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Decommissioning of Georgian Nuclear Research Reactor

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1. Introduction
   Georgia had only one nuclear research reactor IRT-M belonged to the Institute of Physics. The pool type reactor was put in operation at 1960 and shut at 1988. During its operation the reactor was refurbished two times due to what its power was increased from 2 MW up to 8MW. Accordingly, the neutron flux was increased up to 1014n/cm2•sec. The especial investigations were conducted to research properties of different materials exposed by neutrons on low temperatures (temperature of liquid nitrogen and helium), therefore the reactor had special station and circuits for nitrogen and helium. For 28 years (1960-1987) the nuclear reactor was operated more than 70,000hours. More than 9 000MW•day heat energy was produced, which corresponds to the consumption of nuclear fuel - Uranium-235 in the amount of 11 kg. The reactor had used various types 201 fuel assemblies, in which the total content of 90% enriched Uranium- 235 was about 30kg
2. Preliminary Decommissioning Activity
   At 1990 considering real situation: absence of storage and processing facilities, technique, affordable finances and skills for conducting the full scale decommissioning activity (which fully corresponds the criteria [1]), the decision was issued to conduct the differed decommissioning. The decommissioning plan DDP was developed aiming transfer of the reactor to the low power nuclear facility. According to the plan, after obtaining of special permissions, fresh fuel was sent to the same type reactor and spent fuel for refurbishing. The plan considers conducting of concreting of lower part of the reactor tank where the reactor core is situated. The special Barium containing concrete is supposed to use to cover reactor core, some high active reactor parts (especially placed there) and experimental channels [2]. Before the concreting the calculations were conducted to assess the exposure on the concrete top using the special software. (Fig.1). According to the plan the following activities were conducted:
3. Preparation of the reactor hall;
4. Preparation of the reactor tank with its internals;
5. Preparation of the experimental horizontal channels;
6. Preparation of the radioactive waste;
7. Preparation of the auxiliary systems and reactor equipment;
8. Concreting the reactor tank;
9. Concreting the 8 experimental horizontal channels;
10. Concreting the waste in the dry storage vertical channels;
11. Concreting the waste in the storage well;
12. Installation of the monitoring and surveillance system.
    All activities were conducted within IAEA TC Project GEO/4/002 "Conversion of Research Reactor to a Low Power Facility". To provide safety conditions during the concreting activity the special underwater concreting was conducted (Fig.2). The measured data has good compliance with calculated ones.
13. Decommissioning of Axillary System
    The decommissioning of axillary systems was started only after putting into operation of Centralized Storage Facility. All systems in the reactor hall was dismantled within IAEA project GEO/3/002. Considering IAEA standards [3] the special decommissioning plan was elaborated and approved by regulatory Body. The plan considers existence of indicators for decommissioning activity [4]. According the plan the following systems should be dismantled:
    1) The dual-circuit cooling system of the reactor.
    2) The system of mechanical and chemical purification of the coolant of the primary circuit of the reactor cooling system.
    3) The part of the pipeline of the system of circulation of gaseous helium.
    4) The system of filters intended for cleaning the air from radioactive gases and aerosols being ventilated from the above-reactor space and different special technological rooms prior to their release into the atmosphere.

5) Devices of mechanical and chemical purification of water of pools intended for temporary storage of the fuel assemblies and cassettes.
The preliminary radiation monitoring fixed 60Co and 137Cs as main contaminant radionuclides. The secondary cooling circuit was assigned as a radiologically clean (under clearance level). The average contamination value by 60Co was 20-30 Bq/cm2 and dose rates near the contaminated surfaces were in the range 5-50 mSv/h. Not having for this time the capability to clean safely all dismantled parts, the decision was issued to close hermetically all contaminated tubes and put into the storage facility. Only some small parts with comparably high activity (including resigns) were immobilized into the concrete drums 926 drums). The same technology was used to dismantle huge pipelines connected the reactor hall to the cryogenic station (The activity was conducted under IAEA TC project GEO/3/004). The total activity of the pipes under dismantling was 1.8x109 Bq. The pipe cleanings started with IAEA TC project GEO/9/011. The Cryogenic station will be dismantled within IAEA Project GEO/9/012

REFERENCE

(a) IAEA WS-G-2.1
(b) IAEA TECDOC 1124
(c) IAEA SRS-45
(d) IAEA NW-T-2.1

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