



## ATLAS+ Advanced Structural Integrity Assessment Tools for Safe Plant Operation

**Research area:** Structural Engineering

**PI:** Dr Mahmoud Mostafavi, University of Bristol

**Partners:** 18 Partners across Europe including VTT Finland, EDF Group, Framatome, and CEA

**Funders:** EU

**Contact details:** [M.Mostafavi@bristol.ac.uk](mailto:M.Mostafavi@bristol.ac.uk)

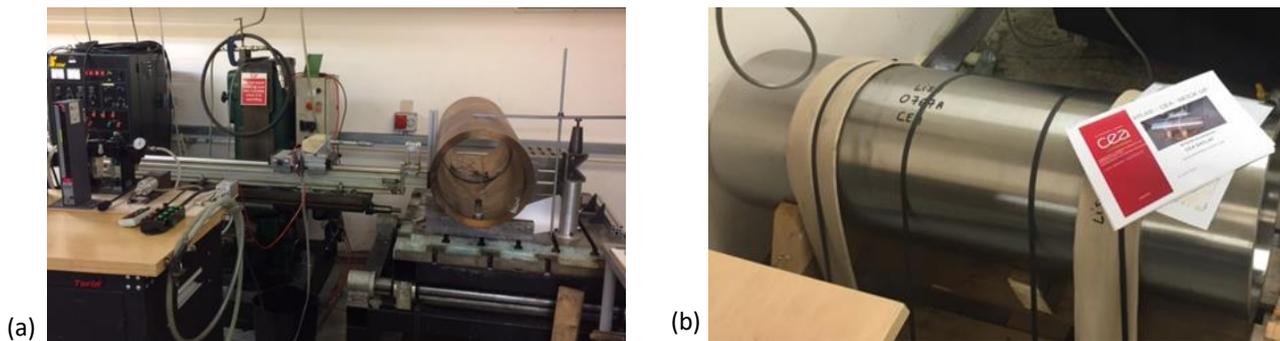
**Project website:** [nugenia.org/portfolio\\_item/atlas/](http://nugenia.org/portfolio_item/atlas/)

### The Challenge

There are 15 nuclear reactors in the UK and many more around Europe. Many of these reactors have been or will be working past their designed life but how does ageing effect their safety and productivity? This is a challenge particularly important for the UK where 20% of our electricity is produced by nuclear while our first commercial nuclear reactor in a generation will not be connected to the grid until 2025. Current assessments of safety of power plants conservatively underestimate the structural integrity of safety critical components. The challenge in this project is to apply state of the art scientific advances to the safety assessments of ageing reactors to safely extend their lives.

### The Solutions

Figure 1



Pipe manufactured by CEA France and analysed at University of Bristol.

In collaboration with Alternative Energies and Atomic Energy Commission (CEA) France, a welded stainless steel pipe, which is an integral part of the primary cooling circuit of the EPR reactor to be built in Hinckley Point C, was manufactured. The locked in mechanical stresses, that are inevitably introduced in any welded pipe, were measured at the University of Bristol before the pipe was aged at reactor temperatures for 1000 hours. The changes in the locked in mechanical stresses after the ageing process were measured at University of Bristol. Such changes are representative of variation in the state of the components as a result of service conditions and play a significant role in the structural integrity of safety critical components during their use.



SOUTH WEST  
NUCLEAR  
HUB

Figure 2



*EPR Reactor pressure vessel in the installation process at Oikiluoto (June 2010 – image: Framatome).*

After re-measuring the locked in stresses which can change as a result of ageing, the pipe was transported back to France where it will go through a full-scale destructive experiment. The destructive test along with the change in the mechanical locked-in stresses will be used to update the engineering practice of assessing the integrity of components after long periods of time in service.

### ***The Impact***

The project, closely aligned with EDF Group's implementation procedure, will inform structural integrity assessment codes so they include the effects of in-service loading. This can have a significant effect on deciding whether a plant should be shut down or can continue producing energy, safely, beyond its designed life.



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