



# Industrial Safety and Risk Management

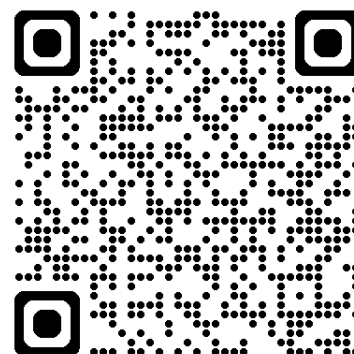
Product sheets

Brussels | Belgium



INTERNAL

22 April 2026



[engie.sharepoint.com/sites/TE-ISRM](https://engie.sharepoint.com/sites/TE-ISRM)



# Risk and Safety Management BE Belgium Risk & Safety Management



## A team of experts dedicated to safety in industrial projects

The mission of the transversal competence centre 'Risk and Safety Management' is to deliver the highest level of engineering and consultancy services regarding risk and safety management during the full life cycle of industrial assets.

Safety is essential to any industrial project, not only to comply with laws, regulations and standards, but also to prevent accidents that could put the project or organisation into jeopardy (during construction or operation). In addition, by taking a proactive approach towards risk and safety, late modifications or delays can often be avoided.

### The expertise

The expertise of the team covers a wide range of sectors and a wide range of competences. Sectors covered include nuclear industry, energy production (incl. thermal power, renewable energies, located onshore & offshore), transport and distribution of electricity, CNG, LNG, hydrogen, urban infrastructure and transports, petrochemical and pharmaceutical industry, computing and datacenters, banking,...

### Safety is good for business

The team 'Risk and Safety Management' provides real added value to clients by managing risk and safety in industrial projects, in a timely manner and cost-effective way. Experts will for instance:

- Identify any possible HSE showstopper at the early stages of a project (e.g. major permitting obstacle such as safety distances).
- Help to identify and manage risks and reduce losses, with techniques such as HAZID, HAZOP, etc.
- Contribute to safe and reliable designs.
- Identify and help projects comply with pertinent laws, regulations (e.g. European directives), industry standards and good practices.

### The team

The size of the team allows it to be transversal to all the energy and infrastructure sectors of Tractebel. It contains:

- Around 20 engineers from different backgrounds, most with an additional academic degree in prevention or safety engineering.
- 2 ENGIE key experts: 1 on project safety management, 1 on industrial safety assessment.
- 4 experts approved by authorities in Belgium for major hazard assessments according to SEVESO regulations.
- Several Safety Coordinators design phase and realisation phase (according to the transposition into Belgian law of the European Directive 92/57/EEC on Temporary or Mobile Construction Sites).



Safety is essential to any industrial project, not only to comply with laws, regulations and standards, but also to prevent accidents.

#### The tools

Tools include software licenses such as: PHA-Pro (for participative risk assessments), PHAST (for consequence modelling), PHAST Risk (for QRA), RiskSpectrum (for reliability and availability analysis), etc. Other tools and methods have been developed within the team, to optimise the application of safety within projects.



## COMPETENCES RISK AND SAFETY MANAGEMENT

DOMAIN OF COMPETENCE	TYPICAL MISSIONS
<b>RISK AND QHSE* MANAGEMENT SYSTEMS</b>	Design and implement a project safety management system for an industrial project (covering both industrial safety and construction site safety), HAZID, Value@Risk project risk assessment (using in-house method), quality audit, safety audit, lead H&S manager for an engineering project, etc.
<b>PROCESS AND FUNCTIONAL SAFETY ASSESSMENT</b>	Develop and implement a process / functional safety strategy, HAZOP, SIL allocation, e-HAZOP and SAFOP assessment (for electrical systems), etc.
<b>MAJOR HAZARD, FIRE AND EXPLOSION ASSESSMENT</b>	Develop and implement a fire safety strategy, develop and implement an explosion safety strategy, QRA (Quantitative Risk Assessment), consequence modelling, explosion risk assessment (ATEX), assessment of external risks of wind turbines, external human-induced event assessment, assessment of consequence of major hazards on nuclear power plants, SEVESO safety report (Flanders), etc.
<b>CONSTRUCTION SITE SAFETY MANAGEMENT</b>	Design and implement a safety management system for a construction site, define contractor specifications for managing safety on a construction site, safety coordination, safety audit (using ProSAT in-house tool), safety supervision, incident/accident investigation and root cause analysis, etc.
<b>ASSET HSE* CONFORMITY ASSESSMENT</b>	Define a conformity strategy for an industrial project, implement a conformity strategy, define a regulatory framework, add H&S requirements in technical specifications and procurement files, carry out assets conformity assessment, occupational H&S inspections, etc.
<b>RELIABILITY ASSESSMENT</b>	FMEA, quantitative fault tree reliability assessment, SQUAD availability assessment (using inhouse method), RAM (Reliability, Availability and Maintainability) analysis, etc.

# Squad Availability Assessment Risk & Safety Management



## SQUAD - Rigorous method for availability assessment

SQUAD is a powerful method developed and implemented by “Tractebel – Risk & Safety Management” to investigate the availability & reliability of any system that needs to fulfil a given function. SQUAD stands for Semi-QUantitative Availability analysis for Design of systems (i.e. using both qualitative and quantitative techniques), and consists in the combination of two analysis techniques:

1. A Failure Mode and Effect Analysis (FMEA) to identify failures and their effect on the system/function.
2. A fault tree model to calculate the system availability.

### Our approach

SQUAD is a two-step method.

#### First step: FMEA:

- Gather relevant system information,
- Define the scope and function to fulfil,
- Describe the functionality of the system,
- Perform the FMEA for each item and collect reliability data.

**Second step:** FTA (Fault Tree Analysis) – graphical representation of the propagation of component failures leading to system/function failure.

### Clients benefits

- Ensure that availability & reliability are numerically calculated.
- Allow the investigation of different hardware configurations corresponding to the targeted availability and investment.
- Identify the potential weaknesses and improvements of the system.
- Provide inputs for a reliability, availability and maintainability (RAM) analysis and for a maintenance plan.

### Offered service

- Preparation and facilitation of the FMEA to assure a complete investigation.
- Experienced and skilled FMEA facilitators and scribes.
- Experienced and skilled reliability engineers to assess the system availability, using specialised software tools.
- Efficient, complete and clear reporting.



# Combining FMEA and FTA techniques to ensure your availability and reliability targets are met

The FMEA is performed with a multidisciplinary team and is usually done during a workshop, facilitated by an experienced FMEA-leader and assisted by a FMEA-scribe.

The FTA and availability model is a desktop study based on the result from the FMEA and the system schematics, and using a specialised software tool.



## REFERENCES SQUAD AVAILABILITY ASSESSMENT

### RENEWABLE ENERGY

**SOUTH AFRICA – Eskom** – Availability analysis of the concentrated solar power demonstration plant in Upington.

### INDUSTRY

**BELGIUM – ENGIE Electrabel** – Availability assessment on the steam output of the Lanxess cogeneration plant in Antwerp.

**THE NETHERLANDS – ASML** – Availability investigation of a cooling system and an ultrapure water system.

**POLAND – Michelin** – Olstzyn – Availability assessment of different configurations for the tire factory energy center.

### THERMAL POWER PRODUCTION and DESALINATION

**SHETLANDS – ENGIE Cofely UK** – Detailed availability investigation with improvement proposals of the power station of the BP Sullom Voe oil terminal turning into single GT operation.

**AUSTRALIA – ENGIE Pelican Point** – Availability investigation of the impact on the CCGT power plant of the addition of a Battery Energy Storage System.

**FRANCE – Total** – Availability analysis of a hypothetical off-grid gas power plant supplying a LNG terminal, incl. comparison between gas engines and gas turbines, comparison between OCGT and CCGT, and assessment of additional BESS.

**MOROCCO – ENGIE-Nareva** – Dakhla – Availability study of desalination plant.

### GAS, LNG and H2-INDUSTRY

**JORDAN – Aqaba Development Corporation Expert** – Terminal overall availability analysis of the LNG Terminal Aqaba.

**ALGERIA – Sonatrach** – Hassi Messaoud – Availability assessment of gas compression stations as part of a revamping project.

