



Project update

Clean compressed air to drive power plants

Project details		Key aims	
<b>Project title</b>	Isobaric Adiabatic Compressed Air Energy Storage Combined Cycle - ISACOAST-CC	<ul style="list-style-type: none"> <li>• Development of a CAES system that is highly efficient with minimal losses</li> <li>• Storage of wind and solar power to overcome the intermittency of renewable resources</li> <li>• Provision of back-up against failures of other generating units or transmission lines.</li> </ul>	
<b>Participant</b>	Technische Universität Braunschweig, Germany		
<b>Start date</b>	2007		

Project summary

Researchers are developing a new combination of power plant and energy storage running on compressed air which delivers stored renewable energy from the wind and the sun. EON's International Research Initiative is helping experts to look at innovative ways in which compressed air energy storage (CAES) technology can be used to power a combined cycle gas turbine plant to generate electricity.

Technische Universität Braunschweig in Germany proposed the project, which is led by Professor Reinhard Leithner, Head of the Institute for Heat- and Fuel-Technology, and Professor Martin Mönningmann, now Lehrstuhl für Regelungstechnik und Embedded Systems at the Ruhr-Universität Bochum. CAES offers a means of using electricity generated from the wind and the sun to build up compressed air energy reserves

when there is an over-supply of renewable generation. The energy can be stored in caverns or huge underwater tanks and released at times of high demand. In addition, an innovative heat storage system will be designed to store the heat generated during compression of air with high efficiency at low costs. Upon release from the storage system, the compressed air is heated and used for a highly efficient gas and steam turbine cycle.

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The design of the main gas turbine plant and ancillary equipment was the starting point for this project.

Due to the complexity of the system, a simulation-based approach was taken to investigate design aspects of the new power storage plant type.

Simulations are helping understanding of different aspects, particularly:

- The consequences of uncertain factors, such as customer demand or the kinetics of the combustion process
- The balance between the inevitable over sizing of units for robustness and unit optimization for economic reasons.

A number of simulation and optimization approaches are combined in the project. The software being used

called Enbipro has been developed at Technische Universität Braunschweig for more than 10 years and is playing a prominent role.

Two of the project's key challenges are to adapt commercially-available gas turbines to operate in both storage and generation cycles and to identify an optimized heat storage device which operates economically.

Work has begun to optimize individual components for use in the CAES system. These included currently available items such as compressors, turbines, heat recovery steam generators, steam turbines and heat exchangers.

In some cases components will have to be specially designed. Among these are the ducts and valves which will link the CAES and the heat exchanger in the

heat storage device. Representative data for these types of components are being created for use in the simulation modeling.

During this period the project concept was publicized at the Kraftwerkstechnisches Kolloquium in Dresden and the 5th International Conference on Energy, Environment, Ecosystems and Sustainable Development (EEESD '09) in Athens, Greece.

Several theses were written for this project and have been announced or are in the process of being announced.

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