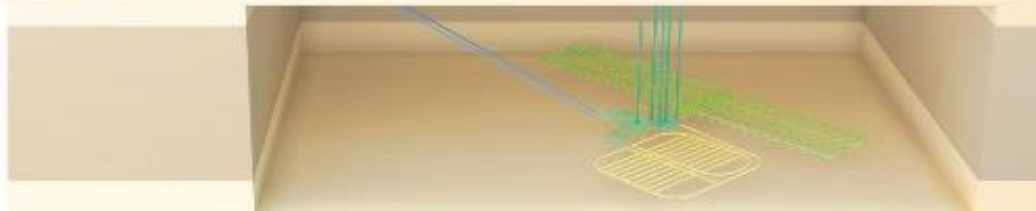


December 2022

CIGEO BASIC NUCLEAR INSTALLATION
(BNI) CONSTRUCTION LICENCE
APPLICATION FILE

Contents of Cigeo construction licence application file


DOCUMENT 0
**Presentation of
non-technical
aspects**



HCTISN Monitoring Group for Cigeo
Consultation
13 December 2022

500 metres deep

15 km² Disposal area

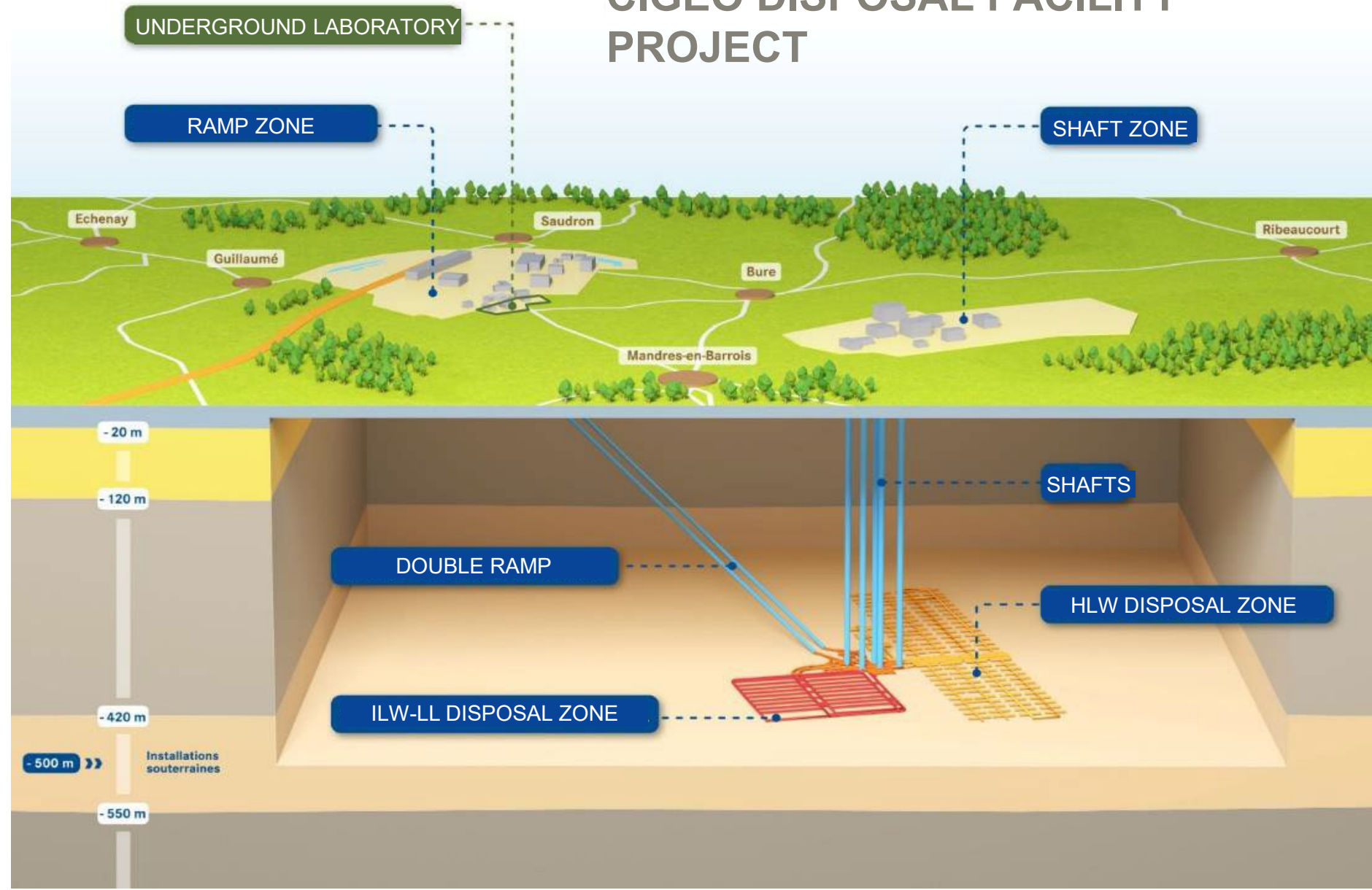
250 km of drifts and cells

83000 m³ of waste

120 years of operation

25 billion euros

CIGEO DISPOSAL FACILITY PROJECT



Principle of geological disposal

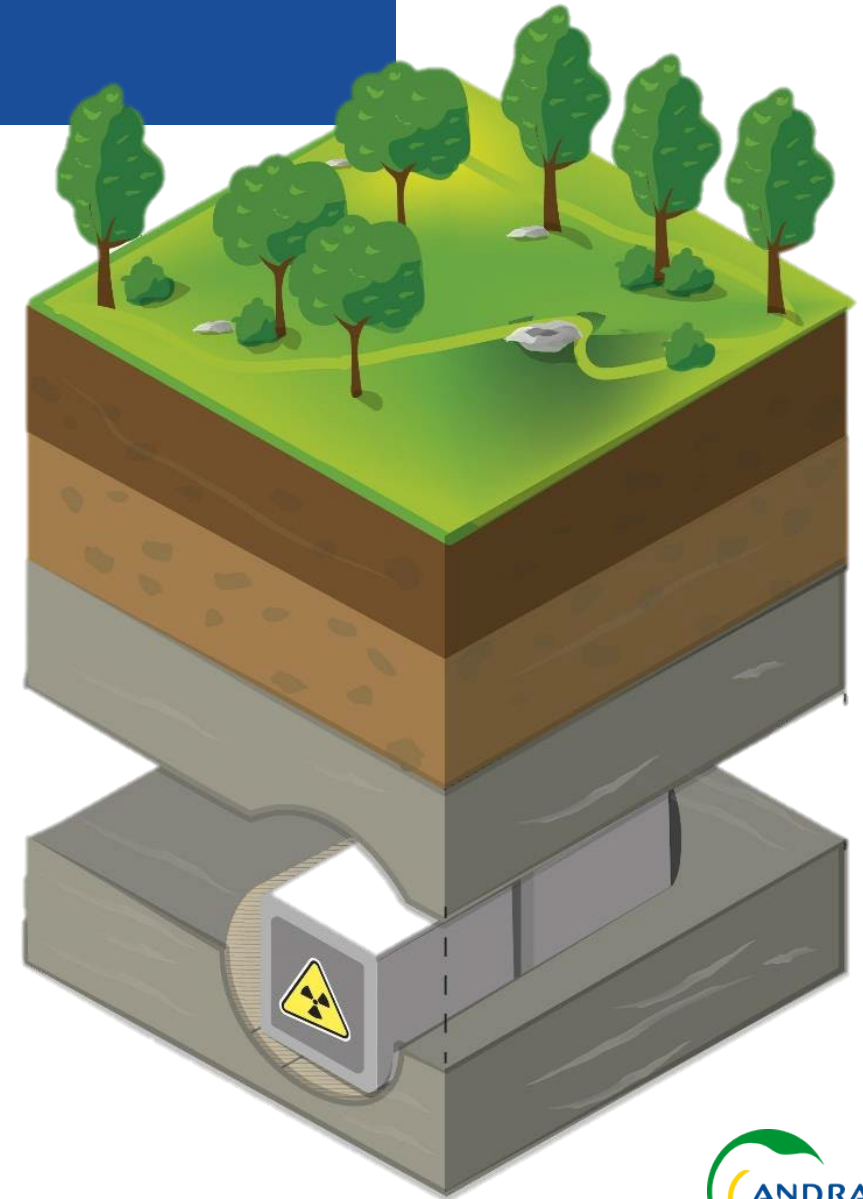
Due to the highly dangerous nature and long life of HLW and ILW-LL waste, it cannot be managed sustainably at the surface level.

Objective of geological disposal: to protect the population and the environment over the very long term without requiring human intervention.

- Located at such a deep level, it will not be at risk from any long-term natural changes (climate, erosion, etc.), nor from any societal upheaval.
- The clay layer forms a natural barrier, which will take over from the human structures.

Principles:

- To isolate the waste from the population and the environment (depth of disposal).
- To contain the radioactive substances and limit their circulation (properties of geological stratum).



Cigeo: Prudential and insurance value

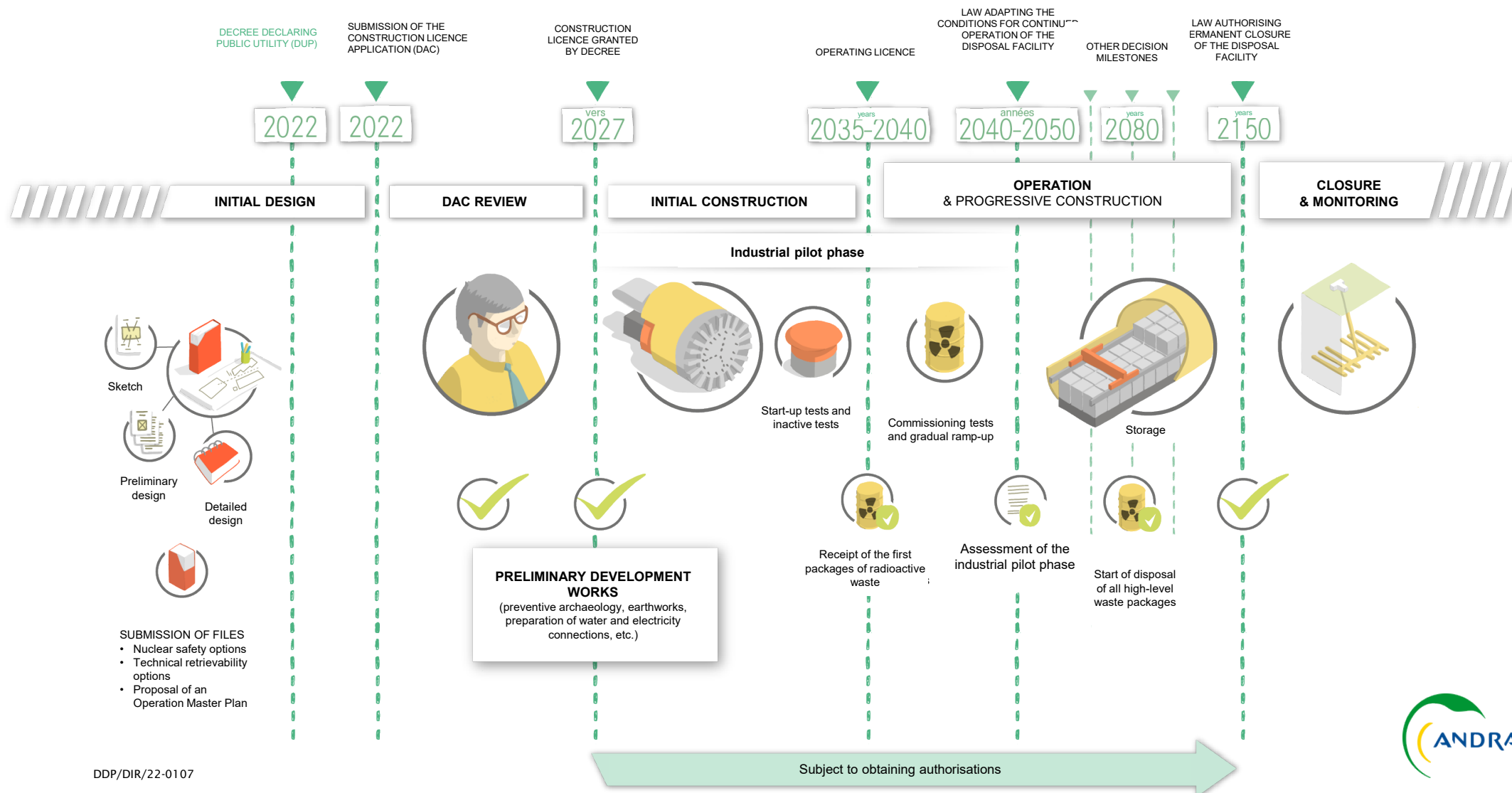


As part of the response to the DUP application, Andra published a socio-economic study. The SGPI counter-expert assessment emphasised that:

“The Cigeo project has a strong prudential and insurance value in the face of the environmental and health risks that would manifest themselves locally in the vicinity of unattended or even abandoned storage facilities in the event that a future society finds itself in a very degraded situation in which safety standards are no longer respected. ”

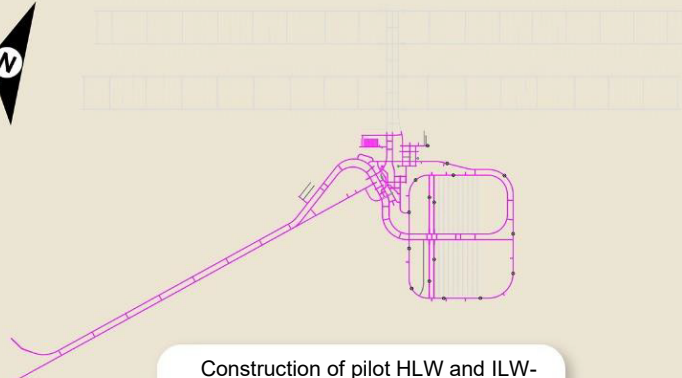
See https://www.andra.fr/sites/default/files/2021-03/Andra-Note_synthese_ESE.pdf

Provisional project schedule

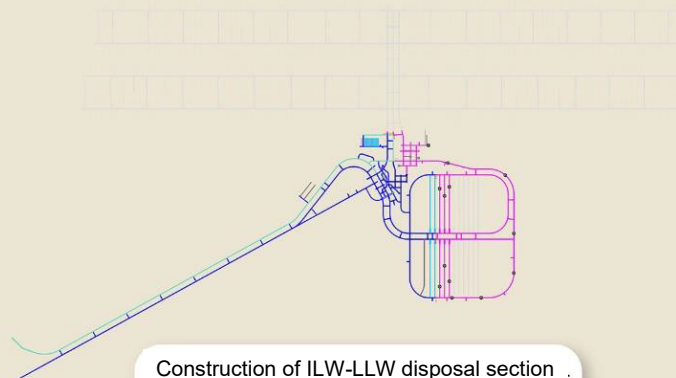


The Cigeo disposal facility

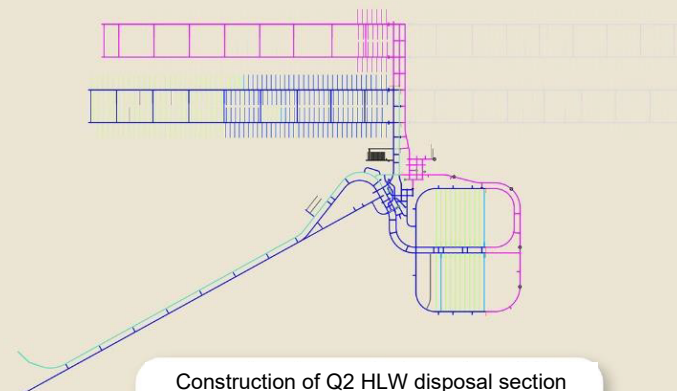
Underground deployment in stages



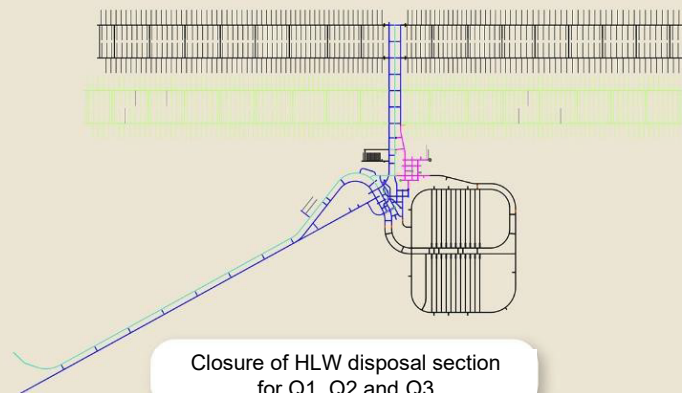
Construction of pilot HLW and ILW-LL sections



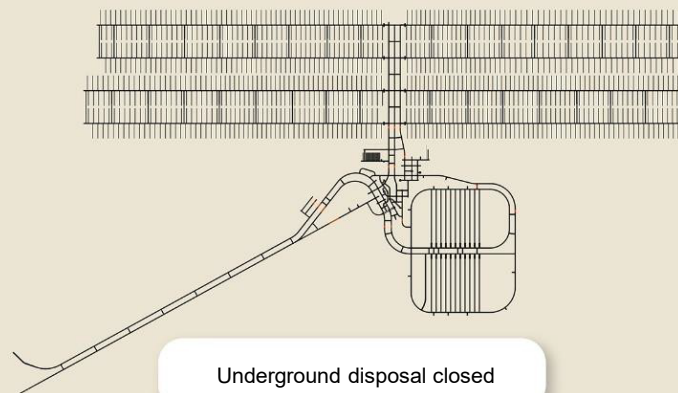
Construction of ILW-LLW disposal section
Disposal in pilot HLW and B1 ILW-LL sections



Construction of Q2 HLW disposal section
Disposal in Q1 HLW and ILW-LL disposal sections



Closure of HLW disposal section
for Q1, Q2 and Q3



Underground disposal closed

0 1km

Key to Construction/Operation

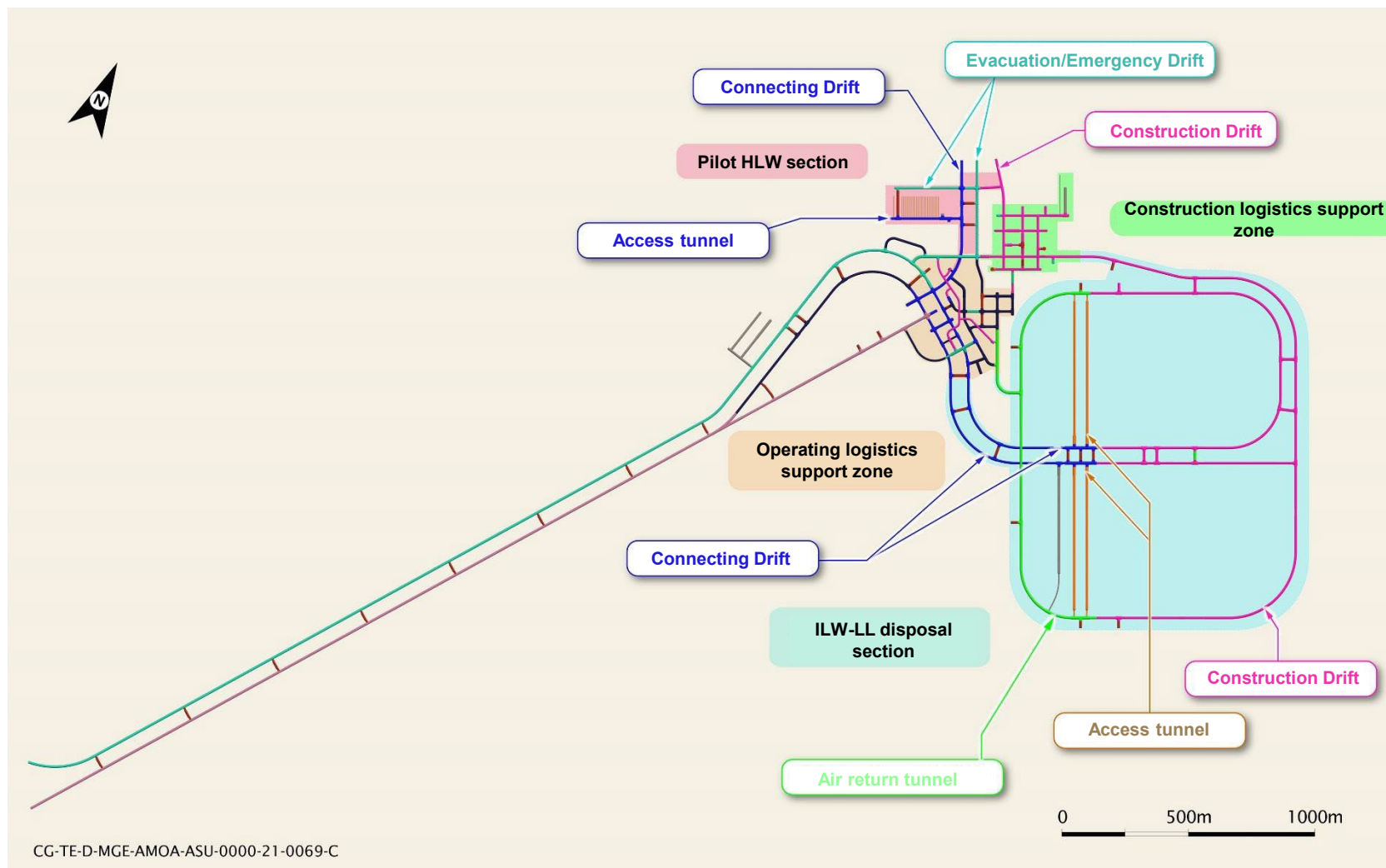
- Construction Zone
- Operating Zone
- Evacuation/Emergency Drifts
- Demonstrators
- Closed section

