

**SERVICE DE METROLOGIE NUCLEAIRE**  
**INDUSTRIAL RISK**

**MASTER THESES**

Academic year **2021-2022**

*The topics listed below correspond more to **themes** in which master theses can be realized, than to a detailed description of topics. Depending on the interest of the students, more theoretical or instead industry-related topics will be developed. Some of the proposed themes are more convenient for an internship, to be made before the master thesis.*

*The themes proposed are preferably **accessible mainly to students in engineering physics and in electromechanical engineering.***

**12. Safety risks associated with storage and transport through pipelines of CO<sub>2</sub> (in collaboration with Tractebel Engie)**

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*For master thesis and internship*



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## PROPOSAL FOR MASTER THESIS/INTERNSHIP

- **Safety risks associated with storage and transport through pipelines of CO<sub>2</sub> -**

### Context

In the context of energy transition, CO<sub>2</sub> will be more and more captured and stored or re-purposed. For instance, CO<sub>2</sub> can be combined with hydrogen to produce e-methane. This would decarbonize the activities of industrial sectors which are, for the moment, releasing significant amounts of CO<sub>2</sub>. It would also decarbonize sectors which are not (yet) ready for electrification, e.g. airplanes.

In relation to safety there are no consolidated approach and models regarding the management of risks during the different phases of such projects.

### Objective

The objectives of this master thesis are:

- To review the hazards and risks associated with CO<sub>2</sub> (transport, storage);
- To investigate the existing technology for transporting, using and storing CO<sub>2</sub>;
- To study accidents or incidents which have occurred with CO<sub>2</sub>, their causes and their consequences;
- To search for international standards / guidance / national guidelines regarding the transport, use and storage of CO<sub>2</sub>;
- To update the existing technical code for risk assessment of pipelines, to make it applicable to CO<sub>2</sub> pipelines (currently it is applicable for flammable gases)
- To define a methodology for modelling CO<sub>2</sub> pipelines incidents (leaks, etc.): comparison of models, assumptions, sensitivity study to identify the most important parameters, etc. This comprises the comparison related to dispersion of existing empiric computer models (PHAST DNV used by TRACTEBEL) with 3D – CFD models.

It is preferred to associate this master thesis with an internship in the Risk & Safety Management team of TRACTEBEL, the engineering company of the ENGIE Group, active in many sectors – energy, urban, water & nuclear. It will be an opportunity to work with experienced colleagues in the field of risk management, have contact with clients developing infrastructure for the future, to get familiarized with industrial software for modelling of accidents, and to discover a rich and stimulating work environment in TRACTEBEL.

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## We are a global community of imaginative experts engineering a carbon-neutral future.

Tractebel is a global engineering company delivering game-changing solutions for a carbon-neutral future. Insights gathered during our more than 150 years of experience in energy, urban, nuclear and water projects combined with local expertise allow us to tackle complex future-oriented projects.

By connecting strategy, design, engineering and project management, our community of imaginative experts helps companies and public authorities create positive impact towards a sustainable world, where people, planet and profit collectively thrive.

With offices in Europe, Africa, Asia, the Middle East and Latin America, the company registered a turnover of 581 million Euros in 2020. Tractebel is part of the ENGIE Group, a global reference in low-carbon energy and services.

### AREAS OF EXPERTISE

#### ENERGY

- Renewables (Solar, wind, Biomass)
- Digital & Decentralized Energy
- Thermal Energy
- Transmission & Distribution
- Natural Gas, LNG, Green Gas & E-fuels
- Offshore Energy
- Industrial process
- Hybrid systems with sector coupling

#### URBAN

- Cities & Territories
- Transport infrastructure
- Buildings

#### NUCLEAR

- Advanced Technologies
- New Build
- Plant Operation Support
- Radwaste Management
- Decommissioning and Dismantling

#### WATER

- Water Resources and Climate Change
- Irrigation
- Water Supply and Sanitation
- Desalination
- Hydropower
- Reservoirs and Dams
- Flood Protection
- Waterways
- Coasts and Estuaries
- Ports and Marine Facilities

### KEY FIGURES

- Presence in more than **70 countries**
- Projects developed in over **160 countries**
- 5,000 employees**
- € 581 million** turnover
- More than **70 technical publications/year**
- High Safety Standard: **Frequency Rate 0.7**



### PROJECT LIFE CYCLE

Tractebel adds value throughout the complete cycle of a project:

