Cross-Country Survey on the Decommissioning of Commercial Nuclear Reactors: Status, Insights and Knowledge Gaps

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Case Study Overview
General Information

France

- 56 (somewhat) homogeneous NPPs operational that account for 2/3 of electricity generation
- New build ongoing at Flammanville
- Single utility responsible (EDF)

Germany

- Since April 2023, end of commercial operation of nuclear power reactors
- Parallel decommissioning ongoing at over 30 reactors
- Diverse ownership structure, special case for GDR legacy fleet

Sweden

- 30% of Swedish electricity generated by 13 nuclear reactors
- Legal pathway for new reactor construction paved in 2022

Switzerland

- 4 operational NPPs generate 1/3 of Swiss electricity
- End of commercial operation planned for 2040s
- Prohibition on nuclear new builds by law since 2017

United Kingdom

- 10 reactors account for 15% of British electricity generation
- Fleet consists of mainly gas-cooled reactors, so-called “legacy” fleet of Magnox reactors
- New build ongoing (Hinkley Point C)

United States

- Largest commercial power reactor fleet worldwide (92 operating)
- Significant support schemes for nuclear power in place
- New build at Voglte Station delayed and expensive

Insights and Research Gaps
Overview

Organization / Regulation

Financing

Production

Waste Management

Insights and Research Gaps
Organization and Regulation

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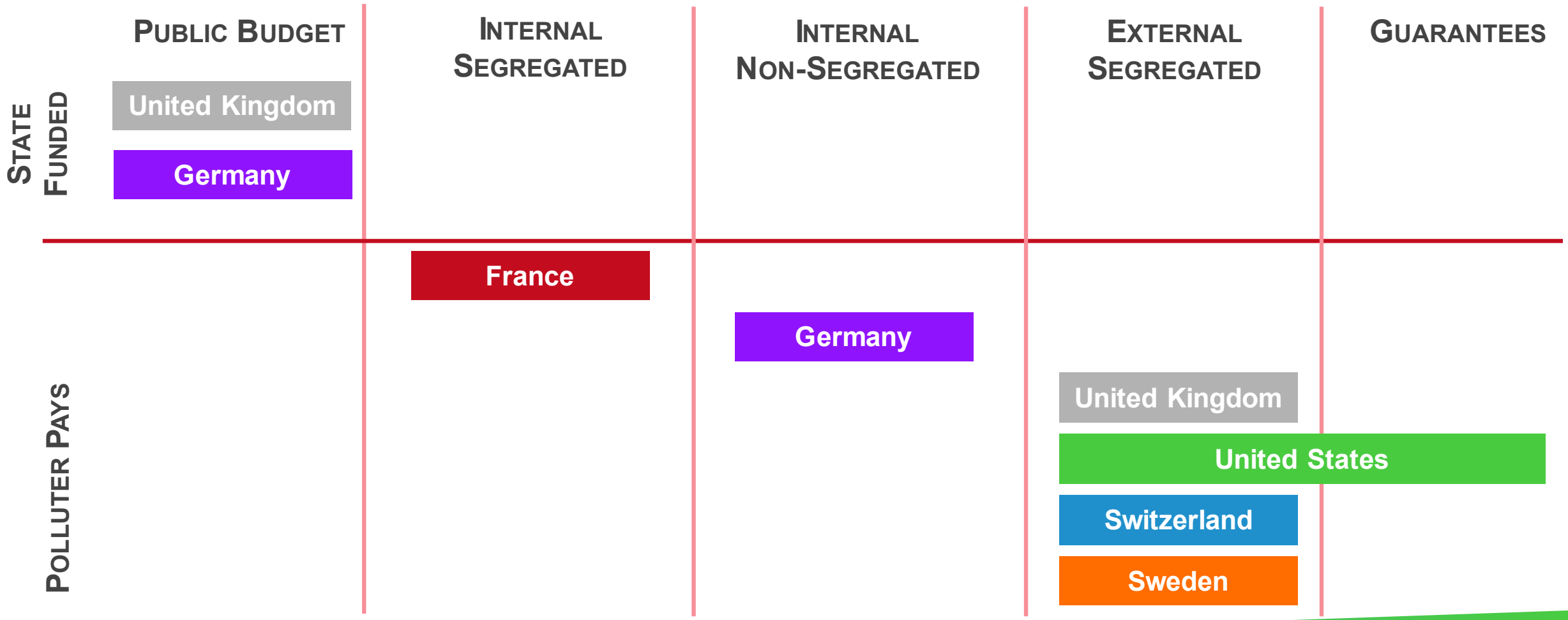
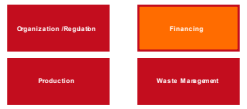
Organization / Regulation

