



# **Engineering a zero-carbon future**

Nearly 8 billion people live on the planet today. And those 8 billion people demand energy, water and other increasingly scarce natural resources to sustain their communities, fuel businesses and realise their human potential. All at a time of unprecedented environmental pressure and a changing climate that urgently demands action.

At Tractebel, we are not standing down from this challenge. We are standing up with engineering solutions for a sustainable future and the zero-carbon transition our world needs. Tractebel engineers and experts are delivering game-changing solutions for energy, water and urban projects in some of the toughest business areas and environments on Earth.

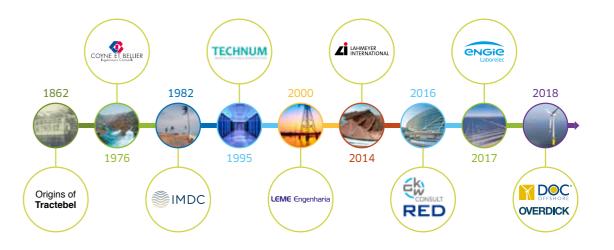
How are we doing it? By combining strategy, design and engineering into one fully-integrated service that delivers breakthrough results.

But do not just take our word for it. Let us show you.

#### Olivier Biancarelli CEO

### **Our Journey**

For over 150 years we have been acquiring the expertise that, today, has made us one of the world's leading engineering companies.



### **One Integrated Service**

With Tractebel, you get a multidisciplinary team that delivers an integrated service across strategy, design and engineering. We lead projects of all sizes and complexities throughout the

full life-cycle. All with laser focus on unlocking opportunities for greater sustainability and a zero-carbon future.

"I have been hugely impressed with Tractebel and the skills of the people we get to work with...just outstanding!"

Andrew Deme, Energy Innovation Manager at Springfield City Group

"We're glad that we decided to work with Tractebel. The endless hours dedicated to our project and your professionalism really impressed us."

