

Ensuring Safety and Enabling Sustainability

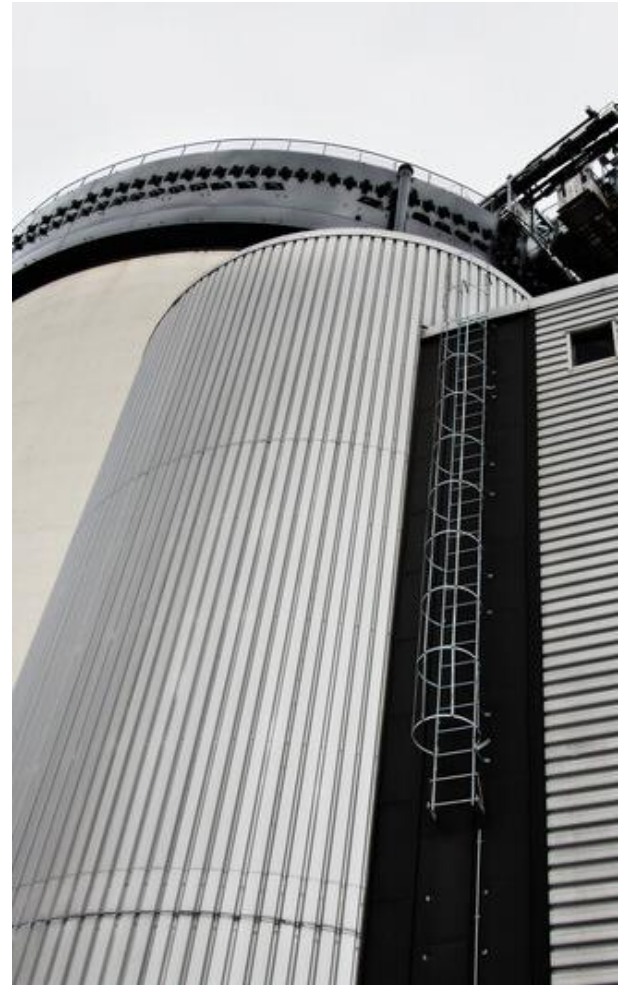
Integrating safety & sustainability in nuclear decommissioning activities

Perspectives from an owner of nuclear facilities

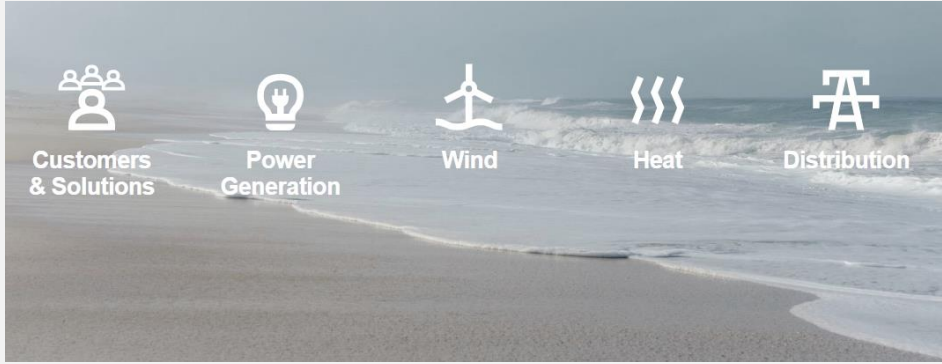
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Business Unit Nuclear Decommissioning (BUND)
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This presentation

- **About Vattenfall**
- **Our approach to Sustainability**
- **Applying sustainability in our decommissioning projects**
- **Some reflections**



Vattenfall at a glance



Customers
& Solutions

Power
Generation

Wind

Heat

Distribution

Introduction

100%
Owned by the Swedish State

7.1 million
Electricity customers

1.0 million
Electricity network customers

1.8 million
Heat customers

2.4 million
Gas customers

18,883
Employees

Main markets

Sweden

Germany

Netherlands

Denmark

United Kingdom



Sustainability

Our prioritised UN Sustainable Development Goals



Sustainability in our nuclear decommissioning

“We aim to have a comprehensive sustainability focus, applying a holistic view on resource management and sourcing of suppliers through sustainable and safe ways of working”



