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Cost/Risk-Decisioneering on Spent Fuel Management: Financial Risk analysis in the EU

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The management of Spent Fuel (SF) is one of the key challenges for nuclear power plant (NPP) operators to tackle, especially in a context of 'wait-and-see'-policies as generically practiced in many countries. From a scientific-technical perspective, mature options to manage this SF do already exist and can be deployed, being it direct disposal of the SF or reprocessing and subsequent disposal of high-level waste. Though, the socio-political process towards operationalisation of geological disposal is a long one.

SF-management is a long-term activity for utilities and is subject to a variety of uncertain influencing factors as there are:
• Technical-economic: proposed SF-management options differ in industrial maturity as well as having different cost, timing and uncertainty exposures;
• Regulatory: new regulations regarding security of the interim stored SF as well as the geological disposal design and conditions impact the timing and cost of SF-management options;
• Socio-Political: the societal acceptance as well as the (nuclear) energy policy impact the timing and costs of SF-management options;
• Financial: the financial rating of utilities but also the financing mechanisms for the SF-management funds impact the performance of SF-management options.

Utilities therefore face uncertain futures on SF-management translating into financial costs and risks that may increasingly impact the financial rating of particularly utilities with eldering NPPs. Where many studies in the past looked into SF-management options from essentially a technology-push perspective, this paper presents the results of a financial cost/risk-optimising decisioneering methodology on SF-management seeking to optimise utilities'cost/risk-exposure to uncertain SF-management futures and the risk-mitigating value SF-management options could bring to utilities.

Within such a multi-variate environment, SF-owners do need to seek for lowest cost and increasingly also lowest financial risk strategies covering the next decades. Balancing lower short-term cost options though with higher risks in the longer-term versus higher costs today with lower risks in the future is a decisional challenge and cannot be grasped by assessment methodologies as NPV/DCF.

A combination of stochastic NPV/DCF complemented with Real Options Analysis (ROA) is required to analyse this multi-variate and multi-decades spanning decisional framework. ROA allows to address questions as:
• When to decide which UNF-management option to be executed?
• What's the value of developments in reducing the cost/risk-exposure for SF-owners in the future?
• What's the optimal SF-portfolio management for a utilities'SF and optimised contractual strategy?
The Nuclear Real Options Model (NROM), embedded in the Nuclear Energy System Strategies Assessment Toolbox (NESSAT) by Nuclear-21, is performing such analysis and applied in cost/risk-decisioneering analysis for governments, utilities and fuel cycle service companies.
An example of analysis covering the EU SF-management options is provided in this paper.

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