Bonaria Siahaan, CEO, Millennium Challenge Account Indonesia



# ENR ranking\* #2 Hydro #3 T&D

- **# 4** Power
- # 5 Wind & Nuclear

## Countries

+150

# Expertise

+150

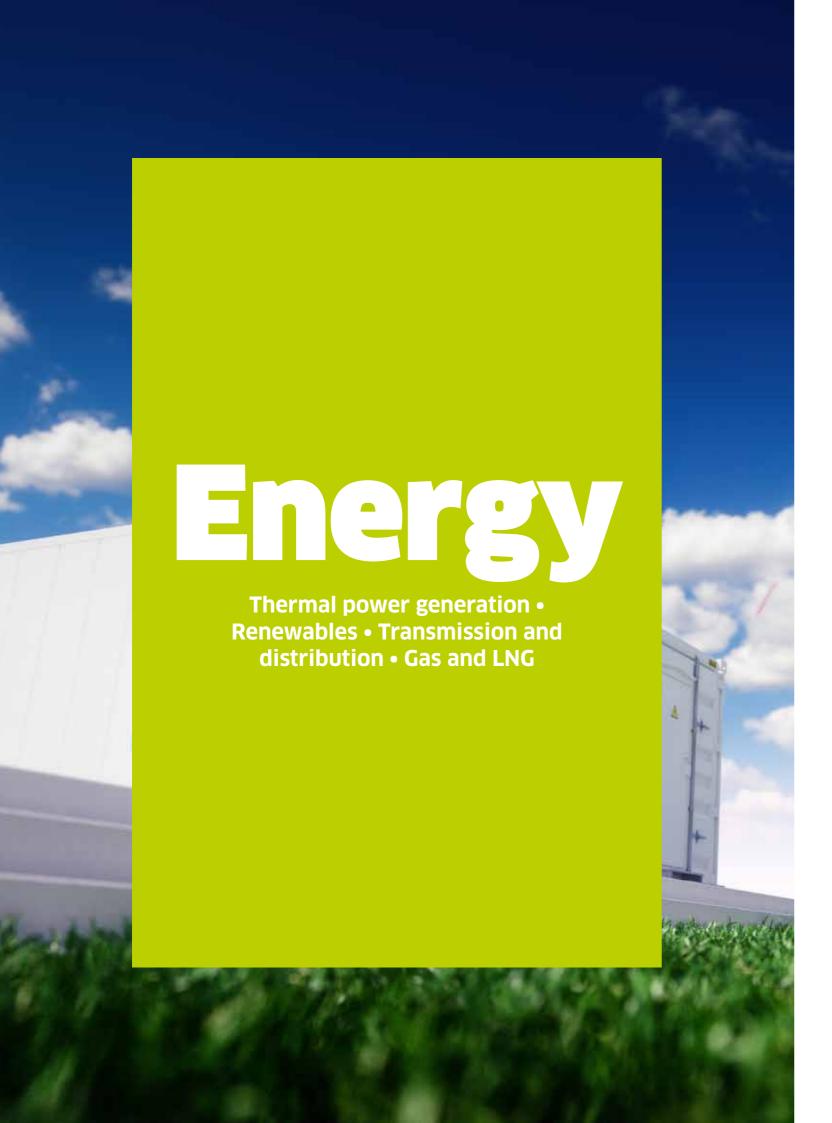
Turnover

**€662** million



# 5 000 employees 30% nationalities key experts offices

\* ENR = Engineering News Record publishes rankings of the largest construction and engineering firms, based on gross revenue. The rankings are generated from projects outside each firm's respective home country.



#3/4/5\*

Trust, we've earned it

- #3 Transmission & Distribution
- **#4 Thermal Power Generation**
- # 5 Wind Power Generation

For over 150 years, Tractebel has been known as an engineering leader in power generation, transmission and distribution around the world. Today, we are focused on engineering to decarbonise and decentralise energy for the clients we serve worldwide. Digital solutions are built in from end to end.

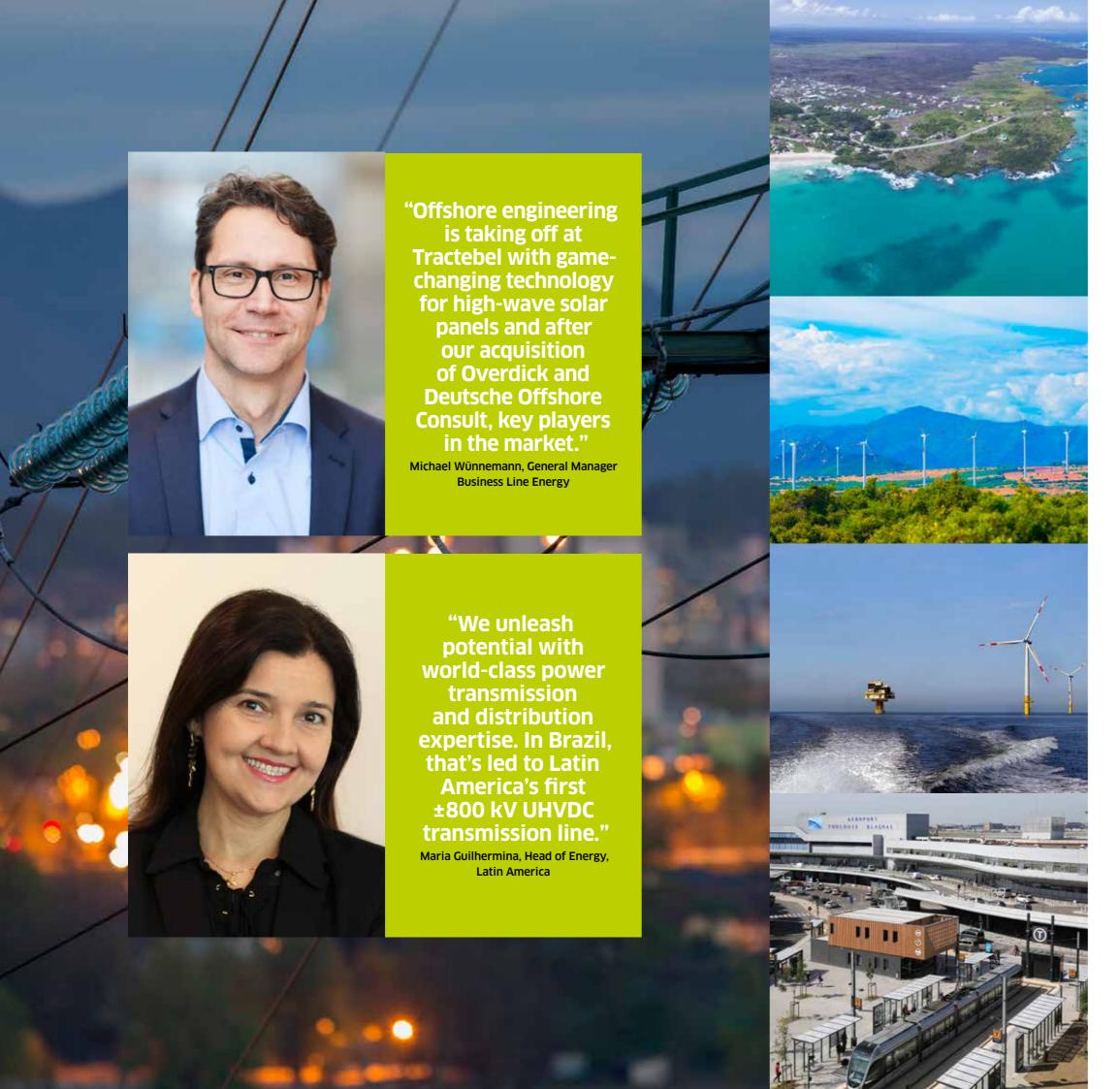
We offer the complete, integrated range of engineering and advisory services to fuel your zero-carbon transition: from development and design, through construction and commissioning, up to operational support, rehabilitation and decommissioning of all sizes of energy infrastructures. This expertise extends as well to EPC, EPCM and brown-field investment projects.

