FANC
FEDERAL AGENCY FOR NUCLEAR CONTROL

BEL V

Joint 8th+ 9th Joint Review Meeting
of the
Convention on Nuclear Safety

BELGIUM

Country Group 5

Tuesday, March 21st, 2023

The Speakers

FANC
FEDERAL AGENCY FOR NUCLEAR CONTROL

F. Hardeman

General Manager

ENGIE Electrabel

W. Van Cauwenberge & P. Verhelst

Safety Advisor

OUTLINE

Part 1 – Belgian regulatory body (FANC + Bel V)

1. Basic information on the national programme
2. Developments since the 7th RM
3. Theme of topical sessions

Part 2 – Licensee of Belgian NPPs : ENGIE-Electrabel

1. Engie Electrabel Business unit nuclear
2. Past action plans
3. Ongoing projects and action plans

Part 3 – Complementary Topics (FANC)

Updates to the report, Q&A, Areas of good performance, Challenges, COVID-19, General Conclusion

Basic Information on the National Programme

1.A	International context for Belgium
1.B	Belgian nuclear sites
1.C	Belgian Nuclear Energy Policy
1.D	Main legislative & regulatory framework
1.E	Surveillance of nuclear installations
1.F	Licensing process
1.G	Emergency preparedness and response

1.A International Context for Belgium

Conventions

- **Convention on Nuclear Safety**
- Joint Convention
- Convention on assistance in the case of a nuclear accident
- Paris convention on nuclear third party liability and the Brussels supplementary convention
- Convention on early notification of a nuclear accident
- Convention on physical protection of nuclear material

European level

- ENSREG (Regulators of the EU)
- WENRA (Western European Nuclear Regulators' Association)
- HERCA (Heads of Radiation Protection Authorities)

International Organizations

- IAEA : Safety committees : NUSSC, WASSC, TRANSSC, RASSC, EPRESC
- OECD/NEA: Various committees (for example: CSNI)

Bilateral agreements

- **FANC** has bilateral agreements with safety authorities of (all) its neighbouring countries : France, The Netherlands, GD Luxembourg, Germany, as well as with other countries (UK, US, CA, …)

1.B Belgian Nuclear Sites – NPPs and RRs

FANC – BEL V
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NPPs

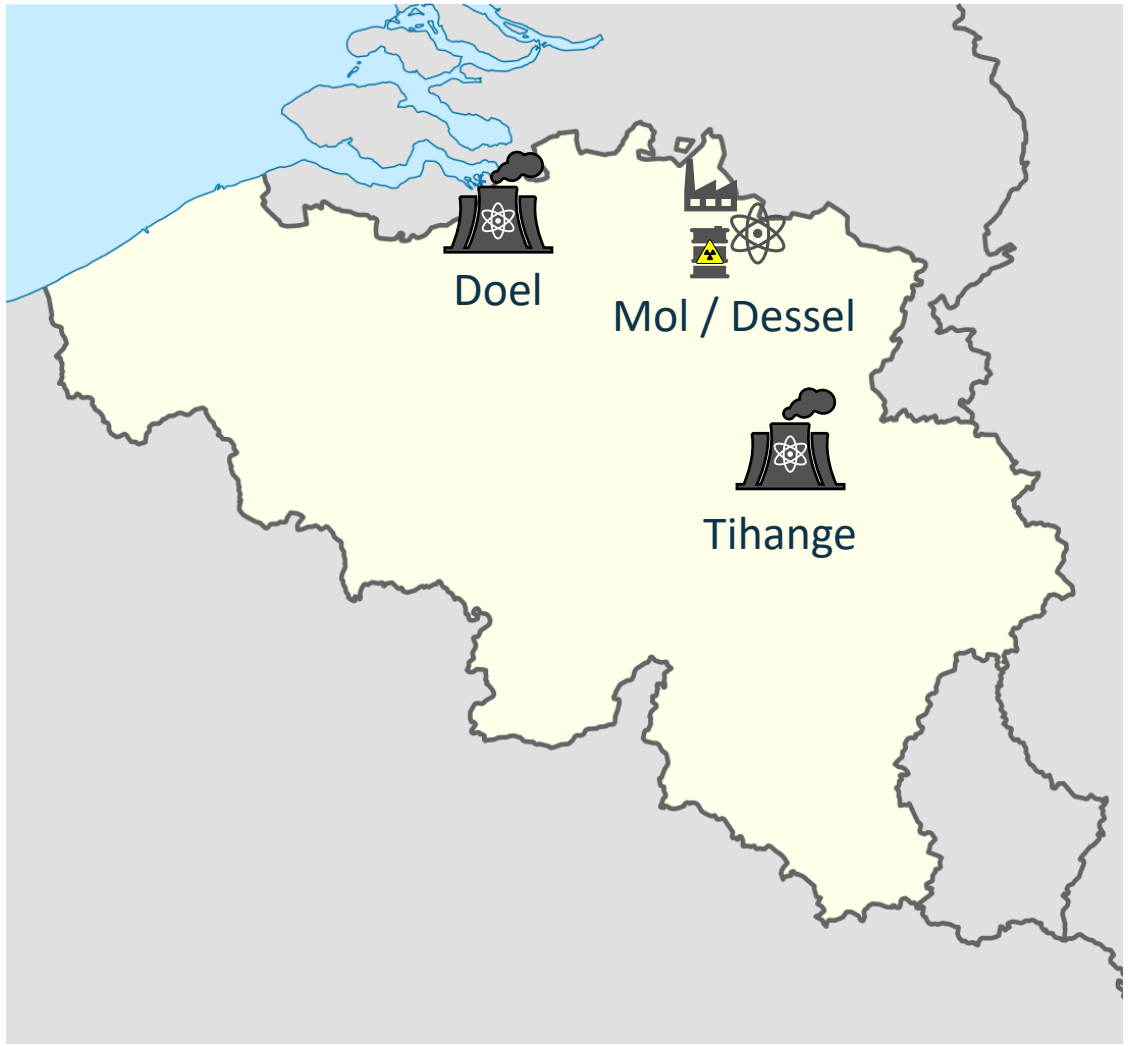
Doel

- Doel 1 & 2 : 2x 440 MWe
- Doel 3 : Shutdown
- Doel 4 : 1003 MWe
- All units are PWR-type

Tihange

- Tihange 1 : 962 MWe
- Tihange 2 : Shutdown
- Tihange 3 : 1006 MWe
- All units are PWR-type

NPPs Licensee :
ENGIE-Electrabel



RRs

Mol

- SCK CEN Research Reactors BR1, BR2, (BR3)

RRs Licensee :
SCK CEN

1.C Belgian Nuclear Energy Policy

2003 01-31
- Phase-out law for industrial electricity production from nuclear fission
- Lifetime of NPPs limited to 40 y, no new builds allowed

2013 12-18
- Modification by law of 2003-01-31
- LTO Tihange 1 reactor: Lifetime extension to 50 y

2015 06-25
- Modification by law of 2003-01-31
- LTO Doel 1&2 reactors: Lifetime extension to 50 y

2022 03-18
- **Government decision opening long term operation for Doel 4 and Tihange 3**

2022-10 2023-02
- **Definite shutdown for Doel 3 and Tihange 2**

1.D Main Legislative & Regulatory Framework for Nuclear Safety

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BEL V

1994 — **The Law of April 15th, 1994**

creation of the Federal Agency for Nuclear Control (FANC)

2001 — **The Royal Decree of July 20th, 2001 ("GRR-2001")**

on the protection of the workers, the public and the environment against the dangers of ionizing radiation

2011 — **The Royal Decree of November 30th, 2011 ("SRNI-2011")**

on the Safety Requirements for Nuclear Installations

2018 — **The Royal Decree of March 1st, 2018**

establishing the nuclear and radiological emergency plan for the Belgian territory

REGULARLY UPDATED / AMENDED

1.E Surveillance of Nuclear Installations : The Regulatory Body

FANC

- The **Safety Authority**
- **Created by the Law of 15 April 1994, under the supervision of the Minister of Home Affairs**
- **Regulatory / legislative** role
  - **License proposals** by Royal Decree (Minister)
  - **Regulation proposals to the Minister**
  - **Binding Technical Regulations (>2017)**
- **Regulatory compliance** missions
  - Performs **inspections** on specific thematic subjects
  - Has **enforcement power**
    close a facility, corrective actions, penalties …
- In charge of **communication to the public**

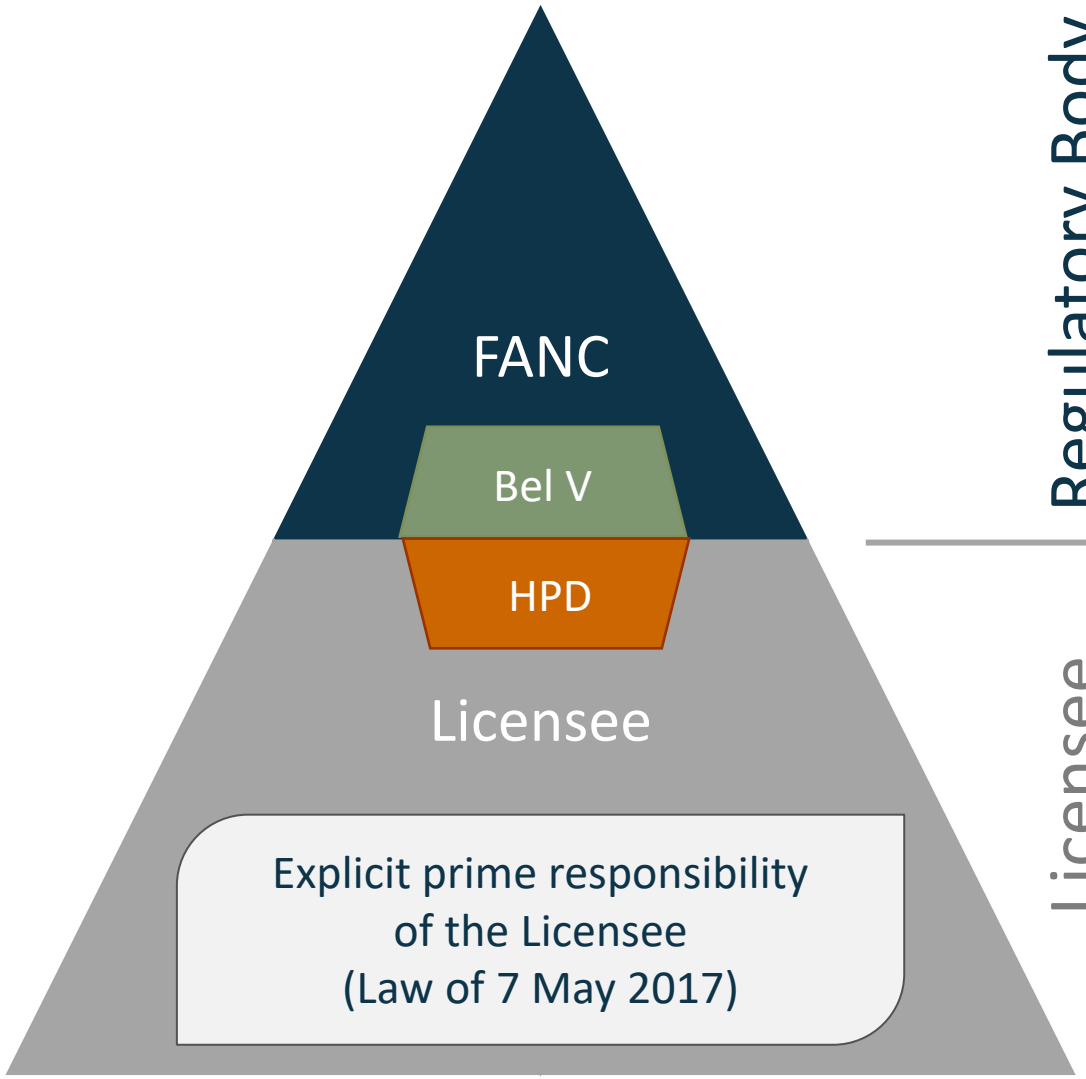
+/- 150 people

BEL V

- The **technical subsidiary** of the FANC
- **Delegation of Regulatory Functions by FANC according to art. 14bis and 14ter of the Law of 15 April 1994**
- **Safety Assessments**
- **Inspections in Class I and IIA facilities**

+/- 80 people

1.F Surveillance of Nuclear Installations



Regulatory Body

FANC

Federal Agency for Nuclear Control

Federal Safety Authority

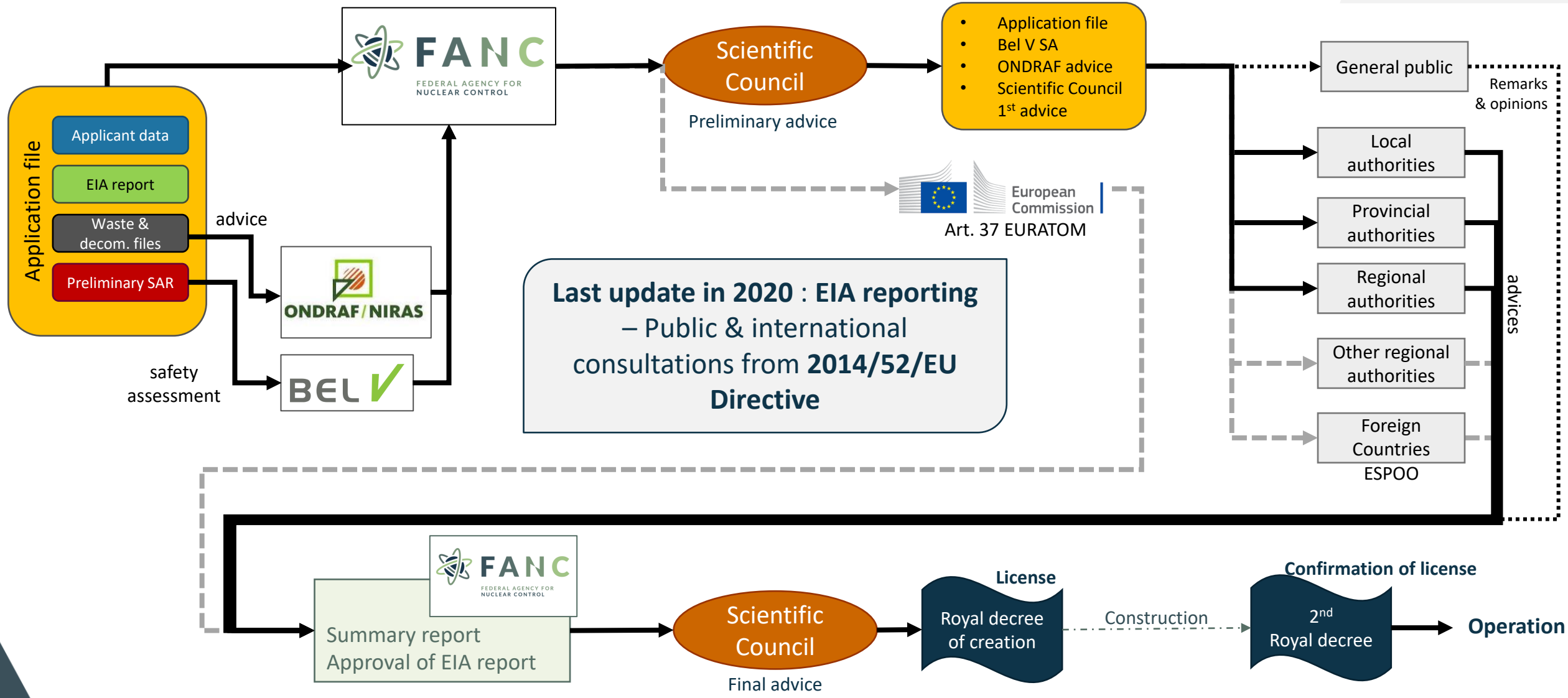
BEL V

FANC technical subsidiary Body

Health Physics Department

Licensee

1.F Licensing Process of Nuclear Facilities (GRR-2001)



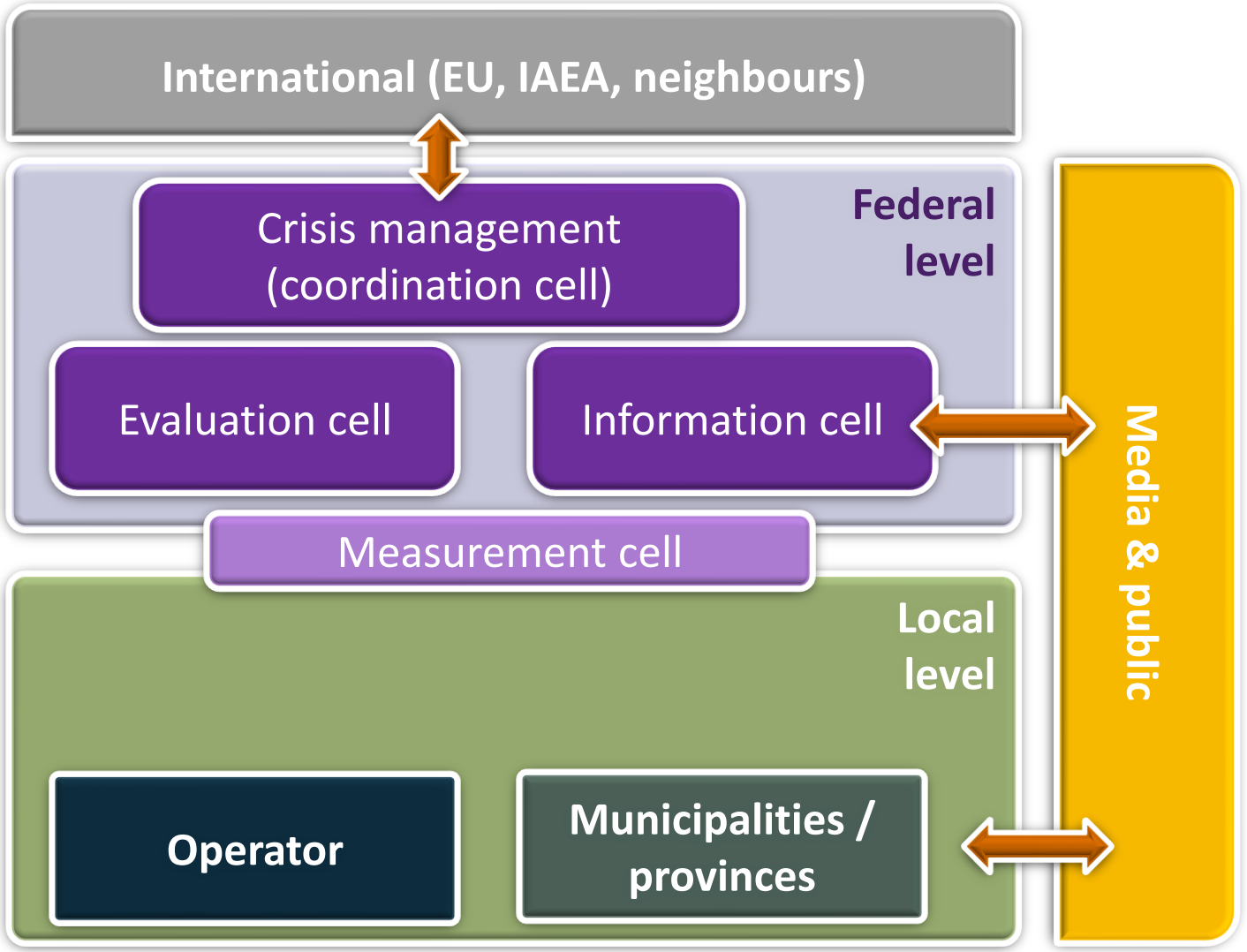
1.G Emergency Preparedness and Response

- Harmonization wrt. IAEA classification
  - **New notification scheme since March 1st, 2018**

- Minister of Home Affairs
  - Overall responsibility

- FANC
  - Chairs Evaluation cell
  - Chairs Measurement cell

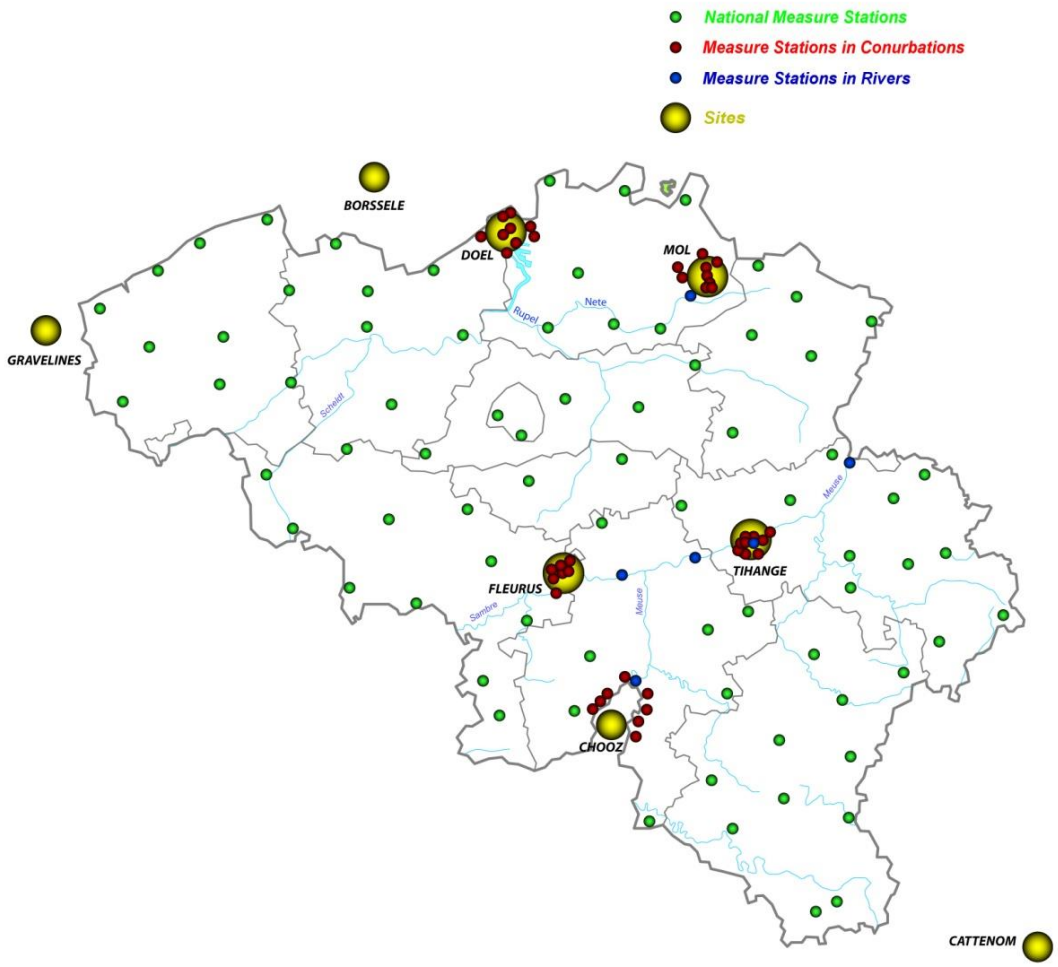
- Bel V
  - Participate to Evaluation cell
  - On-site oversight



1.G Emergency Preparedness and Response – Situation Ukraine

- TELERAD Network
  - ~20 Km mesh : ~200 measuring stations
  - Directly connected to national crisis centre
  - GM detectors, NaI-detectors around the installations, meteorological monitoring stations, …
  - Data published real time on FANC web site

- Situation Ukraine
  - Crisis team composed by experts from FANC and crisis centre
  - On permanent « Stand-by »
  - Regular SitRep (1/week or more frequently if required) on the situation in Ukraine, dealing with a.o. nuclear safety and radiation protection



