



UK Atomic
Energy
Authority

NEURONE: NEUtron iRradiations Of advaNced stEels

Dr David Bowden

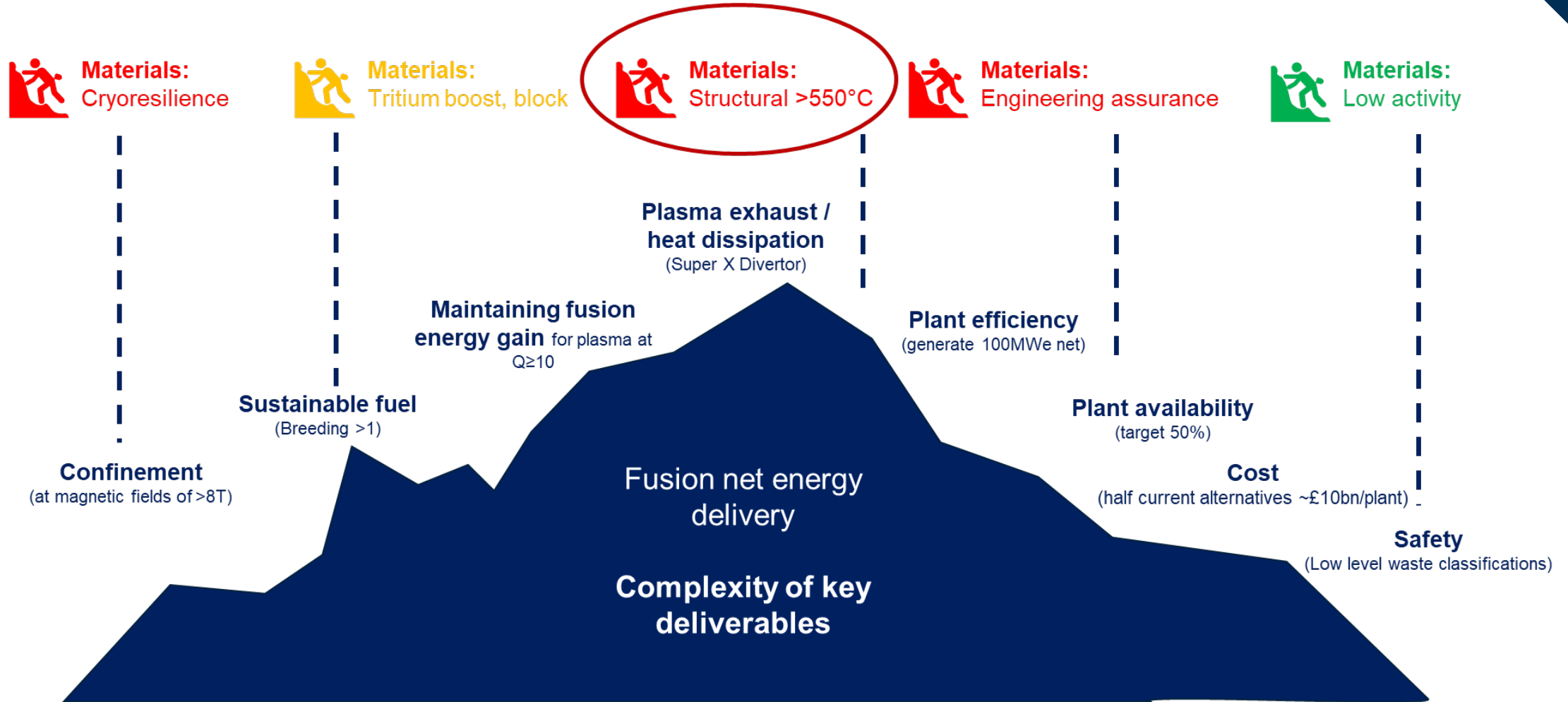
Materials Science and Engineering Group Leader

Introduction to NEURONE

Goal: deliver an advanced, high-temperature steel for fusion (and fission) via novel microstructure and process development coupled with verification with irradiation testing.

