INTRODUCTION
The possibility of generating peak power with a gas turbine plant in conjunction with an underground compressed air storage has been researched for many years.

In 1973 the NWK — now PreussenElektra AG — was the first electrical utility to decide to realize this new technology in the form of a prototype.

The contract for the construction of the gas turbine power plant was awarded to Brown, Boverie & Cie (BBC), and the contract for the construction of the underground compressed air storage in salt rock was awarded to Kavernen Bau- und Betriebs-GmbH (KBB).

The facility was constructed between 1974 and 1977 and following comprehensive commissioning was handed over to NWK for the planned peak shaving operations.

There are a number of indepth publications available on the planning, construction and commissioning of the storage.

The following is a summarized description of the most important details of the cavern system in the planning, construction and operating phases as well as of the storage capacity.

PLANNING
The following specifications had to be met in the design of the compressed air energy storage facility with a capacity of 290 MW:

- Mass flow
  - discharging operations 420 kg/s
  - charging operations 105 kg/s
  - min. pressure before turbine 45 bar
  - discharge period 2 h
  - delivery salt-free air

Given these input data the storage facility was designed on the basis of the following basic specifications:

- no. of storages 2
- storage volume 300 000 m³
- storage depth
  - top approx. 650 m
  - base approx. 800 m
- cavern diameter max. 60 m
- well spacing 220 m

pressures
min. permissible 1 bar
max. permissible 100 bar
max. operating pressure approx. 75 bar
min. operating pressure approx. 55 bar
minimum storage pressure to drive the power plant approx. 20 bar
max. frictional losses in production string approx. 3 bar
max. pressure release rate of storage 10 bar/h

Comprehensive laboratory tests were performed to determine the maximum salt content of the flowing compressed air in contact with the solid rock salt and salt brine.

The laboratory tests showed that even under extreme test conditions the NaCl contents in the compressed air remain below 1 ppm.

CONSTRUCTION

Wells
The high air flow rates for the power plant and the demand for minimum possible frictional losses require large flow cross-sections in the production strings. Technical and cost optimization calculations produced a final casing of 24 1/2" and a production cross-section via a replaceable production string of 20"/21".

Because of the high costs of such big-hole drilling and in consideration of the risks associated with the selected locations of encountering geologically unsuitable formations, the geological conditions of the locations were investigated by sinking exploratory wells of smaller diameter before establishing the cavern wells. Big-hole drilling was started after encountering suitable salt at the foreseen total depth.

These wells (see casing program Fig. 1) were sunk using a combined air-lift/rotary drilling technique, whereby the distance to the cement filled exploratory well in each case was 20 m. In total 5 exploratory wells and 2 cavern wells were sunk between November 1974 and November 1975.

Caverns
Because of a previous high pressure natural gas storage project at the Huntof salt dome, the requisite technical installations for the solution mining of the caverns with fresh water were already available for the NWK project. These installations were connected to the cavern wells via short pipelines.

Leaching programs were drawn up on the basis of the data from the analysis of salt specimens (cores) from the wells as well as geophysical measurements for the correlation of the salt specimens with the overall salt zone. These programs were designed to produce the most favourable rock mechanical cavern shape taking into account the frequent pressure and temperature changes associated with this type of facility.

Fresh water is pumped into the well for the leaching process. For this purpose two freely suspended concentric