2. DEVELOPMENTS SINCE THE 7TH RM

FANC FEDERAL AGENCY FOR NUCLEAR CONTROL

BELV

2.A Updates of the legal framework – EU Directives & WENRA

2.B Response to the challenges of the 7th RM

2.C Peer Reviews

2.D Vienna Declaration

2.E Fukushima response

2.A Updates of Legal Framework (from IRRS 2013)

Law on Health Physics organization

2017-05-07

- Allows government to issue **national declaration** on **nuclear safety, security** & **radiation protection**
- Allows the **FANC to issue binding technical (non-policy) regulations**
- Clarifies **separation regulatory body >< licensees**

Health Physics organization and role of Bel V

2018-12-06

- Introduces Radiation Protection Officer/Experts (RPO, RPE) cf. 2013/59/EURATOM
- New status for Authorized Inspection Organizations (AIO)
- Delegation of certain regulatory functions to **Bel V**

National declaration regarding nuclear safety, nuclear security and radiation protection

2018-10-12

- **Continuous improvement | justification |defence in depth**
- **Safe management** of radioactive waste

Law

Law modif.
April 15th, 1994 law

Royal Decree

RD modif.
GRR-2001

RD modif.
SRNI-2011

Technical
(non-policy)
regulation

Other

2.A Transposition of EU Directives

Emergency preparedness and response plan — 2018-03-01

- < GSR-7, GSG-11, EU Directive 2013/59/EURATOM, HERCA-WENRA, national stakeholders

Transposition of "NSD" EU Directive 2014/87/EURATOM — 2018-10-09

- **Enforces Vienna declaration (< NSO) within national legal framework**

Transposition of "BSS" EU Directive 2013/59/EURATOM — 2020-07-20

- Dose limits | Exemption and clearance levels
- Allows FANC to issue Technical Regulations

Transposition of "EIA" directives 2011/92/EU & 2014/52/EU — 2020-05-29

- Environmental impact assessment of projects w.r.t. ionizing radiations
- Public consultation, transboundary aspects

Law

Law modif.
April 15th, 1994 law

Royal Decree

RD modif.
GRR-2001

RD modif.
SRNI-2011

Technical
(non-policy)
regulation

Other

2.A WENRA RHWG – Updates of Legal Framework

Design of existing reactors & protection against natural hazards

- < WENRA 2014 RHWG reference levels

2020-02-19

Interface Safety-Security

- < WENRA TF report

2021-06-02

On-going projects in relation to WENRA reference levels

- WENRA reference levels for Research Reactors
- WENRA 2020 – RHWG reference levels

Exp. 2023

Law

Law modif.
April 15th, 1994 law

Royal Decree

RD modif.
GRR-2001

RD modif.
SRNI-2011

Technical
(non-policy)
regulation

Other

2.B Challenges from the 7TH RM

New national Nuclear Emergency Plan

- Royal Decree of March 1st, 2018

Finalize the implementation of the IRRS action plan

- IRRS Follow-up in December 2017

The licensee to execute ongoing action plans and the regulatory body to conduct appropriate oversight

- See Licensee presentation on :
  - Stress tests Action Plan
  - Safety Culture Action Plan
  - LTO of Doel 1&2 and Tihange 1 action plan
  - WENRA 2014 Action Plan

2.B Challenges from the 7TH RM (2)

Prepare Final Shutdown and Decommissioning of NPPs :

FANC/Bel V project on

- Knowledge and experience building on decommissioning activities and on waste
- Licenses and safety assessments during POP
- Regulatory surveillance and inspections
- Waste, waste streams and waste management
- The final state: release of buildings and/or of site + end of regulatory control

Developed FANC Guidance

- Phases of the decommissioning
- Cessation of activity and licensed activities in the post-decommissioning phase
- Standard conditions for a dismantling license
- Overlapping information to FANC & ONDRAF/NIRAS
- Clearance of buildings, nuclide specific clearance levels
- Release of sites
- End of regulatory control

2.C Peer reviews since 2017

IRRS Follow-Up in December 2017

Progress

- 29 out 31 recommendations from 2013 closed
- 22 out 24 suggestions from 2013 mission closed, 3 new findings

Conclusions

- FANC & Bel V have made s**ignificant progress** in addressing the findings of 2013 IRRS mission and demonstrated a strong commitment to implementing relevant IAEA safety standards.
- The RB is a **credible, independent body**, and is actively considering its future regulatory challenges.
- **The RB should continue to seek to improve its effectiveness** through focus on closing the few remaining, and new, IRRS findings

2.C PEER REVIEWS SINCE 2017 (2)

EUROPEAN 1ST TOPICAL PEER REVIEW – MAY 2018

Context

- Organized in the frame of the NSD EU Directive 2009/71/EURATOM
- Every 6 years on a selected issue : 1st = Ageing Management

Conclusions of peer review

- **NPPs** :
  - Good AM compared to average EU level
  - No specific negative findings
  - One good practice - 7 good performances
  - 3 challenges
- **BR2 RR**:
  - Most advanced AM for RR in EU
  - 2 Good practices

2.C PEER REVIEWS SINCE 2017 (3)

SALTO DOEL 1 & 2 FOLLOW-UP IN 2019

Context

- 3 issues identified in 2017
- 3 good practices identified in 2017

Findings of follow-up in 2019

- Improved organisational arrangements for LTO
- Update of SAR with AM and LTO assessment results
- Enhanced Competence and knowledge management in AM

WANO AND UPCOMING PEER REVIEWS AT NPPS : SEE LICENSEE'S PRESENTATION

2.C PEER REVIEWS SINCE 2017 (4)

INSARR MISSION BR2 (28/02-7/03 2023)

Context - Requested by FANC for expert advice for major projects

- PSR (2026)
- HEU LEU Conversion
- Ageing

Findings

+ Effective communication between operator and regulatory body
+ Programmatic activities for developing strong safety culture
+ Voluntary reporting to CNS on BR2 Safety
- Strengthen the organizational structure for reactor operation
- Improve functioning of reactor safety committee
- Expand OL&C to cover all operational stages

INSARR FOLLOW-UP MISSION IN 2025

2.D The Vienna Declaration

Principle 1

EC NSD Directive 2009/71/EURATOM (as amended in 2014)

- article 8.a “Nuclear Safety Objective for nuclear installations” transposed as a modification of SRNI-2011 in October 2018 (articles 3/1)

FANC Technical Regulation of 27 May 2021

- sets out the nuclear safety objective of article 3/1 of SRNI-2011
- Based on **WENRA RHWG** work
- Applies to all new nuclear “Class I” installations (incl. new SF2 installations)
- Describes the Defence in Depth
- Quantifies safety (radiological) objectives

2.D The Vienna Declaration (2)

Principles 2 & 3

Principle 2

- Article 3/2 of SRNI-2011 for existing nuclear installations
- The Belgian regulatory framework (SRNI-2011) requires:
  - Conducting PSRs every 10 years with particular attention to the Nuclear Safety Objective
  - The licensee to have Experience Feed-back process with particular attention to the Nuclear Safety Objective

Principle 3

- Belgium is continuously implementing the WENRA Safety Reference levels in its legal framework (SRNI-2011)
- The WENRA reference levels are mainly based on IAEA Safety Standards
- FANC guidance and Technical Regulations are based on (latest) IAEA Standards

2.E Fukushima : Completion of European Stress-Tests Action Plan

Closed in 2020

Final Report for NPPs

available on FANC and ENSREG websites

3. Themes of Topical Sessions

3.A Safety Culture

3.B Ageing Management: See ENGIE-Electrabel Presentation

3.A Safety Culture

Regulatory Body

Framework

- Written Common Management Commitment (“Safety Culture Policy”) since 2017 in the FANC and Bel V Management Systems

Methodology for assessment

« A Safety Culture Maturity Matrix for Nuclear Regulatory Bodies »
- Benoît Bernard
- Bel V, 1070 Brussels, Belgium
- https://www.mdpi.com/2313-576X/4/4/44 , Sept. 2018

- Internal Assessments :
  - Bel V : 2016 and 2021
  - FANC : started in Q1-2023

3.A Safety Culture (2)

Licensee

Framework

- Article 8.b of the NSD Directive 2009/71 (as modified in 2014)
- WENRA 2014 Reference Levels C.7
- Included in the SRNI- 2011 (article 5.7) by the RD of 9 October 2018

Observations by the Regulatory Body

- "IAEA/BNRA (2011) Guidelines for Regulatory Oversight of Safety Culture in Licensees' Organisations"
  - Safety Culture Observations presented to the Licensee in the global yearly safety assessment report
  - Licensee Implementation

"Electrabel Nuclear Safety implementation plan"

- See Licensee's presentation

The Speakers

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BEL V

FANC
FEDERAL AGENCY FOR
NUCLEAR CONTROL

F. Hardeman

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Safety Advisor

IAEA Convention on Nuclear Safety

Joint 8th and 9th Review Meeting

Agenda

Engie Electrabel
Business unit nuclear **01**

Past action plans
Safety Improvements **02**

Ongoing Projects and Action Plans **03**

01

ENGIE Electrabel

Presentation of Business Unit Nuclear

2 sites in Belgium with 7 reactors

Doel

- 4 Pressurized Water Reactors
- In service: 1929 MW
  - Doel 1 15/02/1975
  - Doel 2 1/12/1975
  - Doel 4 1/07/1985*
- In decommissioning:
  - Doel 3 23/09/2022

Accounting for > 40 % of Belgium's electricity needs

3929 MW

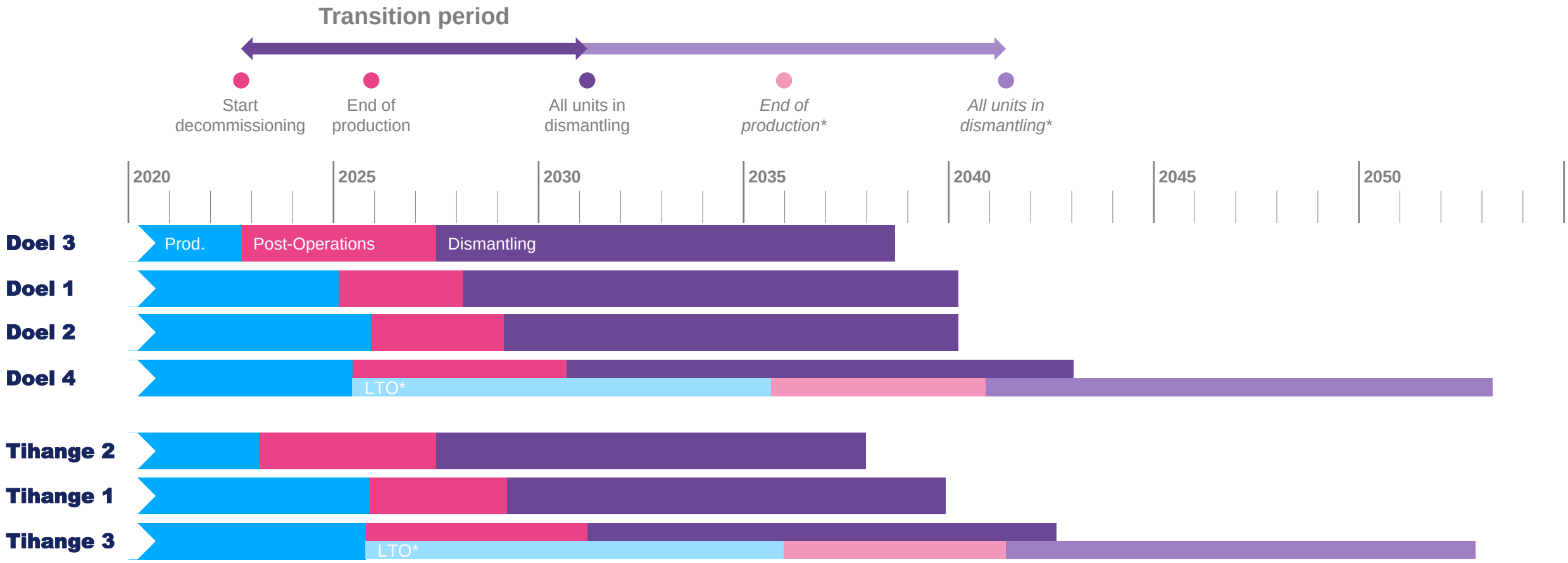
Tihange

- 3 Pressurized Water Reactors
- In service: 2000MW
  - Tihange 1 1/10/1975
  - Tihange 3 1/09/1985*
- In decommisioning:
  - Tihange 2 1/02/2023

* Agreement in principle signed between ENGIE and the Belgian federal government for the extension of Doel 4 and Tihange 3 for 10 years

Decommissioning of all seven units with different timelines

Master Schedule V5.00 (31/05/2022)



* Principeakkoord getekend tussen ENGIE en de Belgische federale overheid met het oog op de verlenging van Doel 4 en Tihange 3 met 10 jaar

Business Unit Nuclear, our strategy

Our Mission

Show nuclear professionalism, from beginning till end!