Key to Cells

- Pending Disposal (= deployed)
- Storage
- Pending Closure

Cigeo disposal facility

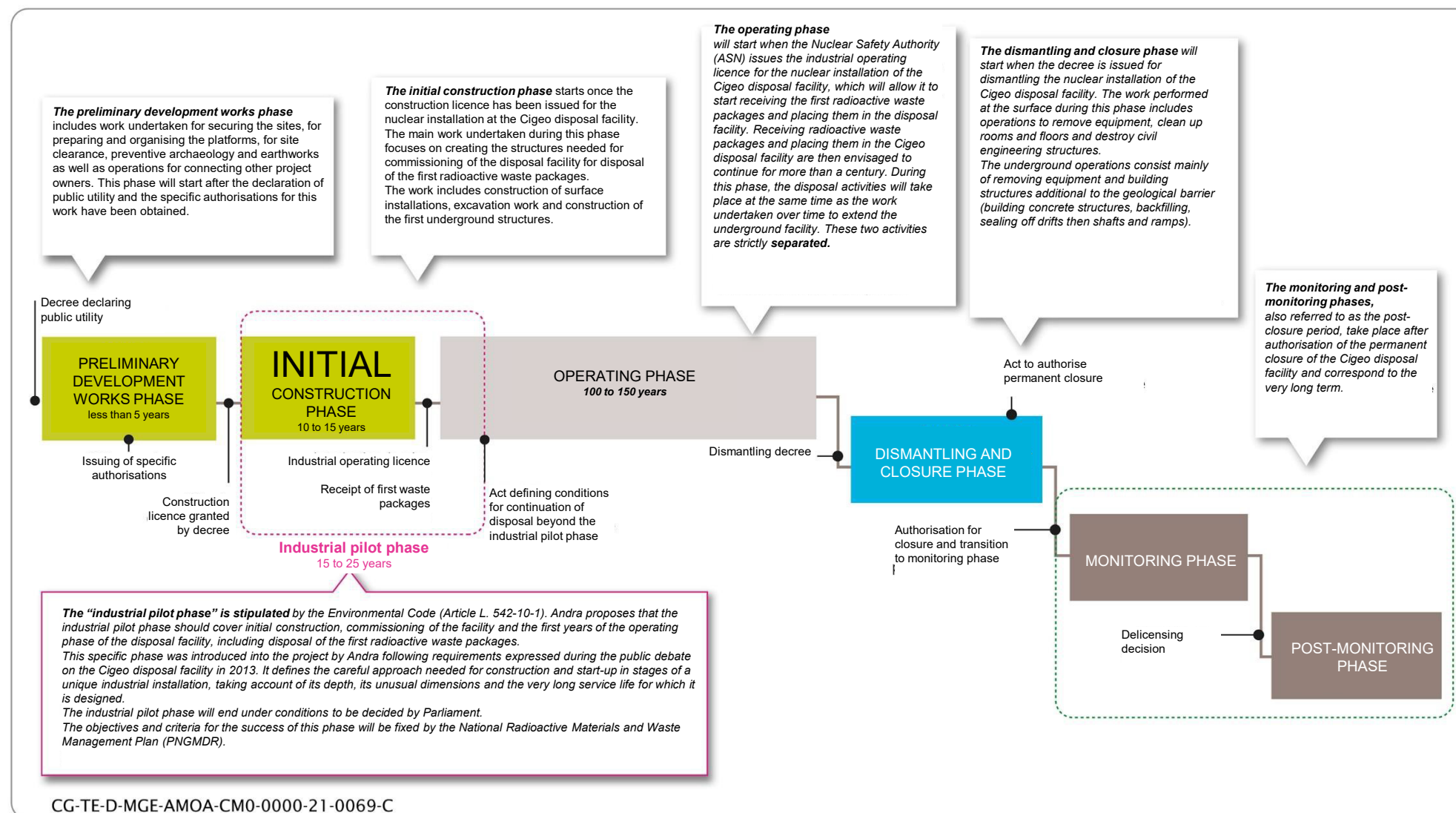
First Phase

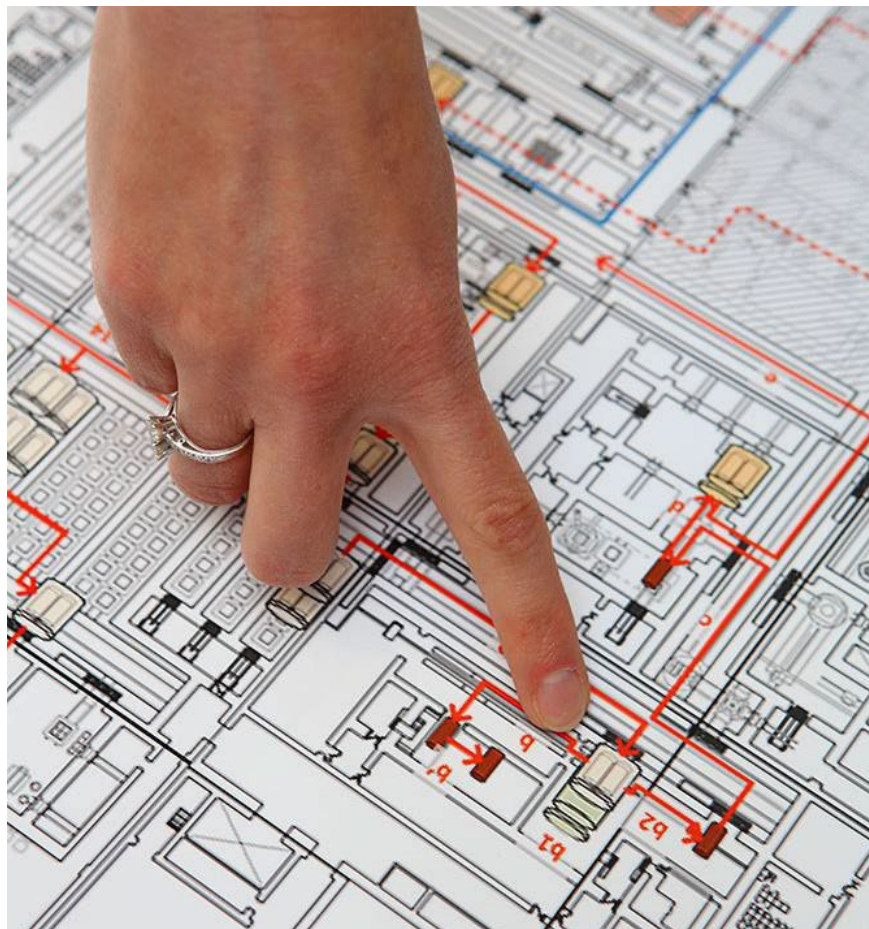


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Cigeo disposal facility

Cigeo life phases

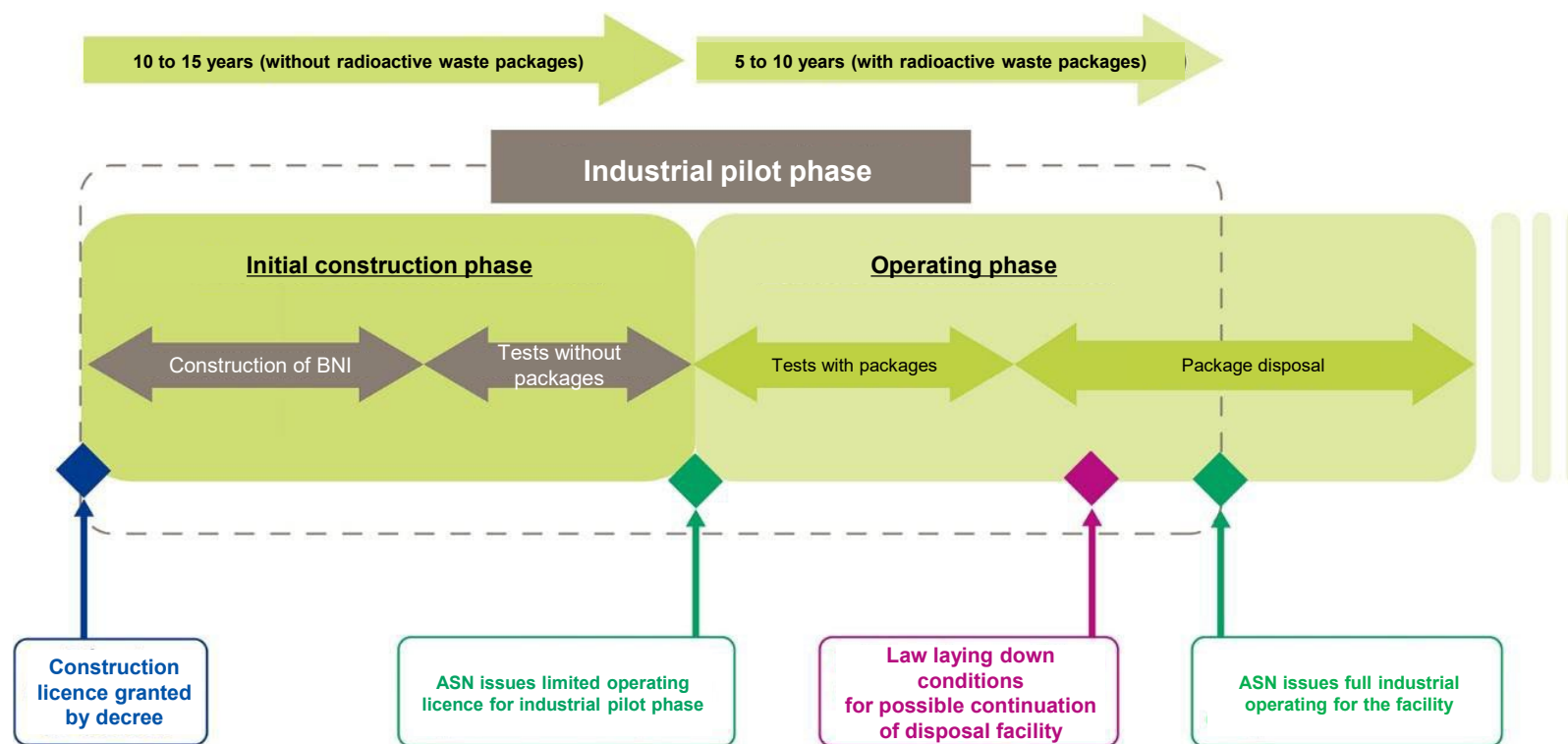




Industrial pilot phase

Outline scheduling for the industrial pilot phase

The Environmental Code (Article L. 542-10-1) stipulates an industrial pilot phase. This specific phase covers the initial construction phase and the first years of the operating phase of the Cigeo BNI.



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DDP/DIR/22-0107

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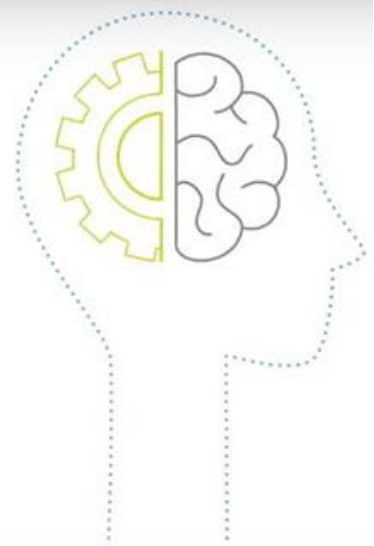
Industrial pilot phase

A major objective for the industrial pilot phase:

- To consolidate, consult and, as much as possible, share the elements of knowledge acquired during this phase in order to strengthen the data used for the design and the safety demonstration
- Then to send these elements to Parliament so that it can make its decision on continuation of the project

A double challenge of the industrial pilot phase:

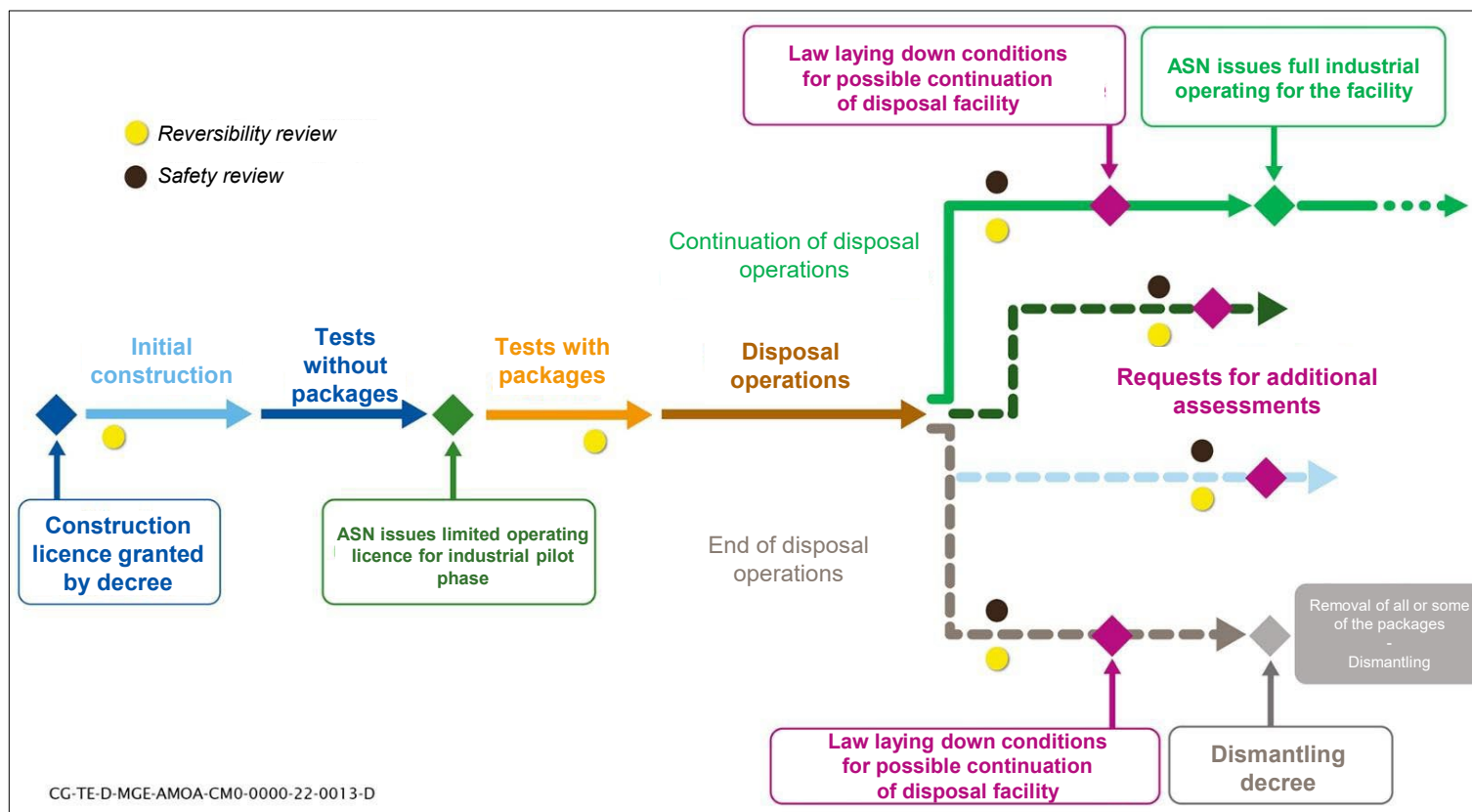
- a phase of technical learning and of strengthening studies and knowledge
 - To strengthen the data used for its design and for its safety demonstration, *in situ*, in real environmental conditions
 - To gradually take control of operation of the industrial facility
 - To carry out retrievability tests
 - To prepare for the next phases
- a phase of learning for the governance of Cigeo
 - The decisions and discussions during the industrial pilot phase constitute practical cases for public and stakeholder participation to set up, run in and gain practical experience in governance