### TRANSMISSION & DISTRIBUTION

**ALGERIA – Siemens / Sonelgaz** – Availability study of 8 existing SCADA systems for the distribution of electricity in Algeria.



TRACTEBEL

ENGIE

# Safety Integrity Level Allocation Risk & Safety Management



## A method to determine the required performance of safety instrumented functions

Safety instrumented systems are designed to reduce the risks associated with the operation of a process which can be dangerous for humans, environment and equipment. The SIL allocation is a technique of risk assessment used to identify safety instrumented systems and to determine the required safety level of the instrumented systems.

This analysis is usually led during the detailed design phase in order to optimize the design and reach the required levels of safety.

### Our approach

- Definition of the acceptable level of the risks according to standards and client requirements.
- Determination of scenarios leading to the loss of integrity of the installation (usually made on the basis of a HAZOP analysis).
- Identification of the Safety Instrumented Functions (SIF's).
- Determination of the required SIL of the defined SIF's.
- Decision if the defined SIS (Safety Instrumented System) is appropriate to accomplish its mission of avoiding a sequence of events leading to a serious accident.
- Formulation of recommendations for additional safeguards if required.

### Clients benefits

- Internationally recognized standards
- Risk-based approach for determining the required performance of safety-related systems.
- Technically sound, system-based approach, with sufficient flexibility for the future.
- The required safety can be reached without extensive change of the process technology.
- Assure optimal design in order to reduce efforts during O&M.

### Offered service

- Accurate and objective analysis brought by:
- Qualified and experienced experts, who guide the team through the SIL session. They will assure that all participants are familiar with the process in order to guarantee a deeply analysis and quality results.
  - The use of software which allows reporting and tracking the recommendations and SIL determination during the SIL study.



# Assuring optimal design of your installation in order to reduce efforts during Operations & Maintenance

This study is performed during one or more participative SIL allocation sessions. The SIL analysis fits typically into the continuity of an HAZOP analysis.

The SIL assessment is led by a safety expert, in the presence of representatives from the field of process and instrumentation and other disciplines (safety, operation, maintenance, etc.). Team members must have extensive knowledge and experience on the installations and the process.



## REFERENCES SAFETY INTEGRITY LEVEL ALLOCATION

### **GAS, LNG and H2-INDUSTRY**

**BELGIUM - Fluxys** - SIL assessment for an ORV (Open Rack Vaporizer).

**FRANCE - Storengy** - SIL assessment of the gas installations of an underground storage facility.

**ESTONIA - Balti Gaas** - SIL allocation definition for LNG terminal FEED project.

**FRANCE - Elengy** - HAZOP update and SIL determination during EPCM phase of the LNG truck loading station on the LNG terminals of FOS TONKIN and FOS CAVAOU.

### **RENEWABLE ENERGY**

**FRANCE - Ailes Marines SAS** - St Brieuc - HAZOP study and SIL assessment on process systems of the offshore electrical substation.

### **INDUSTRY**

**BELGIUM - Port of Antwerp** - Study for the automation of locks in the harbour.

### **THERMAL POWER PRODUCTION**

#### **THE NETHERLANDS - ENGIE**

**Electrabel** - SIL assessment of a coal fired power plant.

**BELGIUM - ENGIE Electrabel** - SIL allocation of a gas turbine.

**Germany** - SIL allocation due to replacement of steam turbine.

# QRA Quantitative Risk Assessment Risk & Safety Management



## A quantitative method to identify and assess the risk of potential major hazards related to your industrial assets

A quantitative risk assessment (QRA) study is a safety management and risk control tool, which can be used throughout the life cycle of an industrial asset. A QRA is able to evaluate potential risks while qualitative methods are less adequate to interpret these. As it provides quantitative results of the assessed risks, it is possible to prove that the risks respect the acceptance levels and a QRA is therefore a widely used tool in the permitting process for new projects (permitting QRA).

Developing a QRA study at an early stage of designing an industrial asset helps also to ensure optimal development and safe operation (engineering QRA). During the lifetime of an industrial asset, the QRA study checks whether the risk reductions undertaken are appropriate and if other measures need to be implemented.

### Our approach

- Selection of relevant hazardous equipment and activities.
- Identification of 'loss of containment' events.
- Use of specialized software to model the dispersion and physical consequence of the 'loss of containment'.
- Map the neighbouring population subject to the identified major hazard events.
- Risk quantification, combination of calculated consequences, presence of humans and frequency of occurrence.
- Present the study result in a report.

### Clients benefits

- Regulatory compliance/acceptance as part of a permitting process.
- Evaluate alternative risk reduction strategies.
- Optimise design to limit the consequences of major hazards.
- Geographic view of the impact of major hazard events.
- Input for emergency planning.
- Identification of processes and operations that need refinement.

### Offered service

Effective major hazard control and mitigation by providing:

- Skilled and experienced persons who have training in major hazard management, process safety and risk assessment.
- The use of appropriate tools, such as the latest dedicated software models and methods that ensure quality results for a complete modelling of major hazards.
- Guidance of your project through the permitting process related to major hazards (SEVESO reports, COMAH).
- Proposals for risk reduction solutions focusing on the top risks.



Providing a comprehensive overview of major risks, their geographical distribution, their effects and probability of occurrence

The QRA method offered identifies hazardous events, and their causes and consequences in order to control the major hazards of the industrial facility.

A quantitative analysis of major hazards is performed to provide information related to the risks for public, workers, environment and equipment and identifies the geographic distribution of these effects. A range of risk reduction strategies can be proposed based on these results.



## REFERENCES QUANTITATIVE RISK ASSESSMENT

### **GAS, LNG and H2-INDUSTRY**

**CHINA - Beijing United Gas Engineering** - QRA Beijing Southwest Liquefaction Plant

**BELGIUM - Fluxys** - Bow-tie major hazard identification of a modification project underground natural gas storage

**CROATIA - LNG Hrvatska** - Krk Island - QRA of LNG terminal followed by QRA of FSRU terminal.

**BELGIUM - Jost** - QRA in the frame of the permit application for a LNG refuelling station for trucks in Herstal and Waarloos.

**BELGIUM - Bruxelles Energie** - Hydrogen production & tube trailer filling: preliminary consequence modelling and safety distances calculation.

### **RENEWABLE ENERGY**

**FRANCE - UEM** - Major hazard assessment biomass plant (Etude de danger).

### **INDUSTRY**

**BELGIUM - EPDC** - Feasibility evaluation by use of QRA for propylene pumping station.

**BELGIUM - Ineos** - Seveso safety assessment report for a ETOX and derivate production facility.

### **NUCLEAR**

**BELGIUM - Belgoprocess** - Assessment of external risk caused by a gas substation towards a nuclear waste facility.

**BELGIUM - ENGIE** - QRA as part of the periodic safety review of nuclear power plants.

### **THERMAL POWER PRODUCTION**

**FRANCE - ENGIE Cofely** - Major hazard assessment cogeneration at CABOT (Etude de danger).

### **INFRASTRUCTURE**

**BELGIUM - BAM** - QRA related to the assessment of transport of dangerous good through a road tunnel.

**BELGIUM - Department Of Mobility And Public Works** - External safety report for the expansion of container capacity in the port of Antwerp.

**BELGIUM - Lantis** - Evaluation of different tunnel alternatives by a QRA assessment of the risks related to the transport of dangerous goods.



TRACTEBEL

ENGIE

# ProSAT Project Safety Assessment Tool Risk & Safety Management



## A structured approach to assess safety management and associated performance for projects under development

ProSAT is a methodology developed by Tractebel to evaluate a project's safety performance, and more precisely to evaluate leading and lagging processes related to site safety. The tool is designed to address site safety during different stages of the project, and facilitates the comparison between audit sessions.

The ProSAT audits can be integrated into the overall project management process.

### Our approach

- Planning the audit (appoint a team of auditors, select the required documents to review, identify the functions to interview and set up an assessment planning).
- Executing the audit (analyse the documentation, tailor the ProSAT audit tool of the project, organize interviews with the people identified, carry out site visits and record evidences and examples in the software database).
- Reporting the results of the audit (analyse and report the results gathered in the audit).

