3439. STEAM GENERATOR REPLACEMENT RINGHALS 3, 195

A consortium of Siemens and Framatome with subcontractors, performed the major part of the replacement of the three steam generators. General information about the replacement is included in the photo booklet.

The outage started May 30, 1995, eight days prior to the plan as a forced shutdown due to a problem with the Main Steam Safety Valves. The forced shutdown partly ruined the detailed planning that was done during the engineering and planning phase. Unit 3 was back on grid September 28. Total outage was 90 days.

The projected personnel dose was 2,23 manSv (223 man rem) and result was 1,33 manSv (133 man rem). Main contributing factors to the good result was that HP was involved in the project from the very beginning, including the RFQ and agreement, extra RCS and RHR cleaning program during shutdown, extensive shielding program including a detailed plan for draining/filling both RCS and SG secondary side, decontamination of RCS pipe ends, optimized and remote controlled equipment, training program with mock-ups and an active HP supervision inside containment.

The contamination inside containment has been low during the whole outage. In general, areas below 40k/Bq/m^2 (24,000 dpm/100 cm^2) which are the Ringhals limit for no extra PC.

Industrial safety was high focused during the engineering and planning. All consortium personnel was trained in general and special rules and work leaders and foremen had a special training, leading to be certified as work permit holders. The training and planning gave a good result: only two accidents with work absence (total 5 days), 17 accidents without work absence and 15 incidents occurred. Main problem areas have been small falling items and grating/scaffolding problems.

Fire protection was mainly connected to extensive grinding, welding and flame-cutting on carbon steel structures. A significant amount of work was done without enough planning and preparation and the results have been a large carbon steel contamination in the whole containment, from polar crane to the basement.

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