

# Lessons for the Organization of Nuclear Decommissioning from the UK and the US: Risks, Challenges, and Opportunities

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## Overview

In the coming decades, nuclear decommissioning is set to become a challenge of increasing significance for the nuclear industry and regulators alike as more and more nuclear power plants (NPP) will reach the end of their respective operational lifetimes (Laraia 2018; Wimmers et al. 2023). Until today, knowledge concerning the organization and technical procedure around nuclear decommissioning remains limited, as only a handful of commercial NPPs have been fully decommissioned, with most projects lasting from several years to decades (Schneider et al. 2022). While technical expertise is slowly increasing as decommissioning projects advance, only limited literature on regulation and organization of nuclear decommissioning exists. This is highlighted by previous research that encourages further research into organizational issues around nuclear decommissioning (Wimmers et al. 2023). While some countries follow approaches that rely mostly on state-run or state-funded actors, such as France, other countries, such as Germany or the United States of America (US), allow for more market-based approaches. The United Kingdom (UK) had previously implemented a market-based approach based on tendering that has since been retracted due to organizational challenges and limited performance. In this paper, we compare the organization model behind the UK's past market-based system and the approach followed by US regulators today in order to identify best practices for regulators and policy makers in countries that are currently facing the challenge of nuclear decommissioning.

## Methods

This paper attempts to compare both approaches based on “new institutional economics”, most notably agency and transaction cost theories (Williamson 1975; Furubotn and Richter 2005; Beckers, Gizzi, and Jäkel 2012). First, a detailed analysis on the UK's past approach, the so-called “parent body organisation” (PBO) model will help understand the reasons for the ultimate failure. A short overview of the UK's current approach to decommissioning will be added. A subsequent in-depth description of organizational models found in the US' decommissioning market allows for the then conducted comparison of advantages and disadvantages of both approaches and a discussion of the ideal approach under given circumstances.

## 30 Results

We find that the reasons for the failure of the PBO system are multiple. First, a lack of oversight by regulators resulted in significant information asymmetry between regulators and operators. Second, the overly complicated contract design and

reimbursement cost approach increased transaction costs and lead to delays. Thirdly, following information asymmetry, monitoring was only possible to a limited amount, leading to cost overruns. Other reasons include trust issues, lack of motivation and lack of responsibility. Today's state-run system brings stability but will most likely take a lot more time and might lead to further cost increases, as the responsible agency has openly admitted to. In the US, we observe the emergence of specialized companies that attempt at parallel decommissioning and rapid knowledge build-up that has the potential of leading to cost efficiency and productivity gains in terms of nuclear decommissioning through economies of scale and learning effects. However, questions of financial liability remain. In our comparison, we find that market-based approaches most notably carry the risk of information asymmetry and high transaction costs, although this strongly depends on the implementation. On the contrary, state-run decommissioning might lead to inefficiencies concerning time and money, as only little incentive for productivity exists, as shown by the current UK approach.

## Conclusions

Nuclear decommissioning remains an often overlooked component of the nuclear back-end, with most research focussing on waste management. In this paper, we are able to compare two market-based approaches for nuclear decommissioning, of which one has been retracted, while the other seems to produce further actors in the field. Based on our analysis, we are able to determine which approach, under certain circumstances, might be beneficial for countries that have not yet implemented nuclear decommissioning regulation or will be soon facing the challenges related to decommissioning.

## References

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