### Clients benefits

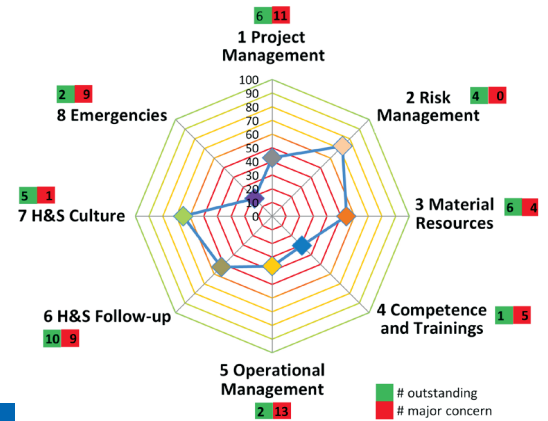
- Provides a clear and an objective picture of the project safety performance.
- Identifies factors that could jeopardize the realization of the safety objectives.
- Ease of use of the results by the project manager.
- Amplifies the capabilities of the experienced auditors without hindering their expertise.
- Provides conclusions allowing the identification of well targeted recommendations.

### Offered service

- Tailoring of the ProSAT in-house developed audit tool, to provide a structured and objective assessment of the safety performance of your project.
- Highly qualified and experienced ProSAT auditors.
- A comprehensive well-structured audit report including graphical representations from the ProSAT audit tool.



Assessing your project against the requirements and with the help of checkpoints: human resources, material resources, rules, REX, coordination, document management, etc.



## REFERENCES PROJECT SAFETY ASSESSMENT TOOL

### THERMAL POWER PRODUCTION

**MOROCCO - Safiec** - HSE audit using ProSAT methodology during the construction of the Safi power plant.

### RENEWABLE ENERGY

**SAUDI ARABIA - Saline Water Conversion Company** - Industrial safety and construction site safety assessment for the Western Coast Satellite Desalination Plants project powered by renewable energies.

### DJIBOUTI - Electricité de Djibouti

- Ghoubet Onshore Wind Farm - ProSAT Site Safety Audits during construction.

**SENEGAL - Lekela** - HSE audit using ProSAT methodology on the construction of an onshore windturbine farm near the village of Taiba 'N Diaye.

**EGYPT- Lekela** - West Bahr On-shore Wind Farm - ProSAT Site Safety Audit during construction.

### POWER TRANSMISSION & DISTRIBUTION and BATTERY STORAGE

**CONGO - SNEL** - HSE audit of the construction works for the rehabilitation and modernization of the INGA HV substation.



TRACTEBEL

ENGIE

# Project Safety Management

## Risk & Safety Management



## Structured integration of health and safety during project development and realization

Project safety management is a systematic approach integrating safety in the project processes. It starts from the development phase and continues throughout the project.

It implies the management of:

- Industrial risks, related to operation and maintenance; and/or
- Construction site safety.

Integrating a structured H&S (Health & Safety) approach in an early stage of the project will enable the project organisation to identify and manage the H&S risks associated with the project in a (cost) effective way.

### Our approach

- Identify the applicable H&S regulations, requirements and rules.
- Coach the project/site management in the area of H&S.
- Develop project specific strategies in compliance with the specific regulations and project needs.
- Identify and use the needed tools and work force to implement these strategies.
- Implement these strategies in all the project processes as an integrated member of the project team.
- Monitor the effectiveness of the H&S strategies.
- Assure the correct application of the project's H&S rules and the safety reporting.
- Organise an end of project evaluation.

### Clients benefits

- Prevent human injury, loss of life and avoid damage to the environment or property throughout the whole life cycle of a project.
- Realise an installation compliant with the relevant H&S regulations and requirements (e.g. from the client, the project organisation, legislation, other stakeholders, etc.).
- Dispose of a complete set of safety documentation at the end of the project, for handover to operation.

### Offered service

- H&S engineers who have leadership skills and are able to establish good working relationships with the project team and external parties.
- Knowledge in H&S management systems, risk assessment processes, regulatory requirements, standards and good practices.

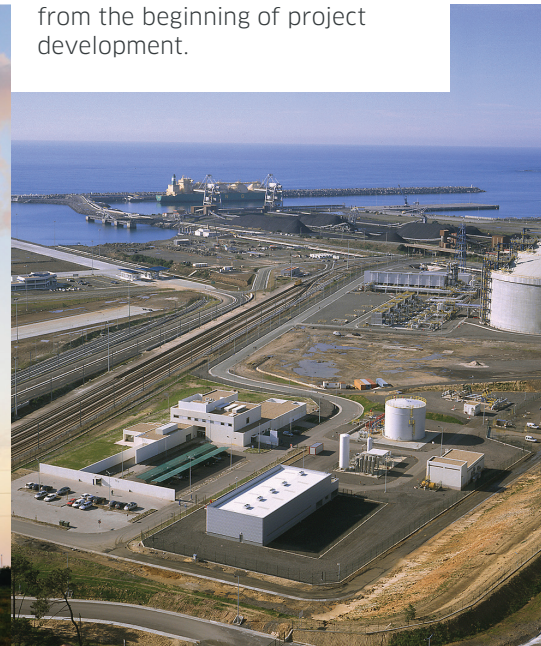


Process managed by a H&S engineer, interfacing with all project disciplines and assuring prompt reporting of safety issues

Depending on the project needs, the following domains can be covered:

**Industrial safety** is developed in parallel with the successive steps of the project processes in order to prevent safety risks during the future operation and maintenance phase.

**Construction site safety** is developed in order to prevent safety risks during the construction and commissioning phases. Preparation of the construction site starts from the beginning of project development.



## REFERENCES PROJECT SAFETY MANAGEMENT

### RENEWABLE ENERGY

**THE NETHERLANDS – GDF Suez Nederland** – H&S management biomass project Gelderland.

**BELGIUM – Elia** – HSE management during the design phase of the Modular Offshore Grid project.

**PORTUGAL – Windfloat Atlantic** – HSE management during procurement and construction of the offshore floating wind project.

### NUCLEAR INDUSTRY

**BELGIUM – ENGIE Electrabel** – Management industrial safety during modification/renovation projects

### THERMAL POWER PRODUCTION

**GERMANY & THE NETHERLANDS – GDF Suez Nederland/**

**Deutschland** – Complete H&S management of the construction projects of coal fired power plants.

**MOROCCO – Safiec** – H&S management as part of the Owner's Engineer mission for the construction of a coal fired power plant.

**BELGIUM – ENGIE** – HSE management for the retrofit of the energy-from-waste powerplant in Schaerbeek, Brussels.

### GAS, LNG and H2-INDUSTRY

**FRANCE – Storengy** – H&S management renovation compression/treatment units.

**BELGIUM – Fluxys** – H&S management Open Rack Vaporiser project.

**JORDAN – APC & JBC** – Safety Management of the APC-JBC gas pipeline project, with several visits to site, from design to full completion of the project.

### INFRASTRUCTURE

**BELGIUM – Besix / Cofely Fabricom** – Construction Site Safety Coordination for the renovation of the Leopold 2 tunnel in Brussels.

# Occupational Health & Safety Inspection

## Risk & Safety Management



## Identification of occupational non-conformities and hazardous areas on the installation, the working place and the surroundings

The method offered by “Tractebel – Risk & Safety Management” aims to verify regulatory and functional compliance of equipment and facilities. By means of checks and measurements, the situations of non-compliance and the risk factors for people, assets and environment are identified. This identification allows implementing corrective actions if required.

These inspections can be carried out pro-actively on design drawings, during construction phase, during the handing over of a project or at the operation & maintenance phase.

### Our approach

- Provide an inspection checklist to ensure a systematic approach.
- Visual inspection and measurements performed on the workplace by the expert.
- List potential non-conformities in an inspection report, including a detailed description, allowing setting priorities and making decisions.

### Clients benefits

- Verification of regulatory compliance and the correct use of industrial standards.
- Ensuring a low risk workplace and working conditions.
- Close and efficient follow-up of construction works of your contractors.

### Offered service

- Inspection carried out by a qualified and experienced expert with both technical and regulatory knowledge, supported by a methodical approach and associated tools.
- Detailed report with photos and descriptions of the non-conformities. This report will enclose recommendations for preventive, remedial or improvement actions to solve the non-conformities.



