RROG meeting 2019

Report on LVR-15 and LR-0 reactors (CZ)

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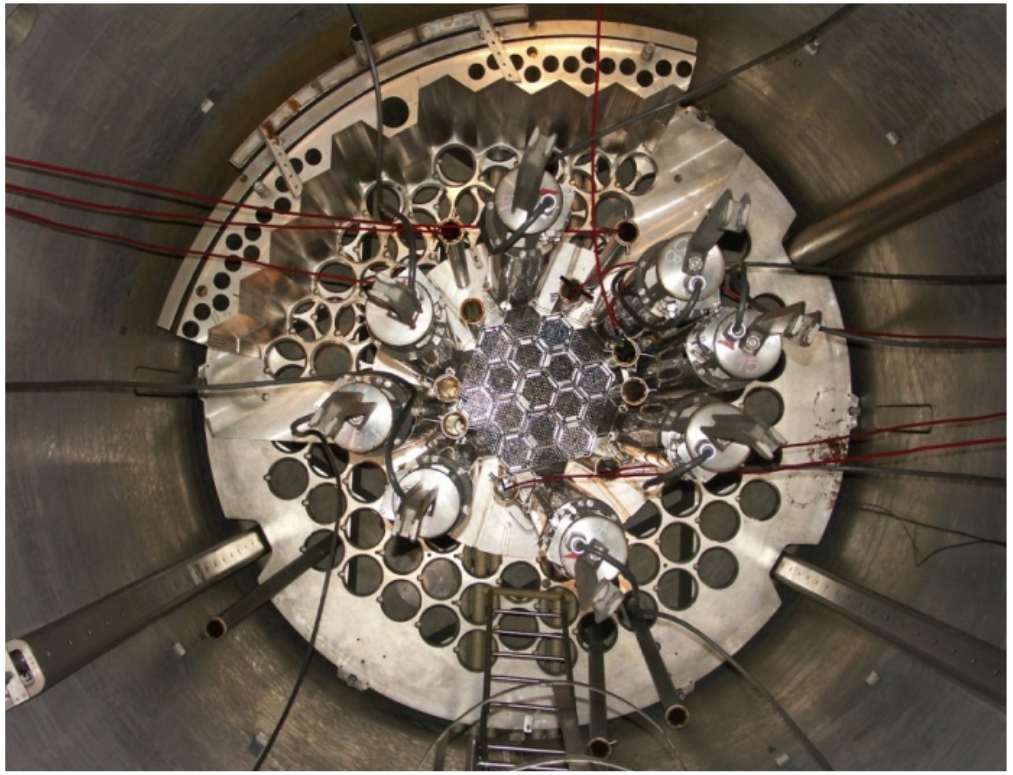
Mainz, May 14 – 17

