
LONG TERM OPERATION DOEL 1 & 2

Introduction Project LTO Doel 12

September 2016



ENGIE
Electrabel



Chapter 1

Doel Nuclear Power Plant

Chapter 2

Context LTO Doel 12

Chapter 3

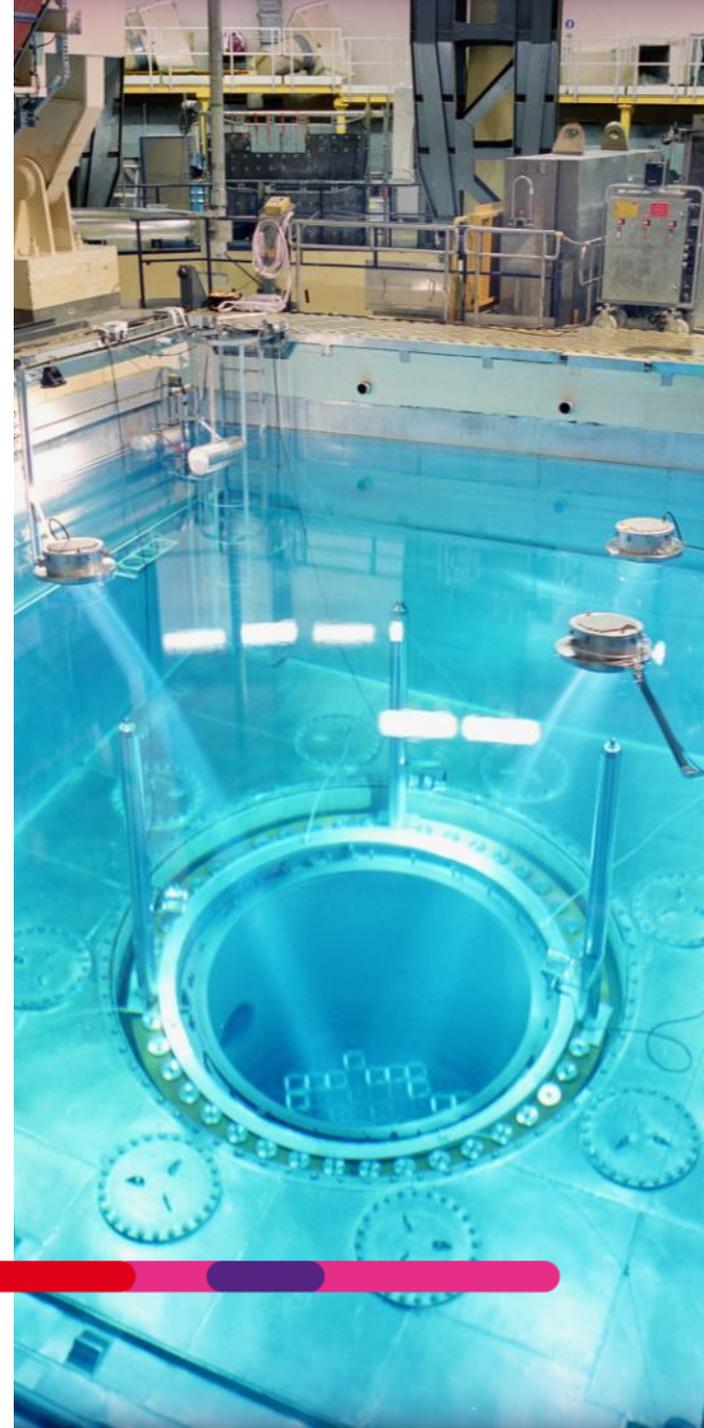
High Level Planning

Chapter 4

Approach and Organizational Principles

01

Doel Nuclear Power Plant



Doel NPP, our site



Doel 2
433 MW

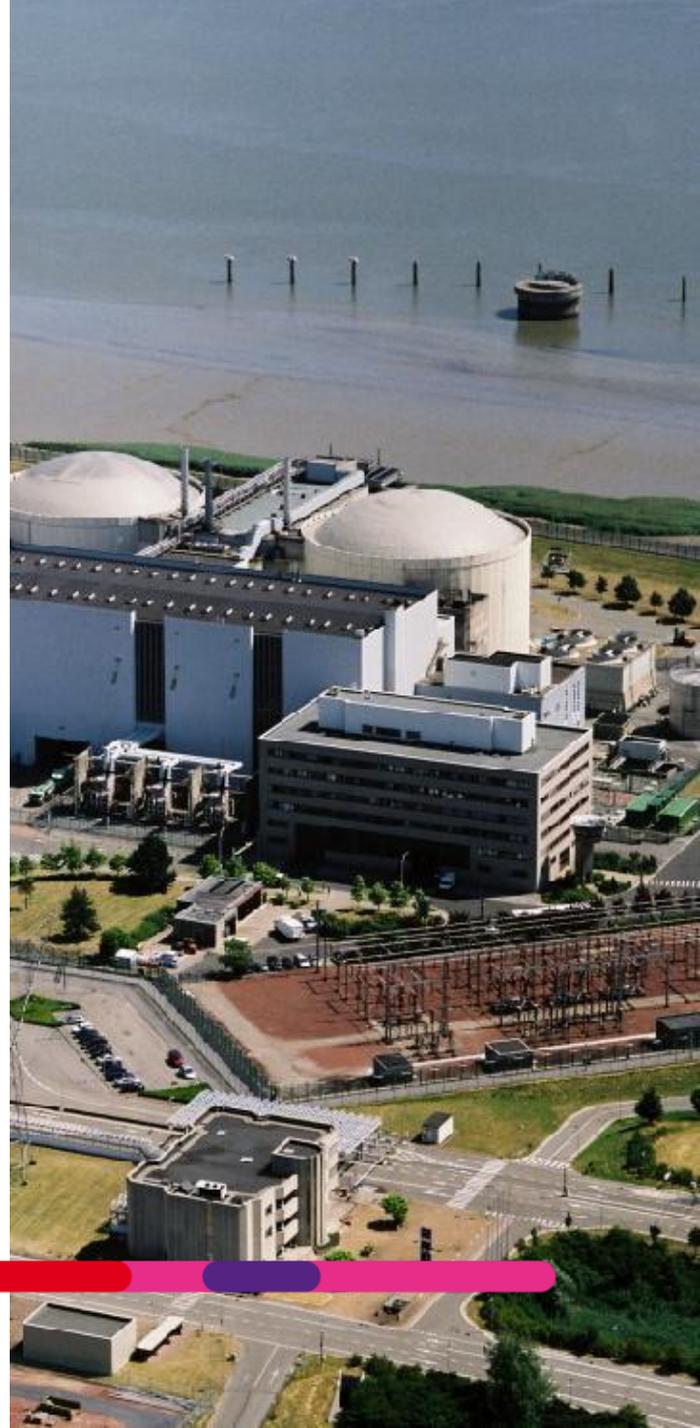
Doel 1
433 MW

Doel 3
1006 MW

Doel 4
1039 MW

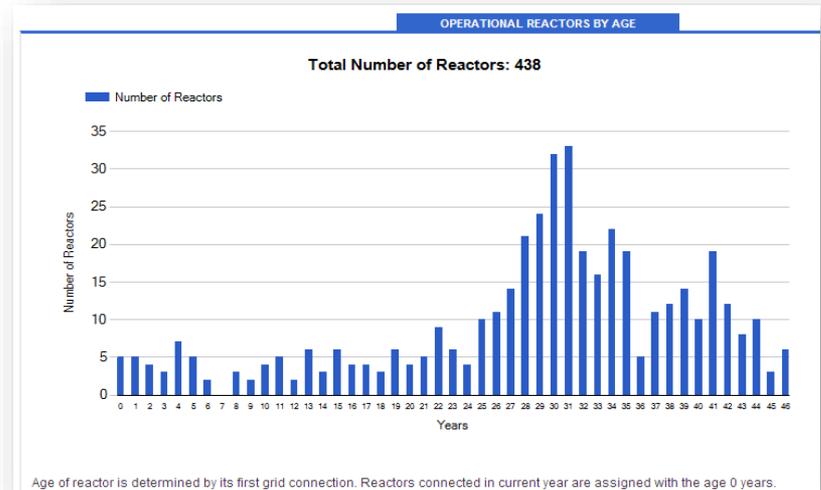
02

Context of LTO Doel 12



Context of LTO Doel 12

- Doel 1 was disconnected from the grid on 15 February 2015 as required by law, while Doel 2 reached 40 years at midnight on 1 December 2015
- **No technical reason to stop operation after 40 years!**
 - See positive OSART review of Doel 1 & 2 by the International Atomic Energy Agency (IAEA) in 2010.
 - Around the world:
 - 438 reactors in operation, 63 of which have reached the age of 40 years or more, representing 38 730 MW of capacity (Borssele in the Netherlands, Beznau in Switzerland, Ringhals in Sweden and more than 30 nuclear power stations in the USA (source: IAEA website)
 - In the world as a whole, extending the operational lifetime of nuclear power stations to 60 or even 80 years is common practice.