Performing complete inspection of the workplaces, considering all safety aspects and regulatory requirements that relate to the facility

This inspection is a critical examination of the working place and surroundings. This inspection is carried out by a safety expert who has technical knowledge, experience with the concerned asset and has knowledge of the industrial standards regarding safety.

This inspection is preferably carried out together with the (future) operator. Other participants could be foreseen, as for example stakeholders of the project/installation.



## REFERENCES OCCUPATIONAL HEALTH & SAFETY INSPECTION

### RENEWABLE ENERGY (biomass and offshore wind)

#### THE NETHERLANDS - ENGIE

**Electrabel** - Safety Inspection of a biomass installation at Electrabel Centrale Gelderland.

#### BELGIUM - ENGIE Electrabel

- Safety Inspection of a biomass installation at Electrabel Centrale Rodenhuize.

#### PORTUGAL/ SPAIN - Windfloat

**Atlantic** - Safety inspection of offshore floating wind turbines

### THERMAL POWER PRODUCTION

#### THE NETHERLANDS - ENGIE

**Electrabel** - Safety inspection of Maxima gas fired combined cycle at Flevo.

#### HUNGARY - Dunamenti Etőmű ZRT

- Safety inspection of GFPP at Dunamenti.

#### THE NETHERLANDS - ENGIE

**Electrabel** - Safety inspection of Coal Fired Power Plant at Rotterdam.

### GAS, LNG AND H2-INDUSTRY

**BELGIUM - Fluxys** - Multiple Safety Inspections at Fluxys LNG Terminal (ORV Project).

**FRANCE - ENGIE** - Multiple Safety Inspections at Saint-Illiers Compression Station.

### NUCLEAR INDUSTRY

#### BELGIUM - ENGIE Electrabel -

Safety Inspections at the Nuclear Power Plant of Doel.

#### BELGIUM - ENGIE Electrabel -

Safety Inspections at the Nuclear Power Plant of Tihange.

### INFRASTRUCTURE

#### EUROPEAN COMMISSION - Joint

**Research Centre (JRC)** - Geel - Safety installations inspections on the roofs.

# Incident/Accident Investigation and Root Causes Analysis

## Risk & Safety Management



## A Preventive Tool for Systematic Analysis of Accidents and High Potential Incidents

Incident/accident investigation is a preventive tool and one of the corner stones of any relevant safety management system. The investigation and management of incidents/accidents improves H&S (Health & safety) performances by:

- Identifying both immediate and root causes.
- Identifying measures to prevent recurrence of similar events and by that way reducing risk to people and assets.

### Our approach

- Investigation in order to gather the relevant events, circumstances and documents.
- Establishing a first investigation report (notification) which provides a factual and objective description of the incident/accident.
- Performing the causal tree analysis, where required, to identify immediate and root causes.
- Providing recommendations for preventive and corrective actions.
- Establishing a causal tree analysis report,
- Managing the corrective action plan to ensure that all recommendations are implemented.

### Clients benefits

- Find out both immediate and root causes that led to the incident/accident.
- Define and implement an action plan to prevent the recurrence of similar incidents/accidents.
- Fulfil legal requirements.

### Offered service

- A systematic incident/accident investigation and analysis methodology in compliance with the standards OSHA 1960.29, OHSAS 18001 and ISO 45001.
- Skilled experts in conducting incident/accident investigations and causal analysis.
- Ability to react quickly.



# Processes for incident/accident investigation and causal analysis facilitated by different tools and templates developed by “Tractebel – Risk & Safety Management”

The participative method proposed by “Tractebel – Risk & Safety Management” allows a systematic identification of the immediate and root causes of incidents/accidents by using a causal tree analysis for the identification of preventive measures.

The incident/accident management and investigation must be led by a qualified and experienced Expert in that matter. It requires enough understanding of the context by giving the right attention to technical process, the organisation of the activities, the procedures, human factors, etc.



## REFERENCES INCIDENT/ACCIDENT INVESTIGATION AND ROOT CAUSES ANALYSIS

### ALL SECTORS

The described approach has been used in numerous cases in which Tractebel analysed incidents or accidents at the demand of our Customers.



## A methodology to identify and control hazards in a structured and systematic way on existing plants, modifications to existing units or new projects

The HAZOP analysis offered by “Tractebel – Risk & Safety Management” is a powerful risk assessment technique for identifying and addressing hazards and for controlling undesirable events or engineering issues of an installation.

The method may be used at the design stage, when plant alterations or extensions are to be made, or applied to an existing facility. A HAZOP study is normally conducted when piping and instrumentation diagrams (P&IDs) or process flow diagrams (PFDs) are available and sufficiently developed for the plant under consideration.

### Our approach

- Breaking the overall complex design of the process into a number of simpler sections called 'nodes'.
- Use of a list of selected and pre-defined guide-words and process parameters to identify potential deviations from the design intent.
- Identification of possible causes and likely consequences, and assessment of risk using a risk matrix.
- Evaluation of existing safeguards and the necessity for additional recommendations.

### Clients benefits

- The process enables a comprehensive evaluation of hazard control systems and provides recommendations for any necessary modifications.
- Rigorous, systematic and thorough method even for complex installations.
- Avoid budget over-runs and project delays due to additional changes during the pre and post start-up.
- Can be used as training aid for plant personnel and to prepare operating manuals.
- Support to comply with the requirements for process safety of Seveso sites.

### Offered service

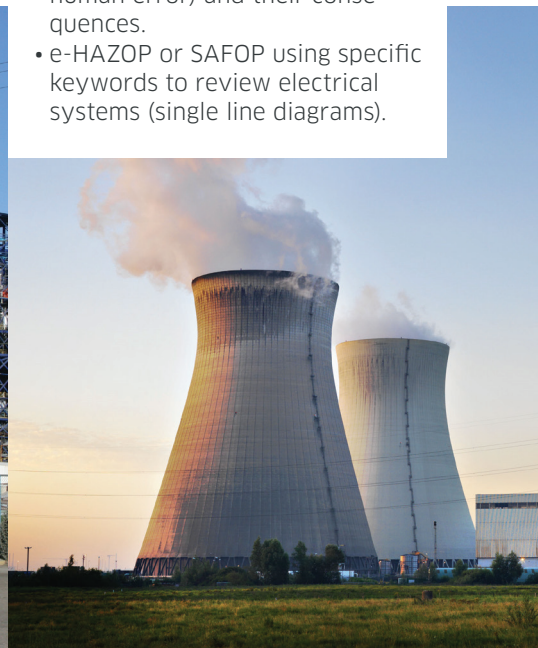
- Highly qualified and experienced HAZOP leaders, who guide the team through the HAZOP session and ensure the overall quality of the review.
- The use of appropriate software which allows high flexibility for the preparation of the session and to support the recording in real-time during the sessions.
- Link between the HAZOP and the SIL allocation, based on IEC 61508 and IEC 61511 standards.



Leading the HAZOP study, carried out by a suitably experienced multi-disciplinary team and ensuring the overall quality of the review

Depending on the level of detail available and the nature of the subject under study, different types of HAZOP can be performed:

- “Coarse HAZOP” during the basic design phase (PFD level).
- “Detailed Design HAZOP” during the detailed design stage (P&ID level).
- “Operational HAZOP”, to review critical operational procedures by using specific guidewords to identify deviations (especially human error) and their consequences.
- e-HAZOP or SAFOP using specific keywords to review electrical systems (single line diagrams).



## REFERENCES HAZARD AND OPERABILITY STUDY

### GAS, LNG and H2-INDUSTRY

**INDIA** – HAZOP study on LNG unloading and storage plant.

**FRANCE** – HAZOP study on underground NG storage.

**ESTONIA – Balti Gaas** – HAZOP study LNG terminal FEED project.

**GERMANY – GLNG** – Brunsbutte – HAZOP study LNG terminal FEED project.

**SINGAPORE – ENGIE** – REIDS project – HAZOP study on the detailed design of a hydrogen and oxygen production and storage, fuel cell and hydrogen refuelling station.

