Uncertainties in nuclear back-end management and the path towards a sustainable decommissioning paradigm

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Lloyd's Register

Lloyd’s Register

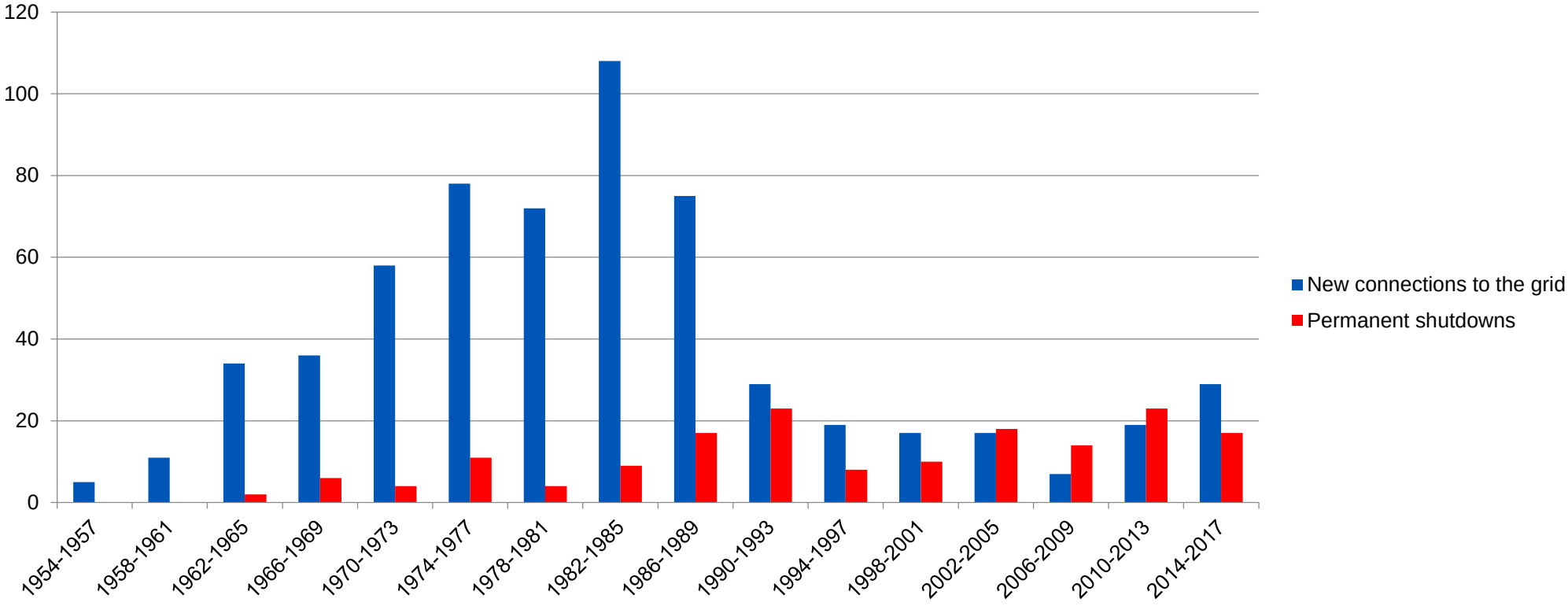
Who we are

- Founded 1760 – for marine classification
- Today – large breadth:
  - Energy, transportation, infrastructure, …
  - Around 7 000 employees
  - Clients in more than 75 countries
- Owned by research foundation
- Independent

Our purpose:
Working together for a safer world.

Age distribution of world's nuclear power reactors

of grid connections and permanent shutdowns



Source: IAEA Power Reactor Information System (PRIS), https://www.iaea.org/pris/

Nuclear decommissioning and waste management

Plan

Reality?

Examples of major uncertainties

Chalk River, Canada

- Shut down date
- Waste disposal
- Interim storage
- Transportation
- Decommissioning end state
- Management company
- Government policy
- Regulatory landscape

But there are plenty of good exceptions

ONKALO, Finland

Source: Posiva Oy

For example:

- World’s first spent fuel repository under construction (Finland)
- Large low-level waste repository built at site, as part of the Fernald Nature Preserve (Ohio, U.S.A.)
- Spent fuel transported routinely in some countries

What is the problem?

- Multi-generational timelines
- Consequences of shutdown
- Tradition of only thinking:
  - Within the fence line
  - Until release from regulatory control

That is, non-technical challenges and lack of holistic thinking.