Context of LTO Doel 12

● 2009 – 2011:

- Political decision LTO D12 & Tihange 1 (2009)
- Federal Agency for Nuclear Control (FANC) strategic memo on LTO (September 2009)
- Preparation of technical LTO file (2009 – 2011)
- Positive OSART review Doel 1 & 2 (2010)
- Initial LTO file submitted (December 2011)

● 2012:

- Analysis by FANC/Bel V (April 2012)
- Scientific Council issues positive advise (June 2012)
- **Government's decision to shut down Doel 1 & 2 (July 2012)**
- Suspension of LTO project for Doel 1 & 2, launch of final shutdown project



Context of LTO Doel 12

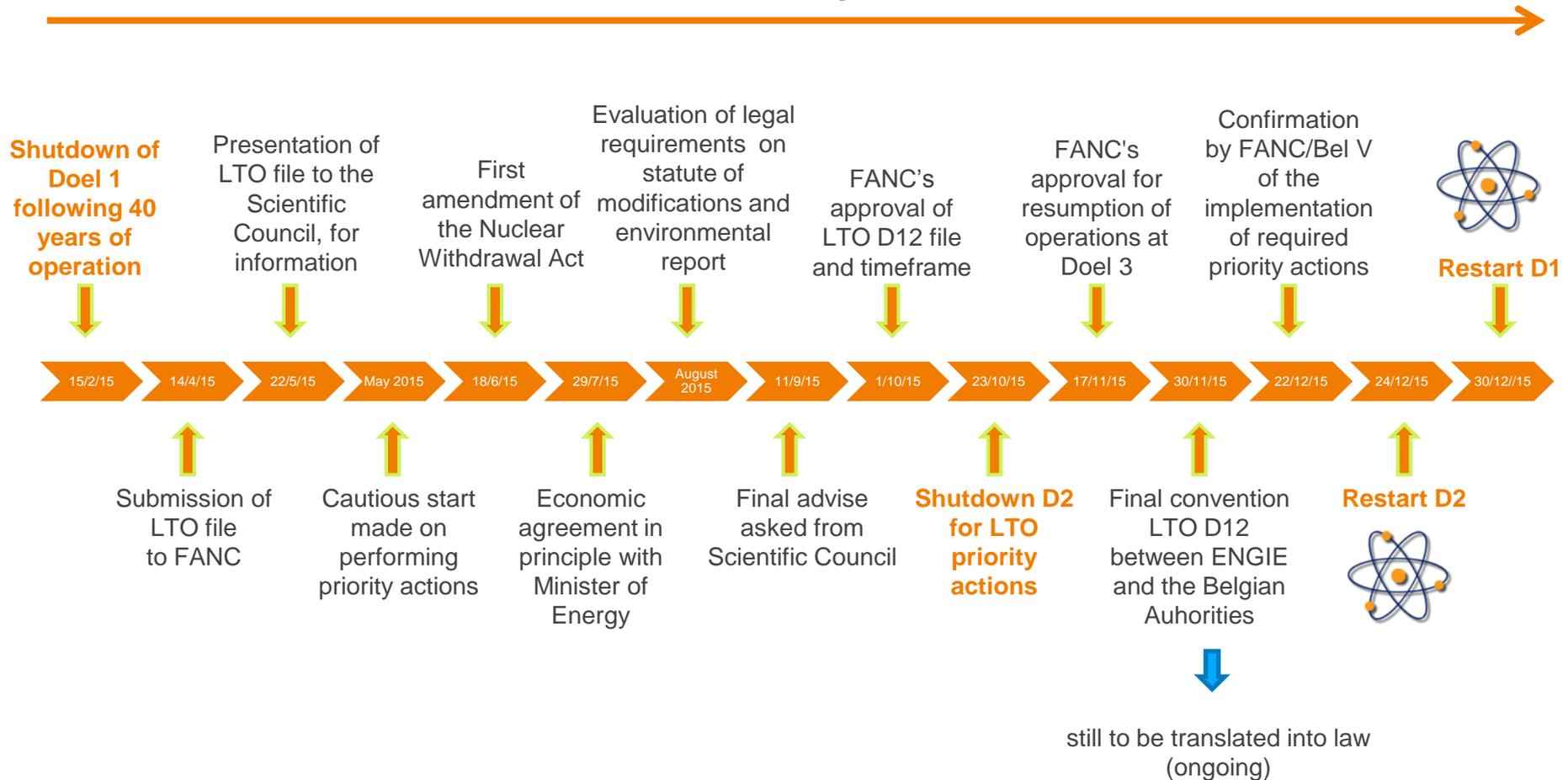
- **2014 – early 2015:**

- New government reconsiders LTO for Doel 1 & 2 (December 18, 2014)
- **Suspension of final shutdown project and reactivation of LTO project Doel 1 & 2**
- Three main green lights needed for LTO D12:
 - Amendment of the Nuclear Withdrawal Act
 - Economic agreement between ENGIE Electrabel and the authorities
 - FANC's approval of the approach