### THERMAL POWER PRODUCTION

**CHILE** – HAZOP study of coal fired power plant (CFPP).

**GERMANY** – Coarse HAZOP study on the basic design and interfaces of a green field CFPP.

**BELGIUM – ENGIE** – HAZOP study of a gas turbine package for a power plant retrofit in Schaerbeek, Brussels.

### INDUSTRY

**THE NETHERLANDS – Google** – Eemshaven – HAZOP study of a datacentre cooling water supply.

### RENEWABLE ENERGY

**BELGIUM** – HAZOP study of wood dust in an incineration plant.

**THE NETHERLANDS** – HAZOP study Pilot Plant CO<sub>2</sub> recovery on existing CFPP.

**BELGIUM** – HAZOP on process systems and e-HAZOP on electrical systems of offshore wind farm substations.

**FRANCE – Ailes Marines SAS** – St Briec – HAZOP study and SIL assessment on process systems of an offshore wind farm substation.

### NUCLEAR

**BELGIUM** – HAZOP study of the basic design for a new installation in the classical island.



TRACTEBEL

ENGIE

# HAZID Hazard Identification Study Risk & Safety Management



## A powerful method for identifying HSE hazards at an early stage in a project lifecycle

A HAZID (HAZard IDentification) is a preliminary risk assessment technique which is used early in project development as soon as the first project information is available (first process flow diagrams, lay-out and project plan). This is usually done at the feasibility or basic design stage of a project.

The HAZID method offered by “Tractebel – Risk & Safety Management” is a technique to identify main HSE (Health, Safety & Environment) hazards which may have the potential to impact the project, to review the already foreseen mitigating measures and, where required, to expand these measures in order to achieve a tolerable residual risk. This is done by the systematic identification of any HSE hazard; it does not aim at solving problems but identifying them.

### Our approach

- Use of a carefully chosen set of categories and guidewords for types of hazards.
- Examine each guideword during the session by a team of competent engineers from a mixture of disciplines.
- Evaluation of the risk and record of existing means to either eliminate the hazard or control the risk.
- Evaluation of the residual risk and necessity of additional mitigation control.

### Clients benefits

- Reveal HSE hazards at an early stage in the project, before significant costs have been incurred.
- Avoid budget over-runs and project delays due to too late revealed hazards and associated corrective actions.
- Record hazards and associated mitigating actions in a structured way. This will enable a close follow up during the complete lifecycle of the project and makes it auditable to management or external inspectors.

### Offered service

Provision of an experienced HAZID-leader and HAZID-scribe who will:

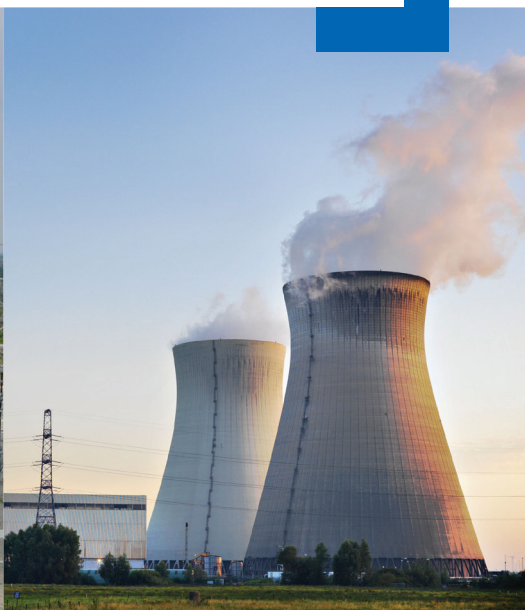
- Prepare the HAZID and write the ToR (Terms of Reference), acknowledging the project scope, if needed dividing the project/system into manageable and logical sections, choosing and adapting the list of categories and guidewords suitable for the project or system to be analysed.
- Guide the team through the HAZID session in a formal and consistent manner and capture the relevant results into the HAZID worksheet.
- Prepare after the sessions a full report which is submitted to the Owner.



# Avoid budget over-runs and project delays due to too late revealed hazards

The HAZID method is a systematic and structured hazard identification technique.

The guidewords are based on applicable standards and on previous similar projects. The method also uses a risk matrix that defines the risk acceptance framework.



## REFERENCES HAZARD IDENTIFICATION STUDY

### RENEWABLE ENERGY (wind, solar, biomass, ...)

**BELGIUM - North Sea** - HAZID study related to the development of an offshore high voltage platform and island and associated cable connections.

**BELGIUM - Rodenhuize** - HAZID study of the preliminary design related to a biomass conversion.

**THE NETHERLANDS - Gelderland** - HAZID study of the Gelderland power station related to the development of a biomass conversion project.

**THE NETHERLANDS - ENGIE** - Rilland - HAZID study of an anaerobic digestion plant.

**THE NETHERLANDS - Tennet** - Holland Kust Noord wind farm - HAZID study of the offshore substation.

### NUCLEAR

**BELGIUM - Dessel** - HAZID study related to the logistics associated with Heeled UF6 storage.

**THE NETHERLANDS** - HAZID study during early project development phase of a low radioactive waste storage.

**THE NETHERLANDS - Pallas** - HAZID study at the start of Basic Design of a medical isotopes reactor project.

### POWER TRANSMISSION & DISTRIBUTION and BATTERY STORAGE

**BELGIUM - Total** - Antwerp - HAZID study related to the replacement of 36kV switchgear at the TOTAL refinery.

**BRAZIL - EOS-Energy Storage** - Tubarao - HAZID study of battery energy storage system.

**BELGIUM - ENGIE-Umicore** - Olen - HAZID study of a battery energy storage system.

### THERMAL POWER PRODUCTION

**FRANCE** - HAZID study related to the development of a COGEN unit on an industrial site.

**CHILE** - HAZID study related to the development of 4 coal units in Chile.

### GAS, LNG and H2-INDUSTRY

**BRAZIL - Rio Grande** - HAZID study for the development of a LNG Import Terminal.

**MOROCCO - Jorf Lasfar** - HAZID study for the development of a LNG Import Terminal.

**CROATIA - LNG Hrvatska** - Krk Island - HAZID study during FEED of a FSRU terminal.

**GERMANY - GLNG** - Brunsbutte - HAZID study for the development of a LNG terminal.

**THE NETHERLANDS - Jumbo Maritime** - HAZID study during the development of a LNG fuelled ship.

**CHILE - ENGIE Hypergreen** - HAZID study as part of the feasibility of a hydrogen project.

**IVORY COAST - Iveco** - Abidjan - HAZID study of a CNG station.

# FMEA

## Failure Mode and Effects Analysis

### Risk & Safety Management



## Structured method for identifying failures of a product or system and their effects

FMEA is a participative risk analysis technique to identify failures of components/items belonging to a product or system and the effect of the failure on the product/system. For every failure mode, the effect on the product/system or function is evaluated.

### Our approach

- Gather relevant system information,
- Define the scope boundary.
- Describe the functionality of the system,
- Perform the FMEA covering each component / item of the system during a workshop.
- Assign and prioritize preventive and corrective measures to reduce risk.
- Conclude on the agreed actions to reduce the risk.
- Document the analysis in a comprehensive report.

### Clients benefits

- Ensure that failures and their effects are identified.
- Identify preventive and corrective measures.
- Avoid late costly changes by early identification of design deficiencies.
- Provide a way to understand the functionality of systems.
- Provide input for maintenance.
- Provide input for a RAM (Reliability, Availability and Maintainability) study.

### Offered service

- Preparation and facilitation of any FMEA to assure a complete investigation.
- Experienced and skilled FMEA facilitators and scribes.
- Efficient, complete and clear reporting.
- Experienced engineers/experts to participate in the multidisciplinary FMEA team.



# Identifying failures and effects of your installation

FMEA is performed with a multi-disciplinary team related to the study object. The analysis itself is usually done during a workshop, facilitated by an experienced FMEA-leader and assisted by a scribe. The scribe records the full analysis live during the workshop.



## REFERENCES FAILURE MODE AND EFFECTS ANALYSIS

### RENEWABLE ENERGY

**THE NETHERLANDS - Eneco** - FMEA analysis of the Luchterduinen electrical offshore substation.

**BELGIUM - Mermaid and Seastar** - FMECA study of the Grid Connection System of the SeaMade offshore wind farms.

**FRANCE - Ailes Marines SAS** - St. BRIEUC - FMEA study of the offshore electrical substation.

### NUCLEAR

**GERMANY - IFMIF** - FMECA analysis of the accelerator facility and test facility of the International Fusion Materials Irradiation Facility.