Our hybrid solutions combine renewable energy generation with electrical storage, power-to-gas, waste-to-X and green gases like biomethane and hydrogen.

#### **Energising solutions**

- 30 000 km HV transmission lines (HVAC / HVDC / FACTS)
- 400 substations (AIS/GIS on / offshore)
- 150 GW of gas fired and biomass / waste to energy power plants
- 60 000 km of gas pipelines and city gas distribution in over 80 cities
- 10 GW of solar power plants (PV / CSP)
- 1 000 on-and-offshore wind farms with over 110GW capacity
- 200 LNG projects





#### **KEEPING CLEAN ECUADOR'S ISLA ISABELA**

**Challenge** | Isla Isabela is the largest island in the Galapagos archipelago, a UNESCO protected World Heritage Site known for its wild beauty. Tractebel was commissioned to perform a study to make the island's energy supply cleaner and more efficient within this unique and fragile ecosystem.

**Solution** | We updated the pre-feasibility study and designed the complete power system as a hybrid mix of PV solar power, Li-ion battery storage and engines fuelled by vegetable oil. It has guaranteed the island an uninterrupted and clean power supply.

#### **GOOD WINDS BLOWING IN VIETNAM**

**Challenge** | With rapidly rising demand for energy, Vietnam is urgently seeking to increase its share of wind energy. As one of the leading consultants for wind power in South East Asia, we contracted with The Blue Circle to act as Owner's Engineer for their Dai Phong 40MW wind farm.

**Solution** | As the Owner's Engineer, we have been engaged in procurement, design review, construction supervision and commissioning at Dai Phong. Our work has helped to set a new standard for the effective integration of international best practices in Vietnam's "green" power market.

