



ESTIMATION OF THE RADIATION DOSES DURING THE DISMANTLING OF THE EQUIPMENT IN BUILDING 117/1 AT THE IGNALINA NPP

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In 1948, the Lithuanian Academy of Sciences established the Institute of Technical Sciences. This institute analysed the issues of rational water energy and fuel consumption, metals industry rationalization and its work processes automation as well as typical projects of industry and dwelling construction.

In the institute, the spreading research in various fields of technical sciences became more related to the physics. Therefore, in 1952 the Institute of Technical Sciences was reorganized into the Institute of Physics-Technology.

In 1956, on the basis of institute laboratories or their groups several new institutes were established. On the basis of remaining laboratories the Institute of Energy and Electrotechnics was established.

In 1967 it was renamed as the Institute of Physical-Technical Energy Problems.

Since 1992 institute is named as Lithuanian Energy Institute.

Nuclear Engineering Laboratory

Main nuclear research areas:

- Safety of spent nuclear fuel management: modelling of fuel characteristics, safety and environmental impact assessment of storage and disposal facilities, normative and legislative base;

- Safety of radioactive waste management: strategy, safety and environmental impact assessments of treatment, storage and disposal facilities, normative and legislative base;

- Evaluation of different factors related to decommissioning of nuclear power plants: planning and cost estimation of decommissioning and dismantling, radiological characterisation of buildings, systems and facilities, safety and environmental impact assessment, normative and legislative base;

- Fire hazard analysis in nuclear power plants and other facilities;

- Research related to the construction of new nuclear power plant in Lithuania.

1. Introduction

The Ignalina nuclear power plant (NPP) was the only one NPP in Baltic States, build in north east Lithuania near the border of Belarus. The Ignalina NPP was operating two world's largest and most advanced RBMK-1500 design reactors (electrical capacity – 1500 MW, thermal capacity – 4800 MW). It supplied about 70% of Lithuania's national electricity demand. In line with accession to the European Union treaty commitments, the Ignalina NPP was closed: Unit 1 was shut down at the end of 2004, and Unit 2 was shutdown at the end of 2009. Since 1 January 2010, decommissioning has become the major Ignalina NPP activity. The auxiliary plant systems can now be progressively dismantled. The first area to undergo dismantling was Unit 1 the Emergency Core Cooling System (ECCS) which is in Building 117/1.

The main part of the Ignalina NPP Unit 1 Emergency Core Cooling System (ECCS) is located in Building 117/1. The view of the main equipment in Building 117/1 is shown in Figure 1.



