

# KNOO

Keeping the Nuclear Option Open



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**Increasing the safety, reliability and sustainability of nuclear power** is the challenge addressed by this new four-year initiative. The £6.1 million programme will examine issues such as how nuclear reactor systems function, how reactors are monitored and how the issue of reactor waste should be approached. The programme will also begin to address the acute shortage of people with the science and engineering backgrounds necessary to pursue a career related to the generation of electricity from nuclear reactors. Funded by Research Councils UK, it represents the single largest commitment to fission reactor research for more than thirty years.

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# KNOW

Keeping the Nuclear Option Open

## OVERVIEW

In collaboration with key industrial and governmental stakeholders and through international contacts, skills will be maintained and developed through research and training.

## OBJECTIVES

- Make research contributions to nuclear power to improve cost, safety and acceptability
- Maintain the expertise necessary for the UK to remain an informed customer
- Develop tools that contribute towards a whole system approach to nuclear power generation

## THEMES – WORK PACKAGES

- Fuel, thermal hydraulics and reactor systems
- Materials performance and monitoring reactor conditions
- An integrated approach to waste immobilisation and management
- Safety and performance for a new generation of reactor designs



## WORK PACKAGES

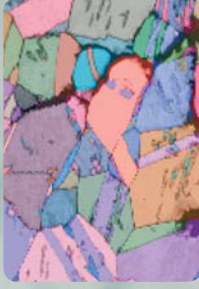
### WORK PACKAGE 1: Fuel, thermal hydraulics and reactor systems

Coupling of multi-pin structural mechanics and three-dimensional transient two-phase thermal hydraulic analysis for the study of pin ballooning under reflood conditions; the experimental and theoretical investigation of vapour and droplet flow diversion in ballooned regions of the core, fundamental investigation of the physics of the wetting of hot surfaces, crud deposition and its thermal hydraulic and neutronic effects.



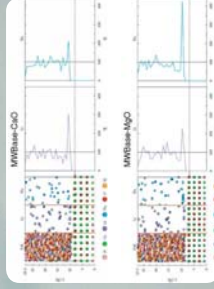
### WORK PACKAGE 2: Materials performance and monitoring reactor conditions

Remote structural interrogation and monitoring tools; miniaturised, encapsulated monitoring systems; FE/self-consistent models to assess materials; mechanical understanding and predictive models of SCC; mechanical performance of nuclear cladding and structural materials; characterisation and modelling of microstructural effects on graphite irradiation behaviour.



### WORK PACKAGE 3: An integrated approach to waste immobilisation & management

Re-mobilisation, transport, solid-liquid separation, and immobilisation of particulate wastes; develop predictive models for particle behaviour based on atomic scale, thermodynamic and process scale simulations; develop fundamental understanding of selective adsorption of nuclides onto filter systems and their immobilisation; mechanisms of nuclide leaching and transport.



### WORK PACKAGE 4: Safety and performance for a new generation of reactor designs

Reactor physics and fluids modelling for fault studies of Gen IV systems; CFD studies of heat transfer in ceramic fuel; dynamical evolution modelling of fission products in fuel and waste forms; mechanistic models to predict irradiation behaviour of graphitic materials; review to identify gaps for materials selection studies; impact on reactor design of hydrogen production of using process heat.