#### **BRINGING ENERGY TO SHORE IN GERMANY**

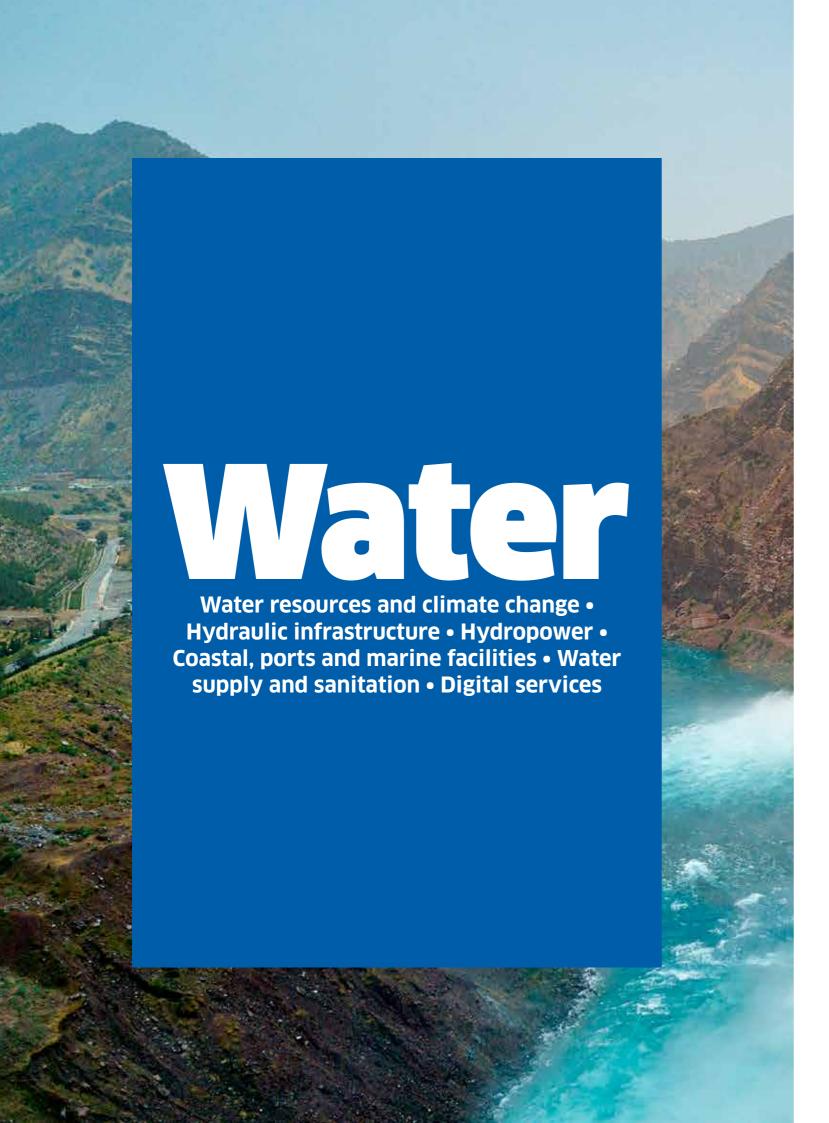
**Challenge** | Merkur is one of Germany's largest offshore wind farms in the North Sea. Tractebel, in a joint venture with ENGIE Fabricom and lemants, was contracted for the engineering, procurement, construction, testing and commissioning of the offshore substation.

**Solution** | Tractebel completed the system studies and detailed design for all high- and medium-voltage equipment (155/33 kV) as well as the high- and medium-voltage related part of the SCADA system. Our experts also followed the project during construction and commissioning.

#### **FUELLING WITH HYDROGEN IN FRANCE**

**Challenge** | France's Occitanie region is building a HYPORT to deploy renewable hydrogen infrastructure around the Toulouse and Tarbes airports. The region contracted Tractebel to conduct a feasibility study to realise this exciting energy opportunity.

**Solution** | Tractebel completed all feasibility studies for the hydrogen ecosystem, including eight hydrogen refuelling stations. Work is ongoing to complete the engineering, procurement and construction management of the first station. It will serve hydrogen fuelled buses, light duty vehicles and a green genset for airplanes.