Context of LTO Doel 12

2015 - Today



Perception on nuclear and LTO Doel 12

- Political sensitive subject = interesting for media



"Dit moet de ogen van de regering openen. Net deze centrale gaat men 10 jaar langer openhouden. Men hoeft dat niet te doen en men mag dat eigenlijk ook niet doen. Gmen roept op om de verlenging van de levensduur van de centrales weg te stemmen in het parlement. Deze centrales zijn simpelweg oud, versleten en onbetrouwbaar", besluit Calvo.

Nederland inspecteert kerncentrale Doel



Duitsland stelt zich vragen over onze atoomveiligheid na recente problemen, vijf vragen al beantwoord

De kerncentrales rammelen voort

1. Welke kerncentrales dreuen er nu eigenlijk nog?
Ook land met in totaal twee kerncentrales, niet in België. Tussen de Franse centrales die worden afgevoerd naar de zee, staat de centrale van Doel 1 en 2. Deze centrales zijn nu 40 jaar oud. Het is de enige centrale die nu nog draait. Het is de enige centrale die nu nog draait. Het is de enige centrale die nu nog draait.

2. Wat zijn de problemen bij Doel 1 en 2?
De centrale van Doel 1 en 2 is nu 40 jaar oud. Het is de enige centrale die nu nog draait. Het is de enige centrale die nu nog draait. Het is de enige centrale die nu nog draait.

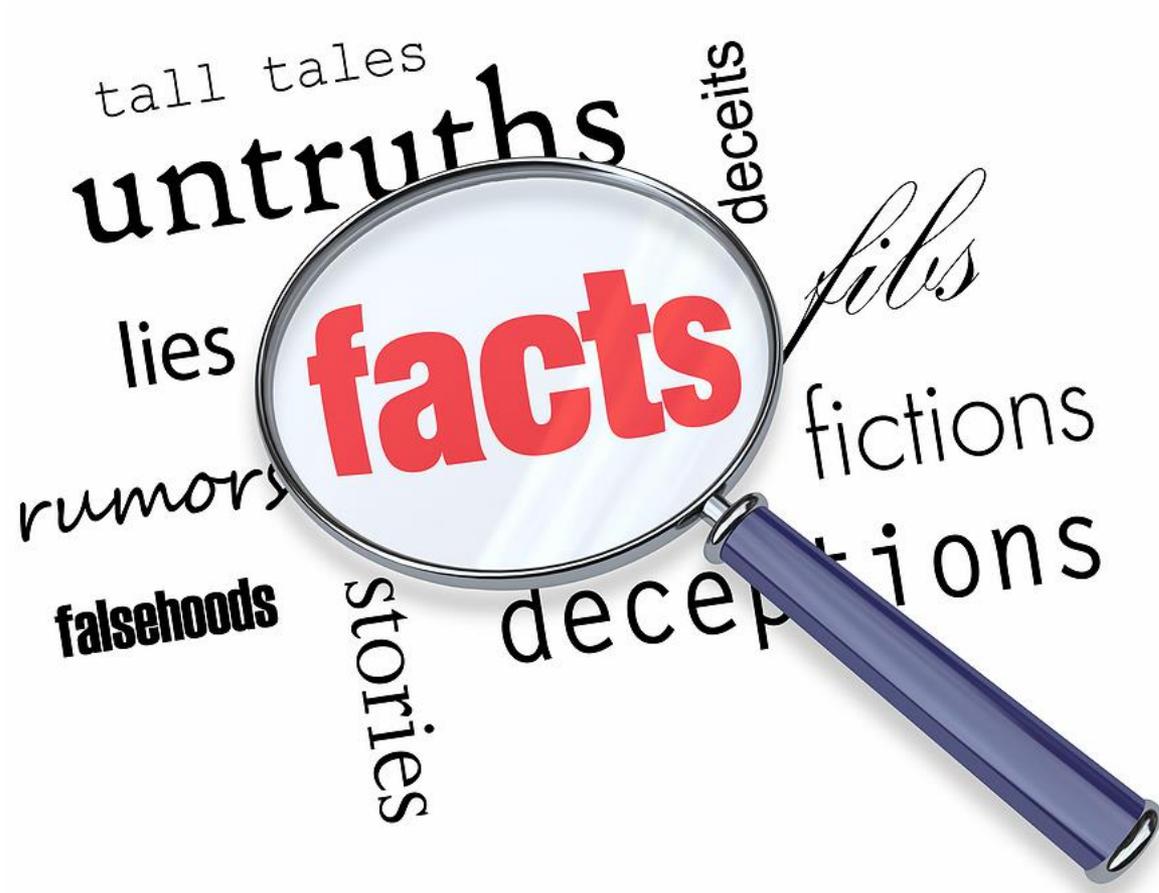
3. Is de veiligheid in gevaar?
De centrale van Doel 1 en 2 is nu 40 jaar oud. Het is de enige centrale die nu nog draait. Het is de enige centrale die nu nog draait. Het is de enige centrale die nu nog draait.