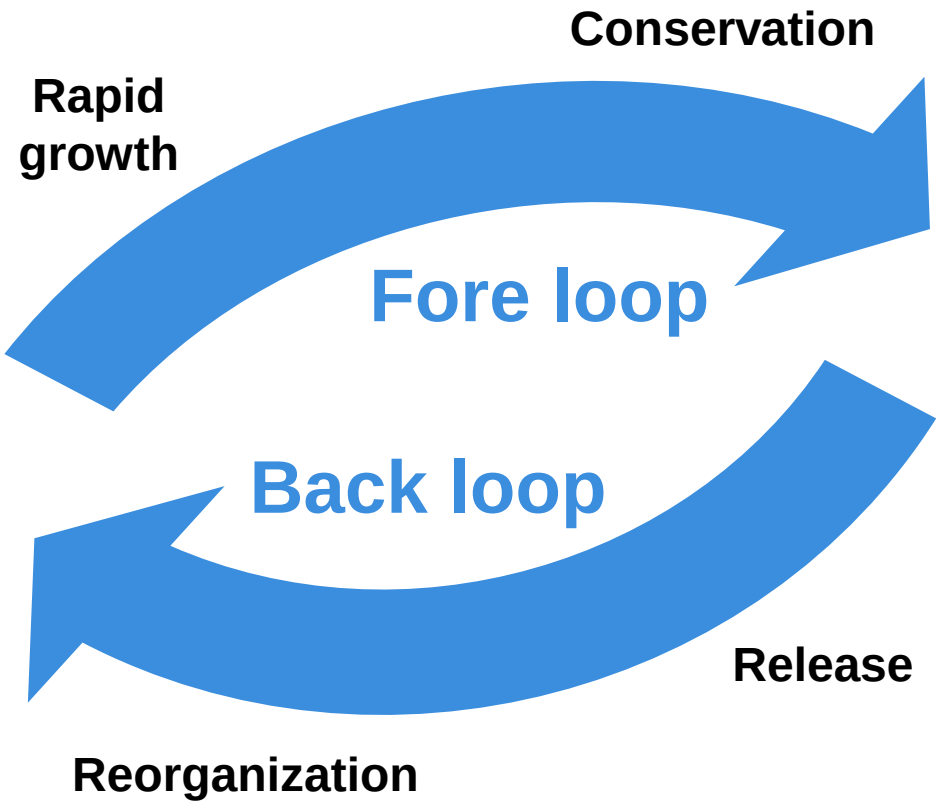
More relevant to view as a sustainability problem – not an engineering problem.

What type of system?

Complicated systems

Complex adaptive systems

The adaptive cycle



Source: Adapted from *Resilience Thinking, Sustaining Ecosystems and People in a Changing World,* Brian Walker and David Salt, 2006.

Example of reuse potential

Jumbo Hostel, Stockholm, Sweden

Example of reuse potential – Nuclear

R1 Reactor Hall, Stockholm, Sweden

Photo: Studsvik AB

Photo: KTH Royal Institute of Technology

Features of a sustainable decommissioning approach

View system's parts as assets – not liabilities

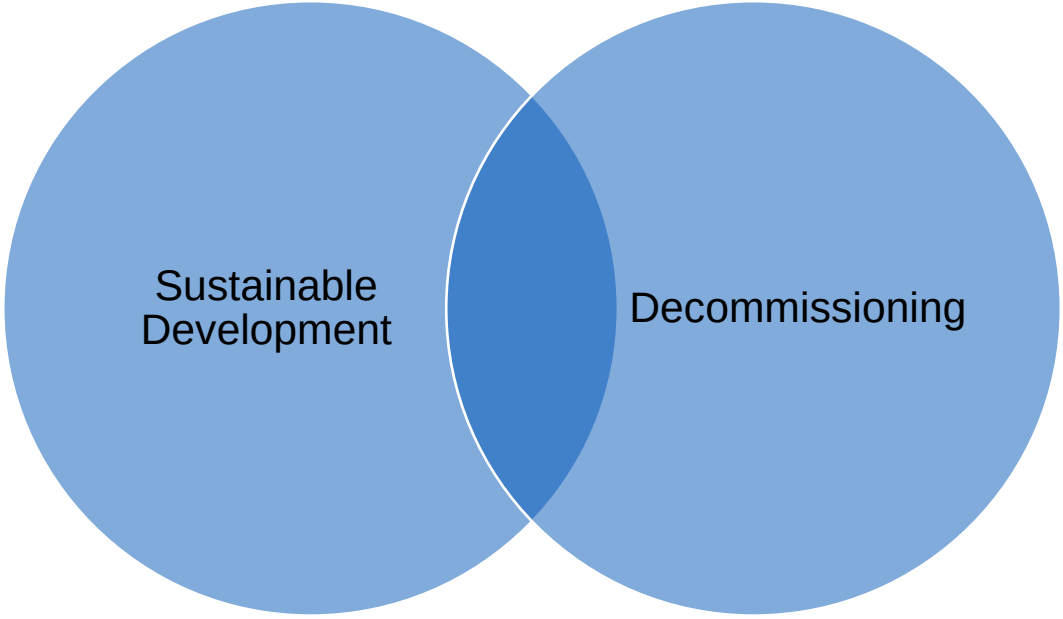
Involve stakeholders in decision-making

Decide new land uses before decommissioning planning

Is sustainable decommissioning the solution?

Key advantages

- Less waste
- Lower risk of significant delays and ”dead ends”
- Greater potential for public acceptance
- Reduced time between shutdown and new productive uses in operation
- Lower costs



Potential for increased safety for: 1) workers (less may need to be removed) and 2) the public (more likely that planned decommissioning will actually occur).

Conclusions

1. Surprises will occur – plan for that
2. Holistic, inclusive, adaptive approach – founded on sustainability principles – has tremendous potential
3. Long-term thinking key – beyond decommissioning

In accordance with general trends in society.

Thank you

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