Our Vision

Contribute to the energy transition in Belgium with safe, reliable and climate-friendly electricity and professional decommissioning of our power plants

Our focus points

- Keep our machines in shape
- Take care of our people
- Find solutions together with our stakeholders
- Generate value

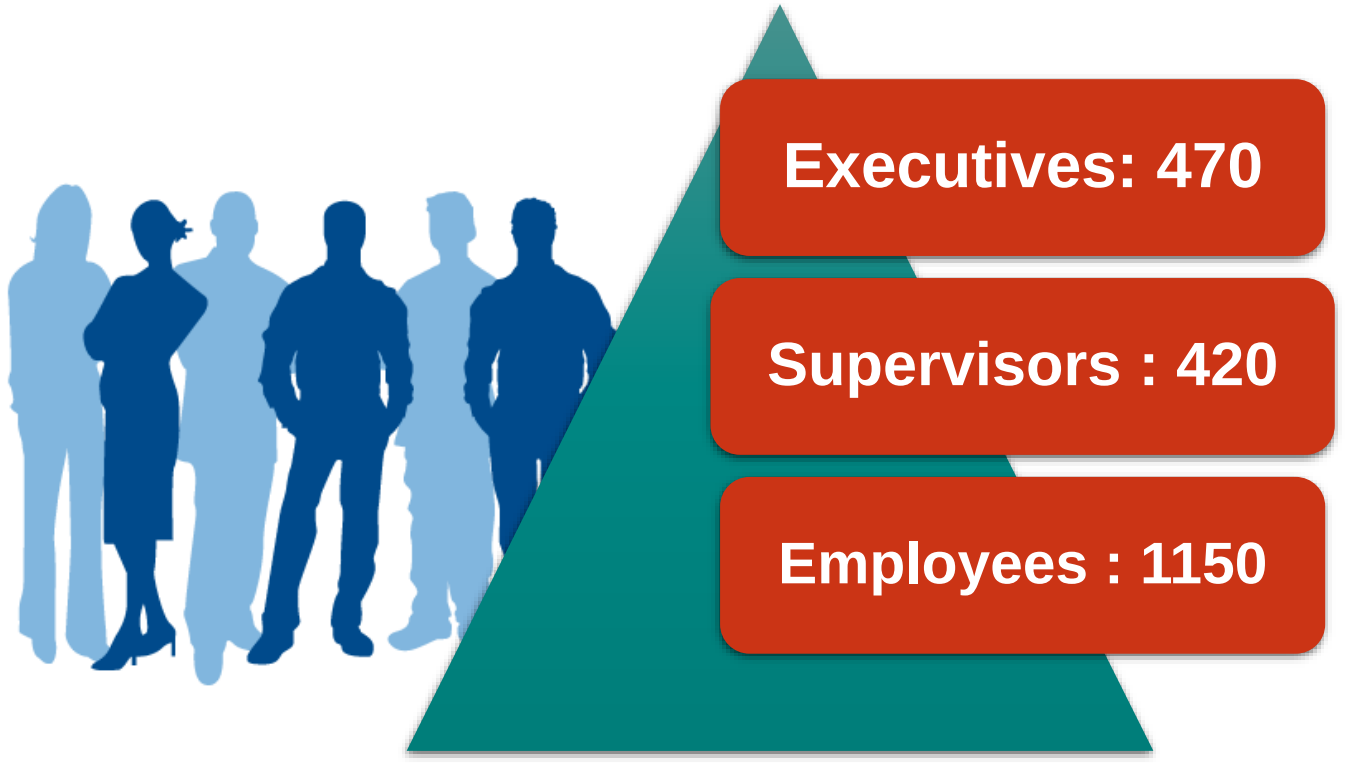
Nuclear safety our number one priority!

Our priorities

Operate our plants as real nuclear professionals until the very last day.

Become a reference in the decommissioning of our nuclear power plants.

ENGIE Electrabel BU Nuclear Organization

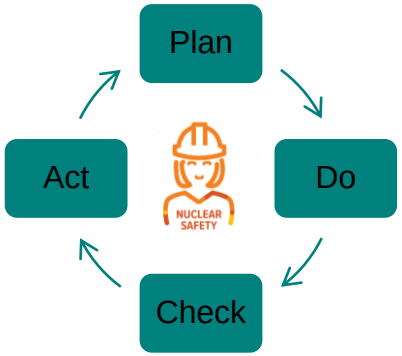


Average number	Contractors Doel	Contractors Tihange
Permanent	650	600
During overhaul	900	1000

Improvement Cycle

« Short » Improvement Cycle

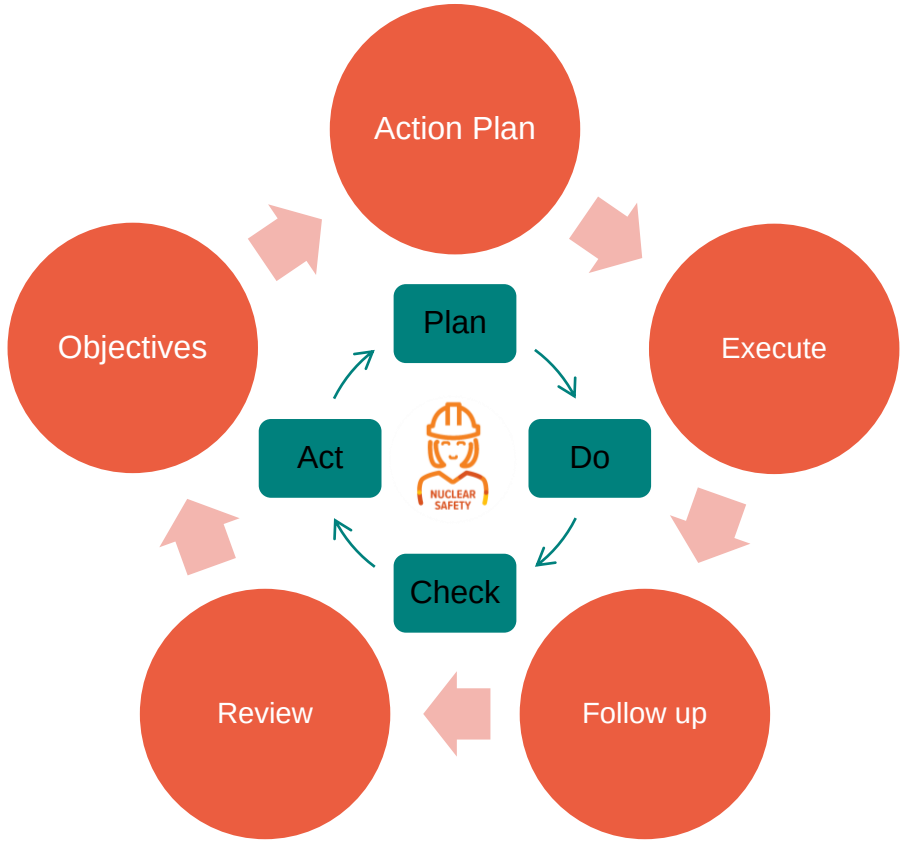
« Avoid Complacency in everyday Activity »



Improvement Cycle

Yearly Improvement Cycle

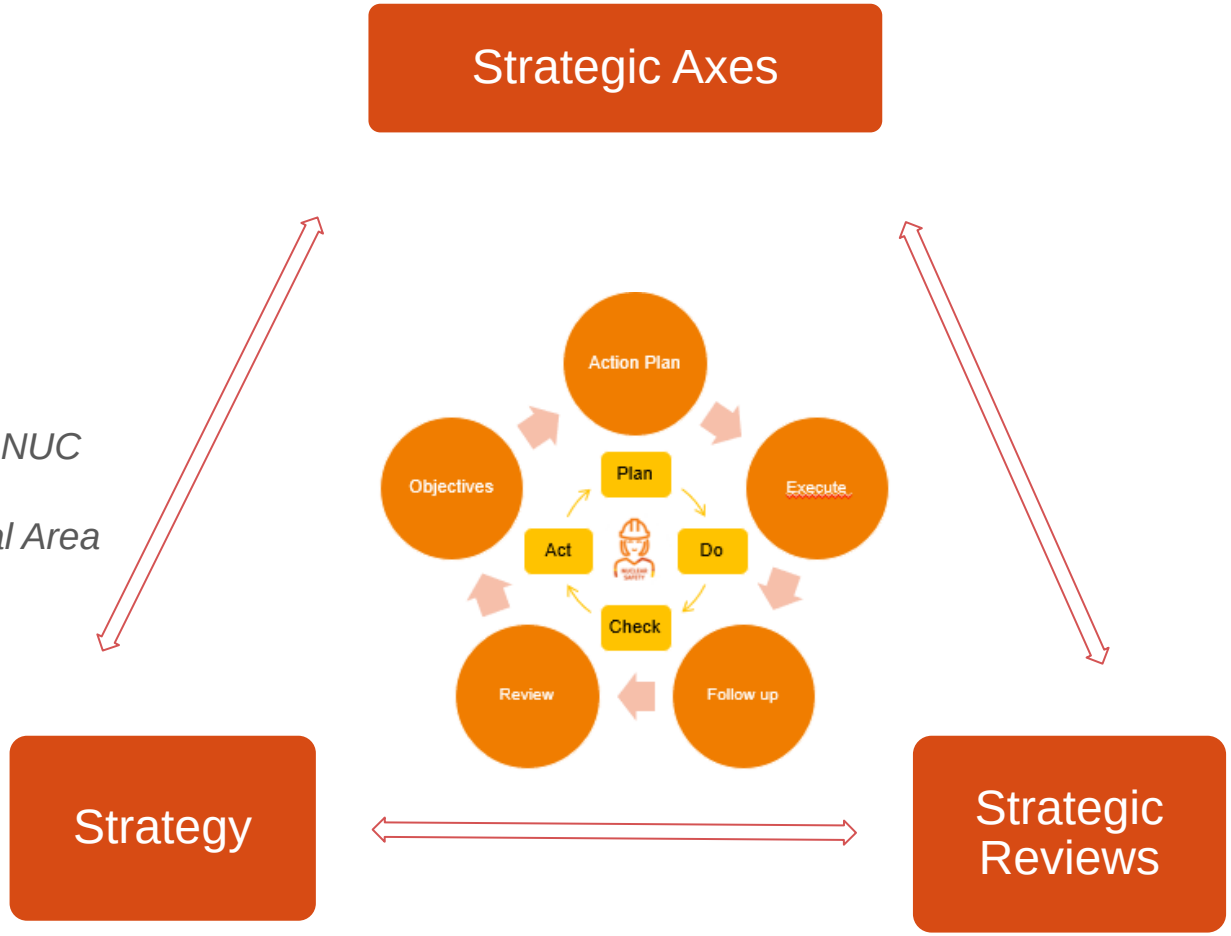
- *Yearly evaluation of status per Functional Area*
- *Define objectives for the year*
- *Follow up with KPI dashboards and oversight meetings*
- *INSO involved in complete process*