4. Zal het licht uitvallen?
De centrale van Doel 1 en 2 is nu 40 jaar oud. Het is de enige centrale die nu nog draait. Het is de enige centrale die nu nog draait. Het is de enige centrale die nu nog draait.

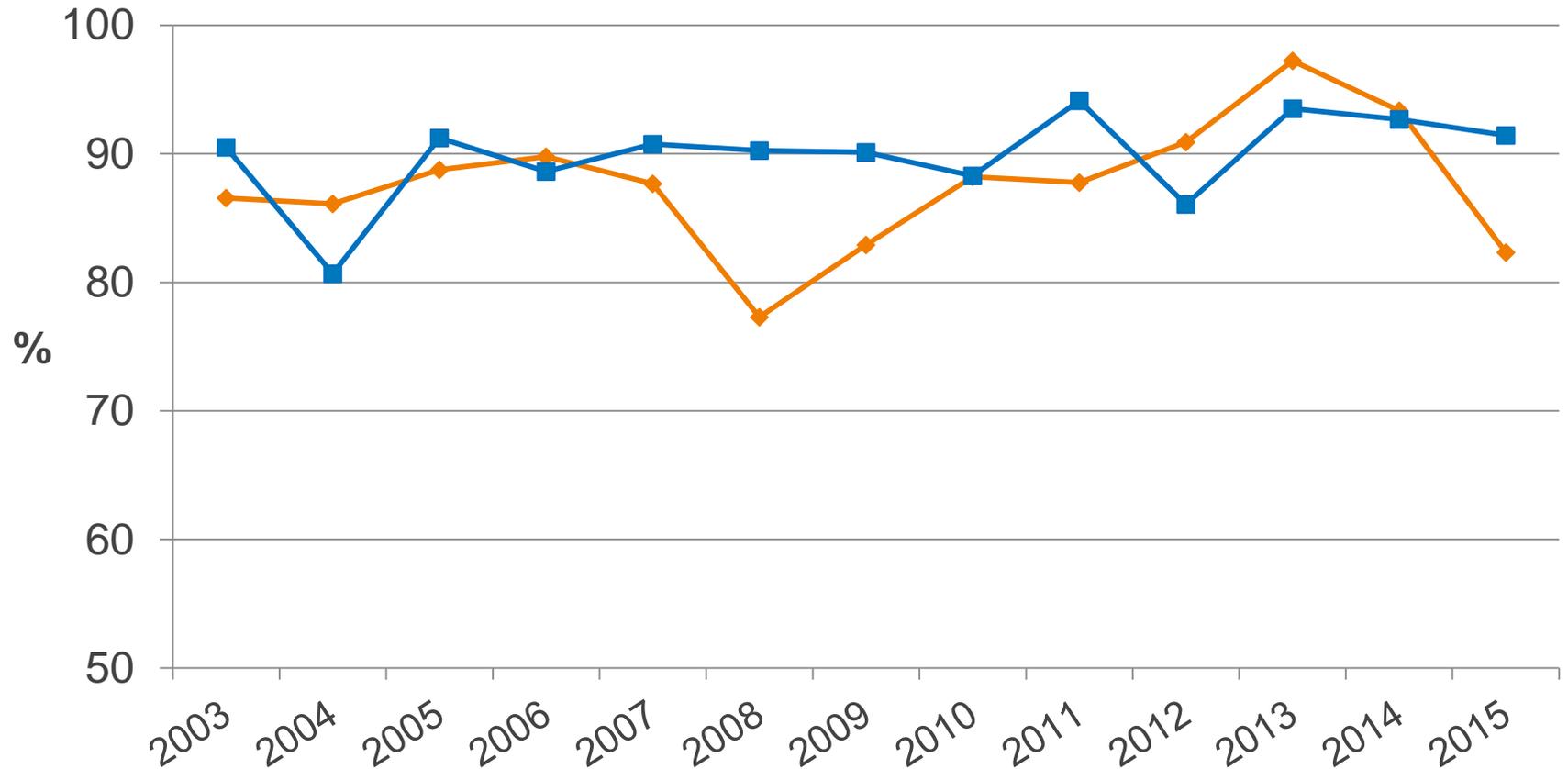
5. Zijn onze centrales niet gewoond de oud?
De centrale van Doel 1 en 2 is nu 40 jaar oud. Het is de enige centrale die nu nog draait. Het is de enige centrale die nu nog draait. Het is de enige centrale die nu nog draait.



