

NTEC course content

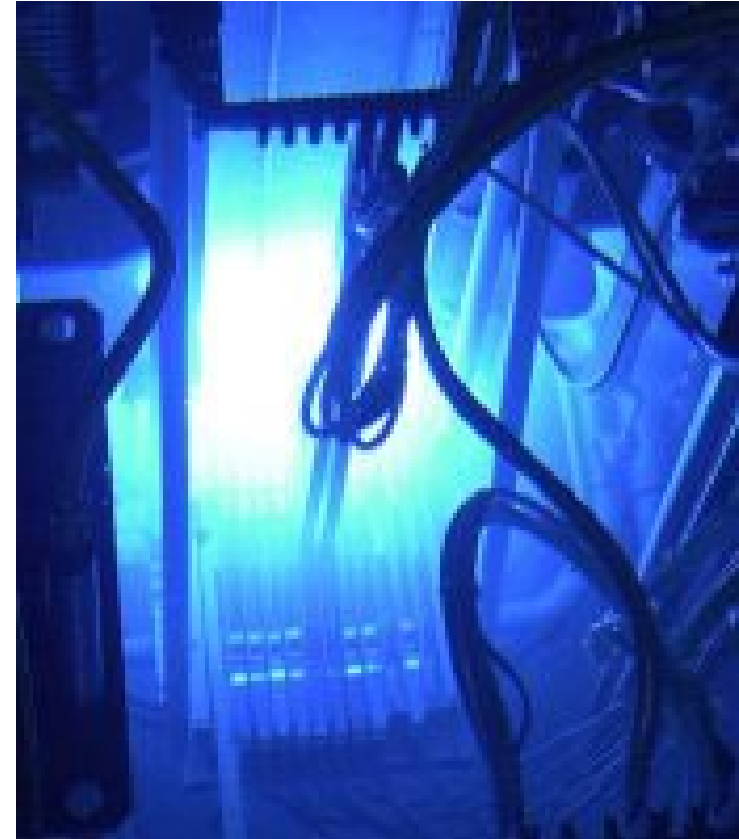
Stuart Christie

NTEC unit list

- Reactor Physics, Criticality & Design
- Nuclear Fuel Cycle
- Radiation & Radiological Protection
- Decommissioning, Radioactive Waste & Environmental Management
- Reactor Materials & Lifetime Behaviour
- Nuclear Safety Case Development
- Particle Engineering in the Nuclear Industry
- Policy, Regulation & Licensing
- Processing, Storage & Disposal of Nuclear Waste
- Radiation Shielding
- Reactor Thermal Hydraulics
- Criticality Safety Management
- Severe Accidents
- Chemical Aspects of Nuclear Technology
- Management of the Decommissioning Process
- Experimental Reactor Physics

Reactor Physics, Criticality & Design

- Reactor designs in the UK and worldwide
- Reactor accidents
- Reactor physics and criticality
- Time behaviour of the chain reaction
- Radiation transport