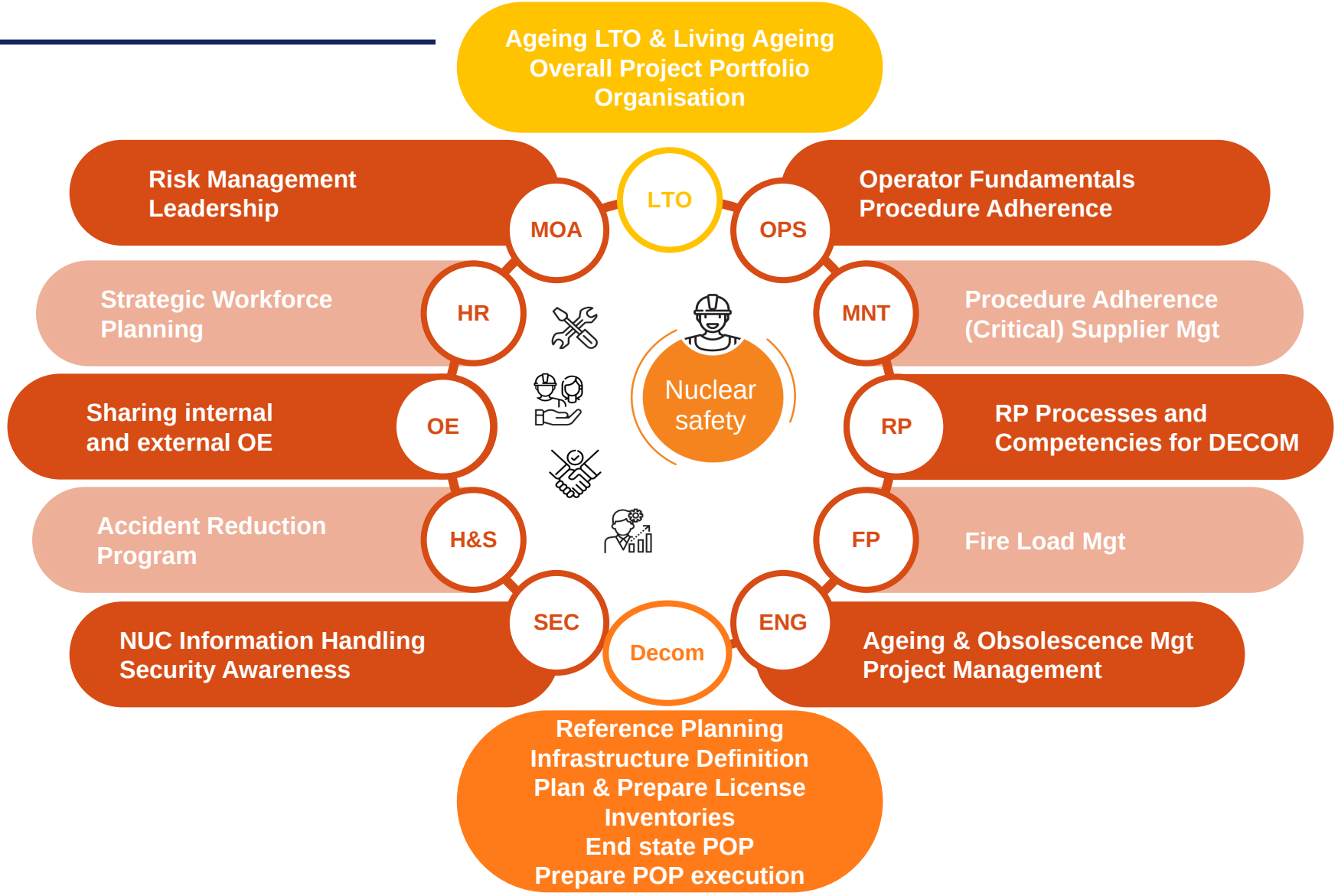
Improvement Cycle

Strategic Improvement Cycle

- *Yearly review of Strategy and Strategic Axes for BU NUC*
- *Yearly update Medium Term NS goals per Functional Area*
- *INSO involvement*



Fleet objectives linked to BU priorities



Audits and peer reviews between nuclear operators

- **Large number of external and internal AUDITS/INSPECTIONS** (ISO, WANO, SYBAN, NEIL, Bel V, FANC, IAEA, QA, QC2, INSO reviews,…)
- **2021**: **WANO** Peer Review **Doel**

- **2022**: **WANO** Peer Review **Tihange** (September) + WANO **Corporate** Peer Review (November)
- Implementation **SOER Recommendations Doel + Tihange > 90% = SAT**
- **2023**: **OSART** mission **Tihange** (April) + **WANO** Peer Review **Follow Up Doel** (October)

02

Past Action Plans

Safety Improvements

BEST Investments Doel & Tihange

BEST: Belgian Stress Test Action Plan

- Containment filtered venting system
- Additional protection of installations against flooding *(e.g. the wall in Tihange)*
- Extension of fire protection infrastructure
- New earthquake-resistant infrastructure with additional safety features built for exceptional external conditions (*e.g. diesel generators, pumps, fire fighting equipment and vehicles, etc.)*
- Reinforcement of the earthquake resistance of important safety systems
- Extension of certain safety systems: injection to primary circuit, injection to steam generators, injection to spent fuel pool
- Strengthening of training programs to manage events on several units simultaneously

Supported by preparation of our people and organization for crisis management during extreme events:

- Emergency planning organization
- Training program
- Primary and back-up emergency plan coordination centers
- Regular exercises in cooperation with FANC, Crisis Center, ...


THOMAS
LIQUIDBARRIER
CGK


sarens
sarens


BRANDWEER
KERNCENTRALE DOEL


BEST

Safety Improvements – BEST: Emergency Planning

New mobile crisis centre trailer

New back-up crisis centre building

LTO D12 and Tihange 1 Key Investments

DOEL 1 & 2

- Design upgrade e.g.:
  - Redundant reactor coolant pump seal injection
  - Containment filtered venting system
  - New seismically qualified fire water pumping station
- Retrofit or renewal of turbines
- Replacement of main transformers
- Improving fire detection and suppression
- Modernization of the electrical and I&C systems
- Inspections and possible replacement of the mechanical components of the primary circuit
- Civil engineering projects
- …

TIHANGE 1

- Design upgrade e.g.:
  - “SUR-étendu = système d’ultime repli étendu = ultimate extended back up system = back up system to bring the reactor to cold shutdown with independent control room and power supply
- Retrofit or renewal of turbines
- Replacement of main transformers
- Improving fire detection and suppression
- Modernization of the electrical and I&C systems
- Inspections and possible replacement of the mechanical components of the primary circuit
- Civil engineering projects
- …

Fire Safety Improvement Plan

Integrated Fire Safety Improvement plan, combining actions identified in:

- Fire Hazard Analysis (FHA) = deterministic study
- Fire Probabilistic Safety Assessment, Fire PSA

Large number of hardware improvements on all units:

- Additional fire detection
- Additional fire extinguishers and sprinklers
- Improved physical separation
- Additional firefighting pumping station
- Coating and rerouting of cables

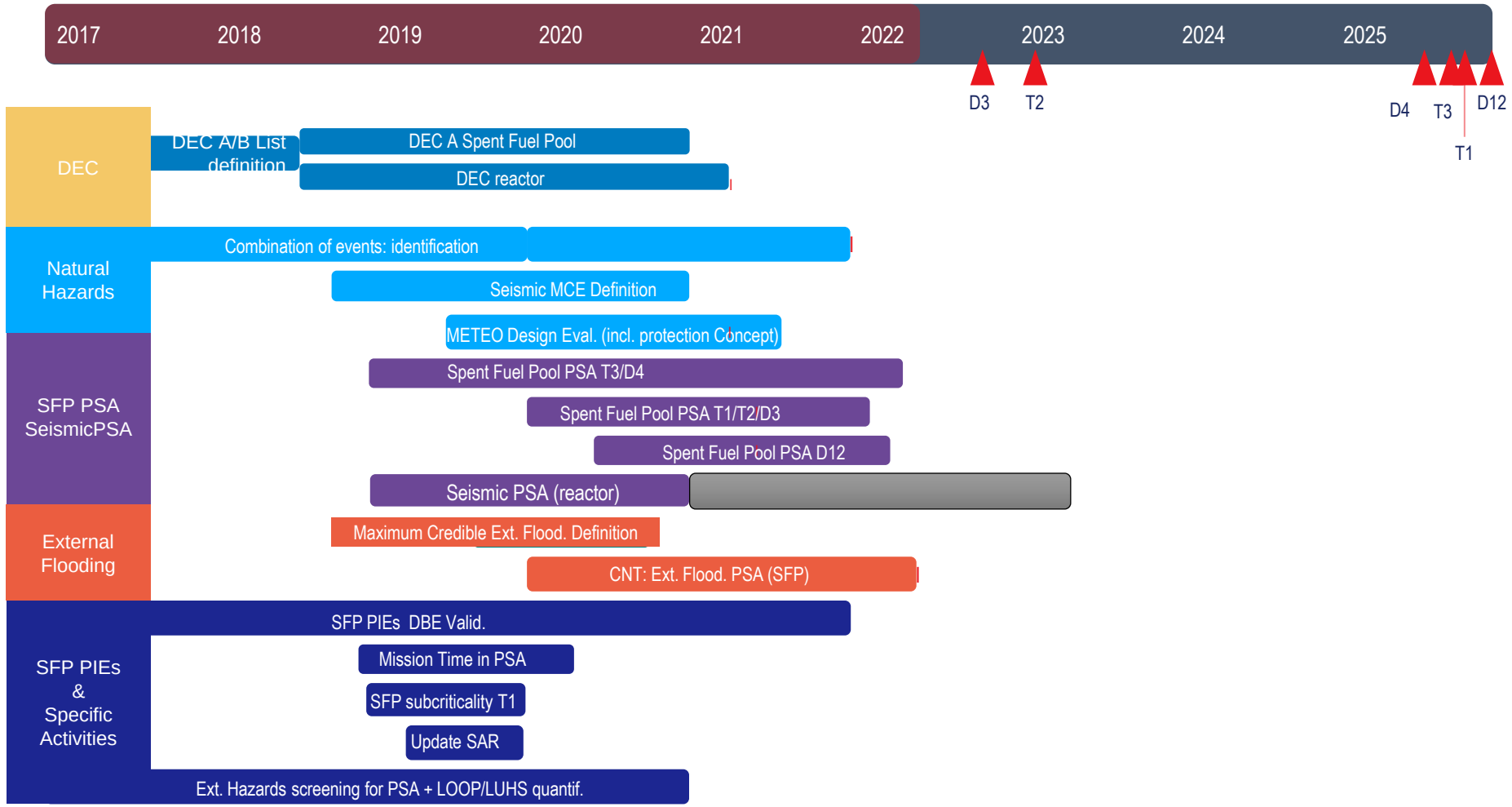
Procedure and work process improvements

WENRA2014 Action Plan

Gap analysis and studies

- First step = Gap Analysis of situation in Belgian units, after BEST and LTO Doel 12 and Tihange 1 action plans, with respect to WENRA 2014 Reference Levels.
- Identified gaps resulted in action plan, in parallel of regulatory project, aiming to:
  - Demonstrate robustness of existing situation and respect of reference levels;
  - Identify improvement actions (hardware, procedure,…) needed to achieve reference levels;
  - Either execute the identified actions or deliver them as input for PSR action plans.
- Action plan takes into account remaining lifetime of units cfr. ENGIE long term strategy:
  - SFP studies for all units
  - Studies for reactor focused on units with LTO potential

WENRA Study Program Timeline Overview



Continuous development of PSA

WENRA 2014 issue O (as mentioned on previous slide):