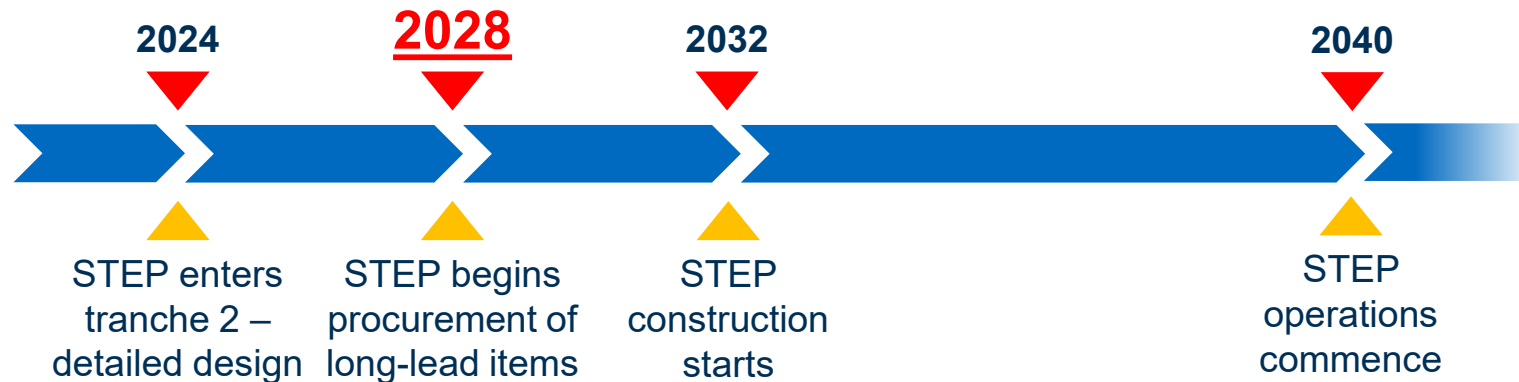
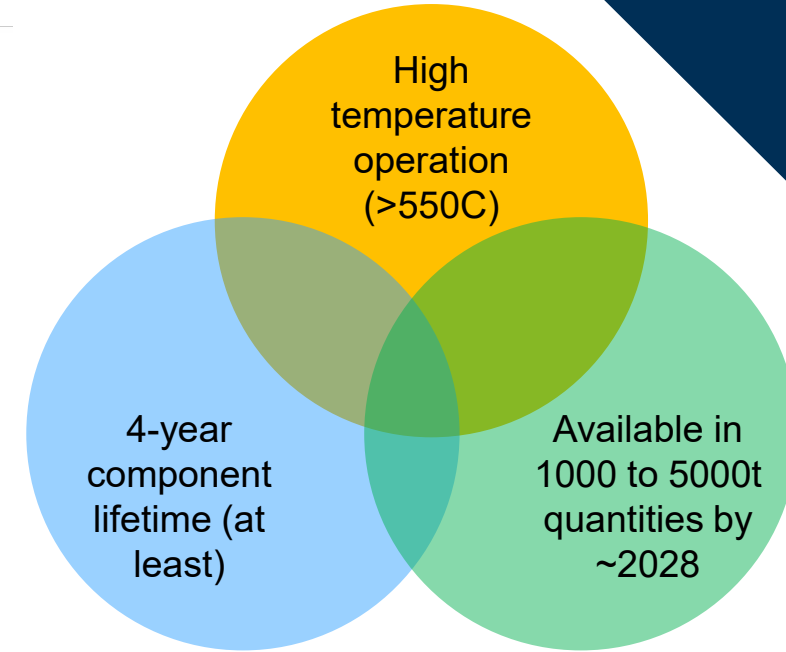
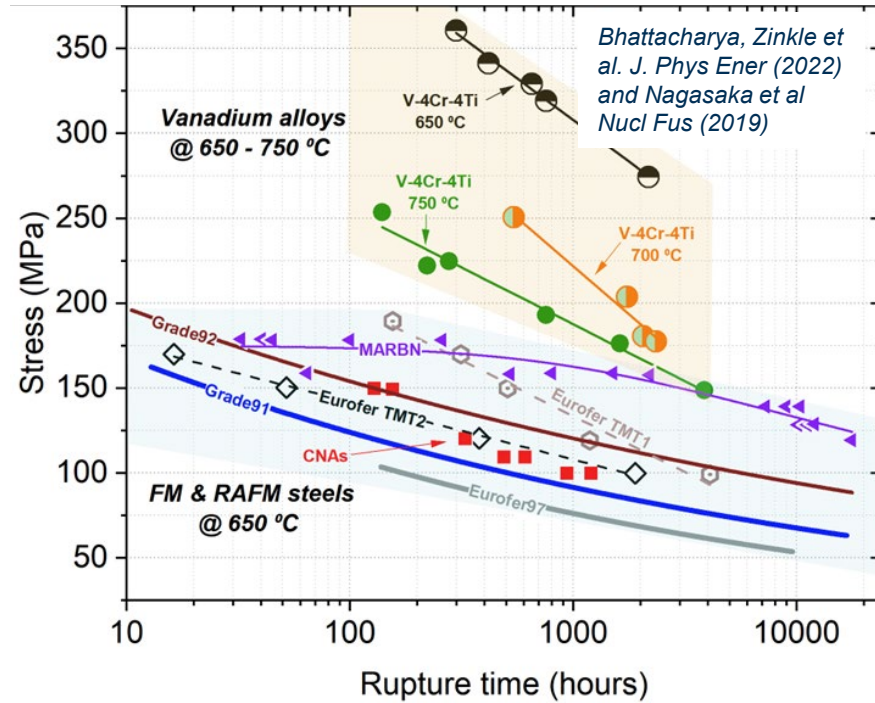
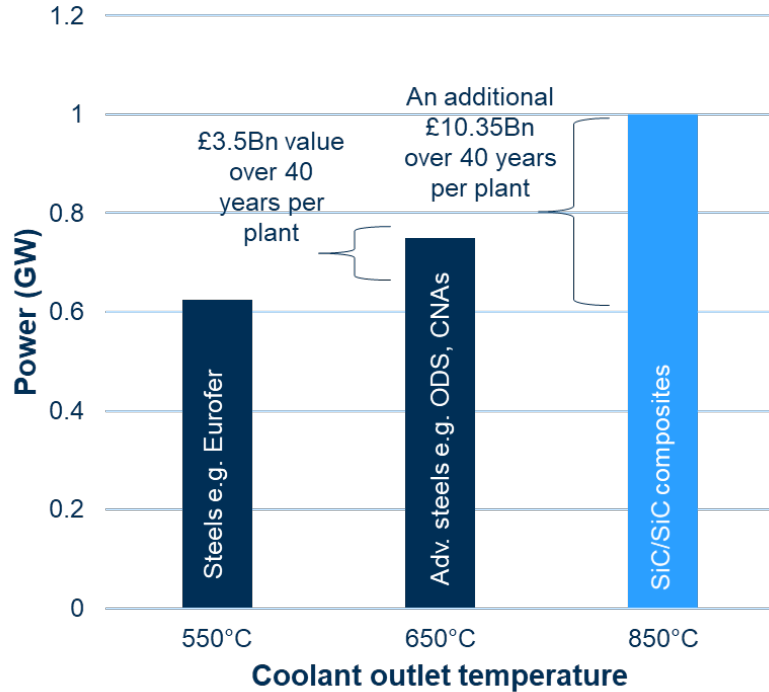
- Following on from NEUIRR project (2016 – 2020)
- NEURONE originally proposed as a five-year programme valued at £10m.
- Brings together 10 organisations across academia and industry.
- Submitted to BEIS in 2021.
- Pending the outcome of the DESNZ alternatives funding stream, UKAEA is self-funding NEURONE for ~£1m in FY 23/24.