ECCS pressured tanks view in Building 117/1

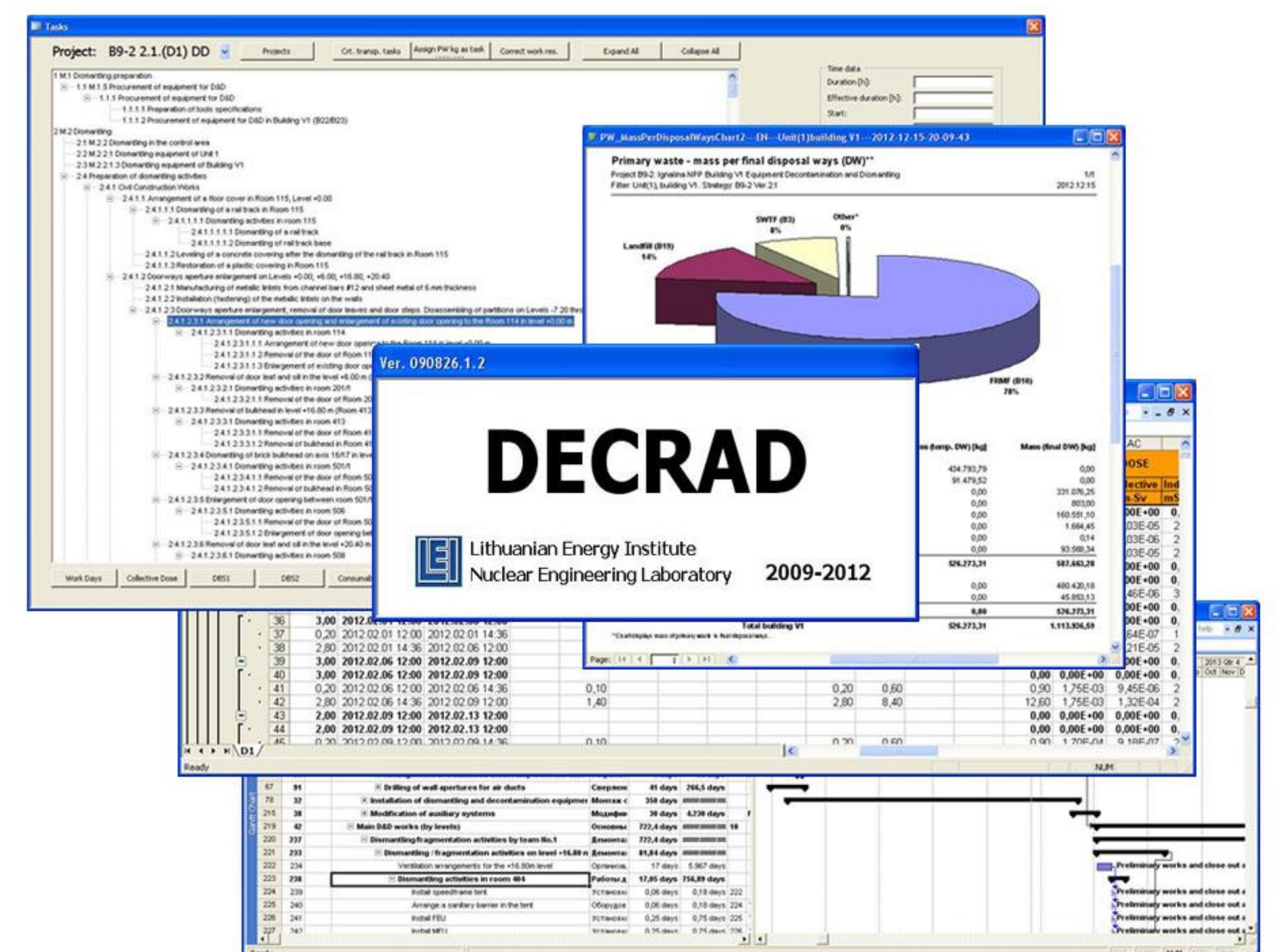
2. Methods

During the planning of D&D activities in Building 117/1, the overall dismantling activities were segregated into ten fundamental activities:

- preparatory activity (includes of civil works, initial dismantling and modification or installation ventilation systems, installation cranes, preparation of temporary waste storage area, etc.);
- dismantling activity (dismantling of ECCS pressured tanks, large diameter pipes, valves and other equipment existing in Building 117/1 using hot cutting and mechanical cutting techniques);
- decontamination activity (to minimise the amount of radioactive waste and to achieve free release (FR) level of the components, the dry decontamination method (manual vacuum blasting technique) was selected);
- pipe halving (to perform successful decontamination of the contaminated internal large diameter pipe surface, it is necessary to halve these pipes);
- handling (waste transportation inside the building);
- loading the package (sorted waste loading into appropriate containers);
- transportation (transportation of the containers with sorted waste from the building to the storage);
- radiological measurement and characterization;
- close out activity (final monitoring of the building, decontamination and disassemble of D&D equipment and dismantling of cranes, etc.)
- management.

To support the preparation of the equipment dismantling project of Building 117/1, DECRAD computer code [2] was used. The DECRAD was developed at the Lithuanian Energy Institute (LEI) by Nuclear Engineering Laboratory. The DECRAD computer code can be used for planning of decommissioning projects, determination of costs, personnel expenditure and radiation exposure as well as recording of components with integrated waste disposal planning.

In DECRAD the calculation of the individual and the collective dose is based on duration of the elementary task defined by DECRAD and a dose rate modelled by VISIPLAN software.



View of the computer code DECRAD

3. Results

During the modeling with the DECRAD computer code, a number of assumptions were used:

- Assignment of the maximum dose rates for activities during determination of collective and individual doses (conservative approach);
- All the packages with radioactive waste or free release waste meet the criteria and are not returned back from the Landfill facility or the Free Release facility to the waste producer for additional decontamination or repackaging;
- The projected D&D process will not change during execution of the D&D activities in Building 117/1.

Due to these assumptions, the planned doses to the personnel were much higher than the real doses obtained during the dismantling of the systems in this building. After D&D activities in Building 117/1, the average individual dose was 0.064 mSv. In any case, the planned and received individual doses fully meet the Lithuanian requirements.

4. Conclusions

The first area to undergo dismantling at Ignalina NPP Unit 1 was the Emergency Core Cooling System (ECCS) in Building 117/1. During the planning of D&D activities in Building 117/1, ten fundamental activities were defined. Using conservative assumptions in the DECRAD computer code, the planned doses to the personnel were much higher than the real doses obtained during the dismantling of the systems in this building.

References

- [1] Environment Impact Assessment Report, Ignalina NPP Building 117/1 Equipment Decontamination and Dismantling, VT Nuclear Services Ltd. and Lithuanian Energy Institute, 2008.
- [2] The software DECRAD validation report, TA-14-13.10. Lithuanian Energy Institute, Nuclear Engineering Laboratory (2010).