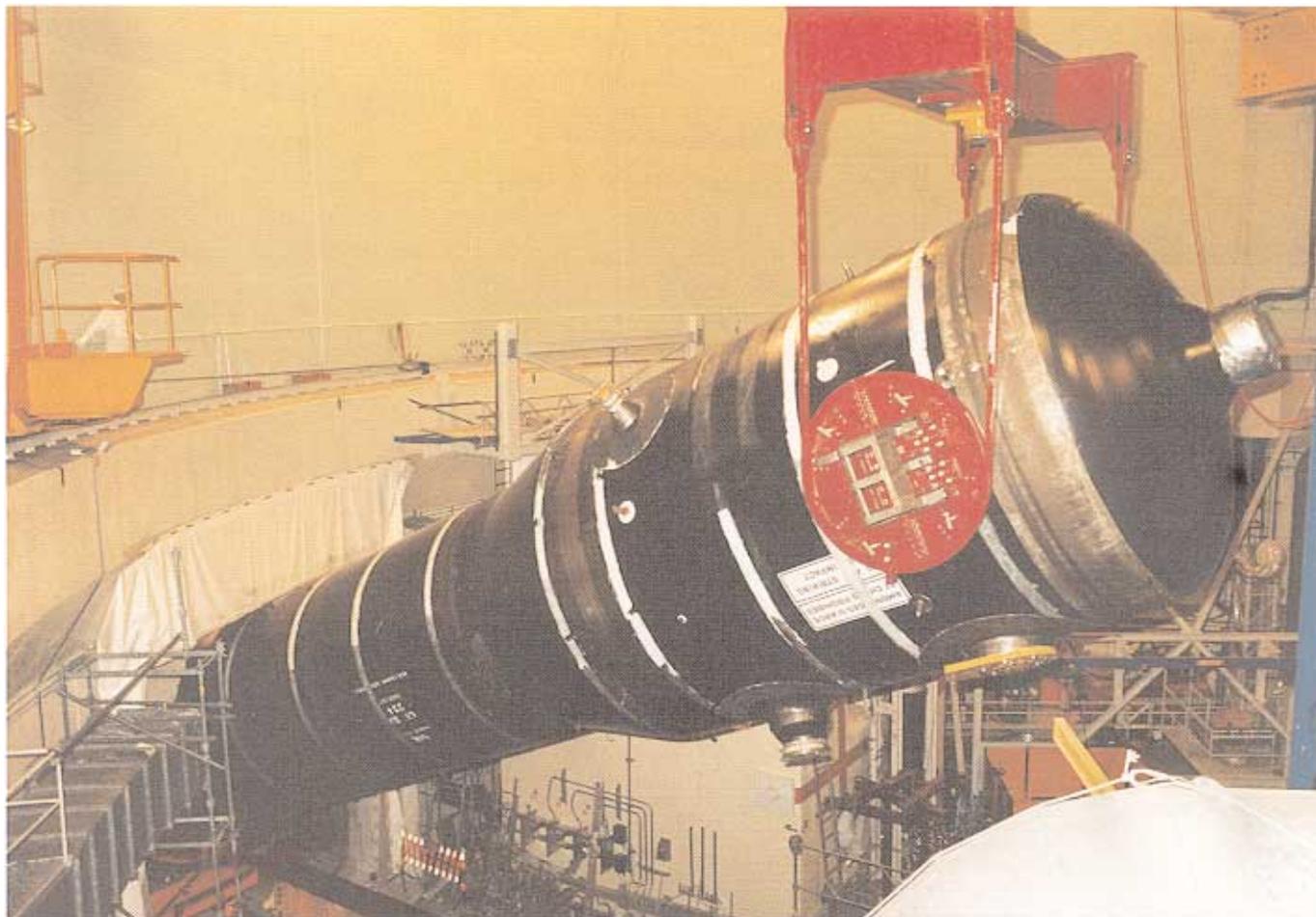


VSL Heavy Lifting meets another challenge

Experience and detailed planning by VSL meet the challenge posed by steam generator replacement.



