

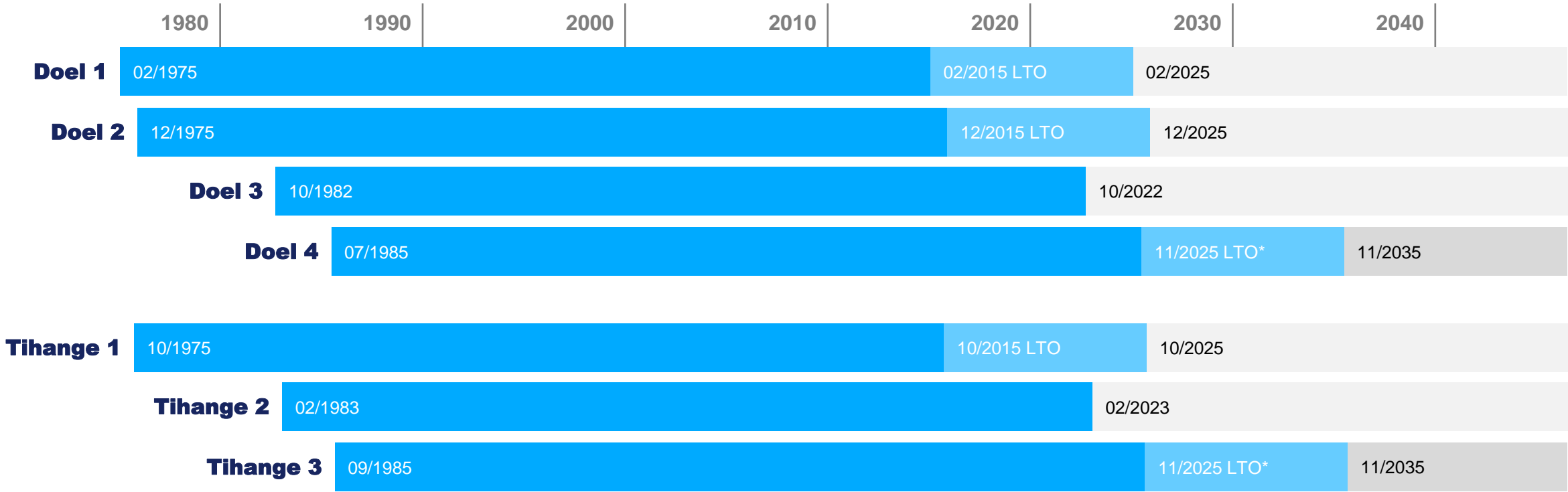
# The decommissioning program of the Doel and Tihange NPPs

March 2023



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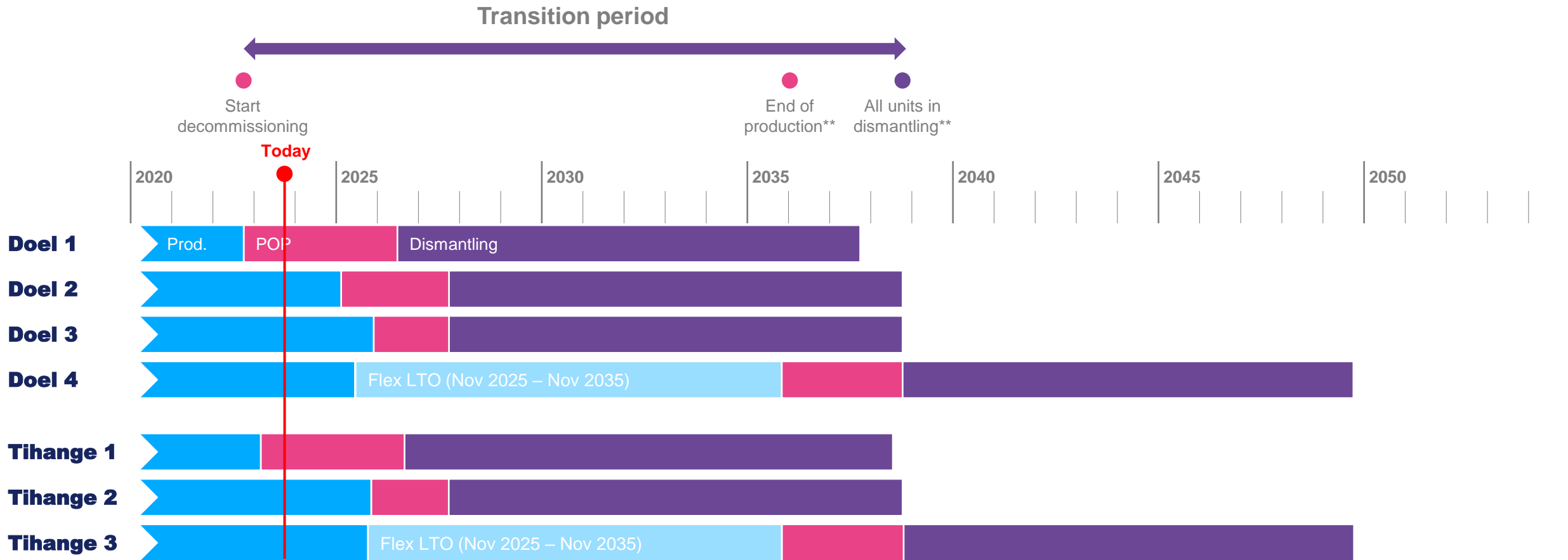
# Timeline Doel and Tihange NPP production