- Spent Fuel Pool PSA Internal Events, internal Fires and Floods, seismic events for all units; external flooding for Tihange only
- Seismic events PSA reactor and, specifically for Tihange, external flooding PSA reactor are only required for units with future long-term operation: to be restarted in case LTO Doel 4 and Tihange 3 confirmed

Reactor: continuous updates of existing PSA models

- Update of Level 1 and Level 2 Internal events PSA, amongst others to include all equipment installed following the stress test and the resulting BEST action plan
- Level 1 Fire and Flooding PSA for all units.
- Level 2 Fire and Flooding PSA for Doel 3, graded approach translation to other units. For Fire PSA results used as an input for fire safety improvement action plan.
- Level 2 Fire PSA for Tihange 3 (ongoing)

03

Ongoing Projects and Action Plans

WENRA2014 Implementation Plan

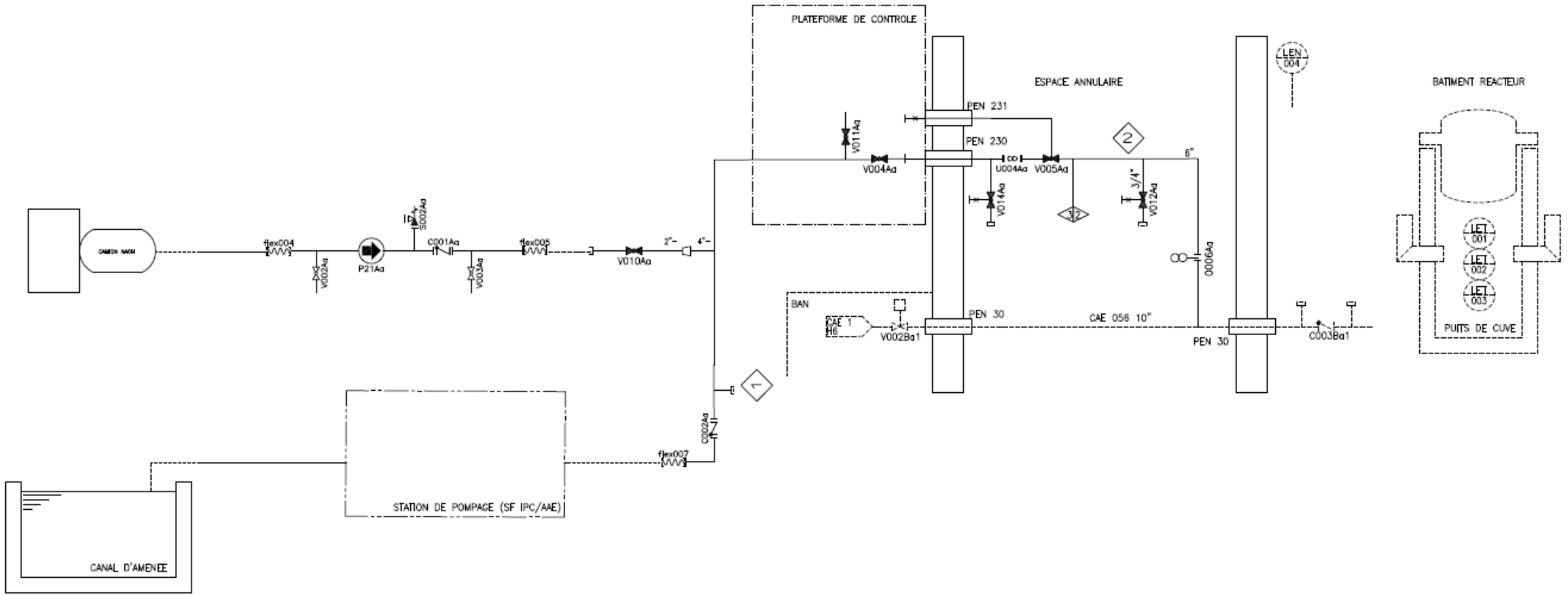
Safety improvements = ongoing

- Part A: **spent fuel pools**
  - Siphon breakers reactor building pools = done (all units)
  - Recommandations from PSA:
    - Emergency preparedness criteria for SFP (all units)
    - Improve incident procedures (all units)
    - Implement corrective actions from walkdowns for seismic SFP PSA (all units)
  - Postulated initiating events:
    - Improve electrical protection of motors of SFP cooling pumps (Tihange units)
    - Foresee spare spent fuel pool cooling pump if not yet available (Tihange units)
- Part B: **reactors**
  - Finish implementation of alternative reactor building spray and reactor pit injection (Tihange 1 and Tihange 3) = IPCA project
  - From DEC A and DEC B studies: improve emergency operating procedures and severe accident management guidelines (all units)
  - Implement corrective actions from walkdowns for seismic PSA (Doel 4 and Tihange 3)
  - NaOH injection to reactor building in DEC condition (Doel 4, Tihange 1 and Tihange 3)

Reactor Cavity Injection and Reactor building Spray System

IPCAA: '*injection puits de cuve et aspersion alternative*'

- Tihange units have dry cavity strategy: during DEC B events cavity should remain dry until vessel failure
- New system to inject water from the river Meuse with mobile means, as alternative spray to the reactor building and after vessel failure, into the reactor cavity
- Operational on Tihange 1 and Tihange 3 (Tihange 2 in post operational phase since end 2022)



System for NaOH Injection to Reactor Building in DEC Conditions

Using mobile equipment installed outside, next to nuclear buildings and flexible hoses: Doel 4, Tihange 1 and Tihange 3

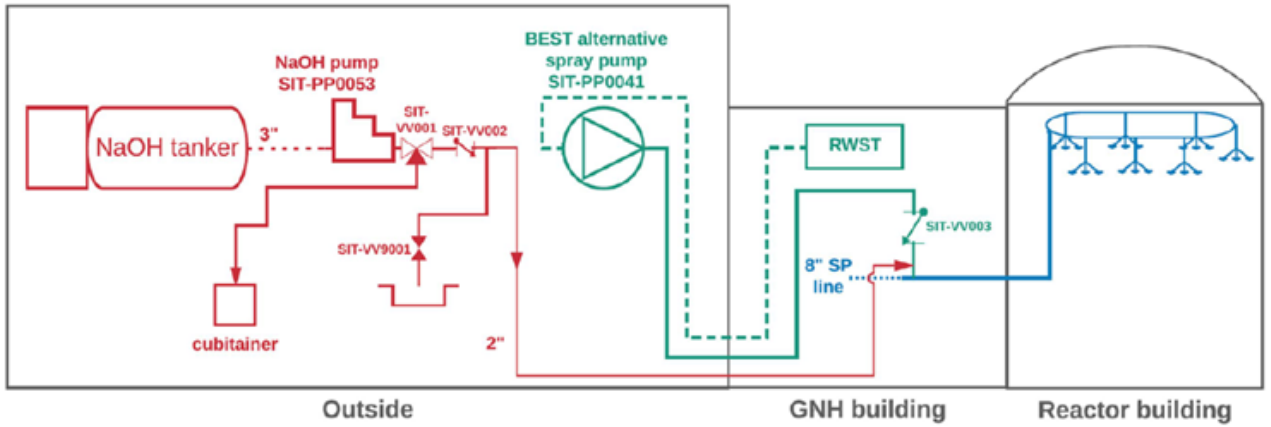
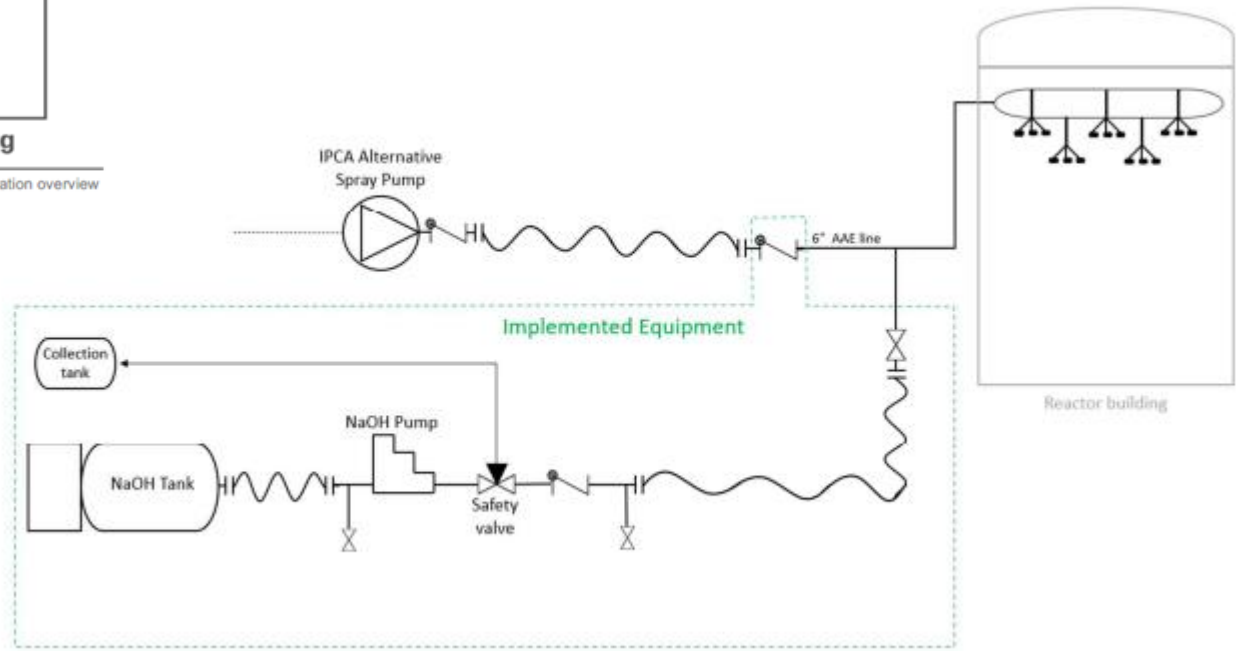
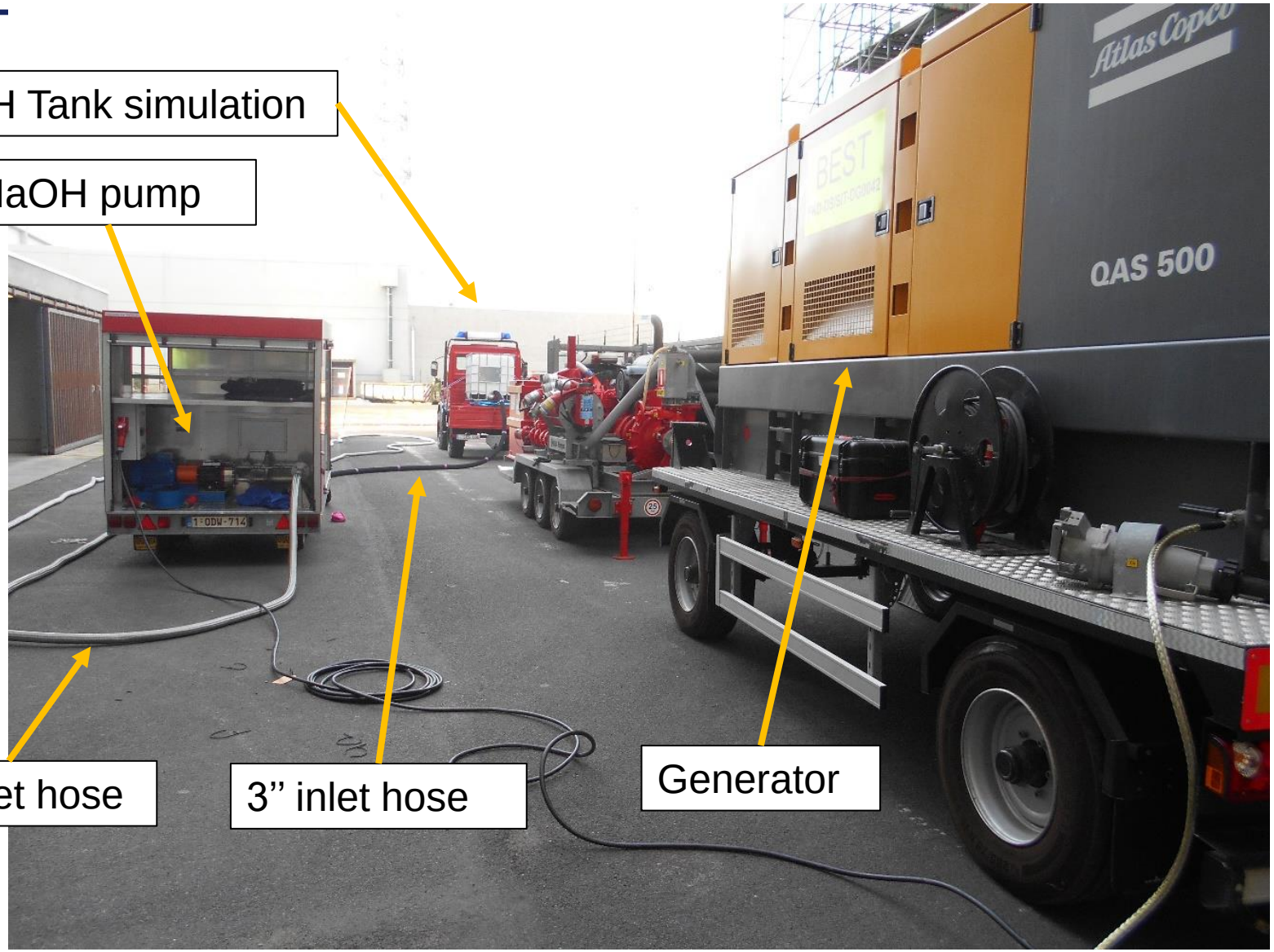


