

HESTOR- Energy storage in the form of hydrogen in salt caverns

The project was carried out by a scientific and industrial consortium consisting of the LOTOS Group S.A. - consortium LEADER, Gas Transmission Operator GAZ-SYSTEM S.A., University of Science and Technology in Cracow AGH, Research and Development Centre for Chemical Raw Materials Mining CHEMKOP, Silesian University of Technology and Warsaw University of Technology.

The project was of a research and development character and concerned the research area of energy efficiency and energy storage. The project considered such aspects as storage of electricity from renewable energy sources (RES) in the form of hydrogen, its transport and storage and end use as a zero-emission fuel in order to re-generate electricity to cover peak demand, also in fuel cells.

Moreover, the Project also considered technical and economic aspects of the use of hydrogen as a fuel in transport, issues related to the development of the hydrogen market, modern hydrogen energy storage services, possibilities of electricity generation and trade and the use of hydrogen in the technological processes at the refinery of GL S.A. were analysed.

The aim of the project was to investigate the possibility of hydrogen storage in salt caverns, generated from RES, and its further use for energy generation, technological purposes in oil & refinery industry and as a fuel for transport. Determination of the economic conditions for the profitability of the project was an important aspect. It was considered that hydrogen will be generated through electrolysis of water, using redundant electricity from wind and photovoltaic power plants.

Generated hydrogen and stored in a salt caverns can be used, while improving energy efficiency, for:

- ✓ energy purposes, by using it as a fuel for gas turbines during periods of electricity peak demand,
- ✓ technological processes at the refinery, reducing the need for its production from natural gas and allowing streamlining and optimisation of the hydrogen economy;
- ✓ transport purposes: the use of hydrogen in transport.

Issues related to electricity storage are one of the key issues of the project, and the positive results of possible technical solutions analysis, taking into account economic criteria, will allow to generate basic socio-economic benefits and to determine implementation schemas.

Hydrogen storage technology as an energy carrier studied in the project is innovative not only on the Polish scale but also on a global scale, because at the moment there have not been built such hydrogen storage nowhere, although research and implementation works are already advanced in Germany. In Poland, we have both adequate salt deposits and we developed modern cavern leaching technologies. They can be successfully used for the construction of hydrogen storage caverns.

It is assumed that the main environmental impact will be the reduction of greenhouse gases emissions by balancing the irregularity of electricity supply from renewable sources (RES).