Research Centre Rez
R&D infrastructure and activities

Daneš Burket

sCO$_2$ workshop, Řež, 1.9.2017

R&D background

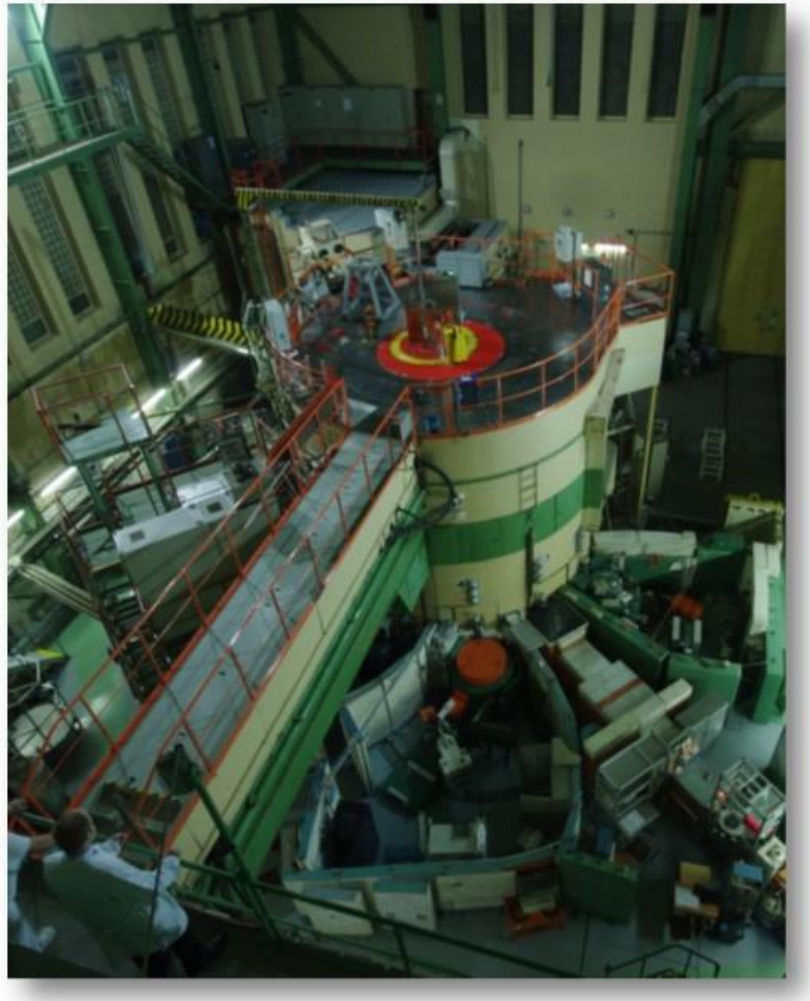
Two research reactors, set of experimental loops, microstructural and microchemical laboratories, NDE laboratory, neutron-physical and thermo-technical computation codes capabilities, design department, workshops and machinery park

makes us able to participate in sophisticated research projects and participate in the development of new technologies for GEN IV, SMRs and the fusion.

The company has developed broad-ranging relations with Czech, foreign and international organisations and participates in many projects togehther with companies, organizations and institutes from EU, USA, Japan etc.

Research reactor LVR-15

- Material research, e.g. the irradiation of reactor pressure vessel materials
- Corrosion testing of materials of reactor primary circuit and internals carried out in experimental loops
- Production and development of radiopharmaceuticals, Tc generators
- Manufacture of semiconductors by neutron transmutation doping of silicon for the electrical industry
- Basic research of material properties



LR-0 experimental reactor

- The light water zero power reactor
- Flexible reactor with flexible core arrangements
- For determination of neutron-physical characteristics of various types of reactor lattices
- Experiments with various insertion zone types (graphite, fluorine salts)
- Kinetic experiments – measurement of neutron flux response to a time-dependent reactivity
- Experimental verification of criticality and subcriticality in relation to zone parameters
- Verification of computation codes

