The work fulfilled safety case requirements to ensure continued operation of the AGR fleet

EDF Energy are the largest producer of low-carbon electricity, the biggest supplier of electricity by volume in Great Britain and the largest supplier to British businesses. EDF Energy is part of EDF Group, a leading global electricity company which began investing in the UK in 1998. Today, EDF Energy employs over 13,500 people across the UK - from Torness in Scotland right down to Exeter in Southern England. EDF Energy has three main business units: 'Generation' which produces electricity from a fleet of nuclear and thermal power stations; 'Customers' who serve our business and domestic markets; and the Hinkley Point C project which is leading the UK's nuclear renaissance with the construction of a new nuclear power station in Somerset.

The Challenge for EDF

When previous supplier of the critical mechanical testing of metallic tiebars decommissioned their testing facility in the 1990s EDF Energy had to find a new supplier for these services to enable continued safe operation of their AGR reactors. In addition to the tiebar testing, EDF Energy also wanted to mitigate the risk of having only one supplier of fuel Post Irradiation Examination (PIE).

Advanced Gas cooled Reactors (AGR) differ significantly from light water reactors and there is little competency on this technology outside of the UK, particularly in relation to post irradiation examination (PIE) of fuel.

Another limiting factor was transportation of the highly active material, both in terms of finding a route and receiving the 55ton AGR transportation cask.

The Solution

Studsvik Hot cell laboratories offered facilities to accommodate both mechanical testing of the high dose tiebars and methods for the AGR fuel PIE. With Studsvik's extensive experience of PIE for the global nuclear industry and proven track record of developing testing methods for other customers, EDF Energy were confident that Studsvik could develop the required methodologies and equipment in close collaboration with UK experts in this field.

For the reception of the 55ton cask a feasibility study was the first step to determine how the idea of using Studsvik as a future PIE supplier could be realised. Through investment in equipment for the fuel storage ponds at the Studsvik site, the crucial factor - receiving the 55ton cask - could be solved.

Routes for marine transportation of both the fissile and non-fissile materials were developed and within two years from initial discussions between EDF Energy and Studsvik, the first transport of AGR fuel elements and tiebars from the UK to Sweden was successfully performed.

The Results

During the period 2008 to 2018 nine marine transports have been performed, 800 tiebar samples have been tested and more than 100 AGR fuel pins have been examined in Studsvik's facility. Results from this work has underpinned the continuous work to fulfil safety case requirements to ensure continued operation of the AGR fleet. In addition, EDF Energy have benefit from Studsvik's flexibility and portfolio of advanced testing/analysis techniques e.g. understanding of failed fuel behaviour, impact of changed manufacturing route on mechanical properties and effect of changes in coolant chemistry on core components.

Through delivery of excellent service Studsvik have maintained an excellent working relationship with EDF Energy. We have demonstrated world class expertise in operation of our facilities to give this important customer confidence in Studsvik. We work closely with the EDF Energy team at Barnwood to ensure client satisfaction on existing contracts and identify new areas of collaboration.

Edf Energy Nuclear Generation Limited, Barnwood, UK.

"I was really enthused by the conversations with the team – in particular, the knowledge, context awareness, and willingness of your cave line staff to try new approaches was great to observe! You have some fantastic staff at Studsvik – thank you for facilitating a visit to allow myself to meet some of them!"

David Mallaburn
Head of Engineering
EdF Energy Generation

Facts about Post Irradiation Examination

The non-destructive tests include fission gas release, rod internal pressure, length measurement, visual inspections, Eddy Current (EC) oxide thickness measurement, profilometry as well as gamma scanning and burnup determination.

The destructive tests include Light Optical Microscopy (LOM), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Ring Tensile Testing (RTT), Axial Tensile Testing (ATT) and Hot Vacuum Extraction (HVE) hydrogen measurements.