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# Manufacturing in fusion-grade steels for breeder blankets applications within the Neurone programme

The deployment of new, enhanced performance, low activation, fusion-grade steels for in-vessel components such as breeder blankets can only be realised through advances in material science, industrial supply chain capability, component design and manufacturing technologies. The process of manufacturing a breeder blanket component will include many of the following steps: casting, rolling, forming, forging, machining, assembly, joining, coating, heat treatment, inspection, non-destructive evaluation, testing and qualification. The combination of novel materials, complex component designs and harsh operating conditions presents many challenges.

This presentation will provide an overview of activities within the 'Manufacturing and Joining'work package within the LIBRTI funded Neurone programme. This work covers:

1) Development of processing routes for conversion of ingots to plate and tube components
2) Manufacturing trials to enable the assessment and down selection of manufacturing technologies
3) Production of subcomponents, leading to the final build of a mock-up assembly in support of the LIBRTI programme

Stakeholders have selected the pressure pin assembly from the LIBTRI solid breeder pin-cell concept for the mock-up build.

Through the Neurone consortium, advanced reduced activation ferritic martensitic (ARAFM) steels have been developed and produced in 5.5 tonne heats via the industrially scalable electric arc furnace and continuous casting process. This steel has subsequently been forged and rolled to plate, for use in joining trials including friction stir welding, electron beam welding and brazing among others. Meanwhile seamless pipe production is being explored by multiple routes including radial forging, flow forming and additive manufacturing. This work is supported through extensive characterisation, mechanical testing and production of a qualification roadmap. This work is led by the Manufacturing Technology & Equipment Qualification (MTEQ) Group at UKAEA, in close collaboration with the Neurone programme partners and a wide range of supply chain organisations spanning RTOs, industry and academia. MTEQ is open to further engagement, and all interested parties are encouraged to attend.

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