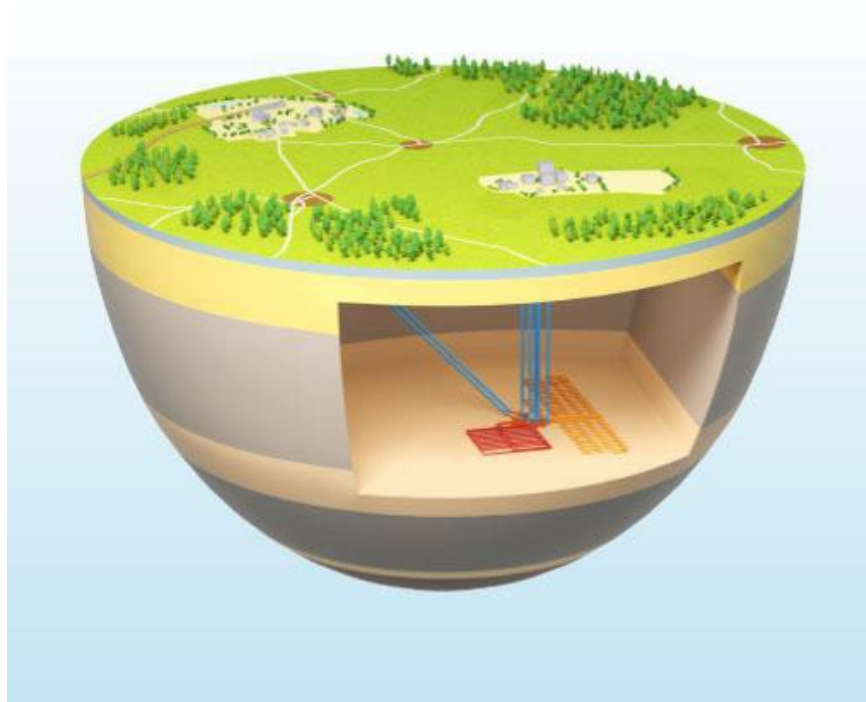
Industrial Pilot Phase



The industrial pilot phase (2/2)



=> Cigeo is the only nuclear facility for which, after its authorisation by decree, the regulations require a Parliamentary decision regarding its potential continuation and passing of a law for its closure.



The scope of the construction licence application for the Cigeo disposal facility

The construction licence application for a basic nuclear installation

Submitted to the Ministers responsible for nuclear safety, by the person responsible for operating the facility (who takes on the operator role when the application is submitted (*Environmental Code, [Article R593-15](#)*)).



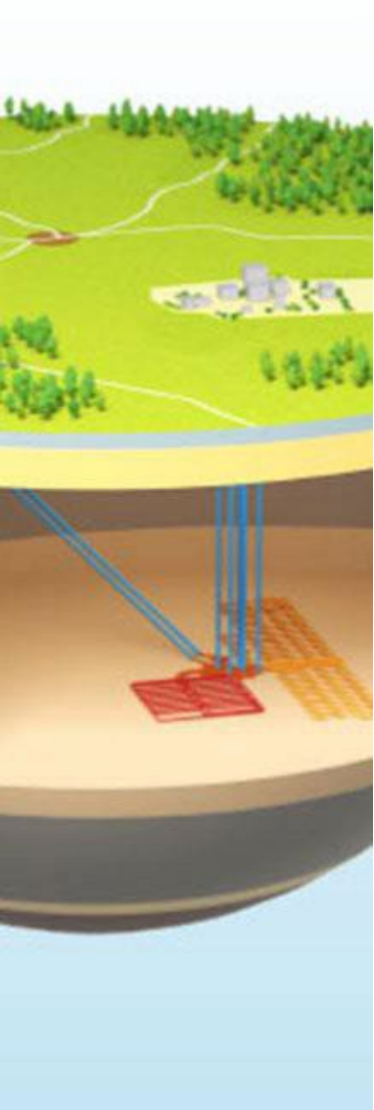
Application accompanied by a file
(*Environmental Code, [Article R593-16](#)*).

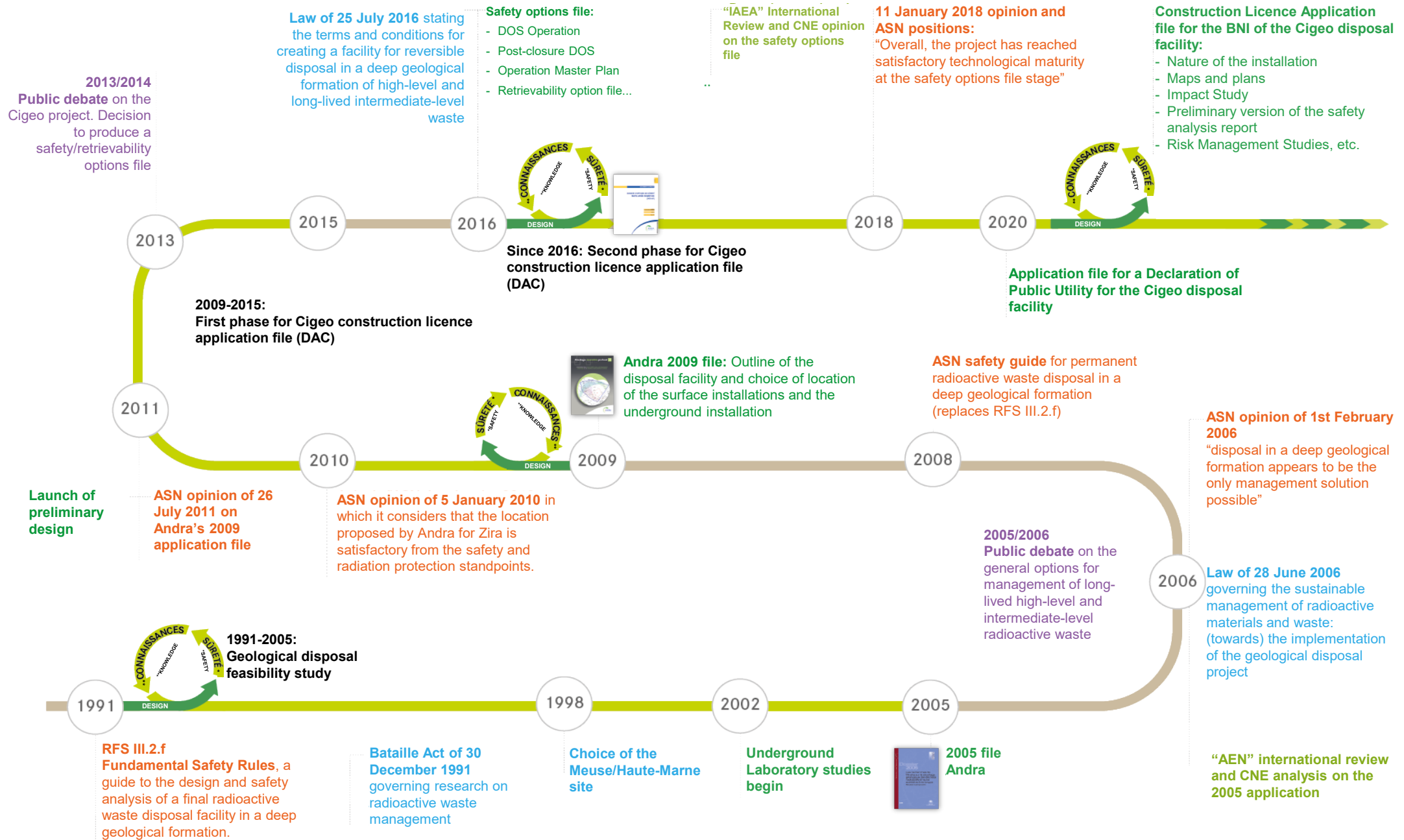


Technical investigation phase



File updated for public inquiry





Construction Licence Application

The purpose of the DAC is to apply for a construction licence by decree for the Cigeo BNI as a whole, as designed for disposal of the reference inventory waste.

It provides the safety demonstration for Cigeo

- in the long term, based on disposal as stipulated at the end of operation, in response to the fundamental objective of protecting the population and the environment
- for the whole of the operational phase

The construction licence, if issued, will only allow initiation of the phase 1 construction and the start of operation

- Scope of Phase 1 a small part of the underground installations and all of the surface installations
- Due to the possibility of technological developments occurring by the time the next phase is implemented, the level of description of the facilities is adapted to the timeframe

The authorisations that will follow the construction licence application

With the industrial pilot phase after a testing phase, limited operating licence for the industrial pilot phase for receipt of the first packages of radioactive waste.

For the next phases:

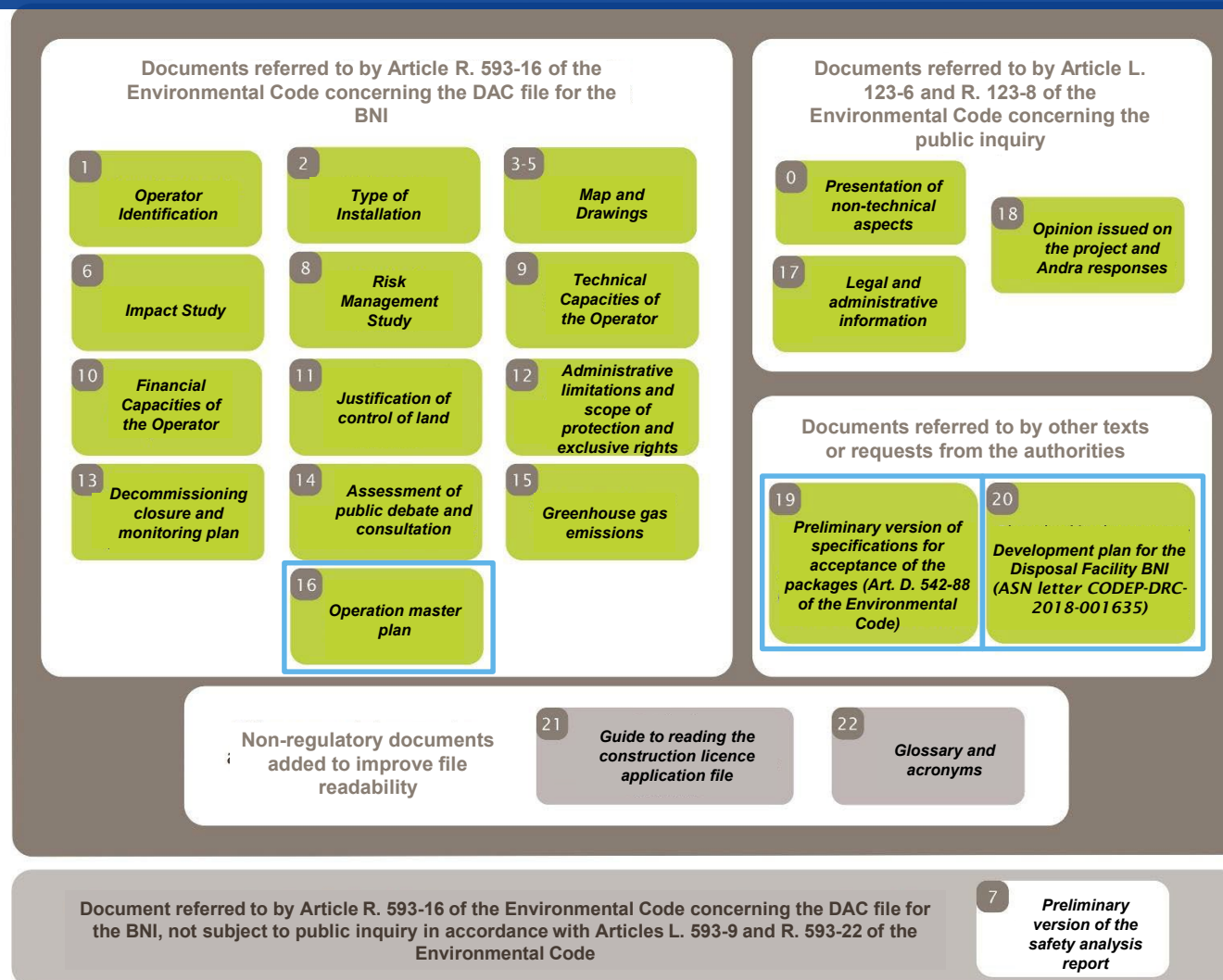
- Parliamentary decision on conditions for continuation of the project, based on the report on the industrial pilot phase
- If Parliament decides to continue and after ASN authorises the full operating licence: construction and subsequent operation (subject to ASN authorisations)

