

ANNEX 8 Research Nuclear Installations

This Appendix has been elaborated beyond the scope of obligations resulting from the Nuclear Safety Convention. The Appendix contains description of the research nuclear installations in the Czech Republic.

1. Description of the current situation

The nuclear program in the Czech Republic has been supported since the beginning of its development by the domestic scientific-research base. The main role of this base has been played by the Nuclear Research Institute in Řež (NRI), established in 1955. Significant part of the experimental part of the scientific base are the research reactors.

The first VVR-S research reactor, supplied from the former Soviet Union, was commissioned in 1957 in NRI. Other research installations accrued with the nuclear program development, so there were four nuclear research installations operated in the former Czechoslovakia in the eighties (research reactors and critical assemblies).

Since issue of the Act on state supervision in 1984, the research reactors have been subject to the same regulatory regime as the nuclear power plants and other nuclear installations, i.e. same licensing stages and necessity to submit determined safety documentation (safety reports, Limits and Conditions, etc.). The reactors have been subjects of the regulatory inspections carried out by the SÚJB, which also verifies and issues authorizations for main control room personnel. This regulatory regime was further strengthened by issuing the Atomic Act in 1997 and its amendment in 2002.

In 1985 the SÚJB Decree No. 9 was issued, establishing detailed requirements for safety of design and operation of the nuclear research installations, which resulted from the IAEA recommendations as well as from experience obtained during the operation and construction of these installations. Operators of all nuclear research installations, in accordance with the Act and this regulation, perform internal inspection activities of their safety and regularly inform SÚJB on operational results and abnormal events.

2. Individual research nuclear installations

LVR-15 Research Reactor in ÚJV Řež a. s.

Construction of the reactor, originally named VVR-S, was commenced in 1955 and the reactor was commissioned on September 24, 1957. Its thermal power was 2 MWt. The reactor served as a multi-purpose research installation for the Czechoslovak nuclear program and the national economy. The reactor was employed to produce radioisotopes, materials irradiation and scientific research in the reactor physics area. Its output was increased to 4 MWt in 1964. Essential reconstruction took place in 1989, when all process equipment including the reactor vessel were replaced. Transition to highly enriched fuel IRT-2M was performed and the output was increased to 8 MWt. In 1994 the maximum allowed output was increased to 10 MWt and the reactor employment was increased by transiting to three-week campaign.

Construction of several experimental loops in the nineties significantly increased the experimental possibilities of the LVR-15 reactor. These loops simulate conditions in the PWR and BWR reactors and thus allow testing of constructional materials under real conditions. In 1995 the reactor switched to fuel with lower enrichment (36 %).

At the present time, the LVR-15 reactor ranks in Europe among several material reactors with average output. Besides material research (reactor vessel materials irradiation, corrosion tests of primary circuit materials and core internals) and tests of primary circuit water regimes, the reactor is employed to perform neutron activation analysis, to produce and develop new radio-pharmaceutical preparates, to produce radiation-treated silicon for electrotechnical industry, irradiation service and scientific research of material properties on horizontal channels. Since 2000 the reactor is ranked among several workplaces in the world dealing with the neutron capture therapy for brain tumors.

In 2002 the operational license for reactor expired and the operator had to apply for its further operation and to submit new complete safety documents. In April 2003 the reactor operator received from SÚJB approval to continue in further operation until the end of 2014.

In 2001 the Czech Republic requested the IAEA to carry out the INSARR mission on the LVR-15 reactor. The mission took place on December 1-5, 2003 and experts from five countries operating research reactors participated therein. The mission stated that "the IAEA recommendations for research reactors safety are observed during the reactor operation, and the reactor is operated in a safe and competent way". The mission further made a statement on active approach of the institute and reactor management to nuclear safety and radiation protection. In conclusion, the mission submitted to the operator a set of recommendations to further improve safety of the LVR-15 reactor operation. Based on these recommendations the operator prepared time schedule for their implementation, which will become a prerequisite for further operation.

Design lifetime of the reactor is until 2018.

LR-0 Critical Assembly in ÚJV Řež a. s.

The LR-0 critical assembly was built by reconstructing the TR-0 critical assembly. Heavy-water critical assembly TR-0 with zero output was constructed in NRI Řež and most of its equipment was manufactured in the former Czechoslovakia. The reactor was employed to perform research on reactor core of the A-1 (HWGCR) nuclear power plant in Jaslovské Bohunice. The reactor was put into operation on June 21, 1972 and operated until 1979.

In connection with transition of the Czechoslovak nuclear program to NPPs with VVER pressurized water reactors, the TR-0 was reconstructed to LR-0 experimental light water reactor with zero output. Physical start-up of the LR-0 reactor took place on December 19, 1982 and the reactor was put into permanent operation in 1983. Maximum allowed output of the reactor is 5 kWt and it is operated using shortened fuel assemblies of VVER-1000 and VVER-440 reactors.

The reactor is employed to perform research on core physics (it has variable pitch of a reactor lattice), storage racks and to simulate neutron fields in the power reactors. The reactor may be regulated using absorption rods, boric acid and by moderator level. In 2003 the reactor operator obtained an approval to operate the reactor until the end of 2009.

Design lifetime of the reactor is until the end of 2010.

VR-1 Training Reactor at ČVUT - FJFI

The VR-1 training reactor was commissioned on December 3, 1990 at ČVUT-FJFI (Czech Technical University – Nuclear Engineering Faculty). The reactor uses the IRT-M fuel and all its equipment was manufactured in the former Czechoslovakia. The reactor is employed in the training process of university students, in the scientific activities and for needs to prepare specialist of the Czech nuclear power. The training reactor participates in international cooperation (TEMPUS, ENEN and NEPTUNO programs) and it has close contacts with similar training reactors in UK, Netherlands and Austria. The reactor has an approval for its operation until 2006.

ŠR-0 Research Assembly in Plzeň

In 1971 the ŠR-0 light water assembly with zero output was put into operation at ŠKODA Plzeň. Original allowed output of the system of 100 Wt was increased in 1975 to 2 kWt. This reactor was put out of operation in 1992.

3. Conclusion

All nuclear research installations operated in the Czech Republic are in compliance with the IAEA recommendations – Safety requirements of research reactor a Code of conduct on the safety of research reactors.