Recognizing Vattenfall’s sustainability goals in nuclear decommissioning

- Vattenfall has committed to take sustainability into account in all actions and decisions
- Interpret this overarching goal in aims and implementation of our nuclear decommissioning activities



Where we make sustainability efforts in our nuclear decommissioning

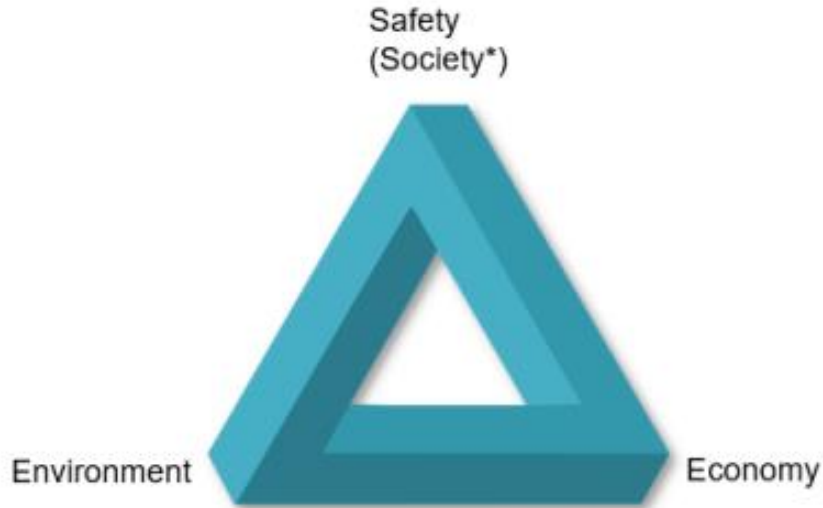
- Factoring sustainable resource and waste management goals into our decommissioning planning (*our aims*)
- Optimizing resource usage throughout our operations (*how we work*)
- Ensure employee welfare (*our people*)
- Working with our supply chain to maximise potential and amplify outcomes (*our partnerships*).



Implementing sustainability in our nuclear decommissioning

- Ensure continuous focus on sustainability in order to meet and exceed ever-changing requirements (**Long term**)
- Focus on educating and developing employees in order to ensure an integrated sustainability mindset (**Short term**)
- Incorporate sustainability into our decommissioning business development and target setting processes.
- Ensure that sustainability requirements are incorporated into our procurement processes
- Benchmark efforts against other parts of Vattenfall, as well as other types of business sectors.

