad reactors, bad pumping lines, etc.). Build new WWTPs according to new standards enabling waste processing.

STRATEGIC AREA II - FINANCE:

Problem statement: Under current conditions, the REEF 2W project is unprofitable without support.

Aim of action: It is necessary to ensure its operational support from public sources or to create other conditions for its efficiency - restrictions on other methods of waste management, restrictions on other types of energy

Strategic Action I: Investment grants for REEF 2W projects. Investment support for projects should be ensured. The investments are significant and include the modification of the WWTP own line.

Strategic Action II: Ensure operating subsidies

Strategic Action III: Ensure bank financing for “low” profitable projects.

STRATEGIC AREA III - COLLABORATION

Problem statement: For REEF 2W projects - especially joint treatment of bio-waste and wastewater treatment, there is no support across individual fields (professional) and state administration units (legislative and permitting).



Aim of action: Change the approach of the state administration and introduce interdisciplinary cooperation for project implementation.

Strategic Action I: Involve local governments and put pressure on the need for projects and start cooperation on project preparation and enforcement

Strategic Action II: Persuade the government and regulators of the need for projects and start cooperation on project preparation and enforcement

Strategic Action III: Convince finance providers of the need for projects

STRATEGIC AREA IV – FRAMEWORK CONDITIONS

Problem statement: For the REEF 2W projects, there are no good framework conditions for implementation, both in environmental and economic terms. Legislative procedures rather integrate the integration of bio-waste and wastewater treatment. The technical infrastructure is usable only in theory.

Aim of action: Improve conditions for project implementation in both basic areas

Strategic Action I: Create legislative conditions for easy implementation of projects - modification of wastewater treatment legislation, sludge and bio-waste management

Strategic Action II: Create conditions for the competitiveness of new renewable energies to conventional energy

Strategic Action III: Change public perception of waste and wastewater treatment projects

CONCLUDING WORDS & CHALLENGES

CHALLENGES

There are many challenges that both the water utilities and public authorities are facing in the process of implementation of REEF 2W solutions. Most likely, there



shall be a problematic access to financing with relatively long payback time for individual solutions (as it was identified in the case of Prague pilot). The above presented approach, however, tackles these issues by many concrete steps.

CONCLUSIONS

The entities, engaged in the project REEF 2W in the Czech Republic will strive to provide a maximum support to implementation of smart energy projects with the help of identified public authorities and professional associations.