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But what are the facts?
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Performance Doel 1 and Doel 2

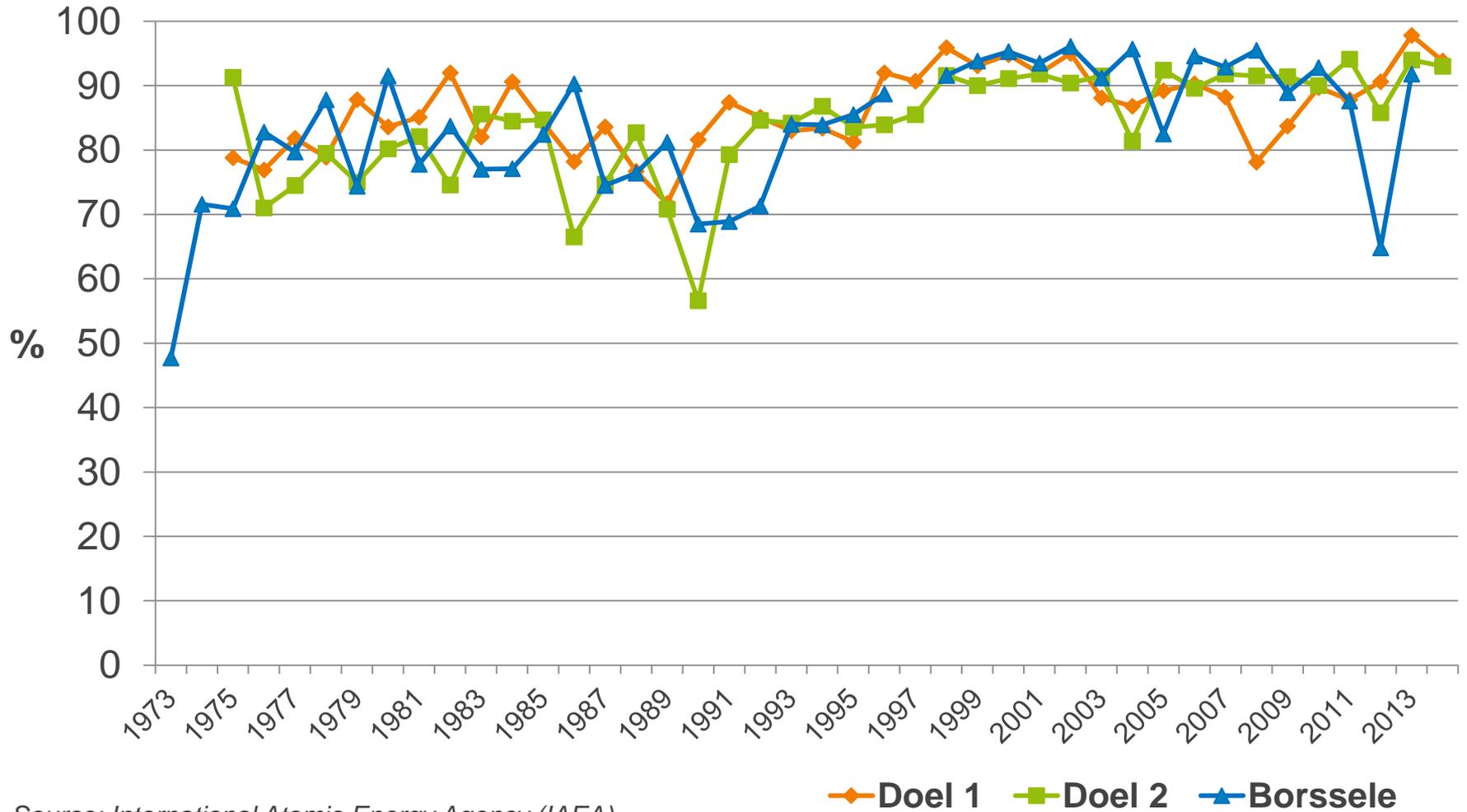


Doel 1 in stretch-out in 2015

Doel 1 Doel 2



Performance Doel 1 & 2 and Borssele

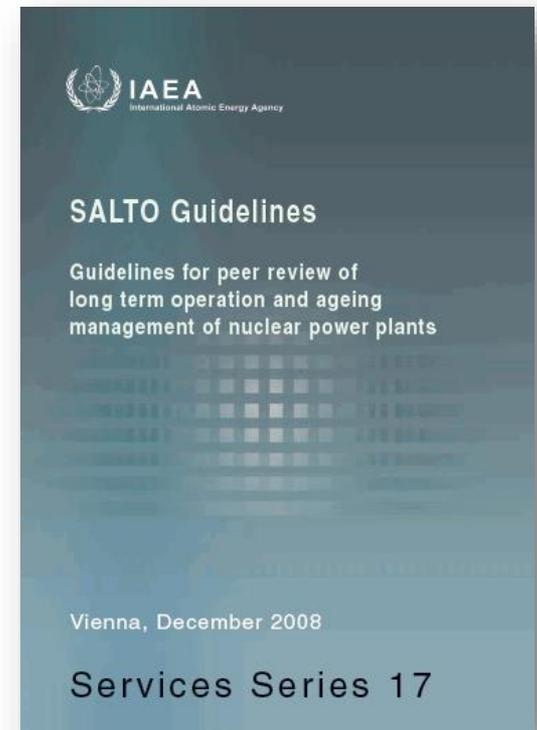


Source: International Atomic Energy Agency (IAEA)



Independent International Oversight LTO Doel 12

- Audits requested by FANC
- **SALTO** = **S**afety **A**spects of **L**ong **T**erm **O**peration
- By **IAEA** = **I**nternational **A**tomic **E**nergy **A**gency
- A team of international experts should make an evaluation of progress for the activities relating to LTO (human resources and knowledge management; management of the ageing of mechanical and electrical components; civil engineering; internal organization; and change management).
