



## CO<sub>2</sub> to SNG Pilot Plant at Tauron's coal-fired Power Plant: Initial Results and Further Opportunities

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This paper summarizes the initial operation experience and selected results obtained during largest in Poland, Power to Gas project called CO<sub>2</sub>-SNG. Supported by KIC Inno Energy project aims to develop a technology for energy storage.

UE countries are leading in CO<sub>2</sub> emission reduction. There are several technological solutions recognised for CO<sub>2</sub> capture, transport and storage (CCS). However, application of full-chain CCS is currently difficult because of low social acceptance for transport and CO<sub>2</sub> storage. On the other hand, EU countries have defined also the objective that at least 20% of their energy will come from renewable sources in 2020. The disadvantage of renewable sources like solar and wind energy is their intermittency resulting in a fluctuation of their production from over hourly to seasonal periods. The project is devoted to solve simultaneously the CO<sub>2</sub> utilization and renewable electricity storage problems.

The process for converting of the surplus electricity from renewable energy sources into synthetic natural gas (SNG) is investigated by Polish and French partners with the goal of its commercialization as a profitable technology for electricity storage. The SNG may be delivered to existing natural gas network utilizing its storage capacity or may be compressed and used as CNG for public transport. The general principle of process is to convert CO<sub>2</sub> captured from industrial facilities (e.g. coal-fired power units, chemical, metallurgical or cement plants) into methane in the highly exothermic reaction with hydrogen coming from water electrolysis powered by excess and cheap renewable electricity from the grid. Additional advantage is possibility of deep integration with carbon capture process (CCP). Usually CCP requires significant amount of heat which in this case, can be taken from exothermic reaction.

One of the milestones was to design and erect CO<sub>2</sub>-SNG pilot plant at the power station of the project leader, TAURON, second largest energy producer in Poland. The pilot plant started in July 2018 and it can convert up to 200kg/day of CO<sub>2</sub> captured from the flue gas of hard coal fired power unit. To be compatible for the use of renewable electricity, the plant has been designed to work with a large range of parameters, up to 350 degC and 15 barg, and from 20% to 100% of the nominal capacity. CO<sub>2</sub> for the process is delivered by the Amine-Based CO<sub>2</sub> Capture pilot plant operated since 2013, where advanced construction of stripper is applied with possibility of using





external heat in the column. The core technology for the methanation reactor with catalyst was delivered by French partners ATMOSTAT and CEA. Several dedicated testing campaigns were performed by Institute for Chemical Processing of Coal in Poland. The technical and economic documentation of the final market product – a larger scale CO<sub>2</sub>-SNG system will be delivered by TAURON and other Polish partners.

From the social and political points of view, the CO<sub>2</sub>-SNG concept combines three important energy sources and infrastructures – renewables, coal, and natural gas into one complementary system, which leads to sustainable and secure development of the overall energy system.

