Main concepts for construction of pump storage system using coal mining infrastructures

The development of renewable energies and their increasingly integration into power supply of Germany is currently a primary task of the country's energy policy. However the problem of storage itself has not been fully solved yet. Besides new energy storage technologies and conventional pump storage facilities, the underground pump storage is another possibility for energy storage.

Due to coal mining there are numerous cavities inside the ground of the Ruhr area in West Germany which will be abandoned due to the closure of the coal mines in 2018. In general this infrastructure would be usable to serve as storage facilities. There is also an enormous

energy potential since the vertical head would be up to 1200m inside the shafts. This head is sufficient to operate the pump storage with small to medium volumes of water. Facilities of this type have not been developed yet, therefore a validation on feasibility and an economic viability still needs to be done. The Project is focusing on these questions.

The general idea is to move a conventional pumped storage facility under the earth's surface. The tunnel system in the underground would serve as the lower reservoir. The upper reservoir would then be constructed at the surface. There are possibilities to execute such facilities either

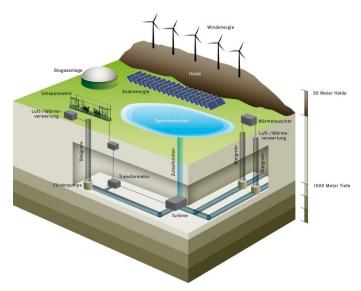


Figure 1: Scheme of an underground pump storage

as a closed system or a more widespread system that uses the complex existing mine drainage system which defines an open system. Main aim is to identify how the huge amount of existing infrastructure within the mines could be used in a post mining period. First valuations show a predicted power rage from 200 to 600 MW.

For the evaluation of the feasibility and the identification of requirements, an interdisciplinary research group has been formed. This group consists of researchers from the areas of expertise in hydraulic engineering, geology, geotechnical engineering, energy economics and social science. Such group works within a close cooperation with the coal mine owner RAG AG. Besides the RAG AG there are 5 departments of the University of Duisburg-Essen, 3 departments of the Ruhr-University of Bochum, the mining consultancy DMT GmbH and the social research institute RISP involved.

The project is promoted by the state of North Rhine-Westphalia und the European Union in context of the "ZIEL2"-Program. The supervising agency is the District Council of Arnsberg und the project executing organization is the "Projektträger ETN" in Jülich. The Project is aimed to be split into two phases. The first phase of 18 months will end in April 2018 and is meant to be a feasibility study of such facilities inside the coal mines of the Ruhr area.



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RAG AG

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