### THERMAL POWER PRODUCTION

**SHETLANDS - Cofely UK** - FMEA investigation of the Sullom Voe power station turning into single gas turbine operation.

**THE NETHERLANDS - ASML** - FMEA investigations of a datacenter, a cooling system and an ultrapure water system.

**AUSTRALIA - ENGIE Pelican Point** - FMEA investigation of the impact on the CCGT power plant of the addition of a Battery Energy Storage System.

### GAS, LNG and H2-INDUSTRY

**ALGERIA - Sonatrach** - Hassi Messaoud - FMEA of gas compression stations as part of a revamping project.

### TRANSMISSION & DISTRIBUTION

**ALGERIA - Siemens / Sonelgaz** - FMEA study of 8 existing SCADA systems for the distribution of electricity in Algeria.

### INDUSTRY

**BELGIUM - Katholieke Universiteit Leuven** - Reliability assessment electrical feed and distribution system KUL university campus by performing FMECA analysis.

**BELGIUM - ENGIE Electrabel** - Availability assessment on the steam output of the Lanxess cogeneration unit in Antwerp.

**POLAND - Michelin** - Olstzyn - FMEA study of different configurations for the tire factory energy center.

**THE NETHERLANDS - Google** - Eemshaven - FMEA study of a datacentre cooling water supply.



# TRACTEBEL

ENGIE

## External Human Induced Event Assessment Risk & Safety Management



### An assessment of the human external induced events in relation to safety of critical assets

An external event assessment evaluates the risks caused by human induced events which have the potential to jeopardize the safety of critical assets but are initiated externally outside the plant border. Such events include release of flammable, explosive, asphyxiating, toxic materials and airplane impact.

The assessment offered by “Tractebel – Risk & Safety Management” focuses on release of flammable, explosive, asphyxiating or toxic materials. Airplane impact (effect and/or probability) is assessed by engineers in the nuclear department.

#### Our approach

- Identification of the legal framework,
- Determination of the applicable risk criteria,
- Inventory of all important human induced hazards in the neighbourhood,
- Deterministic modelling of the consequences of the release accident scenarios,
- Pronunciation on the safety of the asset under study,
- Improvements can be proposed to comply with the requirements.


#### Clients benefits

- Demonstration of the compliance with current safety standards / criteria.
- Demonstration of compliance of the plant with the licensing basis.
- Identification of safety improvements to resolve eventual safety issues.
- Collaboration with the nuclear department for the assessment of airplane impact.


#### Offered service

- The service offered by “Tractebel – Risk & Safety Management” consists in performing a complete, objective and detailed external human induced event assessment, covering release of flammable, explosive, asphyxiating or toxic materials from stationary or mobile sources.





Assessment of external human induced events with the objective of making a pronouncement on acceptability, with respect to the criteria



## REFERENCES EXTERNAL HUMAN INDUCED EVENT ASSESSMENT

### NUCLEAR

**BELGIUM – ENGIE Electrabel** – Ten-yearly safety assessments of the external human induced events - Doel and Tihange nuclear power plants (ongoing since 1995).

**FRANCE – European Pressurized Reactor of France in Tricastin** – Study of the external human induced risk for the European Pressurized Reactor.

# Explosion Risk Assessment Risk & Safety Management



## An independent review of the explosion risks

An ATEX study of an installation demonstrates that the explosion risks have been determined and assessed. This assessment is normally performed during the detailed design phase of an installation, but can also be performed during the operational phase of an installation.

The method offered by “Tractebel – Risk & Safety Management” allows the management of explosion risks, the elaboration of hazardous area classification drawings, and the writing of the EPD (Explosion Protection Document), mandatory document (in Europe) which must be created before the commissioning of installations and kept up to date throughout the life cycle of the installation.

### Our approach

- Listing of all possible flammable substances present in the installations.
- Subdivision of the installation in relevant and manageable sections.
- Definition of zone type and zone extend where a flammable substance may mix with air and form an explosive atmosphere.
- Evaluation of all relevant ignition sources,
- Identification of adequate safeguards (e.g. explosion panels) if needed, to limit the consequences of an explosion to an acceptable level.

### Clients benefits

- Independent assessment of the explosion risks of an installation.
- Facilitate the proper selection of equipment to be used in potentially explosive atmospheres.
- Training aid for plant personnel.
- Relevant information for elaboration of O&M procedures.
- Regulatory compliance (e.g. ‘ATEX equipment’ Directive 2014/34/EU and ‘ATEX workplace’ Directive 1999/92/EC in Europe).

### Offered service

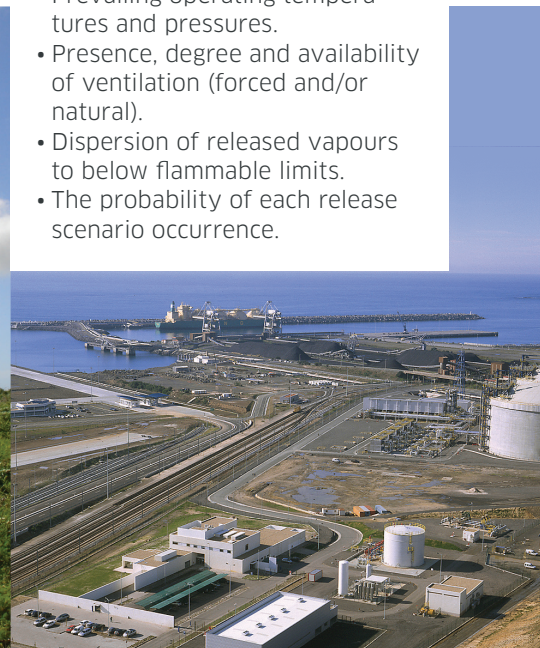
- Perform an explosion risk assessment of an installation during the design or operation phase.
- Define ATEX zoning and provide hazardous area classification drawings.
- Review the contractor design so it corresponds to good practices regarding explosion safety.
- Audit the assets and O&M procedures for compliance with regulations and good practices.
- Produce an exhaustive and structured document answering to regulatory requirements (Explosion Protection Document).



# Performing an explosion risk assessment of an installation during the design or operation phase

The ATEX study is performed by a team of experienced engineers, based on a recognized standard like API, IEC, NFPA, NPR, etc., with due consideration of:

- The flammable materials that may be present.
- The physical properties and characteristics of each of the flammable materials.
- The source of potential releases and how they can form explosive atmospheres.
- Prevailing operating temperatures and pressures.
- Presence, degree and availability of ventilation (forced and/or natural).
- Dispersion of released vapours to below flammable limits.
- The probability of each release scenario occurrence.



## REFERENCES EXPLOSION RISK ASSESSMENT

### RENEWABLE ENERGY

**FRANCE - ENGIE** - Consulting services towards fire & explosion assessment working panel on ENGIE Biomass projects.

**UK - ENGIE** - Risk assessment for the conversion of a coal fired power plant to a biomass fired one.

### INDUSTRY

**BELGIUM - Ineos Lillo** - Explosion Protection Document for several production facilities.

### NUCLEAR INDUSTRY

**BELGIUM - ENGIE Electrabel** - ATEX assessment of 7 nuclear power stations.

### THERMAL POWER PRODUCTION

**INDIA - TECPL** - ATEX assessment of a coal fired power plant.

### THE NETHERLANDS - ENGIE

**Nederland** - ATEX assessment of a coal fired power plant.

### WASTE

### BELGIUM & THE NETHERLANDS

**- SITA** - ATEX scan of waste facilities.

### GAS, LNG and H2-INDUSTRY

**FRANCE - Storengy** - ATEX assessment of the gas installations of an underground storage facility.

**CROATIA - LNG Hrvatska** - Krk Island - ATEX area classification of FSRU terminal.

**GERMANY - GLNG** - Brunsbutte - ATEX assessment of LNG terminal during FEED project.

**SOUTH AFRICA - ENGIE** - RHYNO project - Explosion risk assessment of hydrogen plant.

**BELGIUM - Bruxelles Energie** - Hydrogen production & tube trailer filling: Preliminary Hazardous Area Classification (ATEX).