Specific procedures for certain operations, for example closure

The documents in the support file for the licence application



DAC support file



23 documents in total

→ **3 documents** specific to Cigeo

→ **2 documents** added by Andra for readability and to aid public understanding

Document 0 – Non-technical presentation



DDP/DIR/22-0107

Introduction

1. The main features of the Cigeo disposal facility

- 1.1 *The site*
- 1.2 *The Cigeo disposal facility*
- 1.3 *Development phases for the Cigeo disposal facility*
- 1.4 *The challenges of the Cigeo disposal facility project*

2. Cigeo Basic Nuclear Installation (BNI)

- 2.1 *Nuclear installation in the ramp zone*
- 2.2 *The underground structures zone of the nuclear installation*
- 2.3 *Nuclear installation in the shaft zone*
- 2.4 *The route of the radioactive waste packages*

3. Public Inquiry

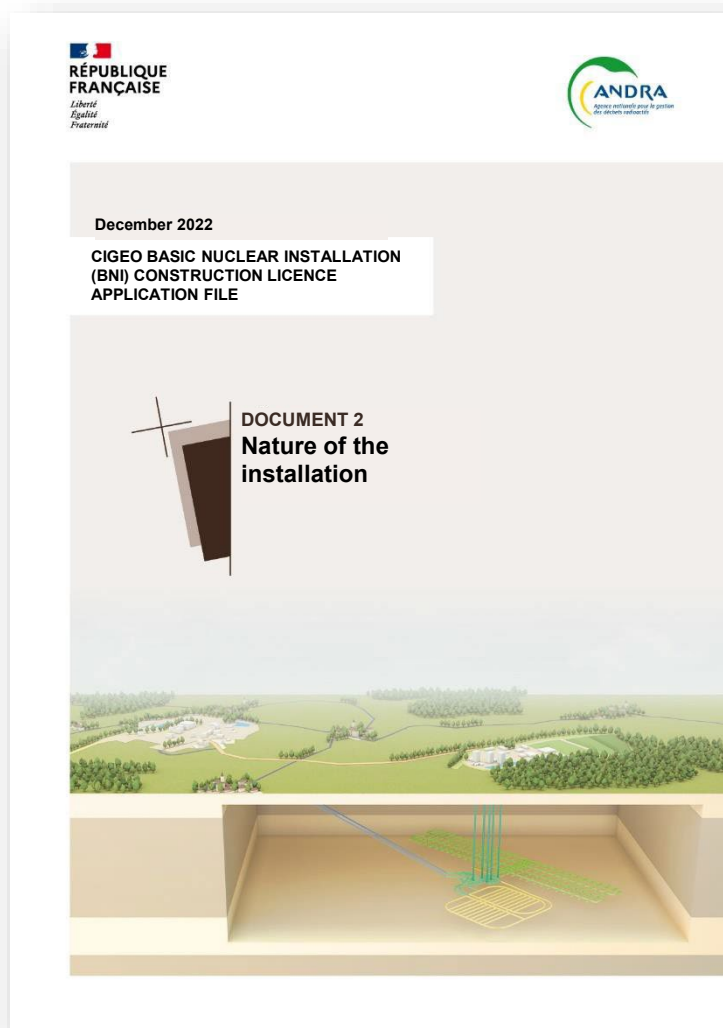
Appendices

Tables of Illustrations

References

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Document 2 - Nature of the facility

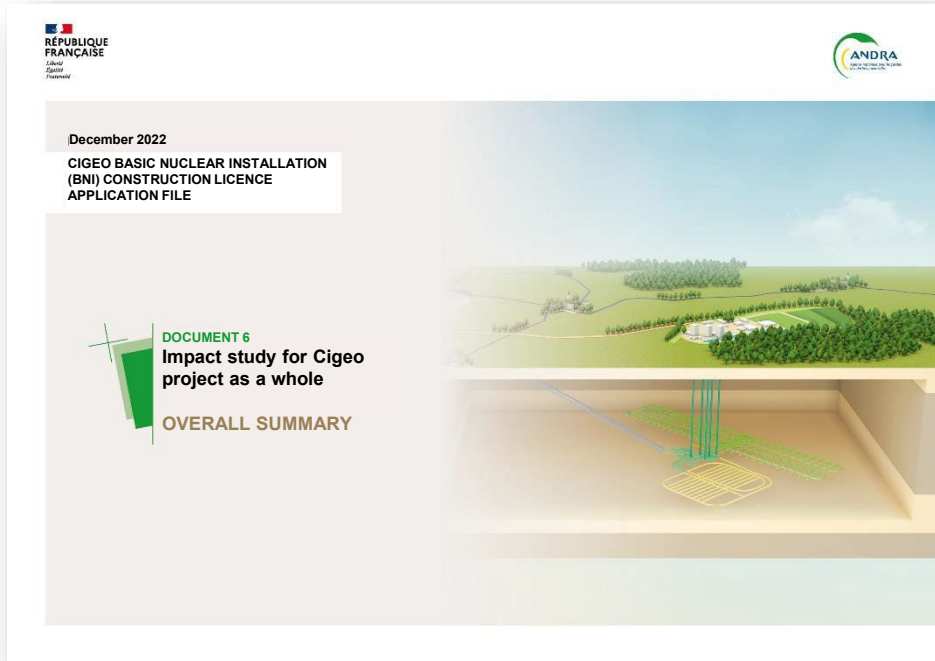


DDP/DIR/22-0107

1. Introduction
 - 1.1 Purpose of document
 - 1.2 Choosing disposal of radioactive waste in deep geological formations
 - 1.3 The radioactive waste packages to be disposed of in the Cigeo BNI
 - 1.4 Life phases of the Cigeo BNI
2. Type of installation and activities undertaken
 - 2.1 The Cigeo disposal facility
 - 2.2 Scope of BNI
 - 2.3 Nature of activities
3. The technical features of the basic nuclear installation and its environment
 - 3.1 Introduction
 - 3.2 Operating capacities of the Cigeo BNI
 - 3.3 Surface structures within the BNI
 - 3.4 Underground structures of the Cigeo BNI
 - 3.5 The industrial environment and communication routes of the disposal facility located around the BNI
4. The operating principles of the installation
 - 4.1 Introduction
 - 4.2 Nuclear process of the surface nuclear installation
 - 4.3 Nuclear process in the underground installation
 - 4.4 Other handling operations
 - 4.5 Principles of ventilation in the nuclear installation
 - 4.6 Excavation work for the cells carried out in later phases
 - 4.7 Closure operations
5. Implementation phases for the facility
 - 5.1 Life phases of the Cigeo BNI
 - 5.2 Deployment of BNI installations and structures in stages
- Appendices
- Tables of illustrations
- References

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Document 6 - Impact Study (1/2)



→ Based on the principle of implementing provisions, in accordance with Article R. 122-5 of the Environmental Code, to

“prevent significant negative effects on the environment or human health and reduce effects that could not be prevented” and compensate for effects that could not be “prevented or sufficiently reduced”

→ Identify and assess impacts on the environment of the Cigeo project as a whole, comprising

- ✓ the Cigeo disposal facility
- ✓ And all operations necessary for construction and operation of the facility:
 - Electrical power supply/RTE;
 - upgrading of railway line 027000 /SNCF Network
 - water supply/SIVU of Haut Ornain and SIAEP of Échenay
 - re-routing of department road D60/960 /Haute-Marne department
 - activities for characterisation and for environmental monitoring/Andra

→ Presents these impacts over the whole lifetime of the Cigeo project as a whole, from its construction, through its operating phase, to the end of operation/dismantling.

Document 6 - Impact Study (2/2)



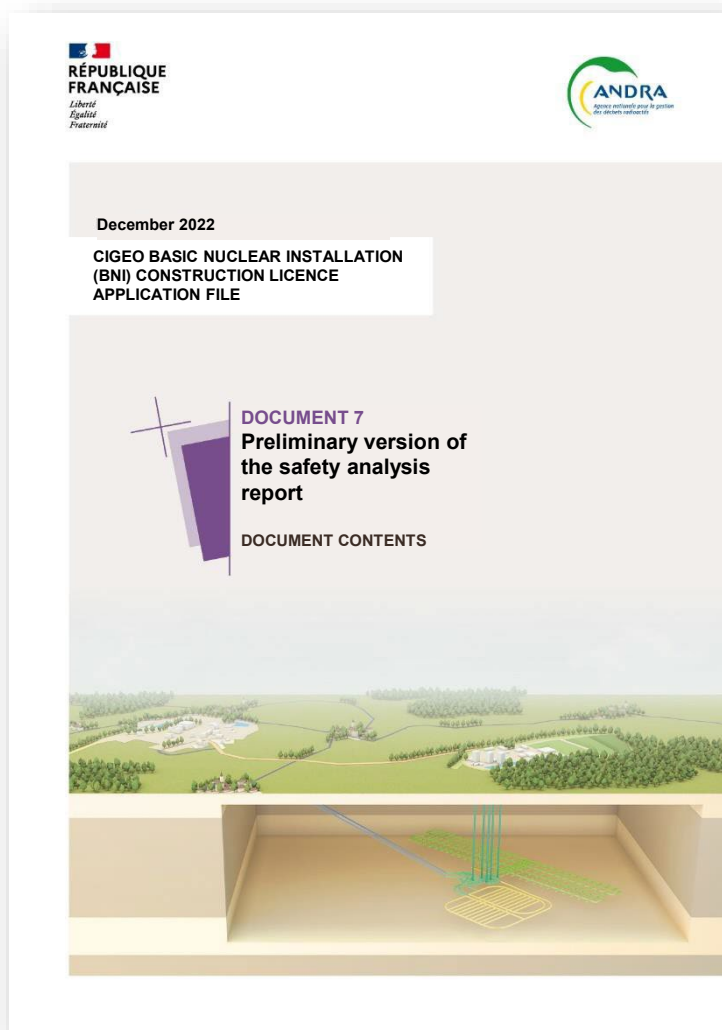
→ First update of impact study for the Cigeo project as a whole (initial version attached to the public inquiry file before the DUP, www.andra.fr/cigeo/les-documents-de-reference).

- ✓ provides more details on **the impacts** of construction of the basic nuclear installation (BNI),
- ✓ **Impact study updated** prior to each future submission of a licence application. These updates will make it possible to ensure the quality of assessment of the environmental impacts of the Cigeo project as a whole, at every stage of its design and construction.
- ✓ [reminder] **Environmental Authority opinion** “this initial study is intended to be updated as the necessary licence applications for implementation of the project are made” and “this vision is the only appropriate one to ensure that the public and the legislative body are informed about environmental issues throughout the life of the project. This updating process will result in successive referrals to the Ae”

→ It is covered by a **non-technical summary**

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Document 7 - Preliminary version of the safety analysis report (1/2)



→ Together with document 8 forms part of the series of successive safety/design/knowledge iterations carried out since the 1991 law was adopted and the ASN examination of the “Safety Options file” in 2016 (www.andra.fr/cigeo/les-documents-de-reference#section-3144)

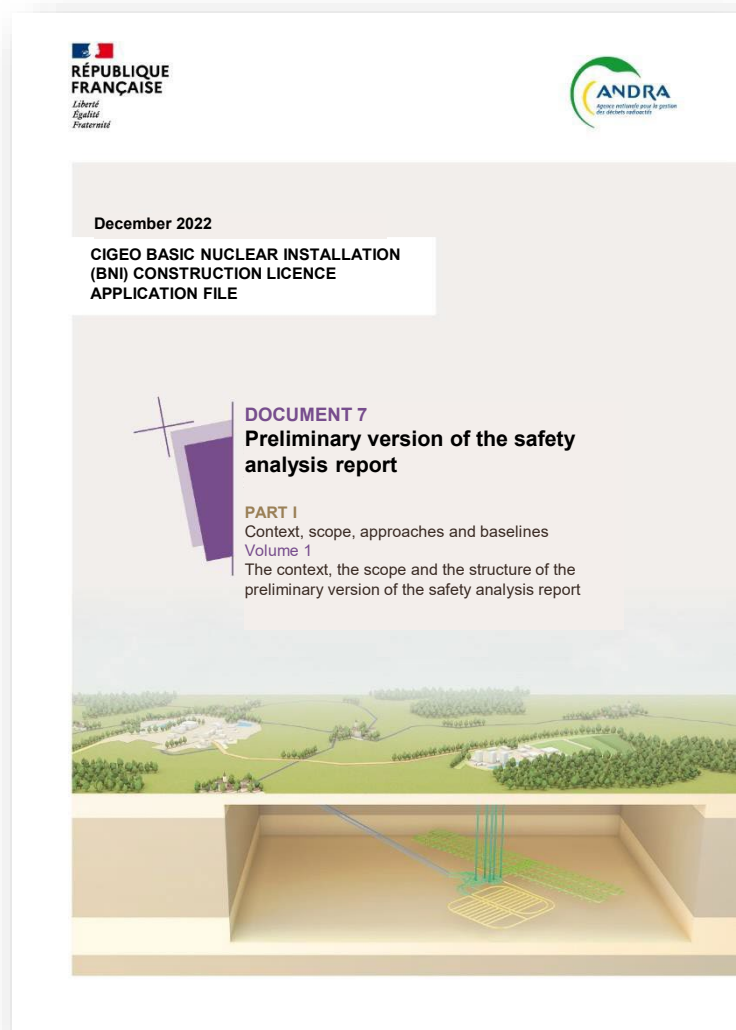
- ✓ **Demonstration of nuclear safety** = justification that, given the current state of technical knowledge, practical experience and the vulnerability of the environment, the Cigeo project makes it possible to achieve “a level of risk that is as low as reasonably possible under economically acceptable conditions”
- ✓ Presentation of the **technical provisions** and the **human and organisational measures** implemented to guarantee protection of interests (safety, public health and hygiene, protection of nature and the environment, including during the long-term phase after closure), and implementation of the reversibility principle
- ✓ **Identification of risks in the post-closure phase and in operation** (including construction phase): analysis of provisions specified for preventing them and justification of the measures aimed at limiting occurrence of incidents or accidents, and their consequences