Interlinkage between ownership and nuclear decom.	Influence of regulatory framework on nuclear decom.
• Direct influence of ownership on decommissioning via financing, scheduling, production of decom. work and liability for unfunded work • Possible differences of incentivation for swift, safe and cost-efficient decommissioning for private owners vs. government owners	• Decommissioning process highly dependent on country-specific laws and regulations • These differ amongst countries, e.g., in terms of responsible agencies (several vs. a single agency) • Key challenge for “newcomer” countries is to harmonize domestic with foreign regulations

Case Study
Financing of Nuclear Decommissioning



Insights and Research Gaps
Financing



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Financing

Improving of cost and contingency estimations

- Cost estimations vary significantly; historically costs have been underestimated
- Accurate estimations might help reduce liability risks and understand incentivation of actors

Decommissioning fund adequacy and transparency

- Decommissioning fund volumes are not always publicly accessible and it often remains unclear for what money is used
- Transparency and increased fund scrutiny might reduce liability risks

Determining financial liability

- In some countries (esp. US), final financial liability is sometimes unclear
- Understanding how other countries might account for fund shortfalls could increase responsibility for cost-efficient decom.

External influences on decommissioning funds

- Market development can influence decommissioning funds that are often accumulated over NPP lifetime
- Identifying influences and potential risks for these funds could increase fund resilience

Insights and Research Gaps
Production and Waste Management

Production

The make or buy decom. production decision

- Nuclear reactors are highly asset specific, resulting in limited number of actors active in the market
- No country follows a single approach
- External or internal conditions must exist that influence decisions

Specialized firms and supply chain issues

- Highly specialized actors are emerging in the decom. market
- With many NPPs likely to be coming offline at similar times, concerns regarding possible supply chain bottle necks are emerging (human capital, specialized material & infrastructure)
- Parallel decommissioning of (somewhat) homogeneous reactor fleets are proposed to go hand in hand with efficiency gains

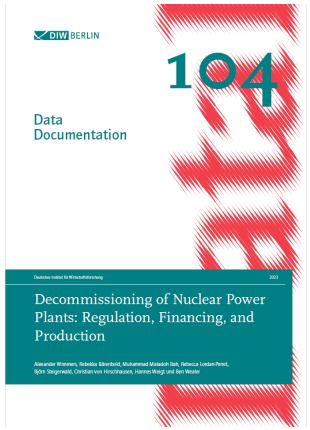
Waste Management

Access to waste disposal facilities

- Worldwide, no final geological repository for highly radioactive waste is in operation
- Three of our six countries have identified a location
- Access to disposal routes for low, medium and high-level waste is imperative for nuclear decommissioning to succeed
- Currently, most waste is stored in interim facilities that might be in operation for many decades
- Lack of disposal routes probably increases decommissioning duration and cost

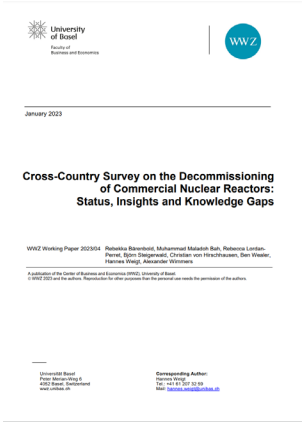
This research is freely accessible

DIW Data Documentation 104: Decommissioning of Nuclear Power Plants: Regulation, Financing, and Production



https://dx.doi.org/10.18723/diw_ddc:2023-104

WWZ Working Paper 2023/04: Cross-Country Survey on the Decommissioning of Commercial Nuclear Reactors



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