# Assets Conformity Assessment Risk & Safety Management



## An effective technique to assess the conformity of industrial installations

Assets conformity assessment is a methodology designed to ensure the installation meets the requirements of the European directive 2009/104/EC and any additional national or employer requirements. This directive provides minimum Health & Safety requirements for the use of work equipment by workers. It contains the employer's obligation to take every measure to ensure the safety of the work equipment made available to workers. During the selection of the work equipment the employer shall pay attention to the specific working conditions which exist at the workplace.

### Our approach

- Use of checklist to ensure a systematic approach.
- Consolidation of the outcome of the compliance assessment in reports providing an overview of actions and recommendations to reduce risks to the workers and to comply with the relevant regulations.

### Depending on the Client's needs:

- The audit can focus on one or more domains.
- Some specific requirements can be excluded of the scope of the assessment when they are well managed by specific Client's processes.

### Clients benefits

- Prevent risks related to unsafe work installations.
- Identify any non-conformities in a timely manner and provide a reference point for the elaboration of an action plan to comply with the European directive 2009/104/EC, national legislation and additional requirements.

### Offered service

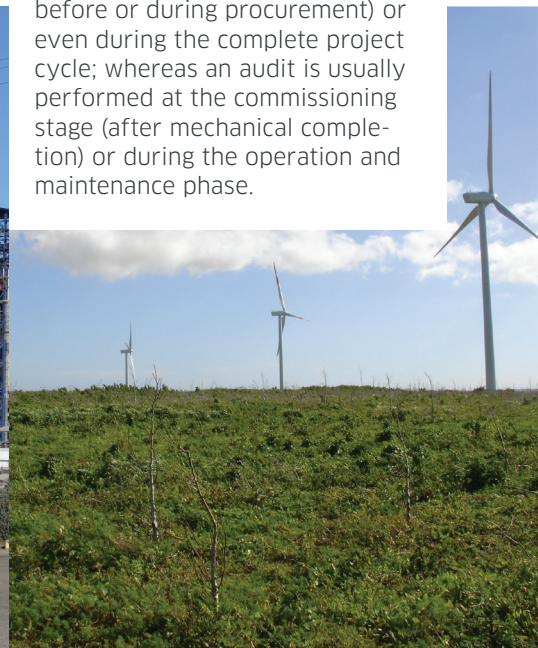
- An assessment/inspection carried out by a qualified and experienced person with both technical and regulatory knowledge, supported by a methodical approach.
- Experts having an engineering qualification, being able to give technical recommendations for preventive, remedial or improvement solutions to enhance safety and ensure compliance with regulation.
- Design of a database to collect and manage all the non-conformities.



Verifying if the installation is safe and suitable for its intended use, defining priorities and an action plan to remedy compliance issues

The service offered by “Tractebel – Risk & Safety Management” is an assessment of a project or an audit of the technical facilities to assess the compliance of the installations with applicable standards and technical regulations.

It also includes the assessment whether equipment/installations are safe and fit for use. A conformity assessment can be done anytime during a project (e.g. before or during procurement) or even during the complete project cycle; whereas an audit is usually performed at the commissioning stage (after mechanical completion) or during the operation and maintenance phase.



## REFERENCES ASSETS CONFORMITY ASSESSMENT

### **GAS, LNG and H2-INDUSTRY**

**FRANCE – Storengy** – Compliance and Occupational H&S check Gas Compression & Treatment Station.

**SINGAPORE – ENGIE** – REIDS project – verification of the conformity of the hydrogen dispenser to the NFPA 55 code knowing that it was purchased under European specification.

### **THERMAL POWER PRODUCTION**

**BELGIUM – GSK** – Conformity assessment of existing installations.

**THE NETHERLANDS & GERMANY – ENGIE Electrabel** – Health & Safety compliance management green field coal fired power plant projects.

### **TRANSMISSION & DISTRIBUTION**

**BELGIUM – Elia** – Conformity assessment and safety assessment of various 380kV substations.

### **NUCLEAR**

**BELGIUM – ENGIE Electrabel** – Conformity assessment of existing units at Doel & Tihange.

**THE NETHERLANDS – Pallas** – Conformity strategy for the development of a medical isotopes reactor.

### **INFRASTRUCTURE**

**BELGIUM – Waterwegen en Zeekanaal NV** – Argus project – Expert advise on the implementation of the Machinery Directive on the automatization of bridges and locks.

# Assessment of External Risks of Windturbines

## Risk & Safety Management



### A quantitative method to assess the external safety risks of wind turbines towards their surrounding

The operation of a wind turbine induces a safety hazard towards the surrounding of the turbine. This hazard is caused by possible failures such as tower failure, blade failure and events such as ice fall/throw. The impacted area may contain habitation but also critical assets such as power lines, transport infrastructure, presence of dangerous products, etc. This described assessment is an analysis of those external risks. It is typically conducted during the permitting phase and/or development phase of the project.

#### Our approach

- Identification of the applicable legislation,
- Definition of the applicable risk criteria: individual risk contours and societal risk curves,
- Description of the accident scenario's,
- Determination of the probability of occurrence and effect distances for each scenario,
- Mapping of the possible impacted elements, e.g. people habitation, transport routes, etc.
- Quantification of the effects by use of dedicated models,
- Assessment of the risk against the identified acceptance criteria,
- Proposal of possible mitigation measures.


#### Clients benefits

- Demonstrate the compliance with legislation.
- Demonstrate the acceptability of the project toward stakeholders.
- Allow developing wind park projects in industrial business areas.

#### Offered service

- The service offered by "Tractebel – Risk & Safety Management" in this matter is to perform a complete, objective, and detailed assessment during the development of a wind project by delivering a comprehensive study conducted by qualified and experienced engineers who are familiar with regulations and industrial good practices.





Assessment based on a systematic method, conducted autonomously by qualified and experienced engineers for on- and offshore wind energy

The service offered by “Tractebel – Risk & Safety Management” identifies all accident scenarios related to the operation of a wind turbine and provides a quantified evaluation of the associated risks and a comparison with acceptance criteria defined by authorities, third parties and good industry practices.

Appropriate measures are proposed to mitigate the risks.



## REFERENCES ASSESSMENT OF EXTERNAL RISKS OF WINDTURBINES

### RENEWABLE ENERGY

Since 2003 hundreds of these risks assessments have been conducted in Belgium and the Netherlands by several of our experts. These assessments range from simple cases up to cases in which several wind turbines of a wind park can impact transport infrastructures and industries falling under the SEVESO III directive.

# TRiceR

## A new way to apprehend wind turbine ice fall risk



## A cutting edge methodology to assess risks linked to ice falls from wind turbine blades in real time available 24/7

Wind turbines that are erected close to roads or agricultural infrastructure pose a risk for people passing by due to the ice fragments that form on the blades and eventually pushed by meteorological conditions they fall.

Safety of wind turbine assets is a major point of concern for project developers, wind turbine operators and authorities.

- TRiceR proposes real time information that maps out the risk probability, the area of exposure and the potential damage ice falls can cause based on meteorological conditions.
- Our methodology combines ice accretion and meteorological modelling; Monte Carlo simulations with fall equations and damage assessment algorithms offer an overall analysis of the risks.

### Our approach

- At Tractebel we provide you all the competences you need through a tailor-made approach and have state-of-the-art software at your disposal to make sure your projects are safe and your goals are met.
- For clients requiring specific support, Tractebel provides all the competences needed through a tailormade approach through our classical consultancy services.

### Client Benefits

- TRiceR is a cloud-based application directly available from the web, no need to install any software or to upgrade versions.
- Ice fall risk assessment available 24/7.
- Two time horizons: long-term for development/permitting purposes and “day-ahead” forecast for operational concerns.
- Direct visualisation of the effectiveness of mitigation measures.