Document 7 - Preliminary version of the safety analysis report (2/2)

→ Includes a presentation of:

- ✓ the Cigeo **BNI**
- ✓ the **general safety approach** related to the specific characteristics of the Cigeo BNI and, in particular, the fundamental objective of long-term protection of the population and the environment
- ✓ **long-term risk management in the post-closure phase** (the structure and content are established in line with ASN Safety Guide no. 1)
- ✓ **risk management in the construction and operating phases**
- ✓ the provisions stipulated to ensure the **reversibility of the disposal facility**

→ When the Cigeo disposal facility is commissioned, this document will become the safety analysis report.



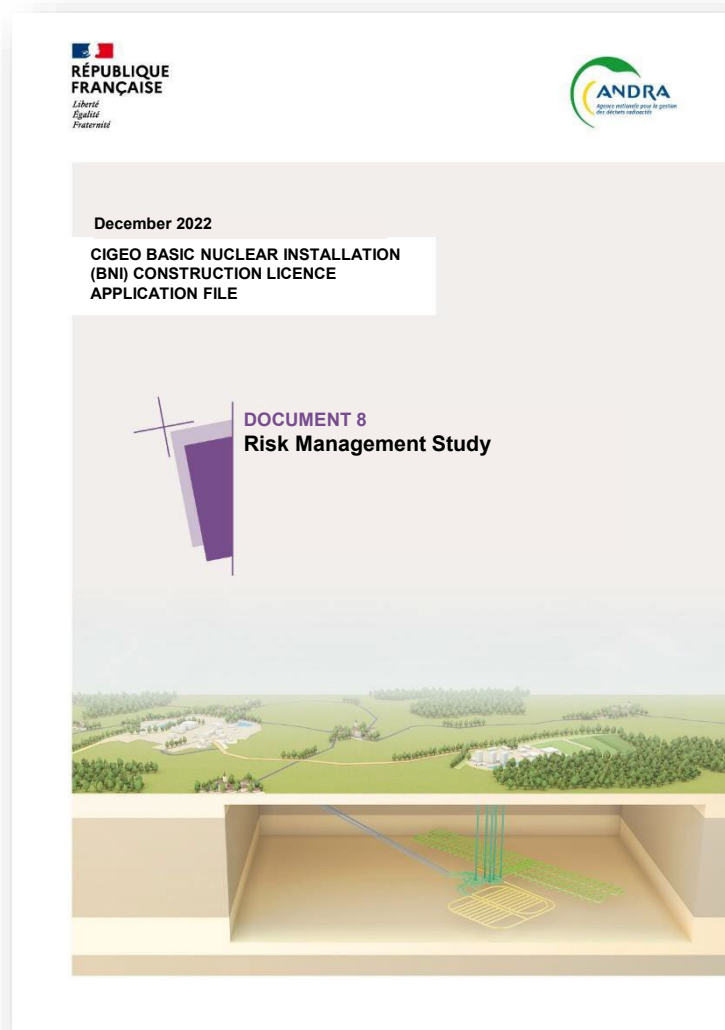
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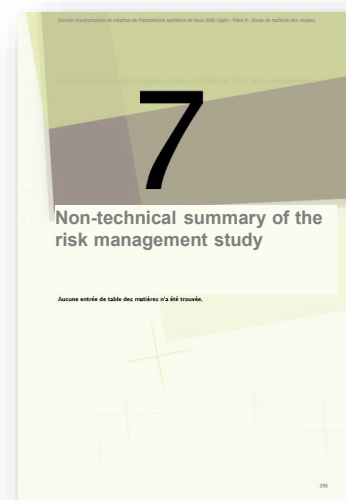
Document 8 - Risk Management Study

→ Provides a summary of the safety approach and inventory of risks presented by the facility as well as the analysis of provisions made to prevent these risks and of specific measures for reducing the probability of accidents and their effects as indicated in Document 7, the Preliminary version of the safety analysis report.

→ Covered by a non-technical summary (Chapter 7 of document)



DDP/DIR/22-0107



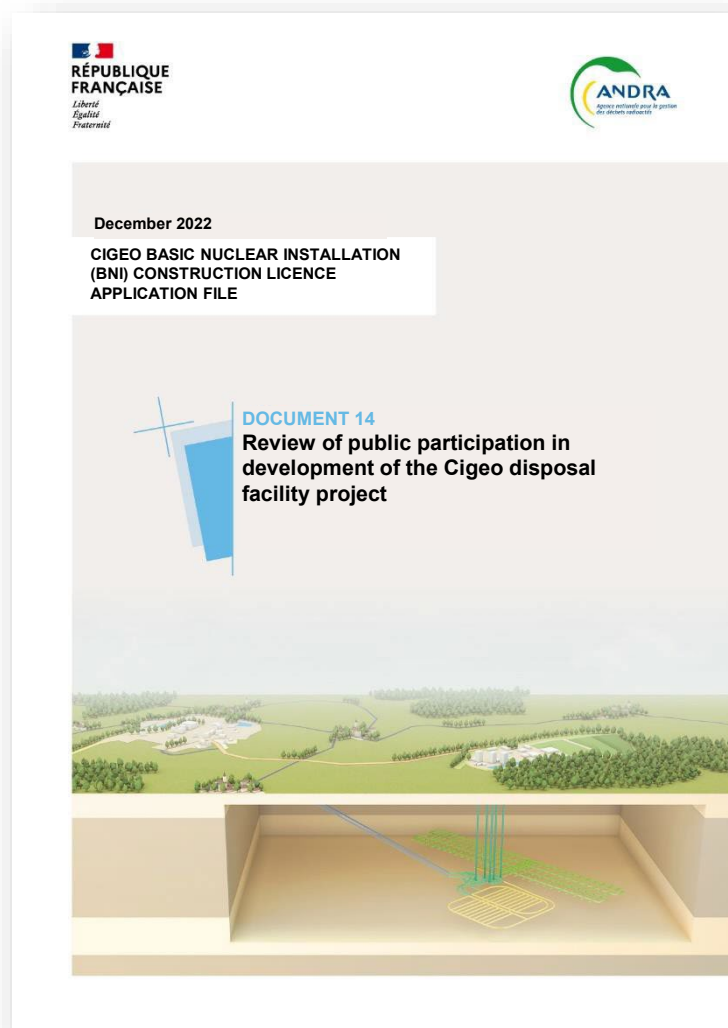
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Document 14 - Review of participation

→ Presents all of the actions performed since the beginning of the project to guarantee public entitlement to information and participation, for those with an interest in the Cigeo disposal facility project, whether this is the responsibility of Andra or of other associated contractors.

→ Update of Document 9 of the support file for the DUP application, which incorporates:

- ✓ the conclusions of the public inquiry concerning the public utility declaration (DUP);
- ✓ the assessment of consultations on the industrial pilot phase and governance of the Cigeo disposal facility;
- ✓ the assessment of the consultation on the re-routing of the department road D60/960 undertaken by the Haute-Marne department council;
- ✓ the requirements of the draft 5th edition of the PNGMDR concerning public participation in the Cigeo disposal facility project



Document 16 - Operation master plan



DDP/DIR/22-0107

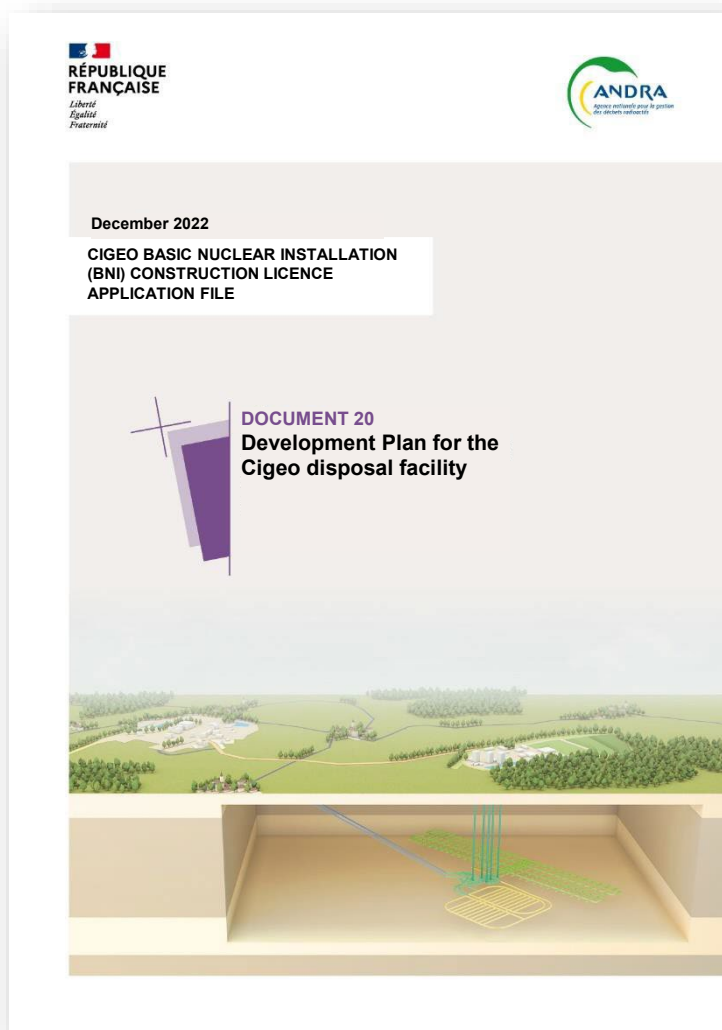
→ Describes the major technical characteristics of the project and the provisional milestones for deployment, including: governance, inventory of waste to be disposed of, provisional deployment of the disposal facility, the industrial pilot phase, reversibility, project financing and costs, memory.

→ A proposed Operation Master Plan (PDE) was published by Andra in 2016. This first edition brings together Andra's actions and proposals, including those resulting from consultations held since 2017. The PDE will be subject to regular updates (every 5 years at minimum, as stipulated in the 2016 act, second edition planned for the DAC public inquiry).



Because it covers all the major issues, particularly in relation to governance and the industrial pilot phase, the PDE forms the main basis for Andra's approach to public involvement after submission of the DAC.

Document 20 - Development Plan for the BNI



DDP/DIR/22-0107

→ Document introduced following ASN opinion on the Safety Options file (DOS) and a recommendation from the Environmental Authority's opinion.

→ Based on achievements accomplished and on the safety demonstration, in line with the deployment in stages of the Cigeo disposal facility, the development plan for the Cigeo BNI includes:

- ✓ the “roadmap” used to prepare for the next steps, especially to prepare for operational implementation:
 - Equipment qualification,
 - Strengthening of the safety demonstration and the design of the disposal facility,
 - Optimisation of the installation.
 - ✓ Improves understanding of the production of technical elements that will be provided by Andra during the deployment/development of the disposal facility
- Document to be updated regularly in line with decision milestones, changes in energy policy, feedback obtained and scientific and technological developments.



Continuation of public information and involvement

The approach applied by Andra

Information

- Presenting the actions taken following the 2021/2022 consultation process (publication of the assessment of this consultation, its summary and the first edition of the Operation Master Plan (PDE);
- Identifying the expectations and requirements of the public and stakeholders;
- Continuing to welcome the public to CMHM facilities and reaching out to them;
- Continuing the information approach, in particular in terms of answering questions from the residents of Meuse and Haute-Marne.

