

Trans-Atlantic Fuel Fabrication Security of Supply Program

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EXTENDED ABSTRACT

Introduction

During the last few years a growing concern is arising among national administrations and utilities due to the need to secure energy supply from all different sources. As part of this effort both utilities and nuclear fuel suppliers are merging forces to build a sustainable supply chain that can provide a reliable nuclear fuel supply in case of a potential disruption.

Wolf Creek Nuclear Operating Corporation (WCNOC) and Almaraz NPP (Spain) together with Westinghouse and ENUSA Industrias Avanzadas (Spain) have entered into a security of supply agreement aimed at demonstrating the feasibility of fuel supply to a US nuclear power plant from the ENUSA Juzbado fuel factory as well as to the Spanish power plant from the Westinghouse Columbia fuel factory.

Wolf Creek Nuclear Operating Station is an 1170 MWe PWR located in Burlington, Kansas. Its current fuel supplier is Westinghouse Electric Company which manufactures fuel in the Columbia Plant, South Carolina. The Almaraz NPP is a twin 980 MWe PWR located in the West of Spain. Almaraz main fuel supplier is ENUSA, a state-owned Spanish company which manufactures PWR fuel under a Westinghouse license in its Juzbado factory, also located in the West of Spain.

This paper describes the project goals, challenges, planning and expected results. At the end a set of conclusions are presented despite the fact that the project is currently being executed and will continue to do so by Conference time.

Project Goals

As indicated above, the primary goal of this project is to demonstrate the reliability of an overseas manufacturer to supply nuclear fuel for a PWR Nuclear Power Plant in the case of a potential supply disruption affecting the primary fuel supplier. Such supply must meet not only technical but also licensing, logistics

and timing requirements which must therefore be considered in an integral manner in the project.

As an aside objective, Westinghouse and ENUSA shall undertake a cross-qualification of their respective manufacturing facilities, by means of an auditing process, as part of which not only the product but also manufacturing process and inspection techniques shall be compared.

Fuel Designs

One of the basic assumptions of this project is for each manufacturer to minimize the number of modifications to their respective fuel product lines needed to allow insertion in the power plants. The base product shall be the so called 17x17 RFA fuel assembly featuring ZIRLO™ tubing, Intermediate Flow Mixers (IFM), RFA-2 mid grids, protective grid and Integrated Upper Nozzle (WIN). The ENUSA product lines are very similar to the Westinghouse product lines although a specific designation has been given to this product: Modified Advanced European Fuel or MAEF.

The fuel designs from Westinghouse and ENUSA, which are to be supplied respectively to Almaraz and Wolf Creek Nuclear Operating Corporation, have been analyzed by both fuel fabricators to assure compatibility with existing fuel in core. The analysis includes not only the core physics and mechanical design but also the manufacturing and quality processes used during fabrication of the fuel.

Most of the components shall be fabricated by Westinghouse, the main component supplier to ENUSA. However, the Lower Nozzles for the Wolf Creek fuel assemblies shall be manufactured by ENSA at its factory in the North of Spain. Pressure drop tests have been performed to demonstrate the feasibility of using this component at Wolf Creek.

For the Almaraz fuel, a specific modification has been required by design to incorporate Gadolinium as burnable absorber. The Gadolinium fuel rods shall be fabricated at the Westinghouse fuel facility at Västerås (Sweden) and delivered to the Columbia factory for the final fuel assembling. A specific fuel rod design study shall be carried out to allow the insertion of those Gadolinia rods.

Licensing

Due to the similarity of both product lines a relatively smooth licensing effort is expected. Key points on this process shall be the different origins and characteristics of the UO₂ powder. ENUSA utilizes an IDR process with powder delivered from the Springfields facility (UK) while Westinghouse uses an ADU route. Additionally, Västerås AUC process shall be used in the Gadolinia rods for the Almaraz fuel.

Features like the WIN nozzle are to be first delivered into the Almaraz plant.

Logistics

This Security of Supply project involves three nuclear fuel manufacturing facilities and two nuclear power plants located at both sides of the Atlantic. Therefore, an extensive effort must be put in place to guarantee the smooth delivery of fuel to the different facilities. A cargo company shall be used to ship the fuel by boat on a trip which usually takes around 3 weeks. For both deliveries the new Westinghouse Traveller container shall be used, although for the Wolf Creek assemblies an additional operation at the Columbia factory must be performed to load the fuel into MCC containers for later delivery to Wolf Creek.

The Gadolinia rods for the Almaraz fuel shall be shipped following an existing route and procedure at Westinghouse for shipment of Gadolinia rods for the US market. The ZIRLO™ tubes shall be manufactured by Sandvik Europe.

Conclusions

As it has been said, the project is now under execution. However some of the expected results are anticipated:

- The project shall demonstrate that in emergency situations a supply of nuclear fuel from a foreign vendor is feasible under timing, logistics, licensing and design considerations.
- It also guarantees that the power plants and utilities do not need to qualify new products or vendors in case of the main supplier not being able to guarantee the fuel deliveries, by creating a backup at the other side of the Atlantic.
- This Security of Supply project must open new supply chain routes for components and powder. Such diversification is needed under the upcoming nuclear renaissance which will test the ability of the nuclear industry to meet more demanding production targets.
- A key factor of this program is the confirmation that alternate supply is feasible for a product which requires no licensing authority approval prior to insertion. This is a major advantage versus qualification of an alternate vendor where new safety analyses are normally required, nearly prohibiting any benefit in an emergency situation.

Both Westinghouse and ENUSA consider that this project is a key step in their long history of mutual partnership which shall tighten even more their historical links to better serve their customers in Europe and the US.

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