High Flux Reactor, World Nuclear News

Nuclear Fuel Cycle

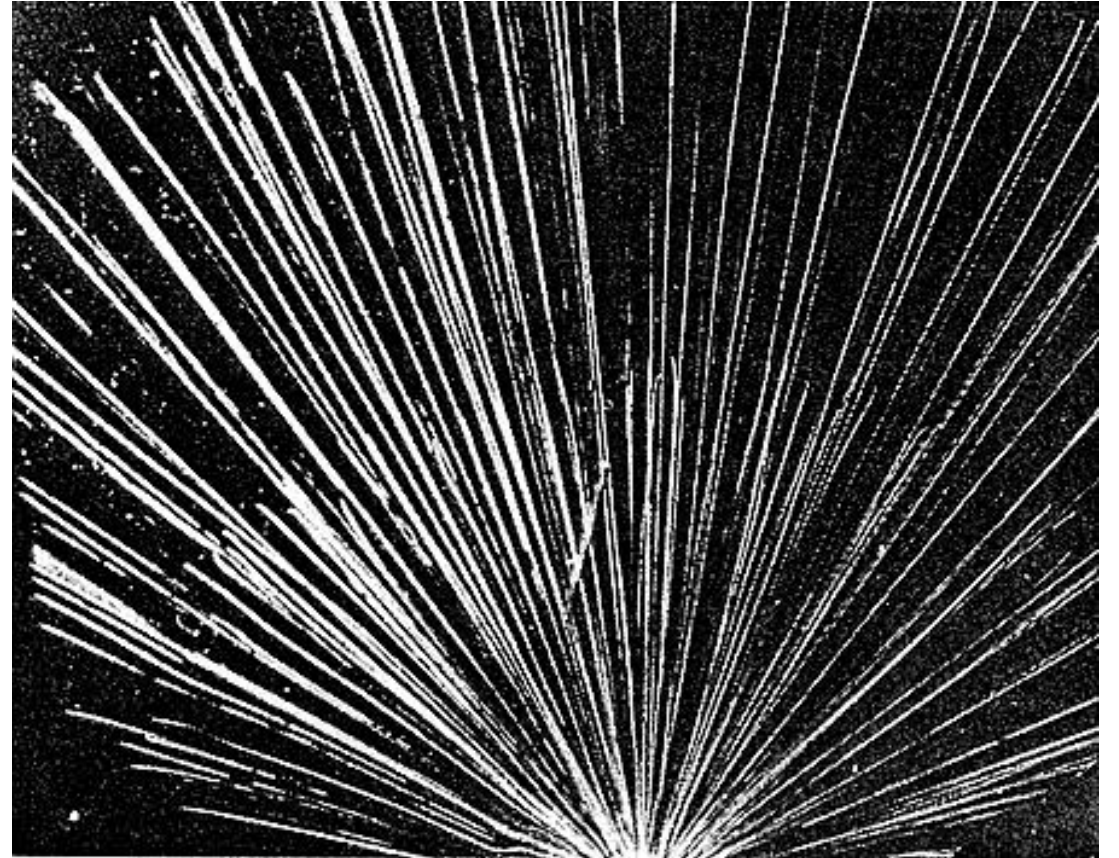


Uranium enrichment cascade, JNFL

- Mining and milling
- Enrichment
- Conversion
- Reprocessing
- Waste management

Radiation & Radiological Protection

- Nuclear and radiation physics
- Interaction of radiation with matter
- Radiation detection
- Biological effects of radiation
- Radiation safety



Alpha particle cloud chamber tracks, Institute of Physics

Decommissioning, Radioactive Waste and Environmental Management



Windscale pile filter decommissioning,
Nuclear Engineering International

- Decommissioning of nuclear facilities
- Site remediation
- Policy, governance and socio-political issues
- Environmental safety cases
- Sustainable decommissioning

