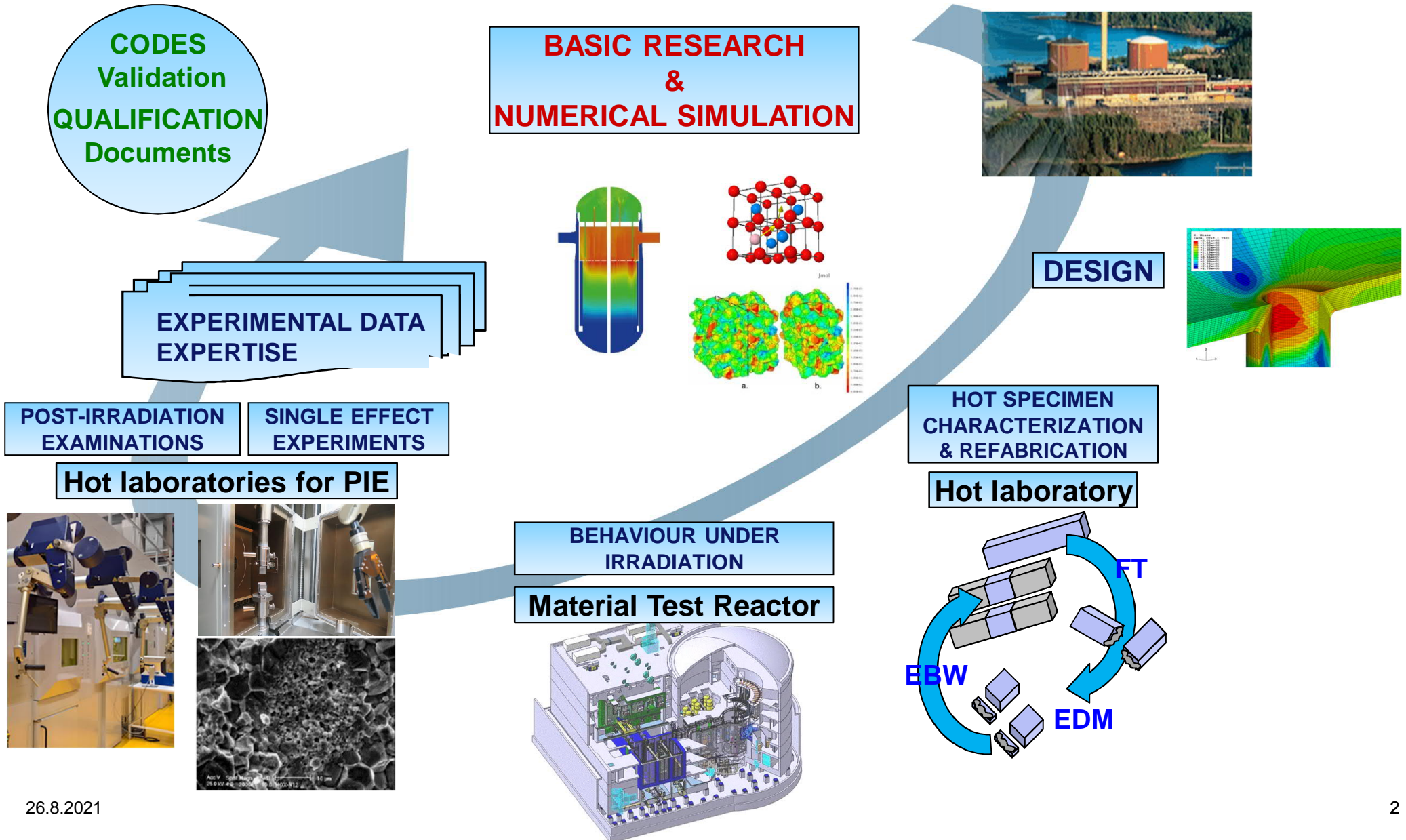


# VTT Centre for Nuclear Safety

## “Materials studies for aging management”

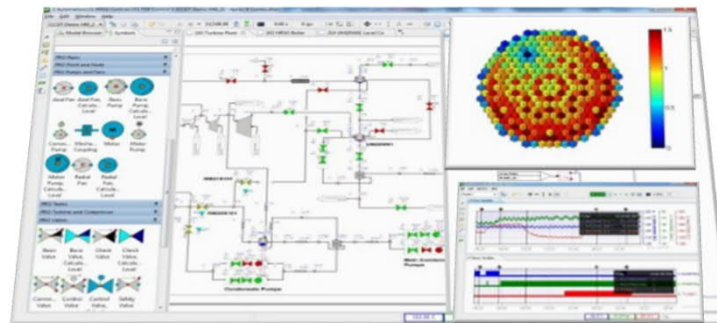
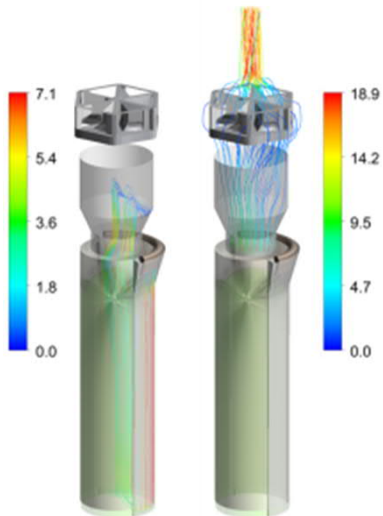
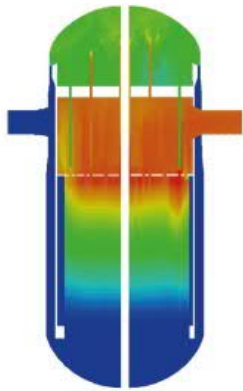
Wade Karlsen, Laboratory Manager

# VTT Rad Materials Research Ecosystem: R&D in support of safe nuclear power



# VTT Rad Materials Research Ecosystem: The VTT Centre for Nuclear Safety

- 3,300 m<sup>2</sup> office wing includes a ground-level conference centre, and three floors of modern, flexible office space for 150 people.
