

Westinghouse VVER-440 fuel deliveries and operating experience

Fuel Deliveries

Between 2001 and 2007, BNFL/Westinghouse delivered a total of 741 VVER-440 fuel assemblies to the Loviisa Nuclear Power Plant in Finland. The fuel was manufactured by Enusa Industrias Avanzadas, S.A., in Spain.

The fuel assembly design, named NOVA E-3 (fixed assembly) and NOVCA (follower), was developed in 1996-98 in a program involving BNFL (UK), IVO (Finland) and PAKS (Hungary). The program included extensive testing and qualification of the new design. In June 1998, the manufacturing of 5 Lead Test Assemblies - 4 fixed and 1 follower assembly - in Springfields, UK, was completed and the fuel was delivered for insertion in unit 2 of the Loviisa plant.



*Two Lead Test Assemblies of the NOVA E-3 design
(before fitting of shrouds and top nozzles)*

The NOVA E-3 and NOVCA VVER-440 designs were integrated into the Westinghouse fuel product portfolio, and all the intellectual property for the VVER-440 fuel was transferred from BNFL to Westinghouse in 2005-2006.

After neither succeeding to extend the Loviisa fuel contract, nor being able to win any other VVER-440 delivery contracts, Westinghouse decided to withdraw from the market in 2008, and closed down the supply chain and design development of the VVER-440 design. In 2014, a re-entry of the VVER-440 market was evaluated following the demand for increased security of energy supply in Europe. Westinghouse, in a consortium consisting of nine organizations, decided to apply for the Euratom funded program for diversification of the VVER fuel market in Europe, and was granted 2 million euros in the spring of 2015 to run the ESSANUF program.

Operating Experience

The overall performance of the fuel delivered to Loviisa was good with regards to dimensional changes, oxidation and burn-up profiles. The inspections performed showed anticipated behavior, with the exception of elevated levels of grid-to-rod-fretting in a couple of fuel assemblies towards end-of-life.

The new design being developed within the ESSANUF project is taking the operating experience from Loviisa into consideration, as well as operating records of Westinghouse fuel from other types of plant and especially VVER-1000.