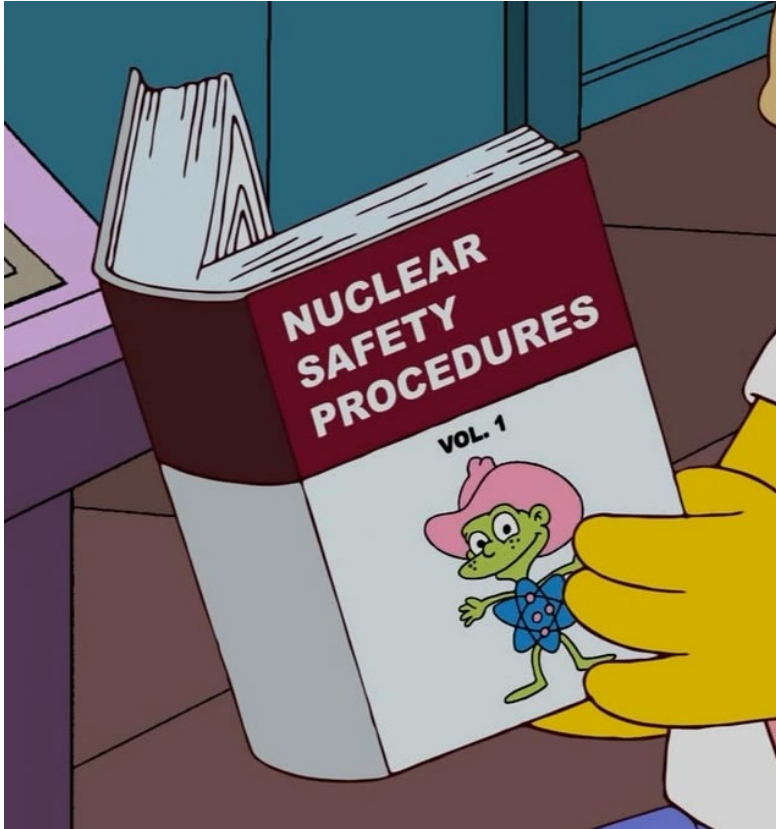
Reactor Materials & Lifetime Behaviour

- Materials science
- Corrosion
- Irradiation effects
- Structural integrity
- Nuclear materials
- Non-destructive evaluation



Nuclear fuel assembly, RIA Novosti

Nuclear Safety Case Development (not in 2023-24)



Nuclear Safety Procedures, The Simpsons

- Purpose and scope of a nuclear safety case
- Nuclear safety justification principles
- Engineering substantiation
- Deterministic safety justification
- Probabilistic safety analysis

Particle Engineering in the Nuclear Industry

- Particle technology and the nuclear fuel cycle
- Suspension rheology and slurry flow
- Colloid science
- Legacy waste retrieval and storage
- Particle science for nuclear fuel manufacturing