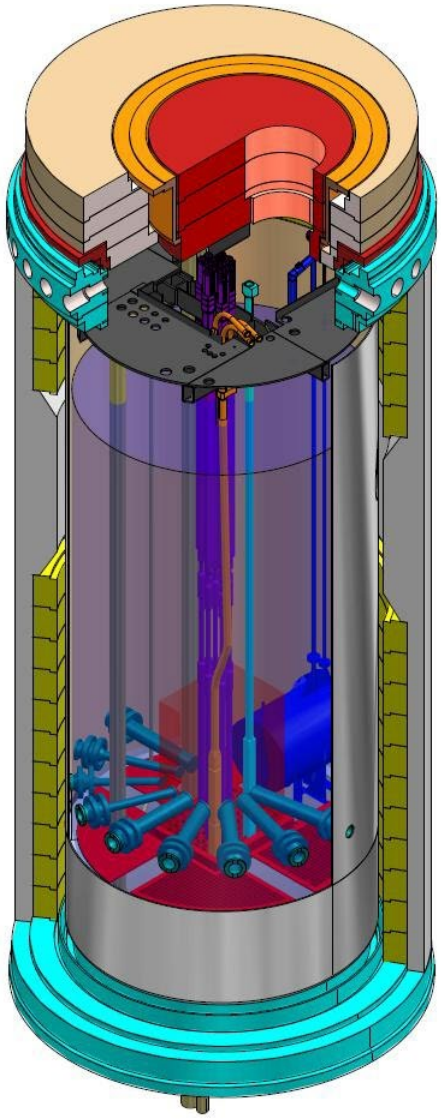
Reactors LVR-15 and LR-0

- Operated by Research Centre Rez
  - LVR-15 operated from 1957, fuel converted 2011 (IRT-2M -> IRT-4M)
  - LR-0 in operation from 1982, converted from birth
  - Both having operating license till December 2020



Research reactor LVR-15

Reactor type	**tank**	
Pressure	**atmospheric**	
Average temperature	**45**	**°C**
Coolant	**demineralized water**	
Reflector	**beryllium**	
Nominal power	**10**	**MWt**
Thermal flux in n-trap	**1.5×10^{14}**	**n/cm^2s**
Fast flux in fuel	**2.5×10^{14}**	**n/cm^2s**



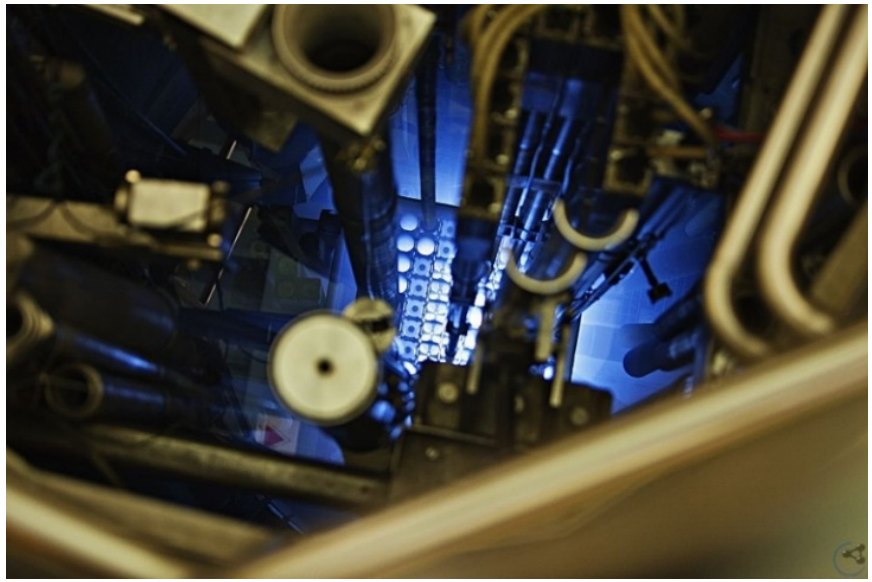
LR-0 experimental reactor

- The light water zero power reactor
- Reactor with versatile core arrangements
- For determination of neutron-physical characteristics of various types of reactor lattices, kinetics experiments
- Reactor ionization chambers and other I&C equipment testing
- Experiments with various insertion zone types (graphite, fluorine salts, heavy water)
- Experimental verification of criticality and subcriticality in relation to core parameters
- Verification of neutronic codes/libraries

Utilization in 2018

- LVR-15:
  - 168.9 operational days (39421 MWh)
  - 1 unplanned shutdown (0.75 day, ext. power failure)