Participation

- Maintaining and extending dialogue with various members of the public and stakeholders;
- Following the local consultation roadmap;
- Implementing the roadmap for consultation after submission of the DAC.



The ways in which the public and stakeholders are informed and involved may take a range of forms (dialogue, information and discussion meetings, consultations, themed discussions, etc.). The details will be defined gradually over time, in line with the safeguards designated by the CNDP.

2022

2023

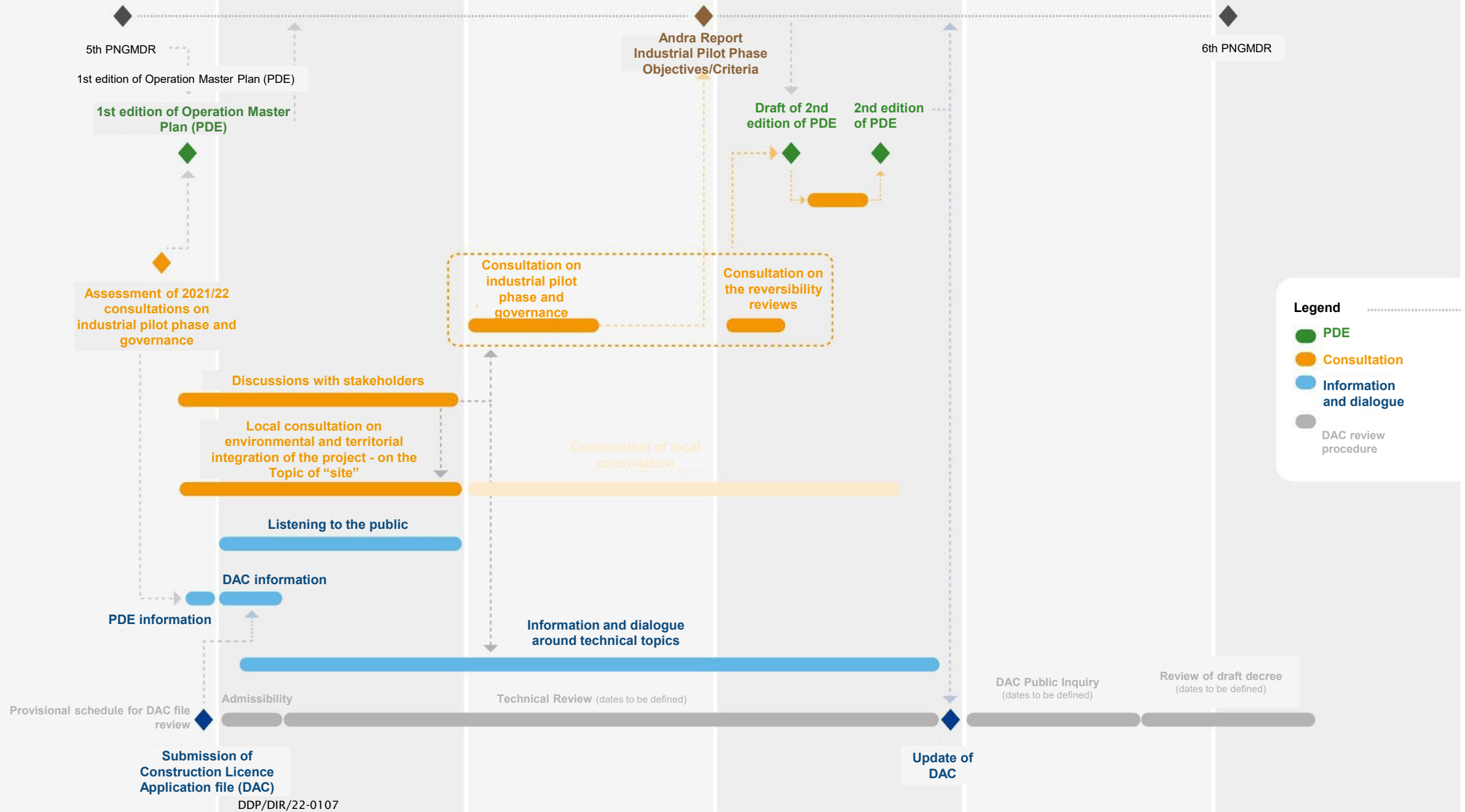
2024

2025

2026

2027

32



Topics for discussion from Andra

- Following on from approaches undertaken as part of the previous sequence and the consultation approach after the 2013 public debate
- The DAC is not submitted to Andra for consultation; this file is a technical document intended for the departments in charge of examining the licence application
- The consultation subjects are topics in line with the 5th PNGMDR
- For each consultation, Andra will produce support documents beforehand and an assessment at the end.

At national and local levels

- Governance and Industrial pilot phase
- Organisation of the reversibility reviews

At local level

- Planning and living environment (site)

See http://www.hctisn.fr/IMG/pdf/4_andra_feuille_de_route_concertation_post_depot_dac_-_projet_de_presentation_pour_le_gs_hctisn_du_27_septembre_2022.pdf

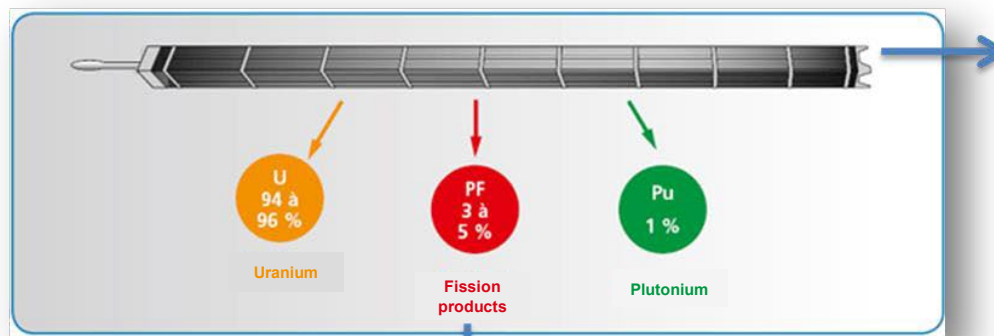


Appendices

Additional information on the Cigeo disposal facility

The high-level waste (HLW) and long-lived intermediate-level waste (ILW-LL)

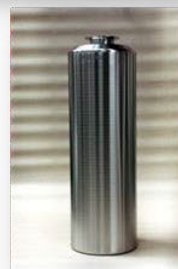
1 – Waste from processing of spent fuel



Hulls and end-fittings (ILW-LL)



Vitrified minor actinides and fission products (HLW)



2 - Waste generated by operation of reactors and other installations (ILW-LL)

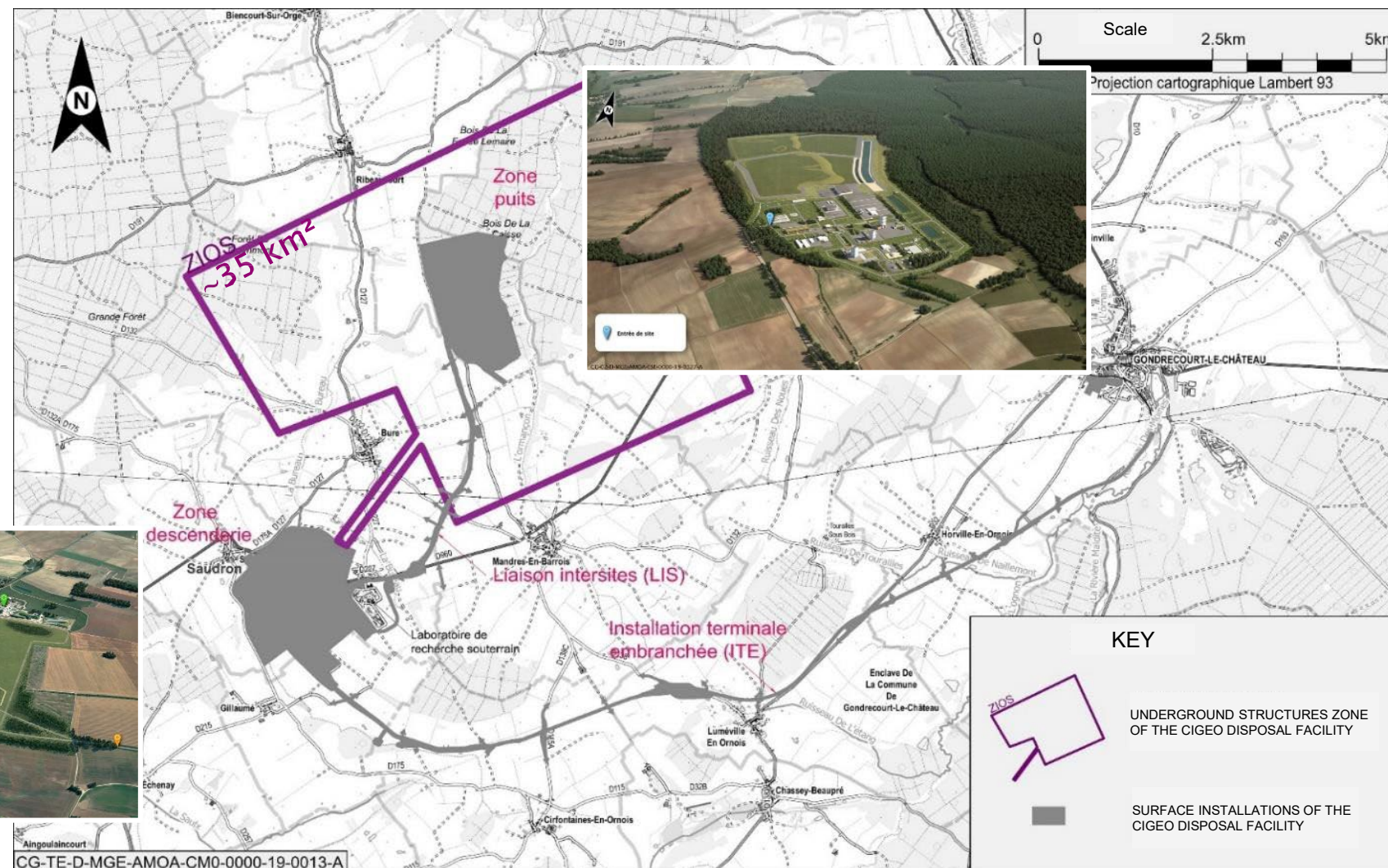


Planned volume of waste: about 73,000 m³ of ILW-LL waste (including about 60% already generated) and 10,000 m³ of HLW waste (including about 40% already generated)

Industrial scenario provided by generators, end of life of the current nuclear power plant fleet

The Cigeo disposal facility

Surface installations



“Shaft” zone (~200 ha)



EXTRAIT DE CG-01-D-MGE-AMOA-CM0-0000-20-0022-A

DDP/DIR/22-0107

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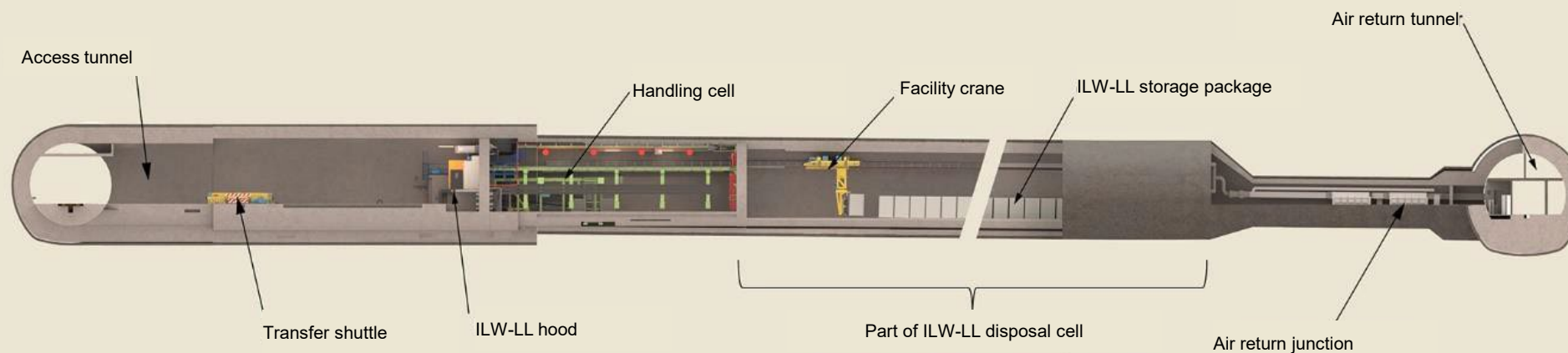
Ramp zone (~300 ha)



