



## CASE STUDY:

# The Cigéo deep geological radwaste disposal facility

## Challenges

The Cigéo project faces several challenges that require innovative solutions:



Accommodating a huge amount of diverse radioactive waste



Ensuring safety and reversibility



Managing long-term operation and decommissioning



Meeting stringent nuclear safety standards



Technical complexities of underground structures



Coordination among multiple trades and stakeholders

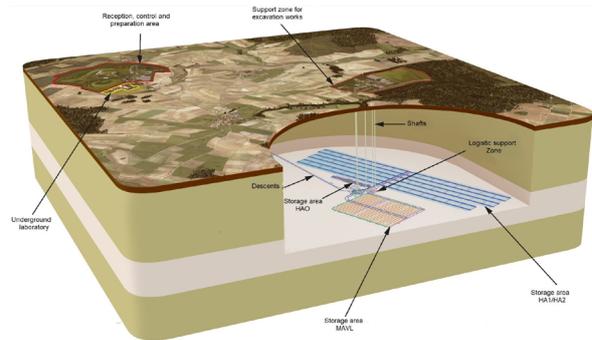
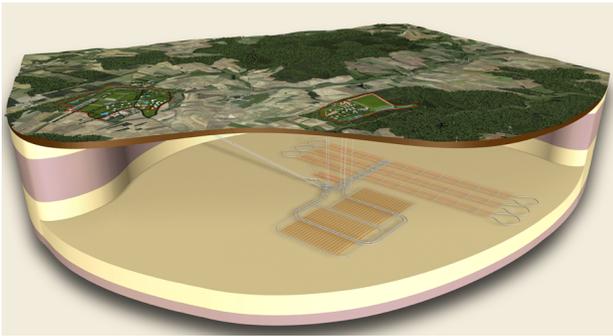
## The project

Led by the French agency for radioactive waste management ANDRA, the Cigéo project aims to create a deep geological disposal facility for high-level waste and long-lived, intermediate-level radioactive waste from nuclear power plants and spent fuel reprocessing. The facility will consist of both ground-level buildings for waste reception and preparation and 500-metre-deep underground infrastructure, including connecting galleries and storage cells. The project is designed for progressive construction and operation over approximately 100 years, requiring highly specific skills and top expertise from French and international teams.

**Tractebel provided engineering and consultancy services during Cigéo's preliminary design phase, focusing on creating durable and reliable nuclear infrastructure.**

# Tractebel's Mission

Tractebel's mandate in Cigéo's preliminary design phase was to provide engineering and consultancy services for the design and implementation of durable, competitive, and reliable nuclear infrastructure. Of the project's seven subsystems, Tractebel led the design project for subsystem 4 (underground infrastructures) and collaborated with consortium partners on subsystem 2 (above-ground nuclear installation). The scope of work included preliminary design studies, final design studies, and drafting regulatory files to support ANDRA's application for a public interest declaration, followed by a construction authorization request.



## Preliminary Design: The Numbers

The preliminary design phases of the Cigéo project spanned seven years, involving **500,000 hours of work by Tractebel and its subcontractors**. The project included the modeling of over 800,000 objects in 3D, representation of over **40 trades**, and planning for an operational lifespan of **120 years**. Key figures for two of the project's subsystems, SS2 and SS4, include over **5,000 meetings**, **200,000 work hours**, and **1,500 deliverables**, including detailed risk analysis documents and extensive civil engineering studies.



## Tractebel's Detailed Assignment

Our detailed assignment involved coordinating the studies on reversibility and recovery of waste packages, optimizing the design of underground and ground-level structures, and ensuring compliance with nuclear safety standards. The team worked on various technical aspects, including nuclear safety and civil, geotechnical and systems engineering. Tractebel's role as an «assembler» ensured seamless integration of logistics and infrastructure, addressing technical challenges and promoting sustainable solutions for the long-term operation of the Cigéo facility.



