SESSION TITLE: Structural Materials

Strengths	Weaknesses
• Graphite science • NDE and monitoring research (non contact) • How materials degrade and creep at high temperatures • Integrated computational modelling • Modelling of structures of nuclear materials (UO_2, MOX, cladding) and has developed a number of codes • Structural Integrity assessment methods • Neutron/synchrotron research capability (residual stress, damage evolution) • Multi-scale characterisation of materials • Growing recognised zirconium research capability • Strong links between industry and academia • Development of some key nuclear research laboratories • Renaissance in Research Council and other funding sources • International collaboration is strong in fusion. • UK approach to developing a mechanistic understanding of materials degradation and structural behaviour rather than a purely empirical approach	• Loss of structural mechanics capability—large-scale structural features tests and capability for modelling large-scale structures • International collaboration is weak in some areas • Radiation damage capability - to undertake radiation damage, and the hot cell facilities to test and examine materials • Corrosion in general and environmentally-assisted cracking is not a strong as it used to be • Lack of commitment to facilities at both low and high temperature • Capacity to undertake v long-term tests (note DIAMOND development for a long-term test facility is a good sign) • Fragmented experimental capability • Vulnerable in terms of specific expertise in key areas: Radiation science, EAC, nuclear manufacturing, structural mechanics • Ability to do prototyping in materials development • Ability to manufacture v. large scale forgings for RPVs
Opportunities	**Threats**
• Strength in HT materials for Gen IV • Increased interaction between academia, National Labs, and industry so students gain access to longer-term R&D and industrial expertise • Growing nuclear research community with more younger research people • Taking on experienced scientists from other countries • Develop new understanding on materials, degradation, inspection to strengthen safety cases for lifetime extension • Bring together fission/fusion structural materials and mechanics -particularly for high temperatures • Nuclear Advanced Manufacturing Research Centre: bringing together manufacturing research with industrial development • Bringing together materials and modelling communities • Creating a Nuclear User Facility to network national capability and facilitate access • Engaging with STFC development in high performance computing for nuclear research in multi-scale modelling (methods & hardware)	• External perception that we don't need to fund research because problems are solved or we can buy reactors off the shelf. • The view that we have sufficient academic capability in nuclear • Delay in civil new build: companies are waiting for a decision • Another nuclear accident • Challenge of introducing new materials, manufacturing methods, into nuclear - after the research has been done linking into Codes and Standards • Engaging steel manufacturers in developing new structural materials • Loss of nuclear manufacturing base and culture • Splitting of fission and fusion in structural materials • Lack of funding for nuclear research • Value from investment in nuclear research facilities is not realised by lack of focused and sustained funding • Public perception of nuclear, including linking fission research with nuclear weapons research