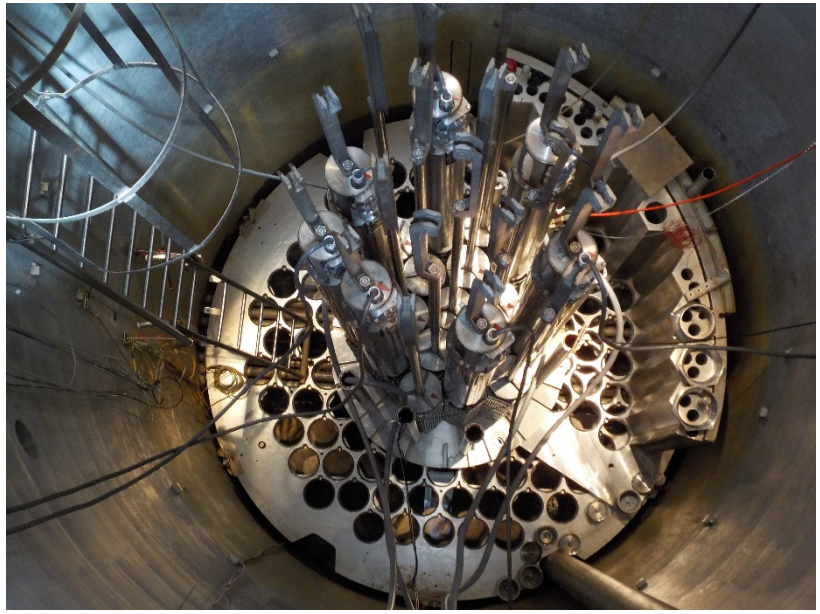
  - Utilization for horizontal channels (neutron radiography, difractometry, scattering and depth profiling)
  - Radionuclide production (Mo99, Ho166, Co60, …)
  - Neutron doping (Silicon, Topaz)
  - Material testing in irradiation rigs



Utilization in 2018

- LR-0:
  - 268 operational hours (84 day shifts)
  - 0 unplanned shutdowns

  - Utilization for research of reactor physics
    - Reaction rate measurement for various neutron reactions, e.g. Na23(n,2n)
    - neutron spectrum measurements in graphite, fluoride & lead insertions



Safety performance indicators in 2018

Year			2015	2018
D1(a)	Collective radiation dose to Reactor Operations Staff (mSv)		43,91	44,83
D1(b)	Number of Reactor Operations Staff		28	28
D1(c)	D1(a)/D1(b) (mSv/man)		1,57	1,60
D2(a)	Collective radiation dose to all staff from reactor related work (mSv)		134,26	88,56
D2(b)	Total number of staff involved		101	106
D2(c)	D2(a)/D2(b) (mSv/man)		1,33	0,84
E1	Rare Gas released to atmosphere [TBq]		51,60	49,20
E2	Tritium released to atmosphere [TBq]	*	0,46	0,34
E3	Tritium water discharge [GBq]	*	1,77	0
E4	Iodine released to atmosphere [MBq]	*	29,10	11,60
* all workplaces with radionuclides in area				

Activities in 2019

- Extended maintenance planned in September – November
  - LVR-15 Radiation monitoring system
  - LVR-15 Secondary heat exchangers
  - LVR-15 Primary coolant system instrumentation (flow, pressure, level, temperatures)
  - LVR-15 & LR-0 Neutron detectors
  - LVR-15 Absorbers
- Finalizing harmonization of reactor documentation (new Czech Atomic Act from 2017)
  - Updated SAR, OLC, AMP, …
  - Newly created SAMGs
- Preparation of new license application
  - INSARR (preINSARR invited for July), PSR

Inspections and Aging Management

- Inspections and maintenance plan approved by regulator (updated in 2019)
  - Longest period inspections (5years) focus on reactor vessel, internals and primary cooling system
  - Last performed in 2017, indicated good shape of the critical components with prediction to 2028 at least

- Aging management program was in till 2018 based on inspections without defining degradation mechanisms, methods and criteria to estimate residual lifetimes – the update in 2019 follows the IAEA guidelines. Monitored SSC were defined, currently building the first data

Decommissioning

- Both reactors have an updated decommissioning program pending for authorization (updated regulerly each 5 years)
  - Important addition is the safety assessment supporting the emergency planning for the decommissioning phase

- The reserve fund is continuously filled as planned (for decommissioning in 2028)
  - Complication is the historical changes in ownership/utilization of the reactors
    - till 1994 state owned and operated
    - 1994 – 2010 operated by private company UJV
    - Since 2011 operated by Research Centre (daughter company of UJV)

Thank for your attention

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