Yellowcake, Kazatomprom

Policy, Regulation & Licensing



All-Party Parliamentary
Group on Nuclear Energy

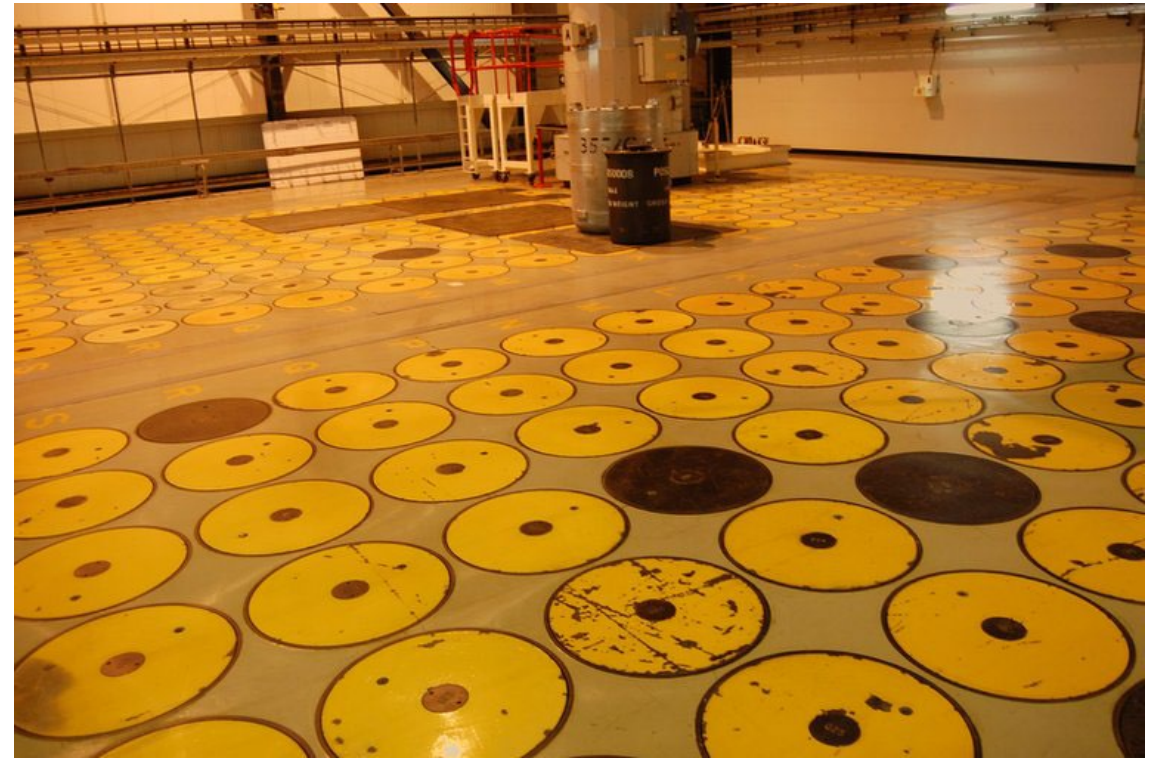
30 June 2021

- Legal systems and nuclear law
- Regulatory framework
- Nuclear licensing
- Environmental permitting
- Radioactive waste policy

UK Parliamentary Group Nuclear Roadmap,
All-Party Parliamentary Group on Nuclear Energy

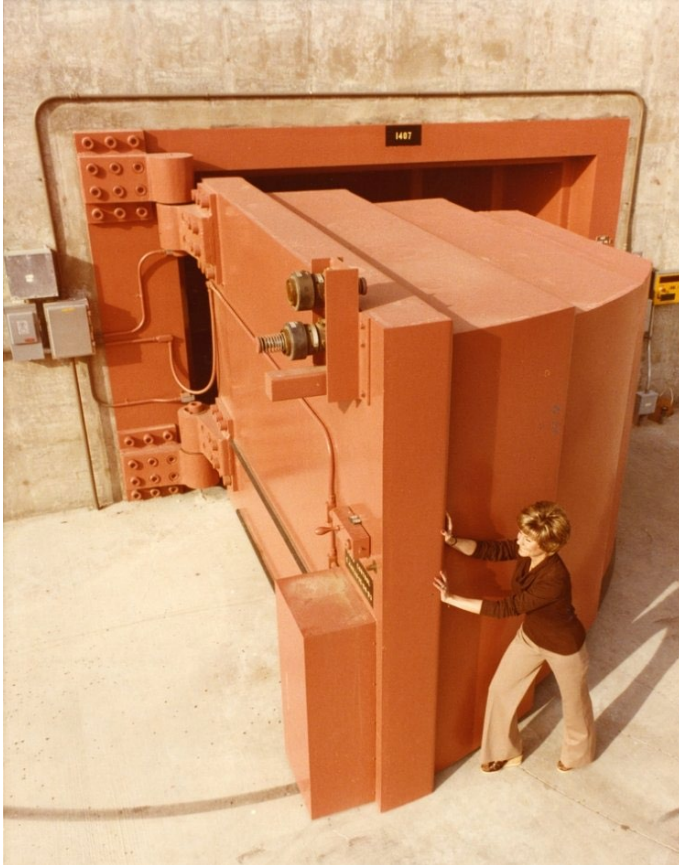
Processing, Storage & Disposal of Nuclear Waste

- Sources of radioactive waste
- Nuclear waste regulation
- Radioactive waste disposal materials and technologies
- Waste disposal concepts
- Geological repositories