▲ *Tilting up inside the containment, end of SG with close tolerances to temporary containment opening.*

The Beznau Nuclear Power Plant unit I in north-eastern Switzerland was commissioned in 1969. For power uprating reasons, the owner of the plant, Nordostschweizerische Kraftwerke AG (NOK), decided in 1988 to have the 2 steam generators replaced in 1993. A consortium formed by Siemens (Germany) and Sulzer (Switzerland) was entrusted with the replacement work.

The overall transport and rigging concept was developed by the consortium. For the handling of the steam generators between the transport vehicles and the sliding tracks, the consortium utilised its own equipment. However, for the steam generator transport into the containment structure and for the handling inside the containment, the consortium awarded VSL a contract which included detail planning of movements, design, supply, erection and dismantling of temporary

steel structures. This happened in early 1992, triggering off a phase of extensive planning and design work.

In the planning phase, the movement path for both steam generators (each weighing 205 t and 18 m long) had to be optimised taking various restrictions and geometrical conditions into account. This was then the base for a detailed step-by-step operations plan and for the design of the necessary auxiliary steel structures (hardware). Parallel to this planning an extensive risk analysis and contingency planning was carried out, particularly in view of the fact that the rigging operation had to start with the old radioactive steam generators.

The main hardware components were: sliding tracks, 2 sliding carriages, a tilting ring, 2 hook-up lifting beams and a central tower, acting as temporary

polar crane support. During fabrication, a quality assurance programme was followed to ensure that the hardware was built to the required standard. This included a load test of the VSL lifting equipment. The erection of the hardware was crowned by the raising of the preassembled lifting gantry onto the polar crane.

The actual exchange work, which took place in April 1993, was a sequence of activities, described below for the case of a new steam generator being brought into the containment. The steam generator was lifted from the transport vehicle onto the sliding carriages by the consortium's winch system. Using the VSL strand pulling system, the steam generator was then moved through a temporary opening into the containment structure. After hooking up with the VSL lifting equipment on top of the

polar crane, the steam generator was tilted up by alternate lifting and sliding steps. Close observation of clearances at the temporary containment opening and between polar crane girders was necessary. Special attention was given to the final step from "near vertical" to "free hanging". The steam generator was then lifted to enable the bottom end to pass over the housing wall. With a combination of polar crane rotations and horizontal movement by the lifting gantry, the steam generator was properly positioned over the housing.

For the gantry sliding, the VSL strand pulling system was used. For clearance reasons, the lowering operation had to be coordinated with rotation of the steam generator relative to its own axis. For this reason, the VSL lifting/lowering unit was installed on a special rotation disk.

Working around the clock, the rigging operation was carried out over 8 days, well ahead of the original schedule.

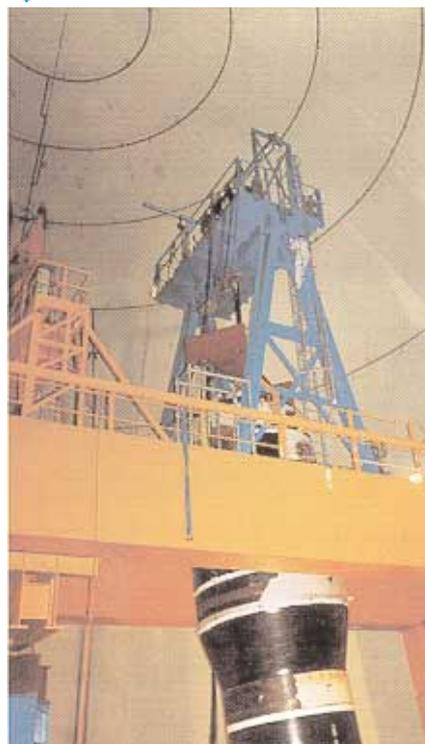
▼ SG being placed onto sliding carriages outside of the containment.



▼ Temporary support for polar crane.



▼ Lifting gantry on polar crane.



Main Participants

Client:

Nordostschweizerische Kraftwerke (NOK), Switzerland

Main Contractor:

Joint Venture of Siemens, Germany and Sulzer, Switzerland

Heavy Lifting

Sub-Contractor:

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