\* Intermediate agreement signed between ENGIE and the Belgian federal government for the extension of Doel 4 and Tihange 3 for 10 years

# Transitioning from production to decommissioning

Based on Master Schedule V6.00 (01/03/2023)



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\*\* Adjustments to the decommissioning schedule in case of an extension of Doel 4 and Tihange 3 for 10 years are based on provisional estimates Q1/2023.

# THE DECOMMISSIONING OF THE DOEL AND TIHANGE NUCLEAR POWER PLANTS



An exciting industrial challenge with a focus on  
safety and professionalism



# Decommissioning a nuclear power plant: a new challenge for the operator



Decommissioning is part of the life cycle of a nuclear power plant. It includes all administrative and technical measures taken from the final shutdown decision to the release of the site for new industrial activities.



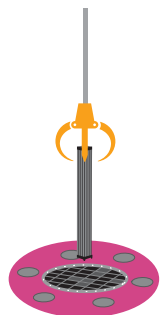
**MATERIALS AND WASTE** are treated on site in designated buildings.

**OUR AMBITION:** Maximum waste reduction and recycling of parts and materials.

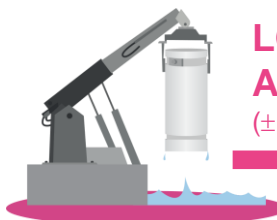
# Post-Operations

## GRADUAL DECOMMISSIONING OF CIRCUITS REMOVAL OF ALL HAZARDOUS PRODUCTS AND LIQUIDS

**REACTOR DISCHARGE**  
(± 1 month)



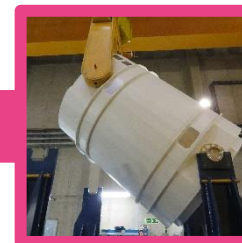
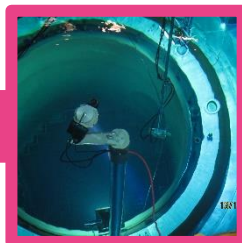
**LOADING OF FUEL IN CONTAINERS**  
AFTER COOLING PERIOD OF ± 3 YEARS  
(± 24 months)



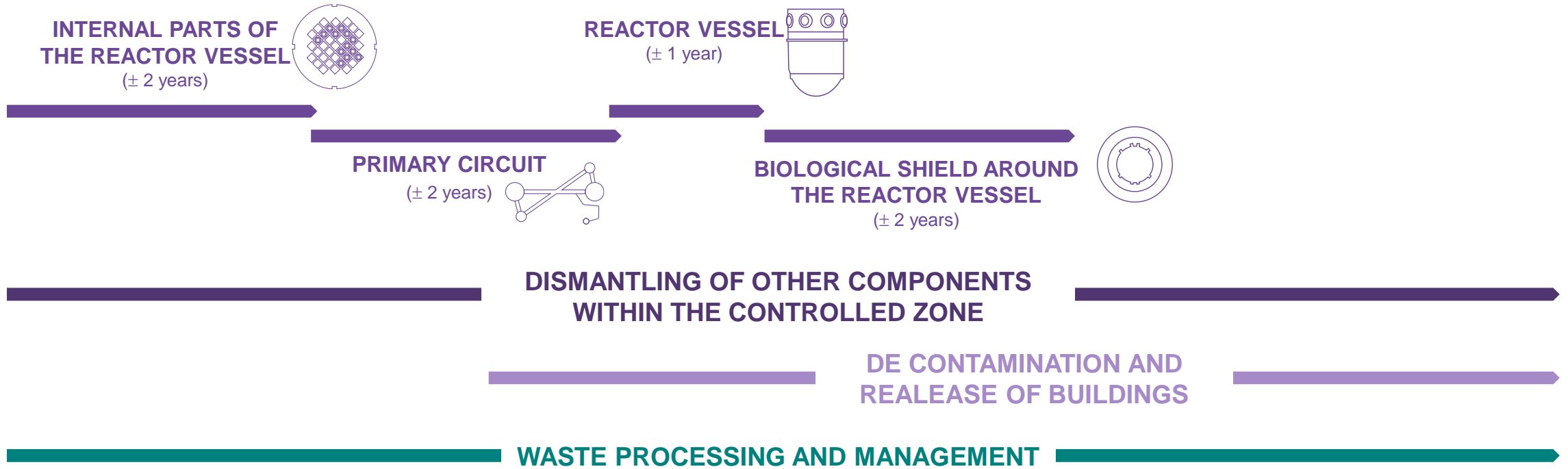
**REMOVAL OF RADIOACTIVE PARTICLES FROM THE PRIMARY CIRCUIT (CSD)**  
(± 6 months)