- Office wing is intended to serve nuclear sector employees in:
  - computerized fluid dynamics
  - process modelling (APROS)
  - fusion plasma computations
  - severe accidents
  - core-computations
  - waste-management
  - safety assessments
  - staff working in the laboratory wing.



# VTT Rad Materials Research Ecosystem: Hot Cells for irradiated materials handling

## Mechanical testing

- Tensile
- Impact
- Fracture toughness
- Crack growth rate
- Hardness

## Fabrication procedures

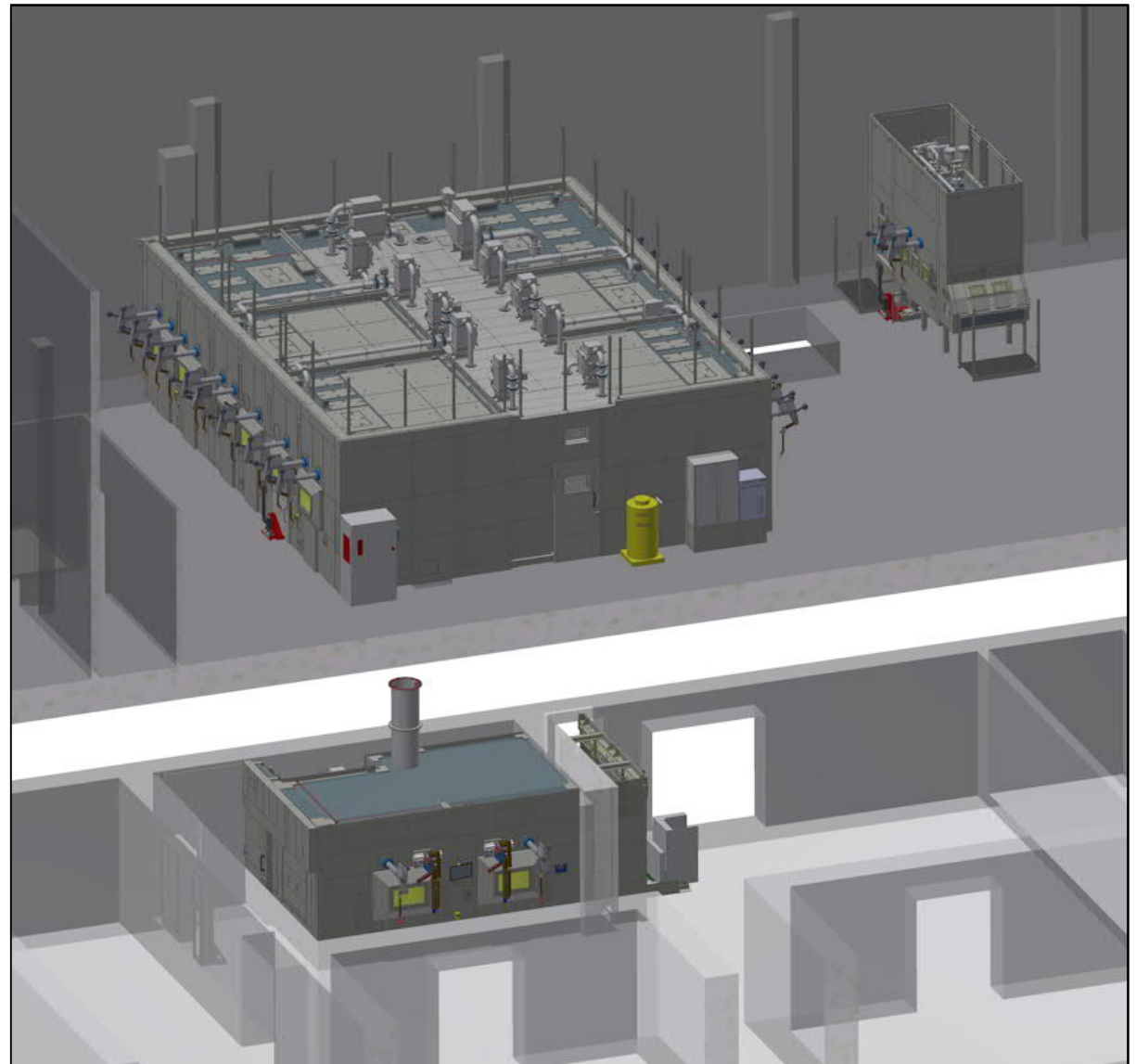
- Electrodischarge machining
- Electron beam welding
- Mechanical sawing & milling