High-level waste store at Sellafield, BBC

Radiation shielding

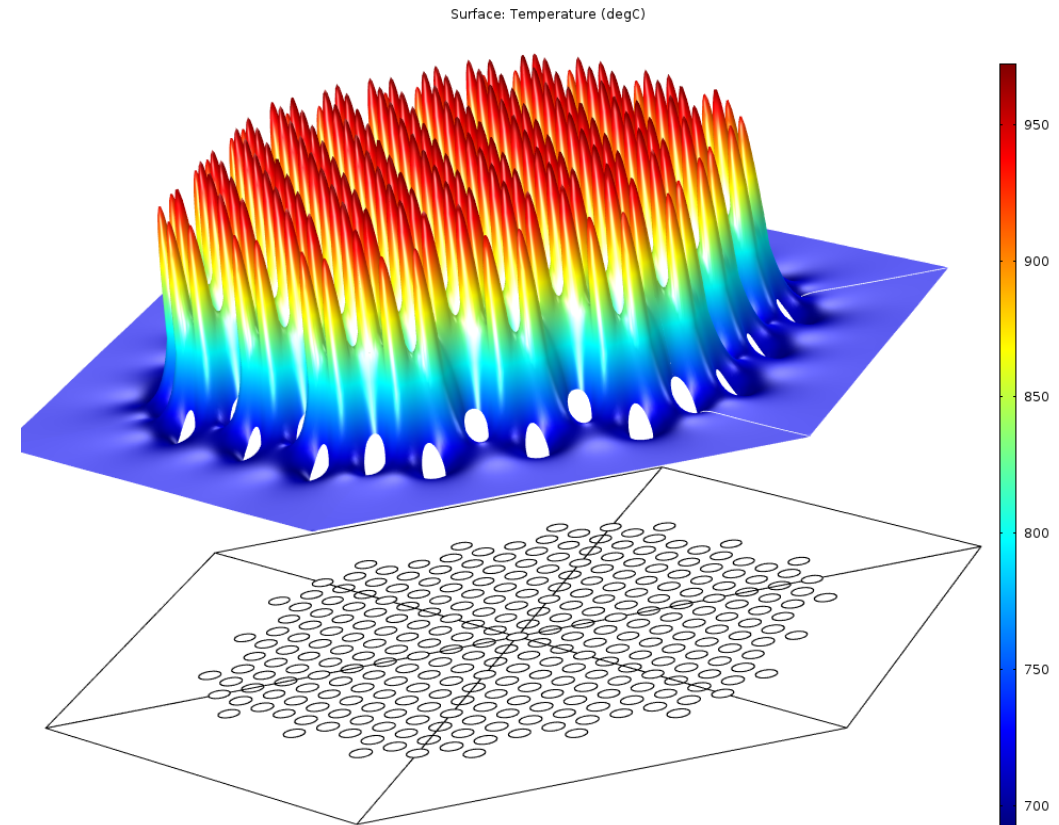


44 tonne door for neutron source shielding,
Energy.gov

- Particle transport
- Principles of radiological protection
- Shielding methods
- Monte Carlo and deterministic modelling
- Radiation shielding design

Reactor thermal hydraulics

- Heat transfer in fuel elements
- Heat transfer by convection and boiling
- Hydraulics of reactor fuels and systems
- Thermal hydraulic design
- Steam and gas power cycles



Nuclear fuel assembly surface temperature model,
Oak Ridge National Laboratory

Criticality safety management



Criticality safety experiment, Lawrence
Livermore National Laboratory

- Physics of nuclear criticality
- Methods of criticality control
- Criticality accidents
- Criticality calculations
- Criticality safety assessment