Tractebel, the world's 2nd largest international design firm in hydropower

Engineering solutions to today's growing water challenges requires bold thinking and new perspective. At Tractebel, we have it. With a 100-year legacy in hydropower, water resources, water supply and sanitation, our 700 water experts are trusted advisers to meet sustainability targets.

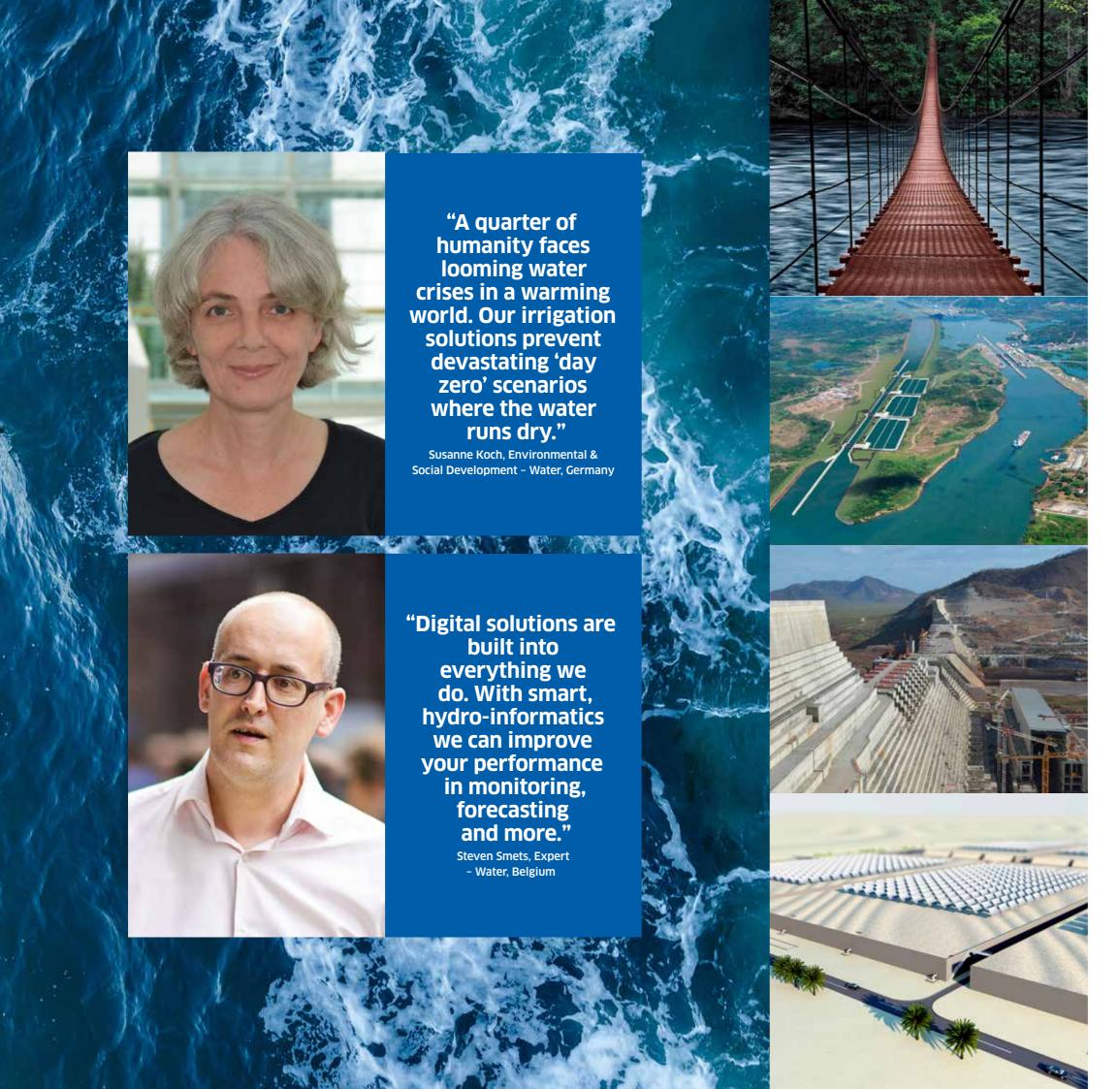
We enable clients to support sustainable environments and healthy ecosystems that can deliver clean and safe water and hydropower supplies. We have in-depth expertise with all types of hydraulic infrastructure from dams, ports and waterways to water transfers, pumping stations and underground works.

