

SECOND-GENERATION COMPRESSED AIR ENERGY STORAGE TECHNOLOGY MEETING RENEWABLE ENERGY/SMART GRID REQUIREMENTS

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ABSTRACT

The Second-Generation Compressed Air Energy Storage (CAES2) technology is seriously considered by a number of power generation utilities that are moving toward execution of the CAES2 projects. Dr. Michael Nakhamkin presented at the Mega-Session of the PowerGen 2010 the fundamentals of the Compressed Air Energy Storage Technology from the first 110-megawatt (MW) CAES project in Alabama to the second generation of CAES2 co-sponsored by Department of Energy (DOE) for two upcoming CAES projects.

This paper will present newly developed CAES2 features to meet specific smart grid and renewable energy requirements as well as limitations provided by the underground storage characteristics.

The presentation will include the approximate 200-MW, 350-MW, and 450-MW CAES2 plants with demonstration of flexibilities to meet specific smart grid and renewable energy requirements and specific characteristics for underground storage limitations including:

- Heat and mass balances indicating the heat rates (3700 to 3900 Btu/kWh) and energy ratios (0.670.75);
- Synchronous reserves with delivery of approximately 60% of the total capacity within 2 minutes from the cold-startup;
- Regulation opportunities to practically instantly change power generation capacities between 40% and 100%;
- Part-load operations with very high and stable efficiency; and
- Capital and operational costs.

The paper will also address the newly developed concepts for:

- Small capacities of CAES2 plant of approximately 5 to 15 MW with above ground storage with new developments to enhance the small capacity CAES plants economics; and
- New developments related to adiabatic CAES plants.

The information will be very important for the power generation community.

