その他セッション「文科省原子力研究開発事業について 廃炉国際共同研究を中心に」

Outline of MEXT competitive funds for nuclear technology
- International Collaboration on Decommissioning -

Nuclear Research and Technology Transfer: UK Perspectives

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The University of Manchester, Dalton Cumbrian Facility

The U.K. has a long history of nuclear power generation and with the development of an extensive new nuclear build programme on top of the requirement to decommission old facilities, there is a need for bespoke facilities to perform research to inform decision making. The University of Manchester's Dalton Cumbrian Facility is an undertaking supported by the Nuclear Decommissioning Authority and The University to address the engineering decommissioning and radiation scientific challenges associated with the nuclear industry and particularly the Sellafield site. The DCF is a world leading scientific capability located near Whitehaven in Cumbria close to the Sellafield site and was officially opened in 2013 by Lord Hutton. The facility currently houses state of the art irradiation capabilities, including a 5MV tandem accelerator; a 2.5MV single ended ion accelerator; and, self-contained Cobolt-60 gamma irradiator; as well as dedicated analytical chemistry and environmental and material science laboratories. The experimental capabilities will be described and discussed.

The ion accelerator systems at the DCF have been used to investigate the effects of various charged particles including protons, alpha particles and a number of heavier ions on nuclear and structural materials, while the Co-60 irradiator has been used to study the effects of gamma radiation on polymers and waste encapsulants, nuclear reprocessing solvents, LWR coolant systems, and atmospheric gases. Examples of work carried out at the facility will be presented to show how this equipment is used to enhance the mechanistic understanding of the deleterious effects of ionizing radiation in the nuclear industry, with applications include in waste storage and reprocessing as well as geological disposal and novel surveying techniques.

The DCF was originally supported by a £20million investment by the two founding partners, which has been leveraged by a further £6.5million of capital investment for research equipment raised from other government and industry sources. Capabilities under development include the world’s highest energy dual ion beam irradiation as well as a picosecond time resolution positron annihilation spectroscopy capability. The DCF, along with the National Nuclear Laboratory’s Central Laboratory and the Culham Centre for Fusion Energy, is an integral part of the UK’s National Nuclear User Facility. The NNUF was established as part of the Governments Nuclear Industry Strategy to provide the UK nuclear R&D community with access to world leading equipment for research on radioactive or activated materials. Future developments and enhancements at the DCF and the NNUF will be presented and important research challenges will be identified.

Imperial College London

The Applied Modelling and Computation Group (AMCG) at Imperial College London have maintained reactor physics and criticality innovation at a world class level that is unique to the UK. The AMCG achieved this by maintaining a strong

multidisciplinary team of mathematicians, physicists and engineers working in close contact with the Regulators and Industry. AMCG is a 50+ strong team of researchers that develops and applies novel numerical methods to multi-scale and multi-physics problems. In 2011, it was presented with the prestigious Imperial College Research Excellence Award. Our specific relevant expertise covers areas of radiation transport, reactor physics, uncertainty modelling, multi-phase flow, coupled nuclear/fluids/structures, fault modelling, computational fluid dynamics (CFD), nuclear waste repository criticality, finite element (FEM) formulations, solid-mechanics, scalable solvers and parallel mesh adaptation. The science is reinforced and further geared through working in other engineering and environmental fields. AMCG has worked and delivered on several industrial projects in collaboration with companies both within the UK and overseas. With Rolls-Royce it developed the EVENT radiation transport model and with the HSE the initial FETCH framework was built. In Japan, the AMCG worked closely with both the JAEA and University of Tokyo (UoT) in projects including the Todai Forum (a meeting of 50 UoT and ICL nuclear researchers held at ICL), fuel reprocessing and transient criticality. In addition, the AMCG has performed consultancy for JAEA. More recently, with the Babcock & Wilcox Company (USA), a predictive model for medical isotope production reactors was developed. Working with ONR the work on accident scenario analysis has been focused on a modelling approach for candling phenomena and its verifications and a recent EPSRC grant has helped develop the severe accident modelling framework.