APPLICATION OF OPTIMIZED NUCLIDE VECTOR FOR RADIOACTIVE WASTE MANAGEMENT

RITA PLUKIENĖ [1*],KRISTINA MIKALAUSKIENĖ[1], GRIGORIJUS DUŠKESAS[1] ELENA LAGZDINA[1], LAURYNAS JUODIS[1] AND ARTŪRAS PLUKIS[1]

[1] Center for Physical Sciences and Technology (FTMC), Savanorių 231, Vilnius, Lithuania

** Corresponding author email: rita.plukiene@ftmc.lt*

The management and disposal of Radioactive Waste (RW) are critical issues for countries operating Nuclear Power Plants (NPPs) or decommissioning them. Most of the waste from decommissioning and dismantling consists of radiologically unrestricted material, known as exempt waste. However, about one-third of the waste contains radioactive material of different activity levels [1]. This radioactive waste must be collected, characterized, treated, stored, and ultimately disposed of in special facilities.

Characterizing of RW follows a consistent methodology across all reactors, focusing on determining the Nuclide Vector (NV). An essential part of the characterization of RW during dismantling are experimental measurements applying non-destructive and destructive techniques. Discrimination of surface and volume activity helps to identify the best way of RW management, especially if surface contamination prevails. In this case the decontamination procedure can significantly reduce the final RW volume [2].

An optimized NV for specific waste streams is achieved by analyzing information about radioactive waste streams. This involves identifying key radionuclides, describing inter-correlations between ETM (easy-to-measure) nuclides and DTM (difficult-to-measure) nuclides including multivariate analysis of the already measured data at the sites, alongside with numerical evaluations of activation and contamination parts in the waste streams. Optimizing the NV can be enhanced through improved sampling methods, data grouping, bias reduction in modeling and measurements, utilizing multiple key nuclides, and applying modeling ratios between DTM nuclides for scaling factor analysis. Some examples of scaling factor optimization will be provided.

1. INTERNATIONAL ATOMIC ENERGY AGENCY, Classification of Radioactive Waste, IAEA Safety Standards Series No. GSG-1, IAEA, Vienna (2009).
2. R. Plukiene et al., Report on gamma spectrometry and sampling procedure 21/07/2024 version 1.0, PREDIS Deliverable 4.6

043_abstract_final