**FINALE CLEANING OF CIRCUITS**  
(± 4 months)



# Dismantling



Dismantling licence

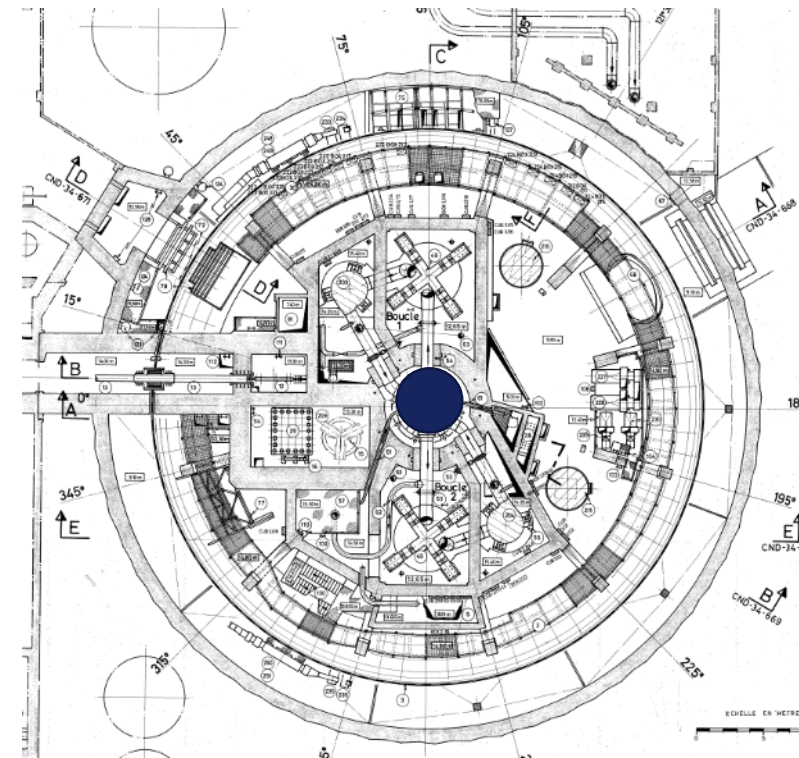


Clearance of nuclear regulations

# Dismantling

## Dismantling of the internal parts of the reactor vessel

- In the reactor/refueling pool - underwater for ALARA (~ tens of Sv/h)
- Remote dismantling with mechanical cutting techniques
- Requires heavy preparation work: structural reinforcement of the dock, collection of machining materials, rotary table, customized manipulation tools



Dismantling the internal parts with band saw at Stade nuclear power station, Germany





# Dismantling

Dismantling of the remaining contaminated systems in the controlled area

Decontamination and release of building structures and the site:

- Peeling concrete
- Removal of contaminated inserts (pipe penetrations, ventilation ducts, expansion joints, etc.)
- Cleaning / decontamination of all surfaces
- Complete mapping of the installation

Final phase of the Decommissioning

- Administrative release from nuclear control of the reactor

Concrete peeling



Removal of deep contamination



Complete mapping of the concrete structures



This can be a long and expensive operation (many measuring points, double checks by the authorities, etc.)