## Microscopy

- Grinding, polishing, etching
- Light microscopy
- Dimension measurements

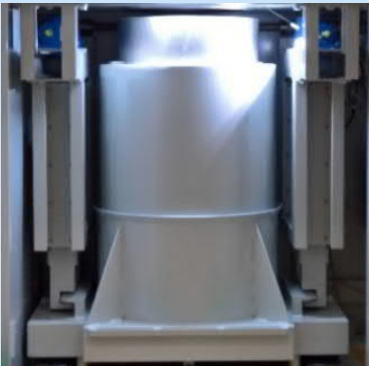
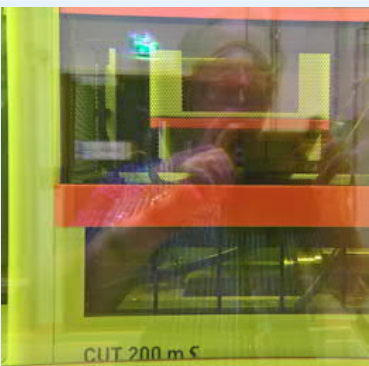
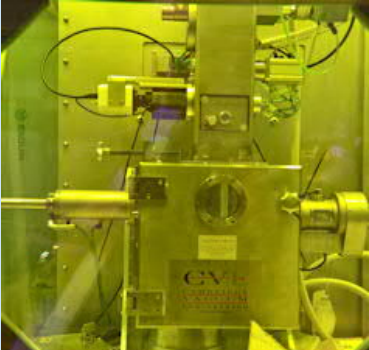
## Special purpose test set-ups

- biaxial creep (fuel cladding)
- corrosion in simulated LWR



# VTT Rad Materials Research Ecosystem: R&D in support of safe nuclear power



| Feature   |  | Task  | Purpose   |
|---|--|---|---|
|    | <p>Flexible transport cask docking system.</p>       | <p>Safely dock casks of various size, horizontally (Ø 200mm port) or vertically (Ø 400mm port).</p> | <p>Enable reception of diverse research materials from various different partners.</p>  |
|   | <p>In-cell CNC electric discharge machine (EDM).</p> | <p>Precisely cut out complex shapes with minimal material damage and debris production.</p>         | <p>Produce test specimens of various geometries, excise samples for microscopy, remove deformed material for specimen reconstitution.</p> |
|  | <p>In-cell electron beam welder (EBW)</p>            | <p>Join various materials with low heat input, high cleanliness, and strong fusion bond.</p>        | <p>Produce composite test specimens of small pieces of irradiated material augmented by joining to non-irradiated pieces.</p>             |

# Analytical Scanning/Transmission Electron Microscope FEI TALOS F200X FEG w/ Gatan Enfinium SE/976 EELS

- Manifestation of neutron irradiation effects
- High resolution microstructural imaging
- Crystallographic information
- Nano-scale elemental distribution mapping