A balanced approach in applying sustainability



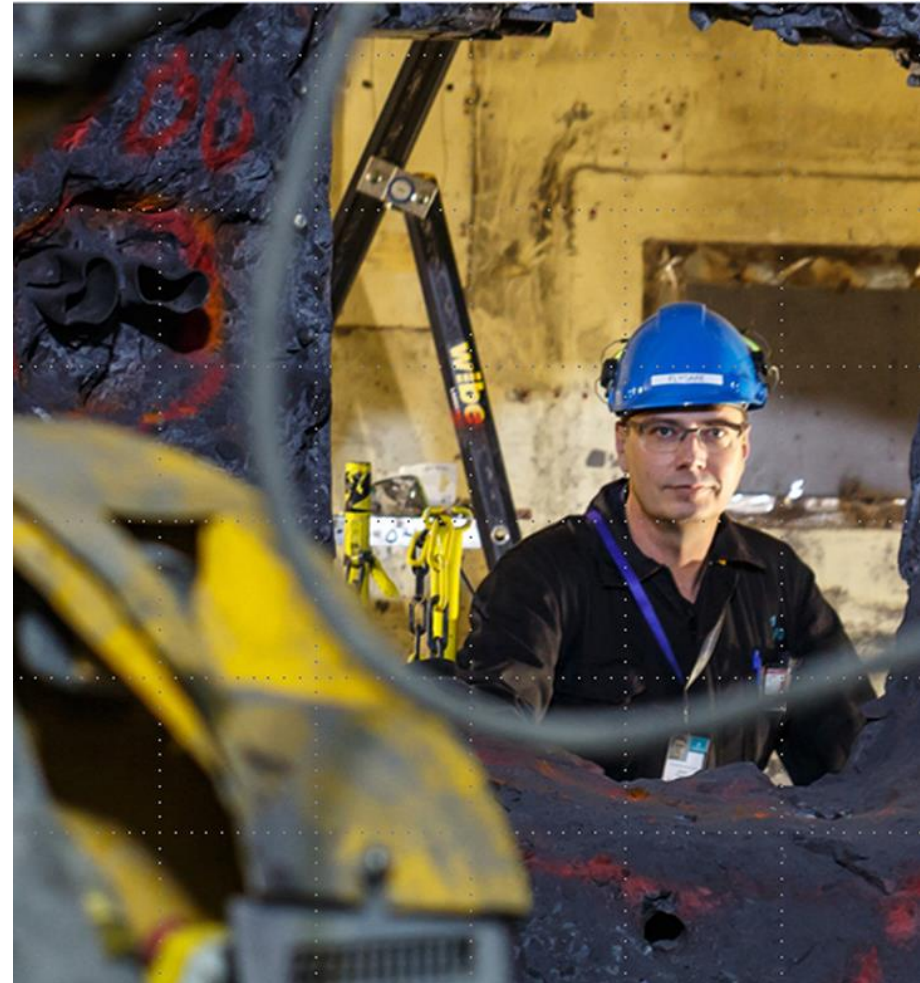
- We assess the activities using the three pillars or dimensions of sustainability.
- In the context of our decommissioning, these three pillars are:
 - **Safety (Society)**
 - Environment
 - Economy
- All three dimensions must be strong and the whole must be balanced.

- **For the societal dimension of nuclear decommissioning operations, we have chosen to focus on the safety of our workers and ensuring a safe working environment.** This narrower framework allows us to focus our efforts on areas of greatest relevance to our specific activities.
- **Wider societal aspects are addressed in parallel through our work being integrated in Vattenfall's overall sustainability management framework.** This ensures that additional social considerations may be addressed, and we benefit from Vattenfall's overarching requirements and supporting processes.

Sustainability in nuclear decommissioning

Applying sustainability in our projects

- We divide our nuclear reactor decommissioning projects into three core sets of activities or phases:
 - Special Items
 - Bulk D&D
 - Conventional dismantling.
- The application of sustainability is adapted to the nature and characteristics of each phase and type of decommissioning activities performed
- Each of the phases will be discussed separately in the coming slides



Applying sustainability in BUND's projects

Special items

Features of this phase: Dismantling and removal of reactor internals and other highly active components

Characteristics:

- High radiation levels
- Complex works, specialist staff and tools
- Removed materials managed as radioactive waste, interim storage pending final disposal

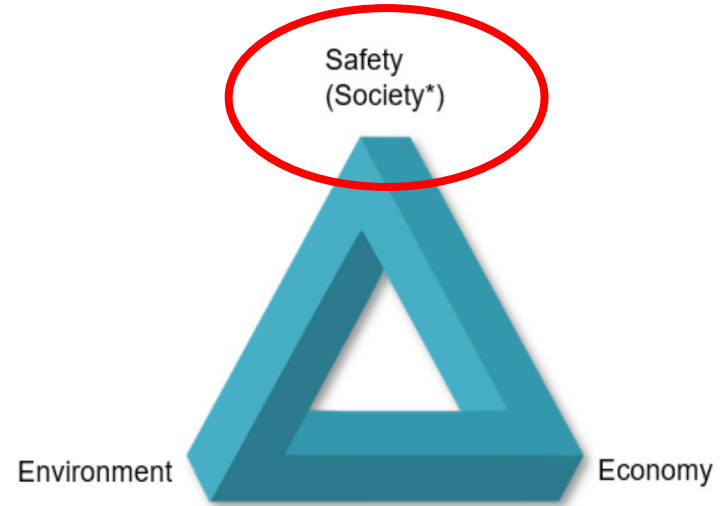
Constraints and opportunities:

Primary aspects

- **Focus on safe working environment:** radiological aspects especially, but also industrial safety

Secondary aspects

- **Waste optimization and resource use:** Storage capacity, optimize no of waste containers (resource use), consider re-use of equipment available at other sites or at contractor
- **Transports:** Fossil-free (CO₂-neutral), waste, equipment transports



Applying sustainability in BUND's projects

Bulk decommissioning

Features of this phase: Dismantling and removal of other material, equipment, systems, or structures which contain radioactivity or require radioactive decontamination

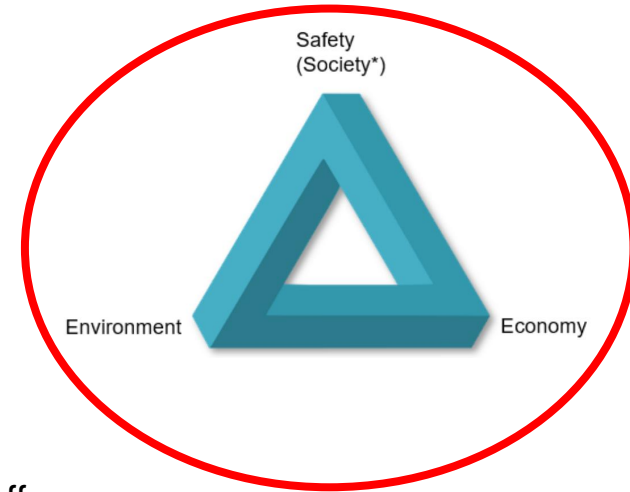
Characteristics:

- Radiation and industrial hazards
- High volumes of materials, large scale of clearance and waste sorting activities, large numbers of transports (material, personnel), complex logistics, traditional methods and tools, mix of own and contracting staff

Constraints and opportunities:

Primary aspects

- **Focus on safe working environment: industrial safety especially, but also radiological aspects**
- **Focus on cost management** including uncertainty
- **Focus on environment** through optimisation of waste management, including clearance, and transports (material/staff)



Secondary aspects

- **Balanced efforts** for improving resource use, e.g., through re-use of equipment, temporary systems, etc.
- **Relational contracting models** built into supplier relationships

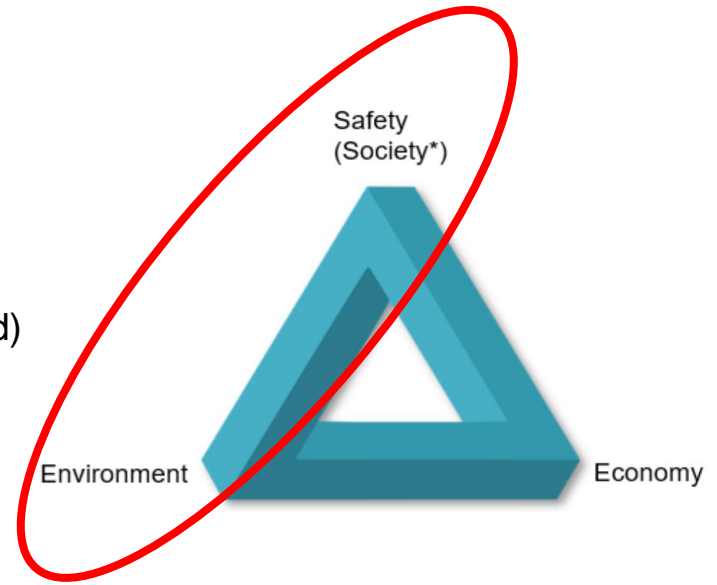
Conventional demolition

Features of this phase:

- Demolition of facilities, in whole or in part, without nuclear or radiation safety-related limitations (after Bulk D&D completed)

Characteristics:

- Industrial safety hazards, incl. heavy machinery
- Established and known scope, standard techniques, large volumes of material, potentially large numbers of transports, external contractors, mature market



Constraints and opportunities:

Primary aspects




- **Focus on environment:** determination of end-state, re-use options for site/structures, optimization of demolition materials through recycle and reuse, reduced transports through reuse on-site (e.g., backfill)
- **Focus on safety:** In this case, conventional industrial safety. Through use of specialist contractors, safe use of machinery, safety of other on-site personnel

Secondary aspects:

- **Integration of cost aspects** through competitive procurement, where sustainability is included in evaluation.

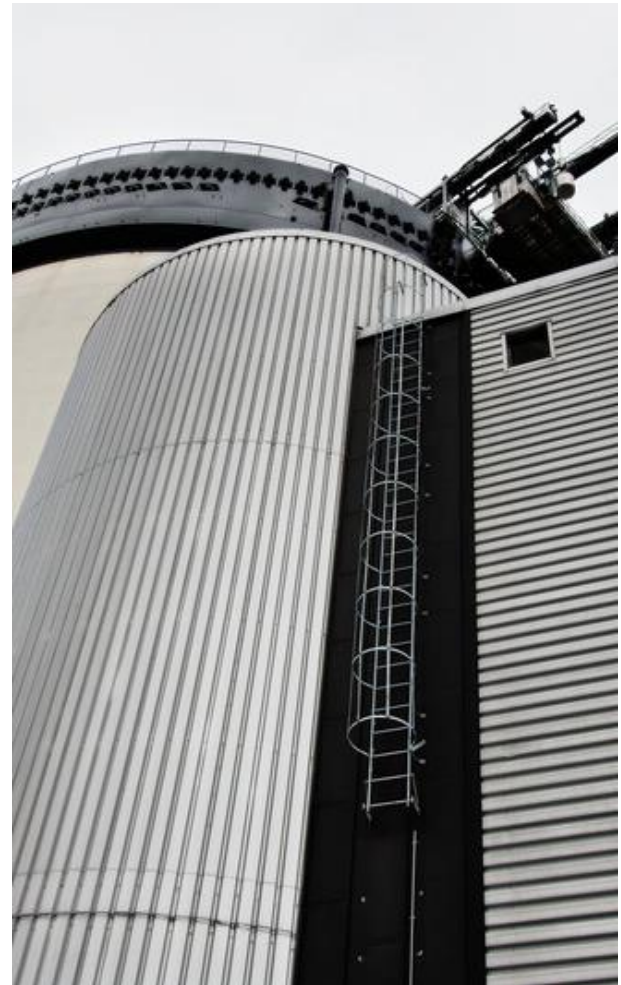
Adapting considerations to project specifics

- In Vattenfall's nuclear reactor decommissioning, we divide these into Special Items, Bulk D&D, and Conventional dismantling.
- The balance of the sustainability components (safety, economy and environment) changes and is adapted to the nature and characteristics of each phase and type of decommissioning activities performed.

		Safety		Environment		Economy
		Radiation protection	Conventional workers safety	Resource use	CO2- footprint	Cost Scope
Special Items		⚠️⚠️⚠️	⚠️	⚠️		⚠️
BULK D&D		⚠️⚠️	⚠️⚠️⚠️	⚠️	⚠️	⚠️⚠️⚠️
Conventional D&D			⚠️⚠️	⚠️⚠️	⚠️⚠️	⚠️

Some reflections

- The supply chain is critical to the implementation of our sustainability strategy, and can hinder or amplify sustainability initiatives. How can we ensure that sustainability requirements are seen more as an opportunity than an imposition on our contractors?
- A core part of our strategy relies on clearance of waste materials and their recycling for further commercial use. This requires both a practical regulatory framework and a functioning recycling chain, including consumers of released materials. How to build and expand this, especially where there is scepticism?
- Sustainability measures added to projects may be seen as entailing additional costs. How can we make them core, integrated considerations that are seen to contribute to our overall business?





Thank you!

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