- **Expert Mission: February 2016**
- **Full SALTO: February 2017**



03

High Level Planning



High Level Planning LTO D12 Projects

- **General time frame**

- The 2018 and 2019 outages are the focal points
- Basic requirements (general and specific)
 - Guaranteeing nuclear safety
 - Remain in accordance with the Doel 1 and Doel 2 Safety Report
 - Avoid the risk of common mode failure of safety equipment
 - Manage technical complexity (for example, parallel actions and interference)

- **Report transparently towards authorities about programme modifications through periodic consultation**

● **2015**

- Short stop D2 (weeks) April/May 2015
- Longer stop D2 (months) autumn

● **2016**

- Short stop D1 (weeks) - summer
- Medium length stop D2 (months) - spring

● **2017**

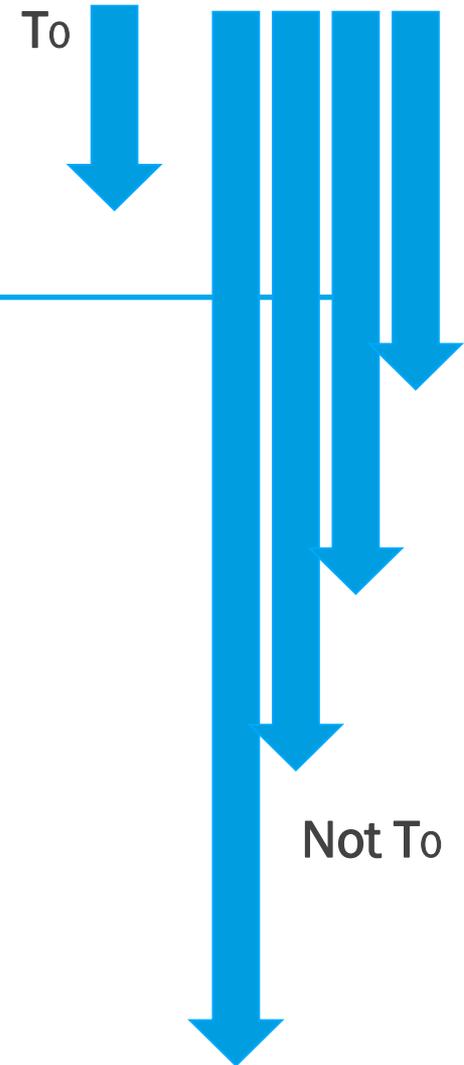
- Short stop D1 (weeks) - summer
- Short stop D2 (weeks) - spring

