Burn-up increase and power up-rate– Operation history of KKL

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The Leibstadt nuclear power plant in Switzerland (KKL) operates a GE BWR/6 boiling water reactor with an up-rated thermal power of 3600 MW, corresponding to a nominal net electrical output of 1145 W. The core today consists of 648 modern 10x10 assemblies with part length rods which results in a power density of 32 kW/kg Uranium or 62 kW/dm^3. The plant is operated in a 12 month cycle with shut downs in August.
During the last 10 years the transformation of the core was carefully monitored and different lead use assembly programmes have been evaluated for an optimised performance of the core. Experience has been gained on a number of operational issues, water chemistry and fuel behaviour aspects such as:

- Transformation from 8x8 to 10x10 fuel assemblies and further to an optimized 10x10 with part length rod and with its influence of start-up procedures and core supervision.
- Optimisation of the assembly and the core design for control cell core loading for an average batch burn-up of 53 MWd/kg uranium reached today. Whereas lead use assemblies have reached 60 MWd/kg for qualification and conformation of burn-up limits.
- Enhanced spacer cladding corrosion (ESSC) - Zinc injection was started 1990 and since 1999 (Cycle 13) onwards KKL applied the empirical recommendation from Westinghouse, developed as a result of the enhanced spacer shadow corrosion.
- Monitoring Oxide and Crud build-up and consequently fuel behaviour has given a sound base for operating the fuel to high burn-ups
- Fuel defects by debris fretting resulting in an improved monitoring of off-gas, flux tilting and inspecting of the fuel failure mode.

The paper is based on a periodic safety review and will outline the experience in a broader sense. An outlook will be given for the future operation.

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