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APPLICATION OF DECOMMISSIONING COSTING FOR RESEARCH REACTORS USING CERREX CODE

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APPLICATION OF DECOMMISSIONING COSTING FOR RESEARCH REACTORS USING CERREX CODE
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Abstract:
The main purpose of the paper is to present the possibility for application of recommended principles and methodology for decommissioning costing of research reactors by using CERREX (Cost Estimation for Research Reactors in Excel) code. For that purposes the model calculation case was developed using the inventory data from Korea Research Reactor 2 –KRR2 (TRIGA Mark III type) [4] and pre-defined set of calculation data implemented to CERREX. To create an interface between the inventory database and CERREX calculation module, the special Excel template was developed taking into account physical (mass, surface) as well as radiological parameters (contamination, dose rates, nuclide vectors, limits and conditions). Finally, the calculated results followed by the results of sensitivity analysis are discussed.

1. INTRODUCTION

The decommissioning of non-power-generating facilities such as research reactors, owing to their worldwide distribution, is of special importance within the IAEA activities. To support the decommissioning cost estimation for research reactors as a part of decommissioning planning process, the calculation code CERREX [2] was developed within the IAEA projects. CERREX code is developed in line with the IAEA recommendations for decommissioning costing [3] and fully implements the ISDC (International Structure for Decommissioning Costing of Nuclear Installations) structure and costing methodology [1].

2. METHODS

In order to assemble CERREX decommissioning costing case and perform sensitivity analyses it was necessary at first to collect inventory data on KRR2 reactor. For that purpose an inventory database template in Excel was used including building–floor–room structure data of the facility and detailed equipment inventory parameters. Equipment parameters represented the following type of data:

1. Identification data –equipment designation, allocation within the facility structure and technological system, relevant ISDC No.
2. Physical inventory data –mass, surfaces, CERREX category of equipment and dominant material
3. Hazardous inventory data –hazardous material and possible hazardous waste
4. Radiological inventory data –internal/external contamination, activation, dose rate and corresponding radionuclide vectors and reference dates
5. Calculation data –recalculation of radioactivities in time and determination of resulting waste streams

At second, the further steps regarding development of model KRR2 decommissioning costing case in the CERREX code should be briefly summarized as follows:

1. Implementation of the inventory database to the CERREX code i.e. definition of relevant partitioning coefficients for defined waste categories;
2. Definition of input parameters (duration, composition of the workgroup, expenses or investments) for period dependent activities;
3. Definition of calculation parameters (e.g. labour rates, manpower unit factors and cost unit factors, work difficulty factors) respecting the ISDC methodology;
4. Analysis of the obtained results –basic calculation case;
5. Performance of sensitivity analysis to estimate the impact of changing input parameters (e.g.: decommissioning start date, level of contamination, scope of the project, labour costs) on calculated results.

1. RESULTS In the paper, the following parameters will be presented and analyzed as the results of the sensitivity analysis performed by using CERREX code (in comparison with the basic calculation case): • Manpower and cos ts according to the ISDC structure; • Amount of different categories of produced waste. The objective for performing of sensitivity analysis is an impact assessment of input data uncertainties.

2. CONCLUSIONS In the paper, the procedure and methodology for development of decommissioning costing cases for any type of research reactor by using CERREX code are presented by using model calculation example. In the future, there is an intention for updating the calculation procedure by integrating the Inventory database file into the existing structure of the CERREX code; it means to create one robust and compact calculation package used for decommissioning costing of research reactors. REFERENCES [1] INTERNATIONAL ATOMIC ENERGY AGENCY, NUCLEAR ENERGY AGENCY OF THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, EUROPEAN COMMISSION, International Structure for Decommissioning Costing (ISDC) of Nuclear Installations, NEA Rep. No. 7088, OECD, Paris (2012) [2] INTERNATIONAL ATOMIC ENERGY AGENCY, Cost Estimation for Research Reactors Decommissioning. IAEA Nuclear Energy Series, No. NW-T-2.4., IAEA, Vienna (2013) [3] INTERNATIONAL ATOMIC ENERGY AGENCY, Financial Aspects of Decommissioning, IAEA TECDOC 1476, IAEA, Vienna (2005.) [4] PARK. S. K., et al., KOREA RESEARCH REACTOR-2 DECOMMISSIONING PROJECT, ICEM'05:The 9th International Conference on Environmental Remediation and Radioactive Waste Management, Glasgow, Scotland (2005)

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