Solution Mining Research Institute Fall 2012 Technical Conference

Bremen, Germany, 1-2 October 2012

ADABATIC CAES PROJECT – ADELE

Andreas Bannach and Michael Klafki

ESK GmbH, Freiberg, Germany

Abstract

Nowadays generation of electric power from renewable energy sources in Germany reaches about 20 % of the total demand. Additional increase in wind and solar power is forecasted to provide up to 35% of Germany's electric power demand until 2020. Power supply from these energy sources enormously depends on actual weather conditions and is therefore characterized by strong fluctuations.

To guarantee the stability of the power grid the volatile power supply from these energy sources must be compensated by flexible facilities. Enhanced energy storage technologies are therefore in demand.

Besides pumped hydro the storage of compressed air in underground salt cavities is the most developed large scale technology which might be put in operation within a limited period of time. Compared to conventional (diabatic) compressed air energy storage (CAES) facilities the more advanced adiabatic CAES technology may increase the overall plant efficiency significantly.

The development of an adiabatic compressed air energy storage is pursued within the R&D project ADELE.

Technically, challenges which must be addressed comprise the turbo machinery, the thermal energy storage, the hot piping as well as the particular requirements on the cavern well and the cavern itself.

For example, the cavern operating parameters are completely defined by the aboveground installations which may lead to severe constraints on cavern configurations and arrangements. Furthermore, significant higher flow rates require larger wellbore dimensions and continuous operation with wet air call for the use of corrosion resistant materials for all subsurface installations.

Additionally, thermodynamic and rock mechanic processes associated with the intended high frequency cycling must be addressed to estimate long-term stability and integrity of the cavern.

The paper presents an overview of the entire ADELE project with particular focus on all relevant cavern aspects.

Key words: CAES, Cavern Design, Rock Mechanics, Thermodynamics, Well Completion