Experimental loops

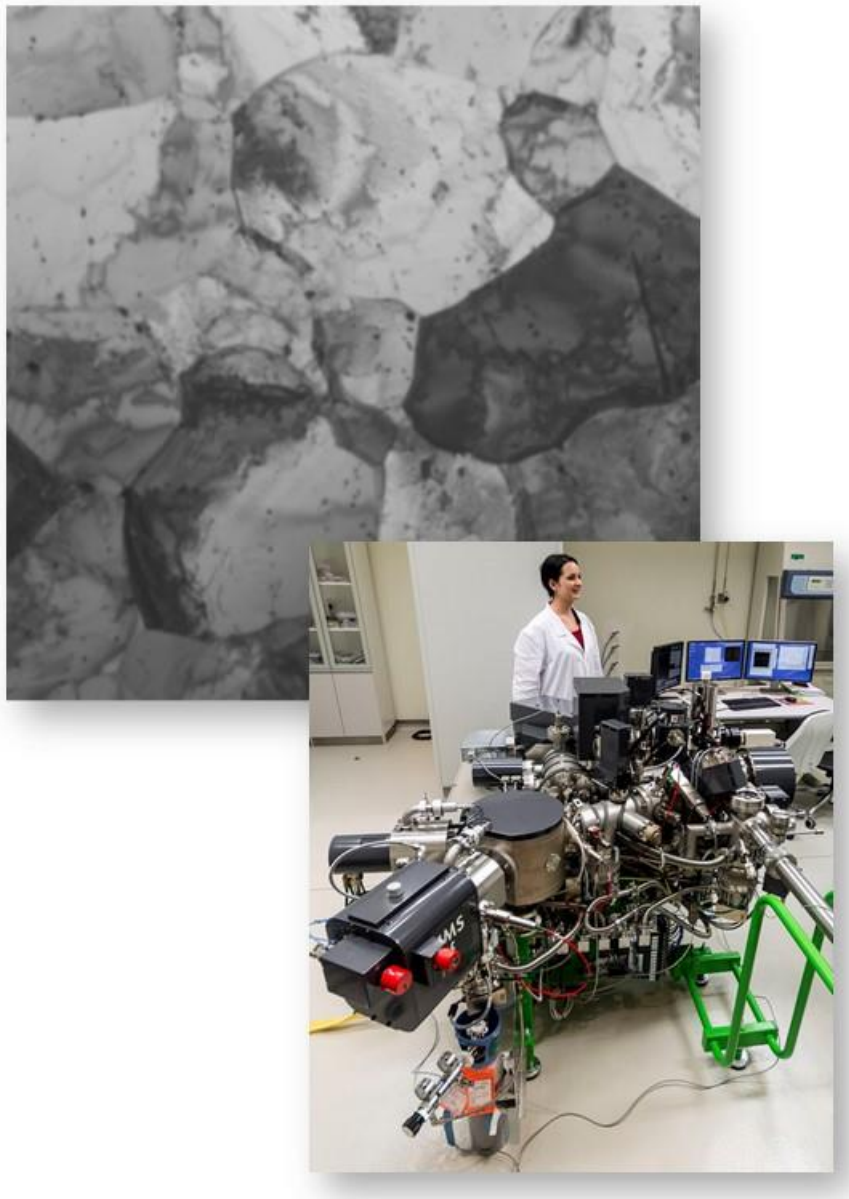
- Experimental loops for modelling of conditions in the reactor core and connected reactor cooling circuits
- Mechanical, thermal-hydraulic, material, corrosion and further research under operational conditions of various reactor concepts
- In-pile experiments – by placing a loop in the LVR-15 reactor, the physical and chemical influences can be supplemented by radiation conditions

Experimental loops

- **LWR loops** – LWR reactors conditions (320°C, 17 Mpa)
- **SCWR loop** – water of supercritical parameter (550 °C, 25 MPa)
- **HTHL loops** – high-temperature helium up to 850 °C
- **CO_2 loop** – supercritical carbon dioxide for research into heat transfer through CO_2
- **Metal liquid loops** – Pb, PbBi
- **FLIBE loop** – LiF-BeF_2 and nickel-based alloy (< 760°C)

Microstructural and microchemical labs

- Microstructural and microchemical analysis of various types of metal and nononmetallic materials
- Study of radiation damage of structural materials for nuclear reactors
- Development of new methods of the detection of very low activity in very small samples
  - Light Optical Microscope (LOM)
  - Scanning Electron Microscope (SEM)
  - Transmission Electron Microscope (TEM)
  - Secondary Ion Mass Spectroscopy (SIMS)
  - Nanoindenter



