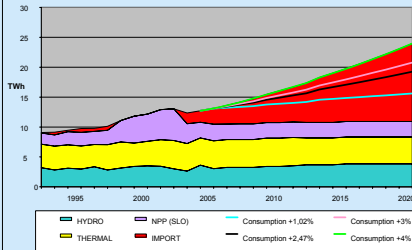




## Nuclear Engineering Research in Slovenia

### Slovenian Energy Strategy and Plans

- Energy dependence already 50.8%
- 22 % of electricity imported
- Energy production and mix not changed



- Sustainable energy strategy
- Renewables not able to meet demands
- First wind farm meeting huge problems
- Other options almost exhausted
- NPP Krško lifetime extension application by 2012
- Government resolution on national development for 2007-2023:

- Second nuclear unit next to existing plant
- Construction start in 2013, in operation in 2017

### Nuclear Stakeholders

- Krško NPP: utility
- Gen-Energy: owner
- Slovenian Nuclear Safety Administration
- ARAO: Radioactive Waste Management Agency
- Technical Safety Organisations
- Uranium mine (in closing)
- Jožef Stefan Institute
- Universities (Ljubljana, Maribor, Nova Gorica, Krško)
- Other institutions

### Krško NPP



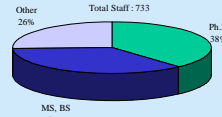
- 2-loop Westinghouse PWR
- 700 MWe, 6TWh/a
- Commercial operation since 1983
- Ownership 50:50 Slovenia-Croatia
- Full scope simulator

### Jožef Stefan Institute

- Basic research
- Applied research
- Regulatory research
- Main areas of research:

- Physics
- Biochemistry and biotechnology
- Information technology
- Health
- Environment
- Chemistry
- Reactor technology

- CCE Framework Programs
- Technical Safety Organisation
- Education & Training
- Staff:



### JSI Nuclear



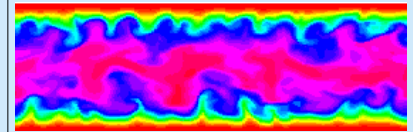
- Reactor Engineering Division
- Nuclear Physics Division
- Low and Intermediate Energy Physics Div.
- Department of Environmental Sciences
- Research Reactor TRIGA Mark-II
- JSI NTC Nuclear Training Centre
- Graduate program "Nuclear engineering" at University of Ljubljana
- ENEN Association

### Research areas

- Nuclear safety
  - Reactor physics
  - Thermal hydraulics
  - Severe accidents
  - Structural mechanics (including ageing and life extension)
  - Probabilistic safety assessment (including human factor)
- Disposal of radioactive waste
  - Suitability of natural structures
  - Nuclide migration
  - Engineering barriers
  - Radioactive waste processing technologies
- Monitoring of radioactivity
  - Measurements of contamination
  - Emergency strategies
  - Radiation protection issues
- Nuclear security
  - Safeguards
  - Physical protection

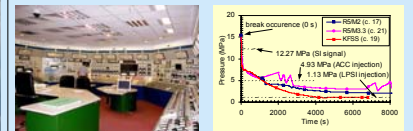
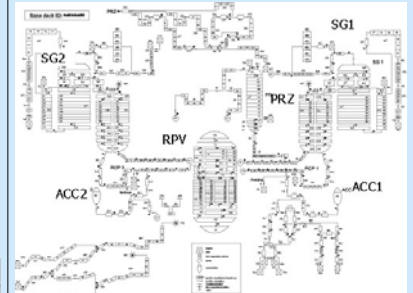
### Selected Examples

#### DNS of turbulent heat transfer



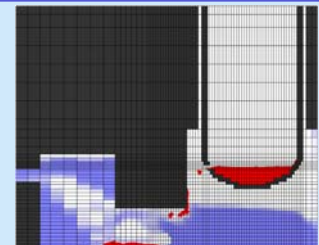
Instantaneous dimensionless temperature field in closed channel with heated walls

#### Thermal hydraulics – safety analyses



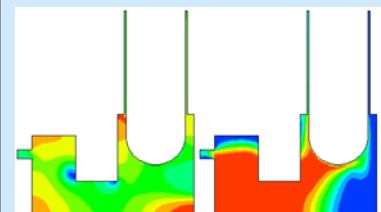
Validation of NPP Krško full scope simulator with system code

#### Fuel-coolant interaction

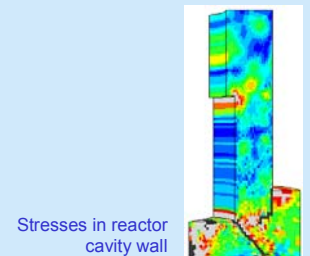


Melt pour in reactor cavity

#### Steam explosion in reactor cavity



Pressure field and water volume fraction



Stresses in reactor cavity wall