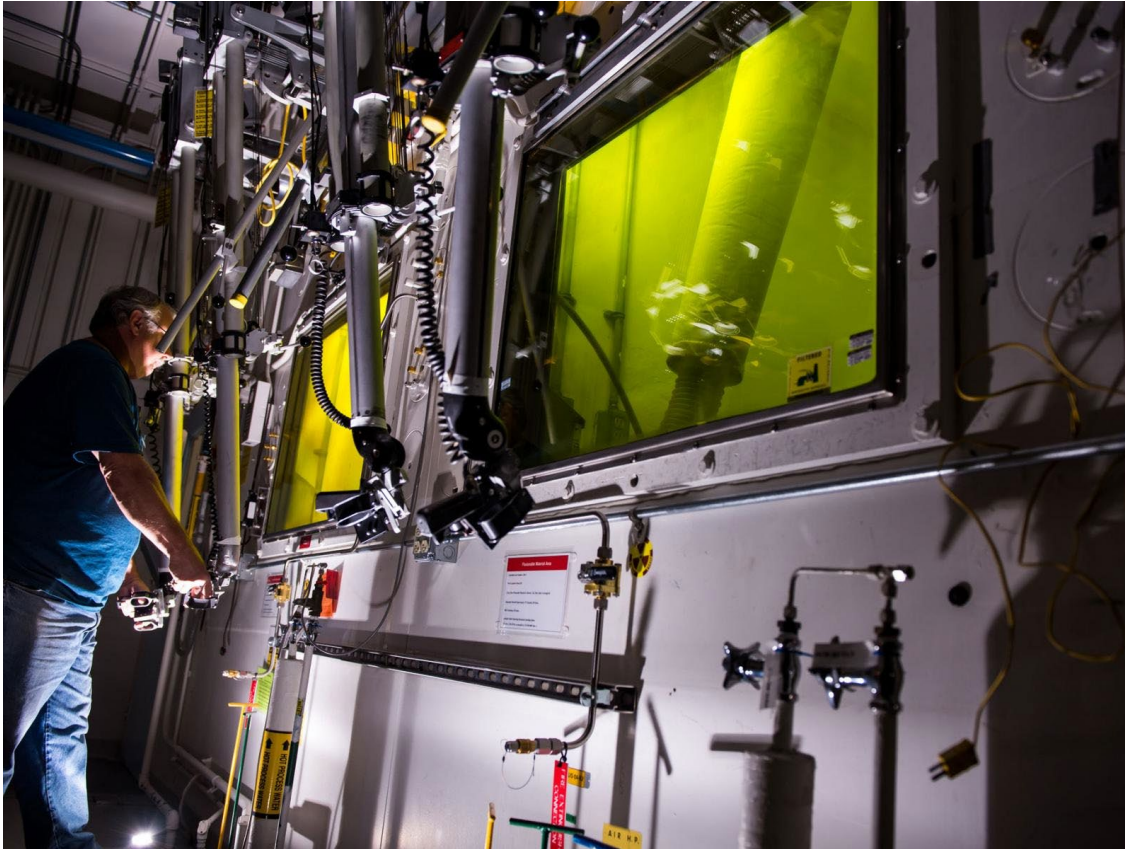
Severe accidents

- Nuclear safety principles
- History of severe accidents
- Accident processes
- Nuclear regulations
- Radiological, societal and environmental consequences



Chornobyl, S. Christie

Chemical aspects of nuclear technology



- Chemical and physical principles
- Nuclear fuel cycle chemistry
- Environmental radiochemistry
- Reactor coolant chemistry
- Analytical and forensic radiochemistry

Shielded cells with remote manipulators,
Pacific Northwest National Laboratory

Management of the Decommissioning Process

- Policy and business objectives of decommissioning
- Hazard reduction and risk management
- Project planning processes
- Nuclear safety culture
- Waste classification and characterisation



Robots used for decommissioning at Sellafield,
Nuclear Decommissioning Authority

Experimental reactor physics



NTEC student operating TRIGA reactor in Vienna, NTEC

- Neutron detection and measurement
- Reactivity measurements
- Control rod calibration
- Reactor behaviour and response
- Nuclear reactor operation

- Summer project working on a specific nuclear science and technology topic
- Industry and university based projects
 - Alternative waste encapsulation technologies
 - Application of machine learning to nuclear fuel studies
 - Space applications of nuclear technology
 - Neutronic analysis of nuclear reactor designs
 - Proton beam therapy modelling
 - Analysis of UK nuclear safeguards