Severe accidents laboratory

Main objective

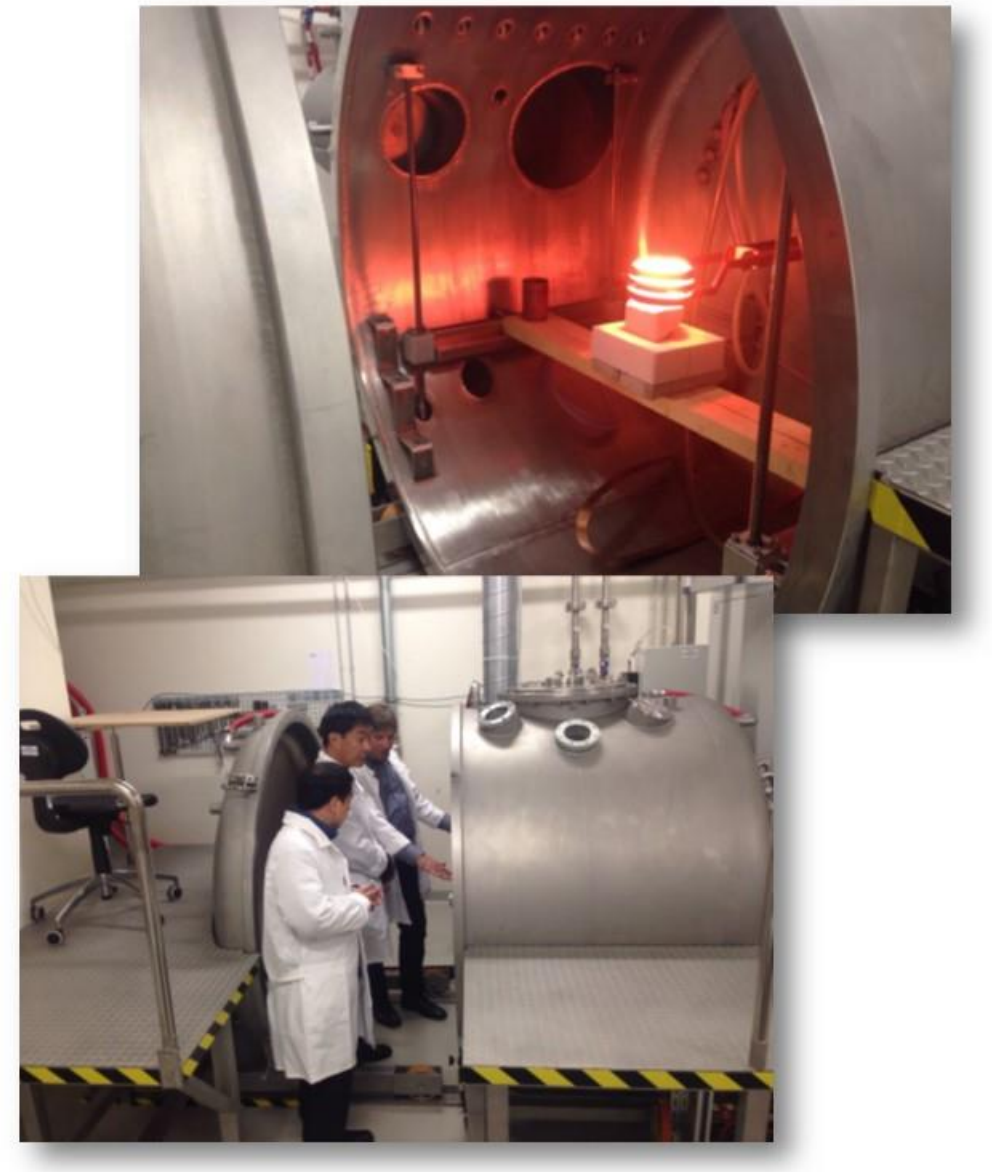
- Developing new procedures of thermal and radiation resistance verification and behavior of structural materials and systems under the extreme conditions of severe accidents.
- Research and development for GEN III and IV

Main technologies

- LOCA device
- High voltage testing room
- Gamma irradiation device

Cold crucible

- Technology for high-frequency induction heating
- For thermal treatment of materials which are very difficult to treat by standard procedures
- Used for melting different materials, primary to study the behaviour of corium in severe nuclear power plant accidents



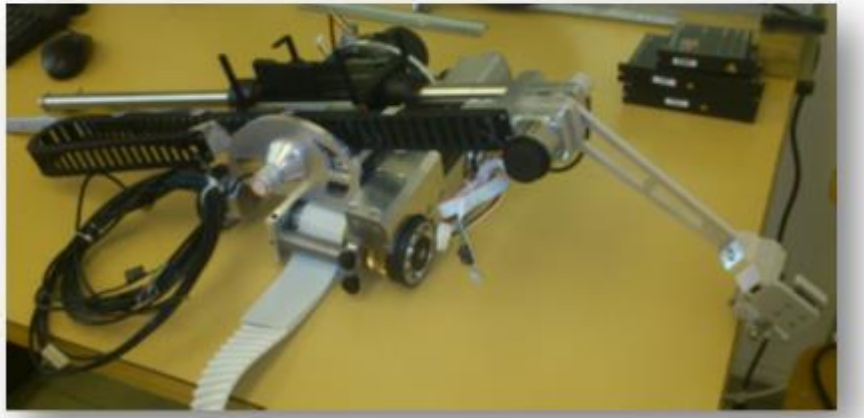
NDE and materials testing laboratories

Main goals

- Lifetime prolonging of current generation of nuclear power plants, beyond 60 years
- Supporting actions in development of materials and diagnostic systems for nuclear power plants

Main aims

- Material studies of highly irradiated materials
- R&D of diagnostic systems
- Fuel assemblies inspection program
- Neutron dosimetry for surveillance program



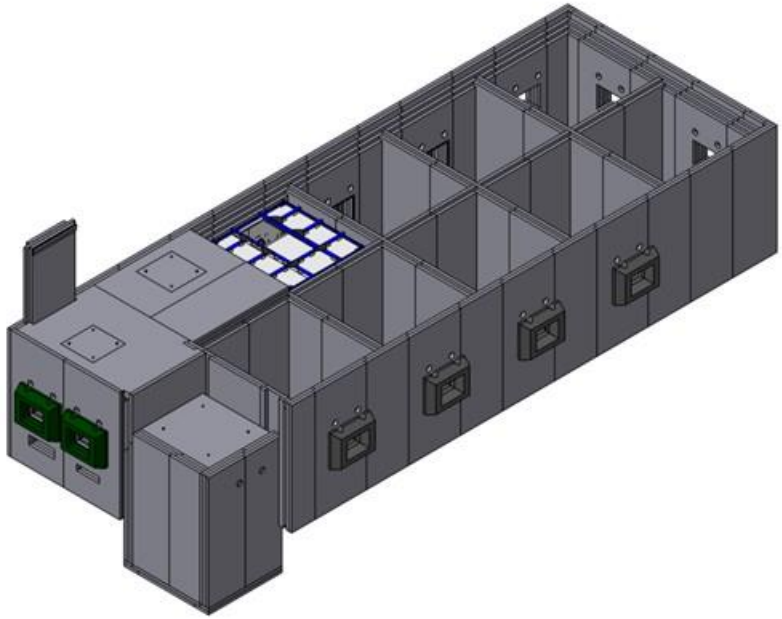
Hot cell laboratory

Main objectives

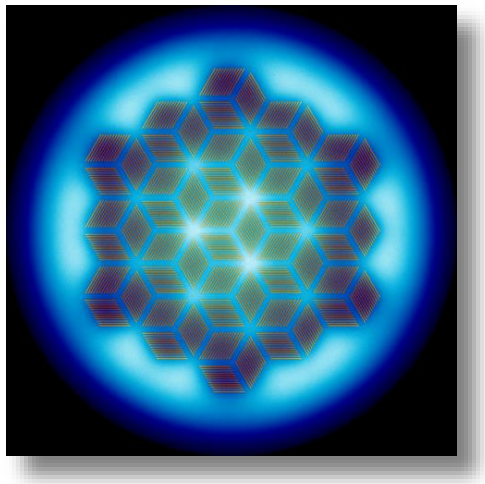
- Study of the microstructure degradation and mechanical properties of nuclear reactor structural components materials after long operational exposure

Main technologies

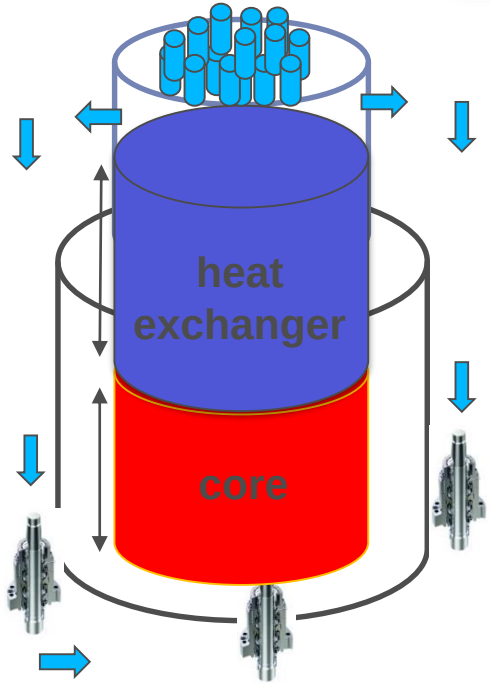
- 8 γ-hot cells, 2 α-hot cells, 1 semi hot cell and 1 dry pool



Energy Well project



- Development of small (up to 30 MW_t) modular reactor based on fluoride salt – FHR (Fluoride Salt Cooled High Temperature Reactor) as an industrial product for the Czech Republic
- Small & modular = which would fit into a standard shipping container
- salt – salt – **sCO_2**



Research Centre Rez

www.cvrez.cz

Hlavní 130, 250 68 Řež
cvrez@cvrez.cz