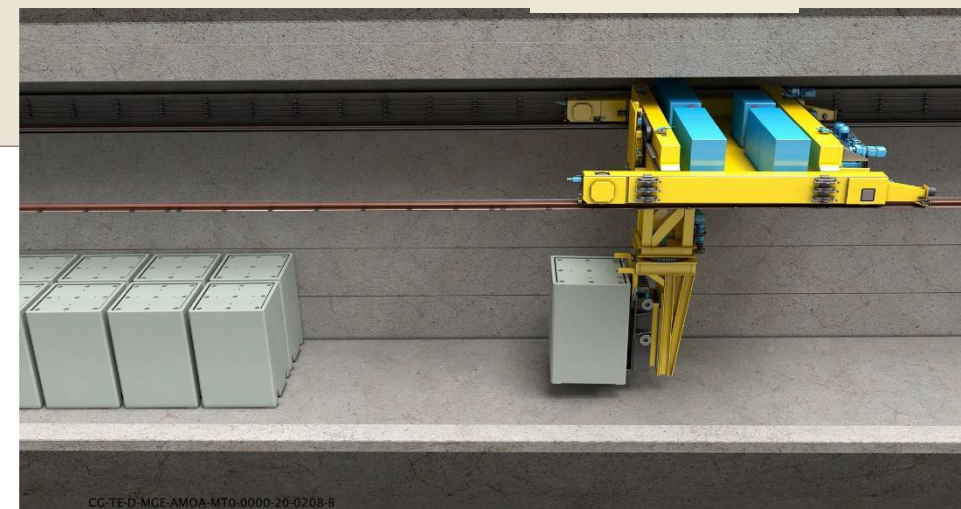
EXTRAIT DE CG-01-D-MGE-AMOA-CM0-0000-20-0010-A

The Cigeo disposal facility

ILW-LL waste disposal cells



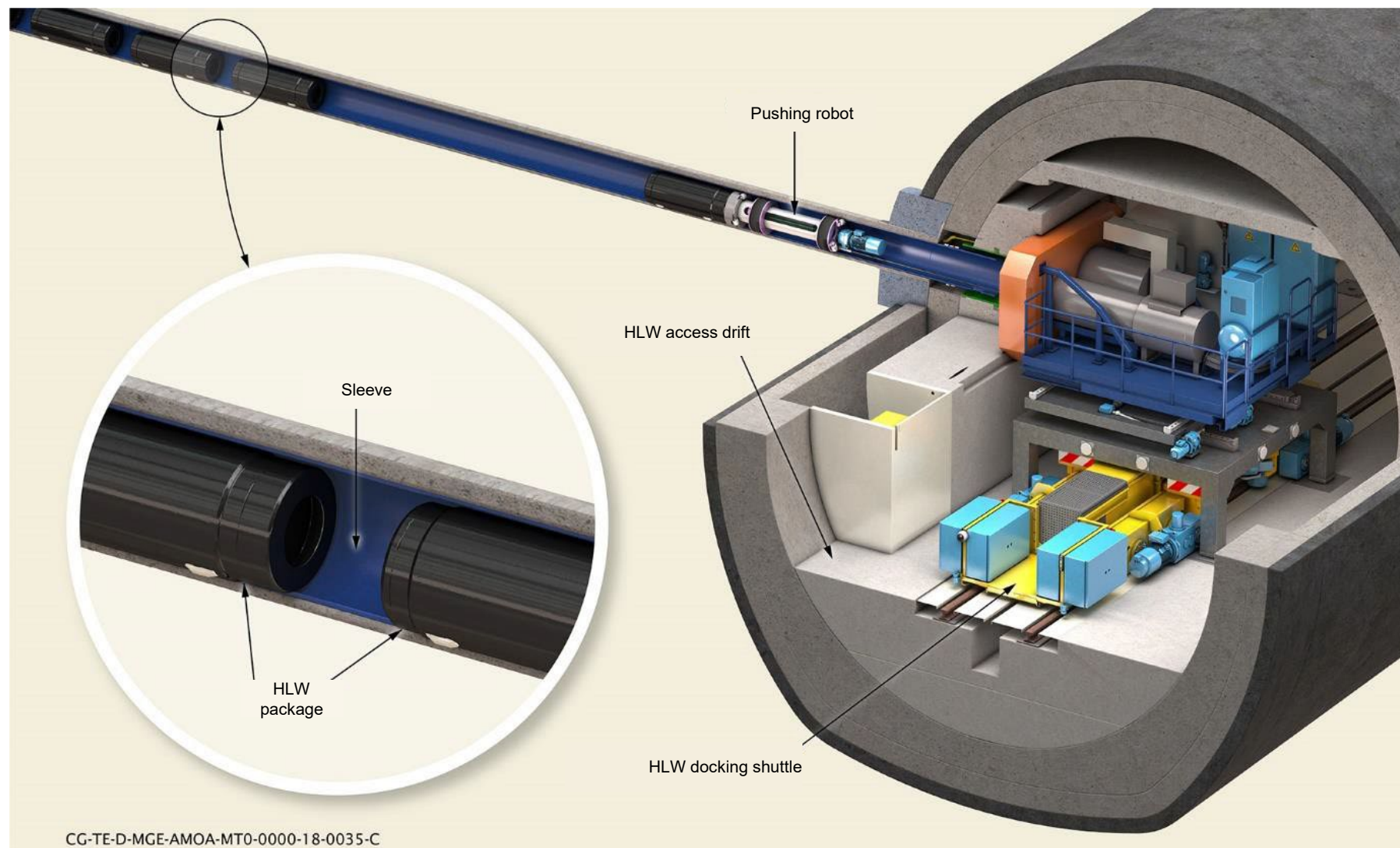
CG-TE-D-MGE-AMOA-ASU-0000-22-0001-A



CG-TE-D-MGE-AMOA-MTO-0000-20-0208-B

The Cigeo disposal facility

HLW waste disposal cells

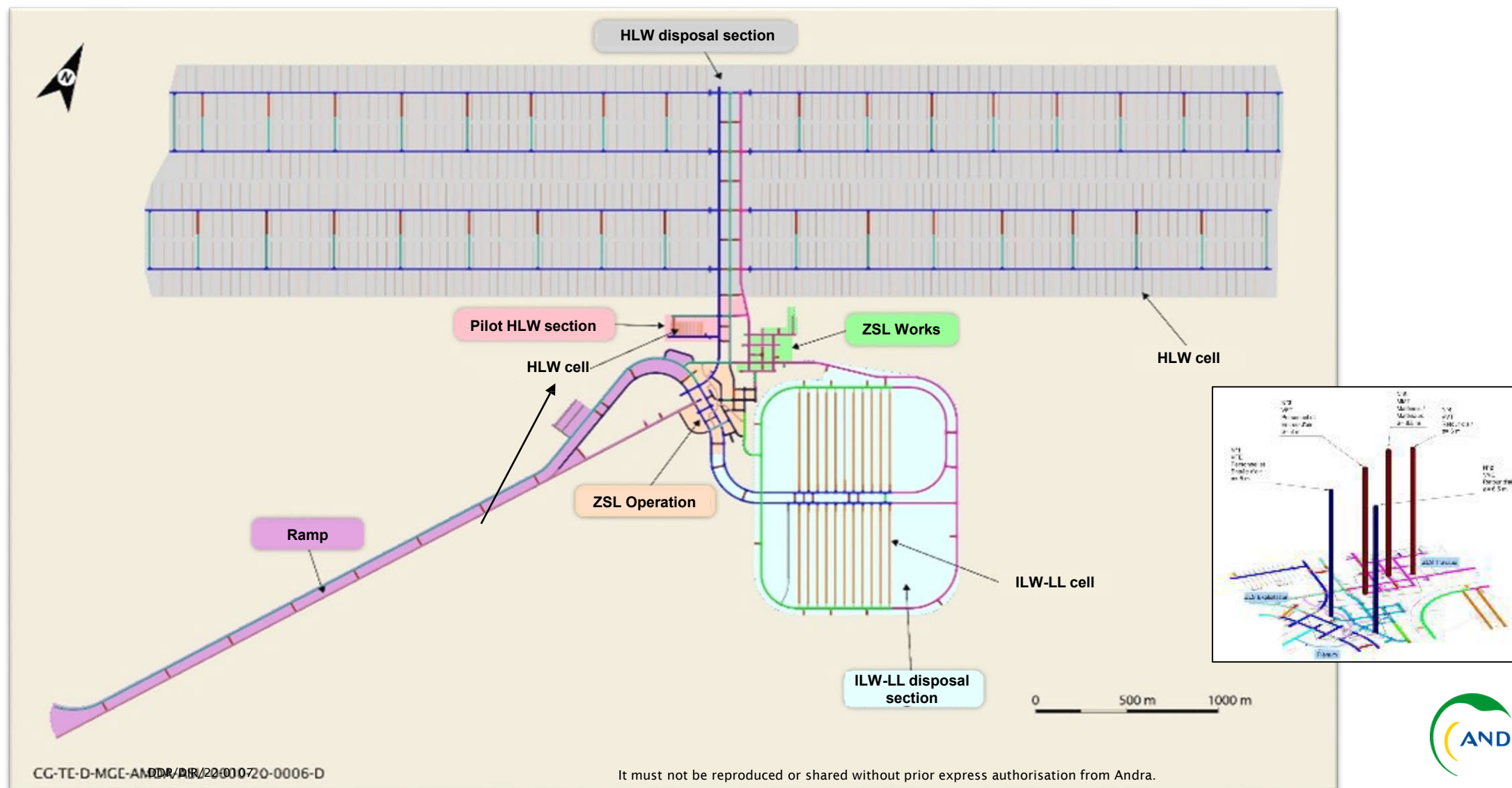


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The Cigeo disposal facility

Bottom-to-top installation (reference inventory)



A reference inventory and a stockpiled waste inventory

Cigeo designed for a reference inventory (+ a stockpiled waste inventory as part of the Cigeo adaptability studies)

Reference inventory

- Nuclear installations licensed at end of 2016 (current fleet, ITER, RJH...)
 - Current fleet:
 - 58 PWR type reactors (56 in operation – 2 Fessenheim)
 - + EPR Flamanville under construction
- Operating life of 50 years taken as standard reference for all reactors
- All spent fuel is assumed to be processed

=> Types of waste: HLW and ILW-LL

Stockpiled waste inventory

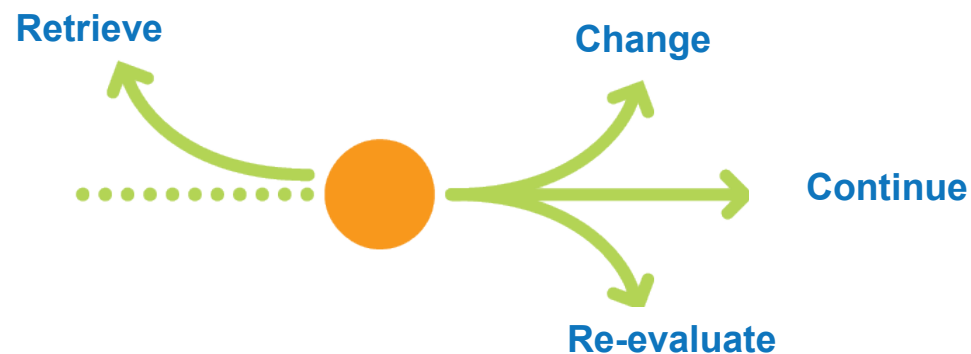
- Taking account of uncertainties, particularly related to the establishment of new waste management solutions or to changes in French energy policy
 - end of reprocessing of spent fuel
 - end of nuclear after 50 years of reactors in operation
 - Lifetime extension for current reactors

=> Types of waste: HLW and ILW-LL spent fuels reclassified as waste, LLW-LL (graphite waste)

Reversibility: an issue of governance

Principle: to avoid locking future generations into the choices that we will be making in design

“The reversibility of disposal is the ability to offer the next generation choices concerning long-term management of radioactive waste, including the choice to reverse the decisions taken by the previous generation. ”



Reversibility tools

The implementation of the reversibility principle relies on governance tools and on technical tools for project control:

- ➔ Continuous improvement of knowledge
- ➔ Incremental development and phased construction
- ➔ Operational flexibility
- ➔ Adaptability of installations (disposal of fuels and waste stored pending management solution)
- ➔ Retrievability
- ➔ Transparency and communication of information and knowledge
- ➔ Involvement of society, evaluation and supervision by Parliament by
- ➔ Nuclear Safety Authority