Figure 2: Schematic configuration overview



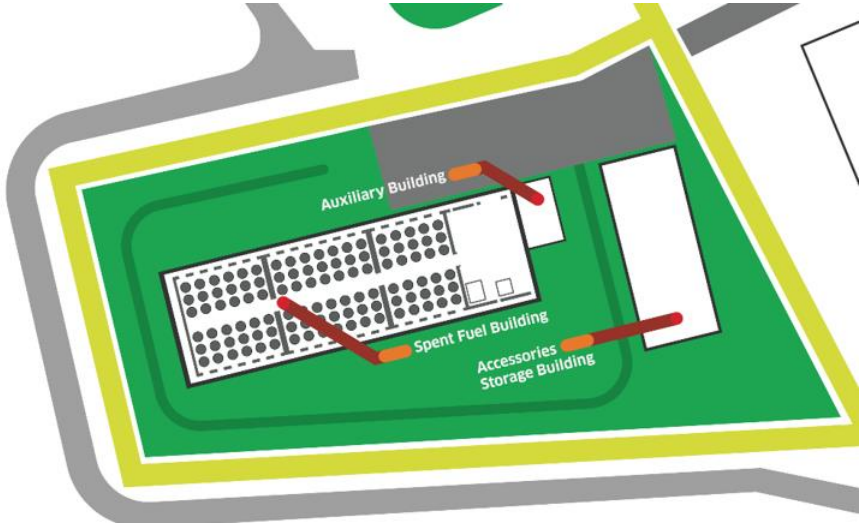
Doel 4 – NaOH Injection System Deployment Test



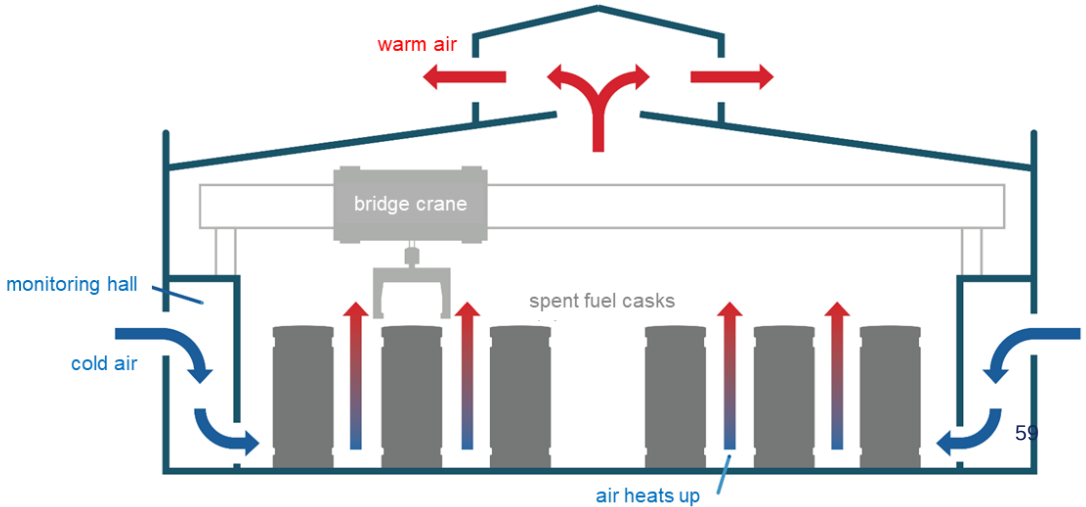
SF² Project: construction of a new dry interim storage facility at the sites of Doel and Tihange

To allow removal of all spent fuel from the NPP pools

Storage building characteristics



- Similar to existing spent fuel container building ("SCG = splijtstofcontainergebouw") at Doel : REX taken into account for SF² design
- Concrete building provides additional radiation protection
- Heat removal ensured by passive ventilation. Extreme outside temperatures and climate change taken into account in the design
- Storage capacity (maximum occupation): 97 positions for Doel and 108 positions for Tihange, sufficient to cover LTO Doel 4 and Tihange 3
- Considered lifetime: 80 years



SF² Project: status

SF² Tihange

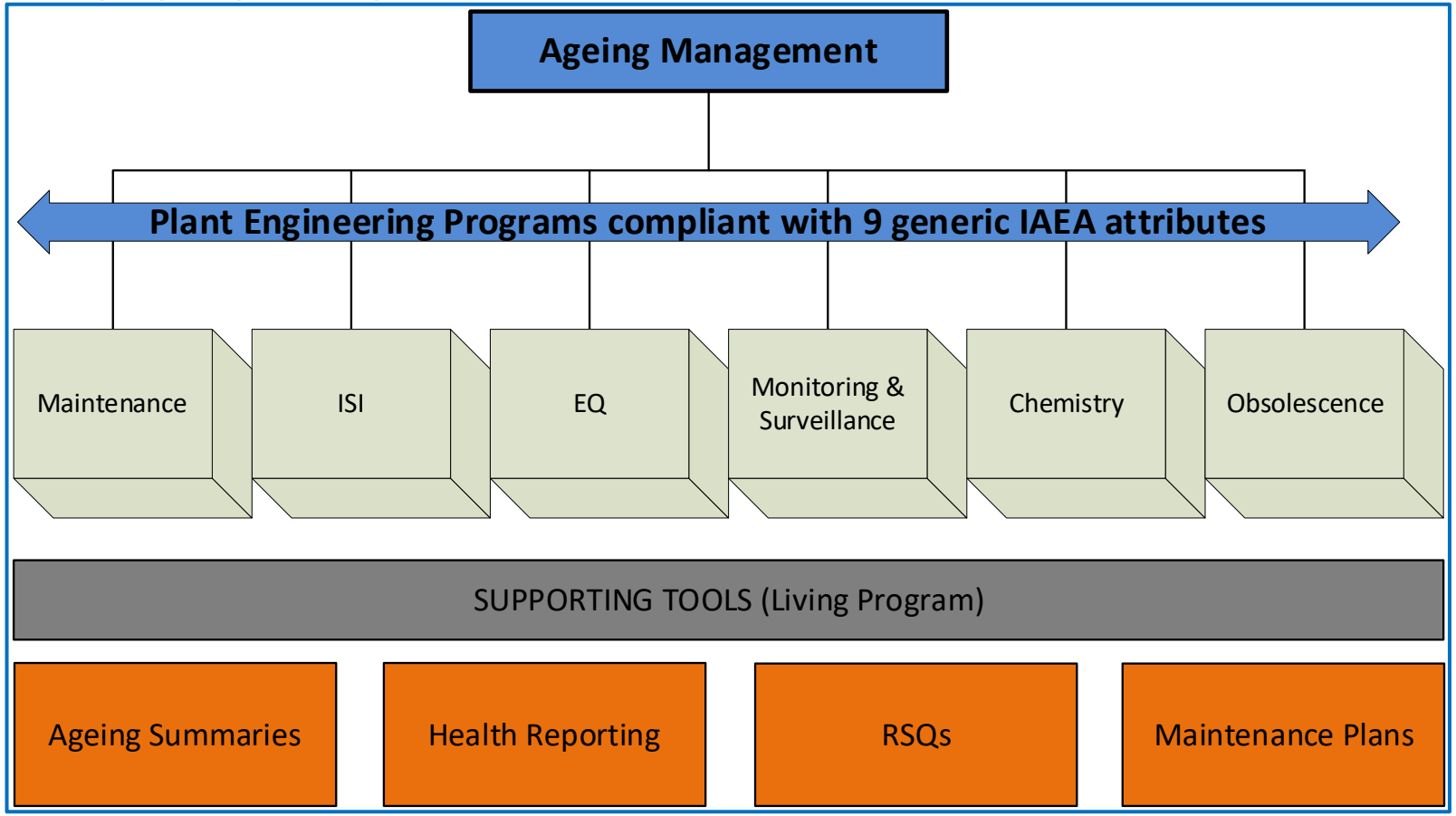
- License (radiological aspects) and permit (conventional aspects) obtained in 2020
- Construction started in 05/2020
- Start of operations foreseen 2024

SF² Doel

- License (radiological aspects) and permit (conventional aspects) obtained in 2021
- Construction started in 09/2021
- Start of operations foreseen 2025

Ageing Management

Living Ageing Management



ENSREG Topical Peer Review 2017

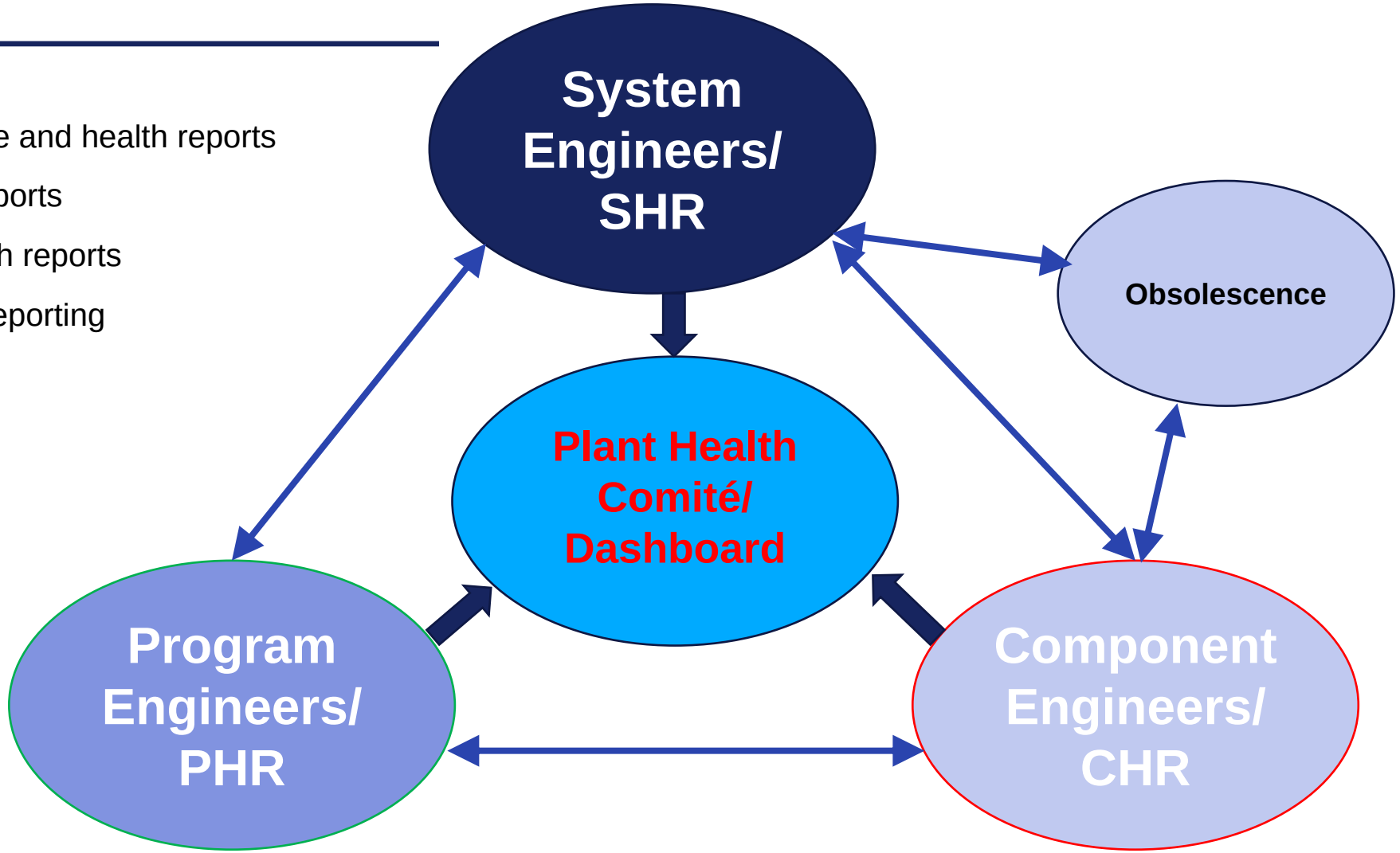
Belgian National Assessment Report:

The present national assessment report on ageing management highlights that the ageing management program by ENGIE Electrabel is now ***in line with the international standards*** *and should* ***ensure an adequate management of the ageing of the safety-related SSCs during the rest of the lifetime of the NPPs****.*

Living Ageing management BU NUC Engie

Triangle of expertise and health reports

- System health reports
- Component health reports
- Program health reporting



Equipment Qualification & Obsolescence Project Objective

Why

Obsolescence is recognized as an ***ever-growing problem*** for the Operating Fleet. Plants will continue to need replacement parts as they age and ***manufacturers disappear*** from the supply chain; other manufacturers ***abandon their Nuclear Quality Assurance Programs***. And nearly all have ***modified their processes and materials*** to those currently available.

What

Streamline and **establish processes & solutions** for dealing with supply chain related issues, tackling:

- Supplier qualification challenges
- Obsolescence issues (proactive & reactive)
- Procurement issues of safety related items
- Equipment Qualification challenges

How

Provide **global governance** with clear overview and description of process related to 'Procurement of Safety Related Items'. Establish/review **operational procedures for guidance & support**:

- Commercial Grade Dedication
- Batch Procurement & Sampling
- Reverse Engineering
- Item Equivalency Evaluation
- Procurement of reused/surplus items

HR strategic roadmap: 3 projects

1 Strategic Workforce Planning

- Up-to-date overview of business needs until 2030:
  - ✓ Integrated work demand (sites, POP, Dismantling)
  - ✓ Critical skills
- Anticipating business-critical risks related to skills and Full Time Equivalents availability
- Mitigating risks (retention, etc.) to continue production until 2025

2 Employability

- Identifying and developing 6 leadership competencies required to address our challenges
- Building skills required to support Dismantling
- Developing transferrable skills and accompany people
- Deploying the methodologies (upskilling, reskilling, coaching, etc.) and resources (skills, IT, partnerships, etc.) needed to support employability objectives

3 Social Dialogue

- Driving social relations agenda
- Ensuring legal monitoring
- Aligning communications and actions across 3 entities
- Assessing negotiated solutions against budget constraints
- Organizing social communication

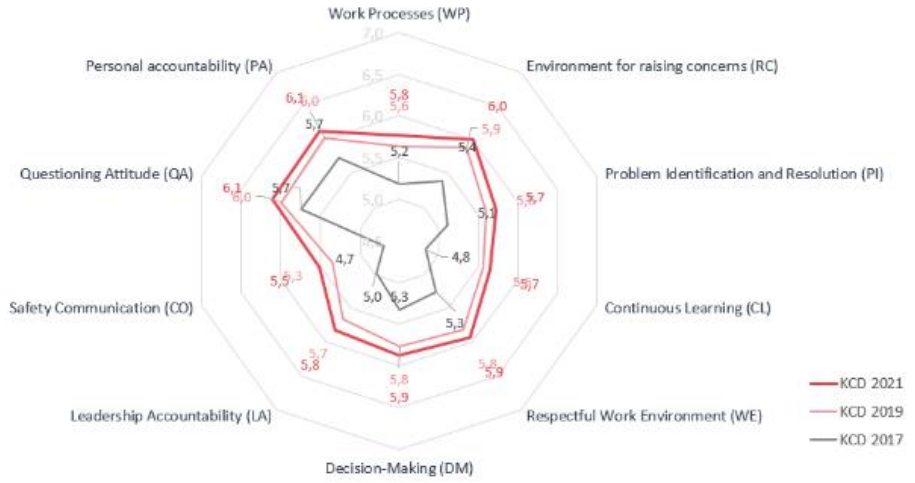
Safety Improvements: Nuclear Safety Culture Assessment

- **Nuclear Safety Culture survey in 2021** + **Annual** Nuclear Safety Culture **Assessment** by **INSO**
  - Input for **Safety Culture Objectives**
  - And department/team specific **Leadership Objectives**

- **Leadership**:
  - **Leader in the field programs** with focus on ‘lead by example’ + ‘coaching on’
  - **Leadership training** for leaders/managers

- **Focus on :**
  - **Use of human error reduction tools**
  - **Risk Management + Decision Making tools**

- **Rigor** regarding
  - Adherence to **Station Expectations**
  - **Procedure Adherence**



Safety Improvements: Nuclear Safety Culture Assessment

WANO judged the continual examination of nuclear safety culture as a strength at Doel Nuclear Power Plant

APPENDIX C – STRENGTHS

Management systems

PERFORMANCE OBJECTIVE

Management systems are defined clearly, resourced appropriately and implemented effectively to support the vision, values and goals of the organisation. This includes systems for developing and preparing individuals to take leadership roles or assume positions of greater responsibility.

Strength OR.1

The Station implemented different means for the continual examination of nuclear safety culture. There is one process driven by the company independent oversight, complemented with a recently implemented process conducted by the Station independent oversight section. In addition to that, a nuclear safety culture survey is provided to the staff.

Conclusion - Main challenges

- Keep focus on safe operation of the plants, until the very last day
- Post operation Doel 3 and Tihange 2 and dismantling preparation
- Unexpected government decision for LTO Doel 4 and Tihange 3
- Supply chain of qualified material and equipment
- “Take care of our people” to ensure sufficient competent human resources to tackle challenges mentioned above


ENGIE
Electrabel

THE SPEAKERS

FANC
FEDERAL AGENCY FOR NUCLEAR CONTROL

BEL V

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FEDERAL AGENCY FOR NUCLEAR CONTROL

F. HARDEMAN

General Manager

ENGIE Electrabel

W. VAN CAUWENBERGE & P. VERHELST

Safety Advisor

3. Complementary Topics

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3.A	Update to National Report
3.B	Selected Topics from Q&A
3.C	Covid-19 response
3.D	Current and future challenges
3.E	Areas of good performance
3.F	General Conclusion

3.A Update to National Report

Definitive shutdown of 2 NPPs

Doel 3 (Oct. 2022) and **Tihange 2** (Feb. 2023)

- Not candidate for LTO (flaws indications in RPV)
- Shutdown notifications received in April (Doel 3) and July 2022 (Tihange 2)
- Assessment of notification by the Regulatory Body

3.B Selected topics from Q&A (1)

Phase out law and possible LTO for Tihange 3-Doel 4

- Phase out law bans new build, but not technological survey/developments (SMRs)
- Government decision opening possible LTO : March 2022
- Discussion between government and ENGIE-Electrabel in progress
- If agreement, the Phase out law will be modified
- FANC requirements are defined (see FANC web site) – experience from previous LTOs
- EIA considered for LTO

3.B Selected topics from Q&A (2)

Releases

Limits

- Initial release limits determined according the US rules 10 CFR 50 appendix I (design criteria) and 40CFR190 (ALARA aspect)
- New reassessment of radiological impact of the limits in 2006 (1996/26/EURATOM Directive) : 0,2mSv Tihange / 0,4mSv Doel (Site) <1mSv

Actual values

- Releases well below authorized limits : Actual radiological impact from 20 to 50 µSv, no plan to reduce the limits but ALARA principle lead to operational objectives
- Actual radiological impact calculated each year and published on FANC web site

"Classical aspects" of the releases

- (temperature, chemical content) depends from and fixed by the Regions. These aspect are published in the ENGIE-Electrabel "Environmental Statement"

3.B Selected topics from Q&A (3)

Human and financial resources

Financial

- When dismantling license(s) for NPP will be granted, FANC income from taxes will decrease significantly. This should occur in ~2027-2028
- FANC is anticipating and prepares new financing mechanisms to be presented to its supervising Minister

Staffing

- The staffing from FANC and Bel V has been stable (or slightly increasing) for ~10 years
- Both FANC and Bel V prepare staffing plans, based on mid and short term operational plans. Staffing adaptations are possible.
- Competence management processes exist at FANC and Bel V

3.C Impact of COVID-19

@ Licensees

- Constant monitoring
- Separation of teams
- Continuity of operations ensured
  - Facial masks mandatory on site
  - Cleaning measures

@ Regulatory body

- Continuity of operations ensured
  - with possible re-scheduling
- Essentially home-based work

Surveillance of installations

- Weekly follow-up COVID-19 situation
- Inspection program globally executed but adapted (reduced inspection teams, remote inspections if adequate…)
- Reduced ‘administrative’ burden on hospitals

3.D Current and future Challenges

Challenges for the Regulatory Body

- IRRS 2023 and associated Action Plan
- Finalization of ongoing regulation development projects
- Ensure a high level of safety of Post Operation of NPPs
- Financing at mid-term
- 2nd EU Topical Peer Review on Fire safety
- (from France Q&A) preparation of shutdown challenged with possible LTO

Challenges for the Licensee

(as previously highlighted by ENGIE)

- Keep focus on safe operation of the plants, until the very last day
- Post operation Doel 3 and Tihange 2 and dismantling preparation
- Unexpected decision for LTO Doel 4 and Tihange 3
- Supply chain of qualified material and equipment
- “Take care of our people” to ensure sufficient competent human resources

3.E Areas of Good Performance

1 Evolution in legislative framework

- Significant updates of the legislative framework for safety
- FANC can issue binding decrees

2 Preparation/Anticipation for 2 concurrent policies : Definitive shutdown and possible LTO

- Two concurrent projects, challenge both the regulatory Body and the Licensee

3 Cybersecurity integrated in purchase process of industrial control systems

4 Workforce Planning

- Methodology and a software tool to give management a view on gaps between available staff and personnel needs

5 Ageing management processes

- Physical ageing managed through triangle of component, system and program health reports, technological ageing or obsolescence through newly developed EQO processes

6 From Q&A

- **Australia** : Knowledge management at Research Reactors
- **Ireland** : Completion of EU Stress Tests
- **Ireland** : Update to the regulatory framework, FANC technical regulations
- **France**, **Ireland** : On-the-field observations of safety culture
- **France**: High level of protection against external hazards incl. greater redundancy, bunkerization

3.F General Conclusion

5.A The Belgian Nuclear context is fast evolving

- Shutdown of NPPs, new decisions (LTO), challenge for future financing of the RB

5.B Belgium keeps a strong international involvement

- Many multilateral and bilateral agreements

5.C Belgium remains committed to comply with the CNS objectives

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Thank you!