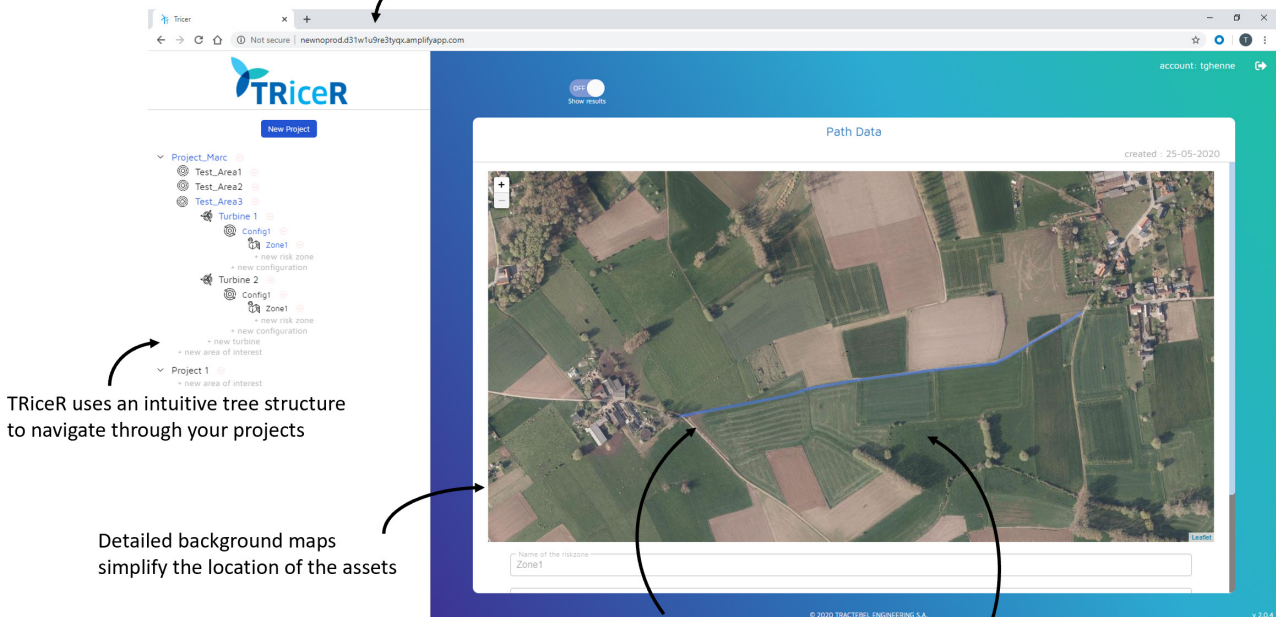
### Our added value

- The first cloud-based application that can calculate the risk of ice fragments falling from a wind turbine.
- The only online application where users can perform ice fall risk assessments of their wind projects getting immediate results.
- The only tool to propose a complete risk-based methodology.



TRiceR follows the recommendations of the international expert group IEA Wind TCP Task 19 specialized in «Wind Energy in Cold Climates»

TRiceR is a web application. No need to install any software on your computer.



TRiceR uses an intuitive tree structure to navigate through your projects

Detailed background maps simplify the location of the assets

Thanks to the power of cloud, your results in a few seconds !

Draw your paths, areas and risk zones in a few clicks

## REFERENCE & TESTIMONIAL TRICER

### Aische-en-Retail / ENECO

Energy yield assessment of a 1x3.6 MW max. wind farm. Icefall study with TRiceR methodology.

### Hoogstraten / Electrabel

Feasibility, permitting, tendering and contracting phase of a 6x4 MW greenfield wind farm. Icefall study with TRiceR methodology.

### Lummen Puratos / Electrabel

Feasibility and permitting phase of a 3-4 MW wind turbine at industrial site. Icefall study with TRiceR methodology.

### Retie / Electrabel

Feasibility, permitting, tendering and contracting phase of a 3x4 MW greenfield wind farm. Icefall study with TRiceR methodology.

### Rodenhuize / Electrabel

Feasibility, permitting, tendering and contracting phase of a 3x4 MW wind farm at industrial.

### The Netherlands / ENGIE

Owner's Engineer for feasibility, tendering and contracting phase of a 7 MW wind farm, 2 Turbines at industrial site.

### Zeebrugge / ENECO

Use of TRiceR tool to assess the ice fall risk of 2 turbines in industrial environment.

### ENECO

*Early-believer of the TRiceR solution*  
 "We have a long lasting relationship with Tractebel for the development of our onshore wind projects. We know Tractebel to deliver top expertise and high flexibility. With TRiceR, they answer exactly to a need we've been facing for a while now. While the tool is easy to use, you are confident it takes into account the full complexity of the project, which is absolutely required when it comes to HSE matters."

# Value@risk Project Risk Assessment Risk & Safety Management



The Value@Risk methodology provides a structured approach through different management tools for analysing and managing threats and opportunities associated with a specific project

A project risk can be described as any uncertain event likely to have positive or negative effects on at least one of the project objectives. Risk Management is essential to the effective management and therefore successful on-time and on-cost delivery of projects. Although most organisations are aware of the need for risk management during the lifecycle of projects, the adoption of consistent processes within a comprehensive framework can help to ensure that risks are managed effectively, efficiently and coherently. developed for the plant under consideration.

## Our approach

- Defining the project framework and objectives.
- Identifying the risks,
- Performing a risk analysis including quantification and definition of the risk.
- Planning the risk responses.
- Monitoring and reviewing risks.

## Clients benefits

- Increasing the likelihood of attaining project objectives.
- Identifying and exploiting opportunities (i.e. risks with positive effects).
- Creating and maintaining value, reputation and internal motivation.
- Encouraging a level of risk-taking that is reasonable in legal terms, considered acceptable and economically viable.

## Offered service

- Establish the context and objectives of the Value@Risk assessment.
- Coordinate the project risk analysis.
- Perform a qualitative risk assessment of the identified risks and opportunities.
- Coordinate the creation of a risk response plan.
- Monitor and review the effectiveness of the risk response.
- Report periodically on the general status to the overall project risk management.



# Defining your Risk Management Plan and ensuring that risk treatment is effective and efficient in both design and operation

The method Value@Risk provides a structured approach and standard tools to perform a risk assessment for analysing and managing project specific threats and opportunities.

It is based on the guidelines of PMBok®, ISO 31000 and COSO.



## REFERENCES VALUE@RISK PROJECT RISK ASSESSMENT

### RENEWABLE ENERGY

**TANZANIA - ENGIE** - Project Risk Assessment Stand Alone Power Units (Powercorner Project).

**THE NETHERLANDS - ENGIE** - Risk Register Off-Shore Wind farm.

**DJIBOUTI - Electricité de Djibouti**  
- Ghoubet Onshore Wind Farm  
- Project Risk Assessment during Feasibility Study.

### THERMAL POWER PRODUCTION

**INDONESIA - Inalum** - Project Risk Assessment Green Field Coal Fired Power Plant.

### TRANSMISSION & DISTRIBUTION

**MONACO - SMEG** - Project risk assessment for the shore to cruise ships electrification project

### NUCLEAR

**BELGIUM - ONDRAF** - Project Risk Analysis Fleurus site decontamination project.

### INFRASTRUCTURE

**BELGIUM - STIB** - Project risk assessment for the conversion of line 3 from tram to metro in Brussels.

**BELGIUM - STIB** - Project risk assessment for the renovation of Gare Centrale metro station in Brussels.

### INDUSTRY

**THE NETHERLANDS - ASML**  
- Business Risk mitigation plan semiconductor industry.





Tractebel is a global engineering and consulting company delivering integrated solutions for sustainable energy and infrastructure projects. Our expertise is trusted worldwide across multiple markets like nuclear, data centres, renewables & energy storage, power & gas network, green gas, hydropower & dams, desalination, complex buildings, marine & transport infrastructures, and environment & climate resilience.

By connecting strategy, design, engineering, social & environmental studies, project management and in-house digital application, 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 6,000 passionate experts across the globe, committed to ethical business, safety, diversity and the fight against climate change. Tractebel is part of the ENGIE Group, a major player in the energy transition, whose purpose is to accelerate the transition towards a carbon-neutral economy.



## **TRACTEBEL ENGINEERING S.A.**

HEAD OFFICE  
Simón Bolívar laan 36  
1000 - Brussel - Belgium  
[tractebel-engie.com](http://tractebel-engie.com)

**Industrial Risk and Safety Management**  
[risksafety@tractebel.engie.com](mailto:risksafety@tractebel.engie.com)