The need for advanced steels

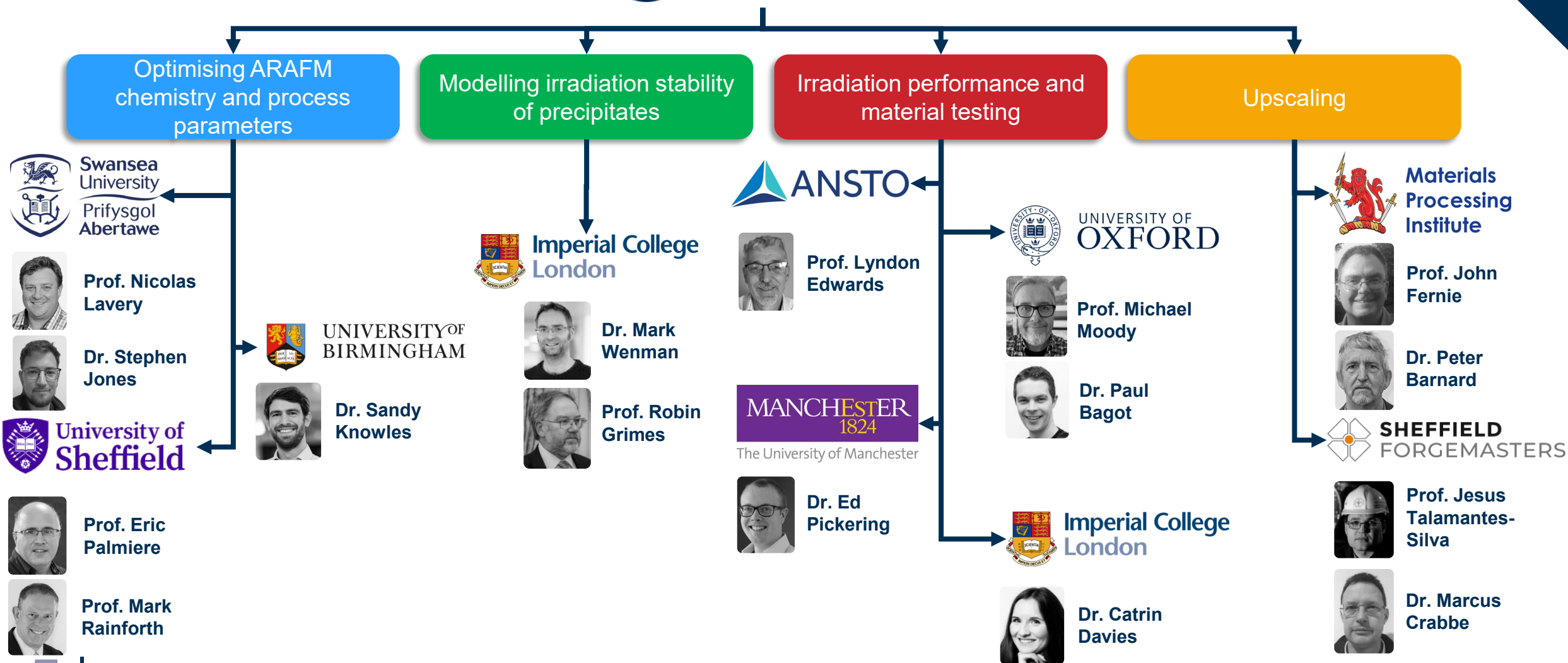


https://www.royce.ac.uk/content/uploads/2021/09/UK_Fusion_Materials_Roadmap_Interactive.pdf

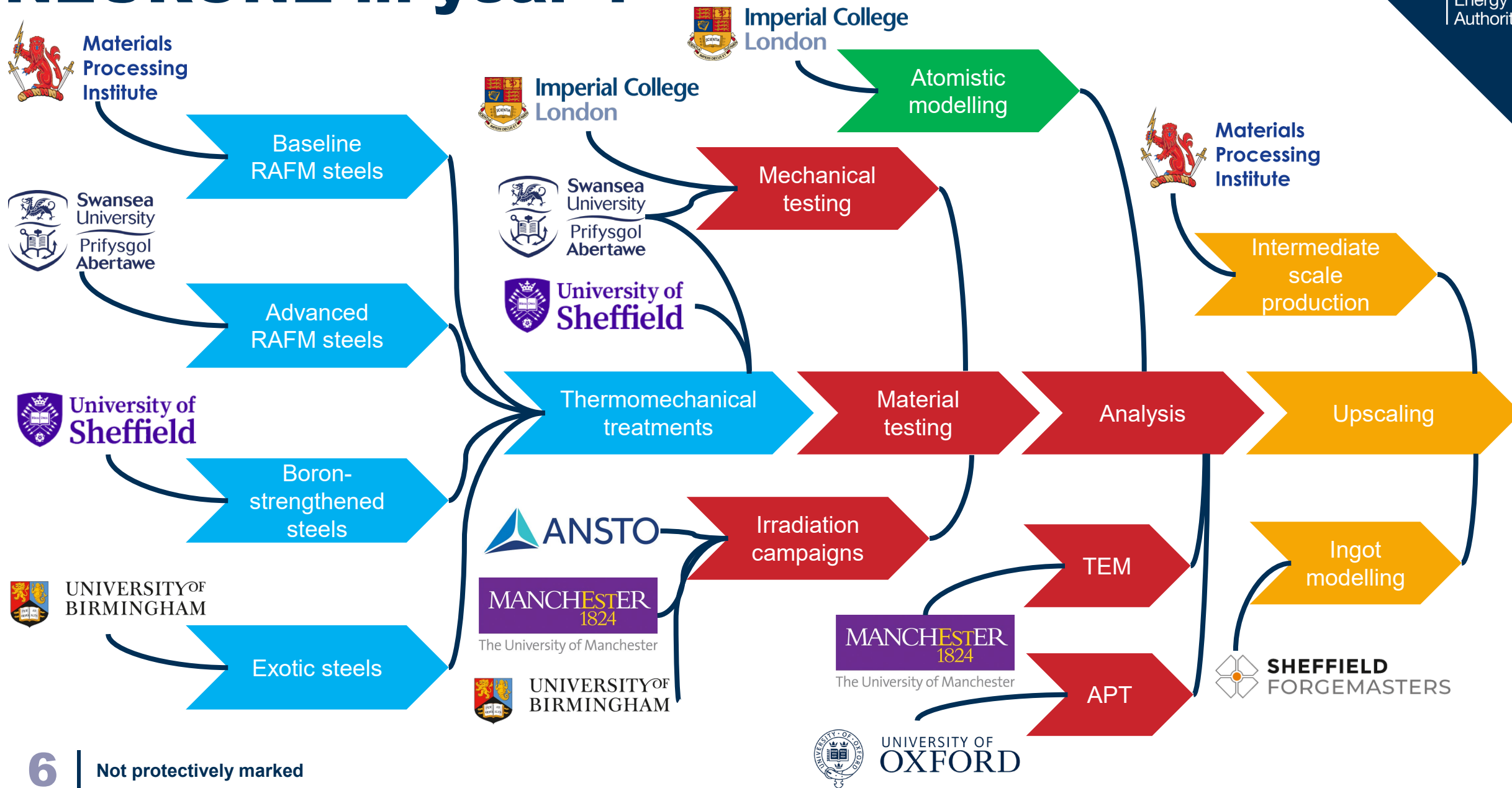
The need for advanced steels



NEURONE in year 1



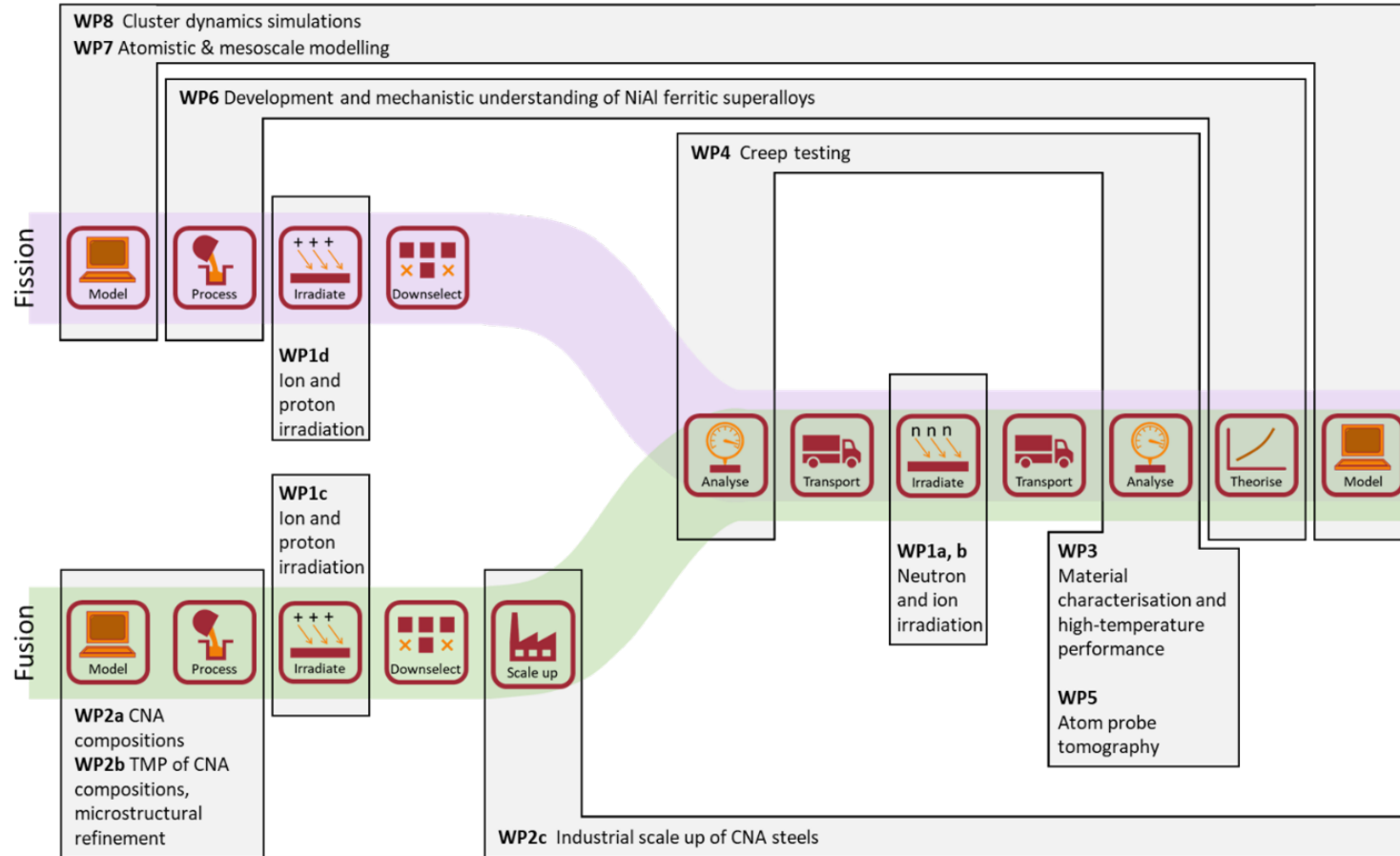
NEURONE in year 1



Year 1 outputs

- Optimisation of chemistry and TMTs for two down selected Eurofer and F82H derivative ARAFMs steels.
- Neutron irradiated steels produced (~up to 0.1 dpa).
- Completion of a He implantation and dual beam He/Fe implantation at DCF.
- TEM and APT of the baseline and implanted ARAFMs steels complete.
- Commissioning of in situ creep capability on the MC40 at University of Birmingham.
- Post-doc in place developing atomistic models informing on precipitate/interface stability under irradiation.
- Ingot casting/segregation model at tonnage scale for ARAFMs steels complete.
- 200kg of VIM ARAFMs steel produced!

Future



Ultimately, NEURONE is much bigger than simply developing and irradiating steels. It is a chance to build an advanced nuclear steels community in the UK – very much a growing demand for GenIV (inc. AMR) and fusion sectors.

Thanks for listening

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