# Demolition

## CONVENTIONAL DEMOLITION OF BUILDINGS AND INFRASTRUCTURE

Cutting the cooling towers with demolition shears

Waste from demolition is taken to conventional landfill sites

Filling of excavation pits and landscaping of the site

Clearance of nuclear regulations



Industrial site



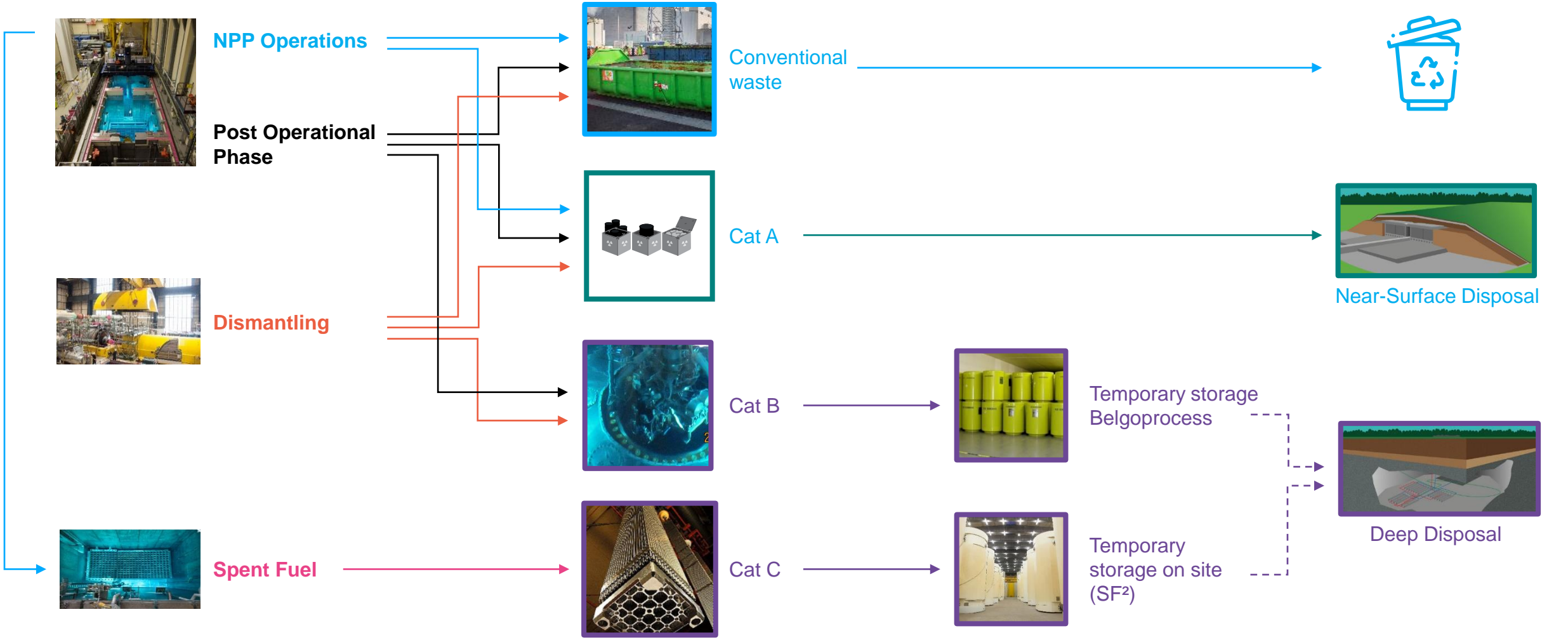
Once the buildings and infrastructures are freed from nuclear constraints, the facility is no longer considered a nuclear installation → the remaining operations are carried out in a conventional manner.

Note: nuclear constraints may remain if there are other facilities on the site.