## Tractebel's Solutions

Tractebel provided innovative solutions to address the project's challenges, including the **development of new calculation and projection methods, use of advanced materials, and optimization of construction techniques**. The team implemented **a two-layer lining concept** for underground galleries to manage geotechnical constraints and ensure long-term stability. Our teams also **optimized the design of the ground-level buildings** to accommodate various waste packages, and **integrated advanced Building Information Modeling (BIM) methodologies** for effective collaboration and visualization.



## The Impact of our Solutions

The solutions provided by Tractebel significantly enhanced the project's feasibility, safety, and efficiency. The innovative design and construction methods **ensured the stability and reversibility of waste storage**, meeting stringent safety standards. Advanced modeling techniques **improved the quality and speed of deliverables**, facilitating better coordination among stakeholders. Overall, Tractebel's contributions helped streamline the project's execution, reduce costs, and ensure compliance with regulatory requirements.



### Accommodating a huge amount of diverse radioactive waste

**Solution:** Development of ground-level buildings optimized for the reception and packaging of different types of radioactive waste.

**Positive Impact:** Ensured efficient handling and storage of diverse waste packages, meeting safety and operational requirements.



### Ensuring safety and reversibility of waste storage

**Solution:** Implementation of a two-layer lining concept for underground galleries to manage geotechnical constraints and ensure long-term stability.

**Positive Impact:** Enhanced the stability and safety of underground structures, enabling future generations to decide on the continuation or recovery of stored waste.



### Managing long-term operation and decommissioning phases

**Solution:** Comprehensive planning for all phases of the project’s life cycle, including construction, operation, and decommissioning.

**Positive Impact:** Provided a sustainable framework for the project’s long-term operation, ensuring smooth transitions between phases.



### Meeting stringent nuclear safety standards

**Solution:** Detailed safety analysis and implementation of strict procedures to assess potential risks and inform of necessary measures.

**Positive Impact:** Secured the safety of waste packages and construction teams, meeting regulatory requirements and protecting future populations.



### Technical complexities of underground structures

**Solution:** Use of advanced calculation and projection methods, innovative materials, and optimization of construction techniques.