Our teams design and build resilient water systems that can adapt to climate variability and extreme natural events. Cities and territories increasingly seek our expertise in coastal protection, flood management, desalination and irrigation projects to support their growing populations.

#### **Delivered water solutions**

- 250 GW of installed hydropower capacity
- 1.5 Million hectares of irrigated lands
- 60 Million people served with safe drinking water
- 40 Million people served with waste water collection systems
- 600 water treatment plants designed and built
- 300 waste water treatment plants designed and brought into service
- 50 000 km water pipelines designed and constructed
- 500 projects using numerical models
- 100 ports and terminals





#### **FLOOD HAZARDS IN NEPAL**

**Challenge** | Nepal faces extreme flood hazards that cause the loss of human lives and crops. The threat is only getting more severe with climate change. The government contracted Tractebel to produce flood hazard and risk maps in 25 major river basins.

**Solution** | Our flood mapping has enabled the government to make informed, smart decisions to manage its water resources and infrastructure. Our work included pre-feasibility studies for flood protection in six pilot basins as well as preparing flood-risk management projects.

#### **NEW LOCKS IN PANAMA**

**Challenge** | The Panama Canal has built new locks to increase its clearance profile and enable Post-Panamax ships to pass through this vital corridor. The Panama Canal Authority contracted Tractebel as part of a consortium to conduct studies and provide technical assistance for this major investment.

**Solution** | Tractebel's conceptional design for the new locks at the Pacific Ocean end of the canal reduced water consumption by a massive 60 per cent. Our innovative hydraulic solutions led to award-winning results with a "Grand Prix National de l'Ingénierie" for the project in 2011 in France.

#### **HYDRO RENAISSANCE IN ETHIOPIA**

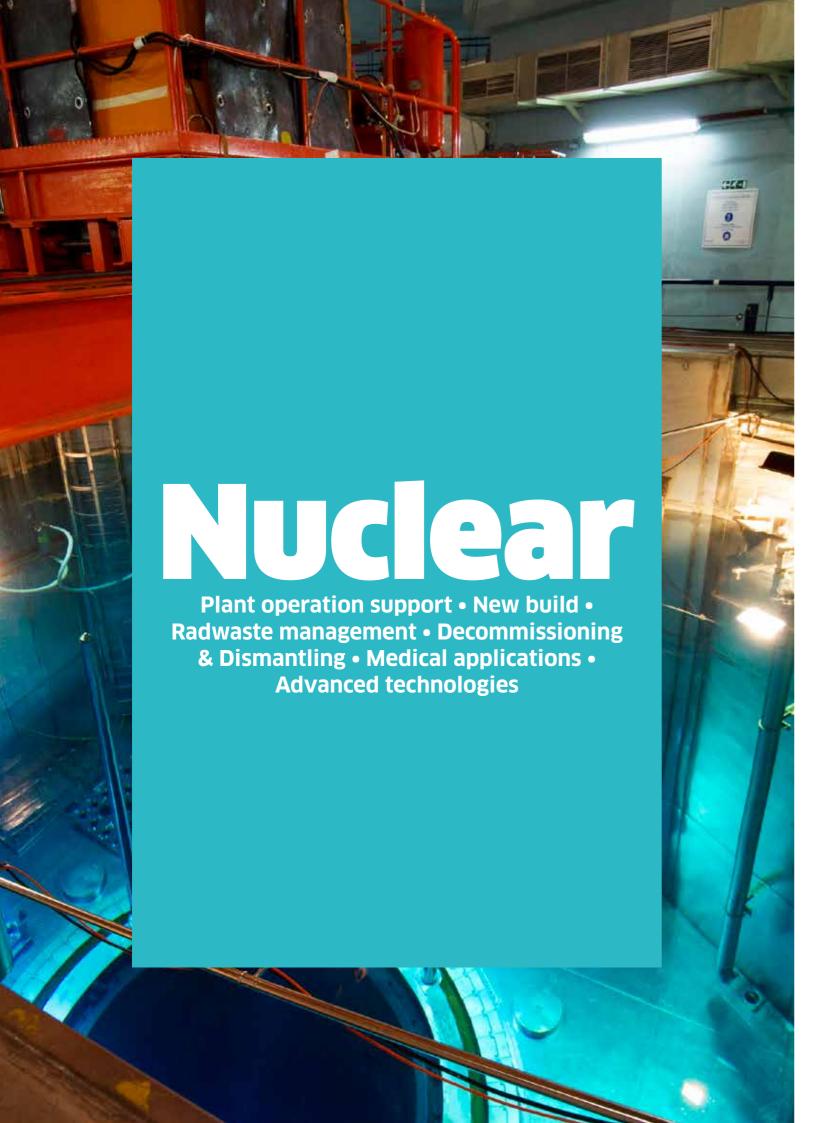
**Challenge** | The Grand Ethiopian Renaissance Dam Project, when commissioned, will be the largest hydropower project in Africa with an installed capacity of 6 000 MW. Tractebel is providing owner's engineering services during construction, including design review, supervision of construction works and factory inspection for equipment manufacturing.

