Peak Power Plants with Air Storage in Salt Caverns

H. Harboe
STAL-LAVAL (G. B.), Ltd.
London, England

ABSTRACT

Practically all electric power systems have daily load variations with deep night valleys and day-time peaks. Large generating units, both fossil fueled and nuclear, prefer a steady load and can often generate cheap excess power during the night. It herefore becomes desirable to develop systems which can store this excess power for use during the daytime and AIRSTOR represents one very promising alternative.

AIRSTOR builds on the idea of performing the air compression phase of a gas turbine cycle during the night (using power from the grid) and the combustion-expansion phase during the day. Between the two phases the compressed air is stored in underground caverns. The day-output becomes three times as big as it would have been from a corresponding gas turbine in continuous operation. Today there are 70 MW gas turbines in operation and these can form the basis for developing air storage units with outputs of 200 to 300 MW.

Three alternative systems for storing large quantities of compressed air are being investigated: (1) mined rock caverns with "hydraulic" compensation where water and air displace each other to keep the air under near constant pressure, (2) dry storage caverns where the air pressure is allowed to vary between set limits, (3) and anticlines where air can be stored in porous rock formations under a tight caprock.

Dry storage in leached salt caverns in many locations may well be the most attractive solution for storing large quantities of compressed air and feasibility studies have shown very attractive overall economic factors.