● **2018**

- Long stop D1 (months) - summer
- Long stop D2 (months) - summer/parallel to D1

● **2019**

- Long stop D1 (months) - summer
- Long stop D2 (months) - summer/parallel to D1



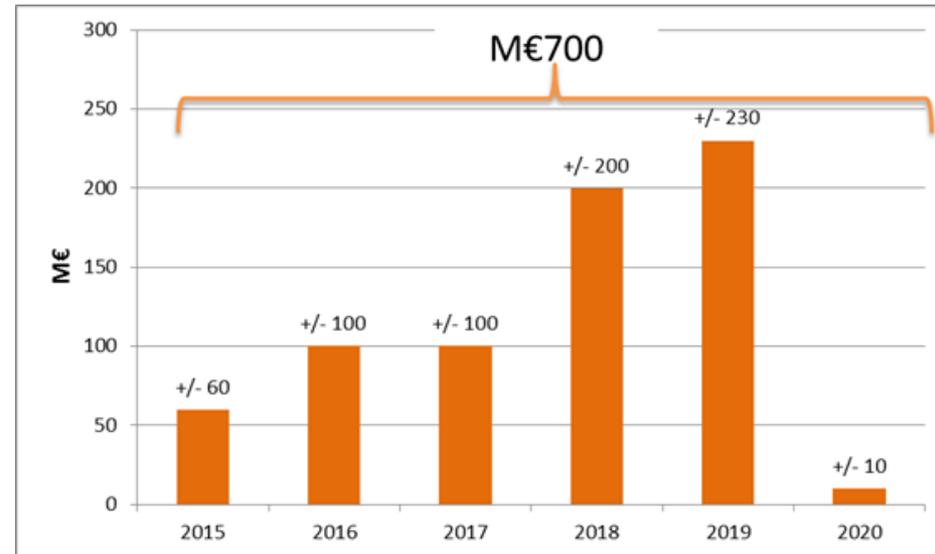
Main investments LTO D12 projects

● Investments up until 2019:

— The total investment amounts to 700 million euros

— The main investments include among others the following:

- Upgrading the design
- Retrofitting or replacing the turbines
- Replacing the main transformers
- Installation of filtered containment venting system
- Improving the fire detection and extinguishing systems
- Modernising the electrical systems
- Inspection and possible replacement of mechanical components in primary circuit
- Modernising the control systems
- Civil engineering projects



04

Approach and Organizational Principles



Approach

- FANC strategic memo Sept 2014: **“LTO-D12: Safety requirement reminder for LTO approval at Doel 1 and Doel 2 in case of amendment to the Nuclear Power Phase-out Act.”**
- Analysis of the Doel 1&2 projects from LTO (Long Term Operation) perspective instead of DSZ (Final Shutdown)
- Action list contains at least:
 - LTO action plan approved in 2012
 - BEST action plan (BElgian Stress Test)
 - 4th PSR (Periodic Safety Review)
 - Inspection program (such as reactor vessels D1 and D2)
 - The scheduled, planned and/or completed actions since July 2012

Approach: analysis of 13 packages

- **LTO file 2012 (1-5)**

- LTO Ageing Mechanical, LTO Ageing Electrical and I&C, LTO Ageing Civil Engineering
- LTO Design
- LTO Preconditions, Competence Management, Knowledge and Behaviour

- **BEST project (6)**

- **4th PSR (7)**

- **Extra inspections (8)**

- **Other projects (9-13)**

- Modifications
- Doel NPP projects, Electrabel Corporate projects
- Non-conformance reports
- Delta 2012 – 2015 as a consequence of operation in perspective of shutdown rather than LTO

Organizational principles

- **Important partners for the success of the project:**

- **ALL INTERNAL AND EXTERNAL EMPLOYEES OF DOEL NPP**
- ENGIE Electrabel and Tractebel as professional organizations with a lot of nuclear expertise
- Tihange NPP and other power plants with LTO experience

- **Basic principles of LTO organization**

- A Doel NPP project as a tool for action execution
- All actions on **the integrated action list (GAL)** are distributed into projects
- A project is led by a project leader who owns the project
- Programme LTO-D12 = sum of projects = sum of all GAL actions
- Projects to be executed in accordance with Doel NPP processes on project and change management
- Projects are brought together into **portfolios**
- A portfolio is led by a portfolio manager
- At programme level SPOC's (Single Point of Contact) have been appointed to communicate with other departments and services



LTO
DOEL 12
VERANTWOORD VEILIG VERDER

LTO Doel 1 & 2:
Safe from the first day on!
Safe by continuous improvement for the next 10 years!

Thank you for your attention!