# Waste Management

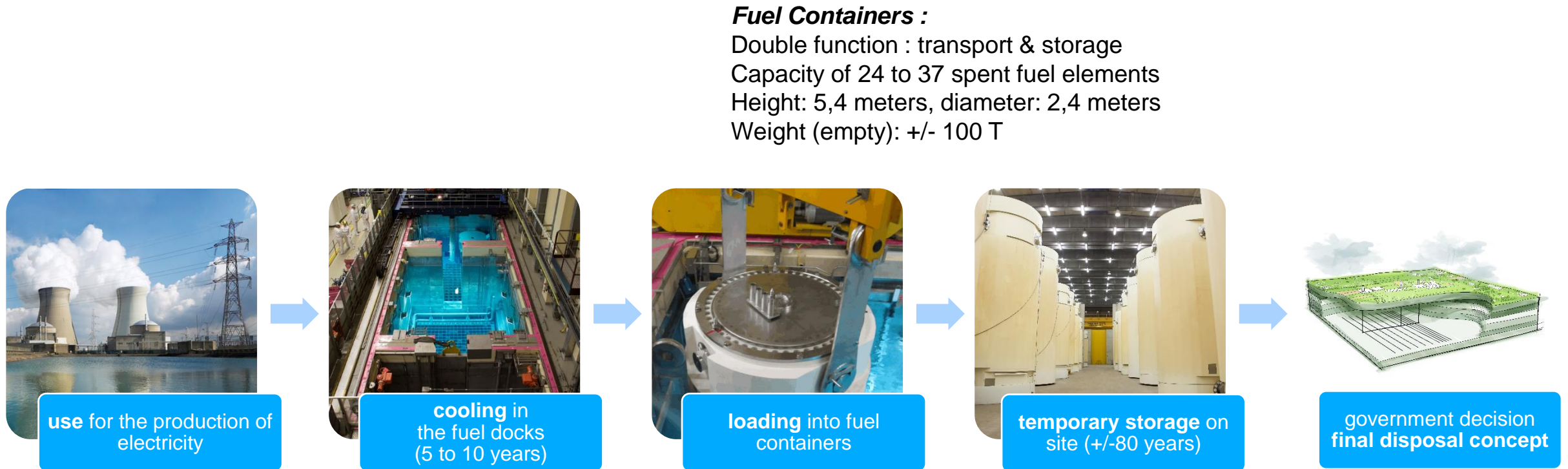
# From producer to exit

Radioactive Waste		Radioactivity		
		Low	Medium	High
Half-Life	Short	Cat A		Cat C
	Long	Cat B		



# Fuel cycle

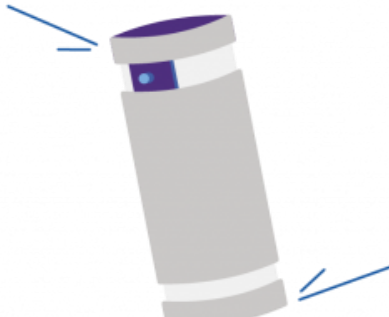
# Fuel cycle



# Characteristics of a fuel container



Resistant to fire



Resistant to earthquakes



Resistant to aircraft impact



Resistant to moisture and corrosion



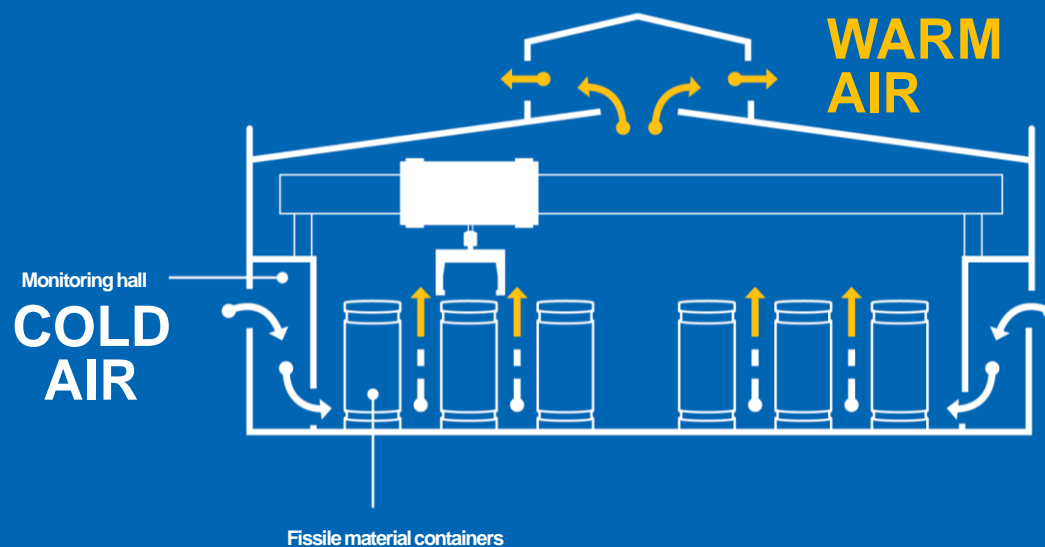
Enables **heat to be** extracted



Provides protection against **ionizing radiation**

# Fuel building

- The concrete building provides additional radiological protection.
- The passive ventilation allows residual heat to be dissipated
- Withstands extreme outdoor temperatures due to climate changes







**Every great story  
deserves a great ending...**

## **Safe**

nuclear & conventional safety, for people & environment

## **Professional**

well organized, effective, cost driven & on time – to be benchmark in decommissioning

## **Responsible**

adhering to regulations & ethics with respect for society