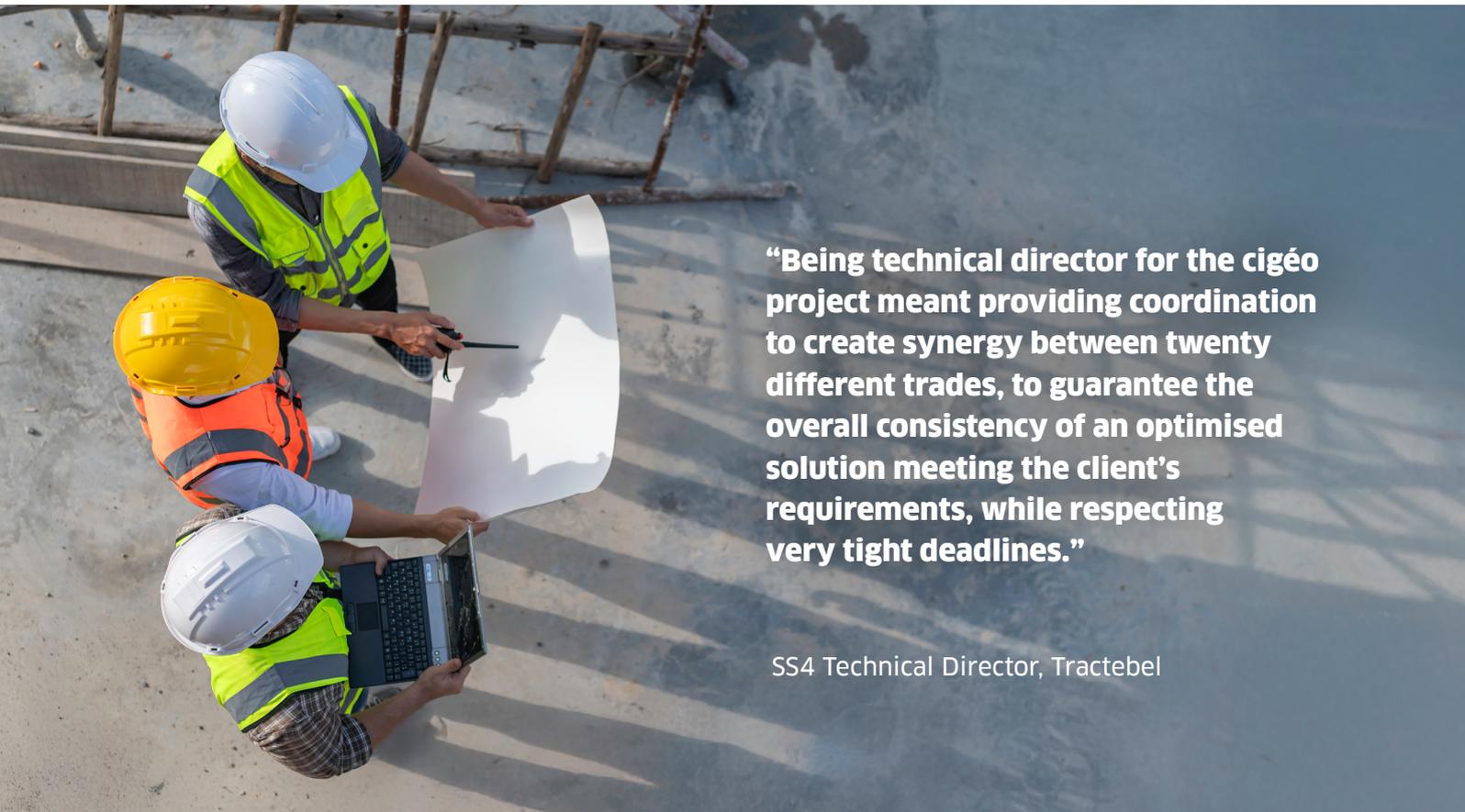
**Positive Impact:** Overcame technical obstacles, ensuring the feasibility and reliability of underground structures.



### Coordination among multiple trades and stakeholders

**Solution:** Implementation of BIM methodologies and collaborative approaches for effective coordination and visualization.

**Positive Impact:** Improved quality and speed of deliverables, facilitating better collaboration and integration among project teams.



**“Being technical director for the cigéo project meant providing coordination to create synergy between twenty different trades, to guarantee the overall consistency of an optimised solution meeting the client’s requirements, while respecting very tight deadlines.”**

SS4 Technical Director, Tractebel



## About us

Tractebel is a global engineering and consulting company delivering integrated solutions for sustainable energy and built environment projects. Our expertise is trusted worldwide across multiple markets like nuclear, renewables, power & gas, electrical grids, hydropower & dams, water resources & supply, desalination, complex & high-tech buildings, transport infrastructures, and ports & waterways.

By connecting strategy, design, engineering, social & environmental studies, project management

and in-house digital applications, we partner with companies and public authorities to create a positive impact on people and planet.

Backed by more than 150 years of experience, today Tractebel is a community of over 5,600 passionate experts across the globe, committed to ethical business and the fight against climate change. Tractebel is part of the ENGIE Group, a global reference in low-carbon energy and services.



## Nuclear expertise and experience

For over 60 years, Tractebel has provided trusted engineering and consulting services based on state-of-the-art nuclear expertise and experience across the whole life-cycle of a nuclear power plant. It has gained its operational expertise as the architect engineer, and responsible designer of the Belgian nuclear power fleet and the key civil engineering partner of the French nuclear operator. Tractebel leverages its **unparalleled nuclear expertise** to work on the world's greatest projects and **lead innovation** in **advanced nuclear technologies (fusion, research and small modular reactors)**.

## Key Figures



\*Q4 2025