**Solution** | With a "smart" quality-control approach, we efficiently supervised construction of the works. With so many contractors involved, our approach to management was key to the successful implementation of this mega-project.

#### **SECURING MEGA RESERVOIRS IN QATAR**

**Challenge** | As a desert nation, water management in Qatar is a matter of national security. The government contracted Tractebel to provide project management services for the construction of the world's largest, most efficient water reservoir of its kind in Oatar.

**Solution** | Our work involves project management of the construction of 650 km large water mains connected to five mega water and pumping stations with an ultimate capacity of 17.5 million m³. When complete, Qatar will gain a strategic seven-days of water stock across its network.



# >1 O O O nuclear experts

and projects developed in over 20 countries 60 years of experience

Nuclear power is an essential source of zerocarbon energy, which makes it an important area of expertise for Tractebel. Our role for over 60 years has been to provide trusted engineering and advisory services based on state-of-the-art expertise and experience.

With over 1 000 nuclear experts and projects developed in over 20 countries, we work across the full life-cycle from plant design to radwaste and decommissioning. In Belgium, we are proud to have been the architect-engineer for seven nuclear power plants while carrying out two long-term operation projects on Tihange 1 and Doel 1/2 in parallel.

Operators, constructors and investors trust our internationally recognised expertise to support safe and profitable operations and design new plants and research reactors. From our Nuclear Innovation Lab, we develop cutting-edge and tailored solutions for applications using nuclear technology that extend to the industrial sector, including nuclear medicine and aerospace.





"Our research on small modular reactors is fuelling entirely new areas for zero-carbon innovation."

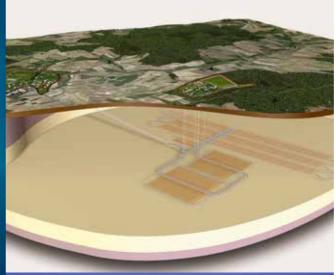
Anicet Touré, Product Manager -Nuclear, Belgium



"We are uncompromising in our approach to safety and relentless in our pursuit of nuclear innovation to power a zero-carbon world."

Emilie Leroux, Technical Director -Nuclear, France







#### **EQUIPMENT REPLACEMENT IN SOUTH AFRICA**

**Challenge** | At South Africa's Koeberg nuclear power plant, the steam generators needed replacing. Koeberg turned to Tractebel for engineering support services to ensure the replacement occurred according to internationally relevant operational and safety practices.

**Solution** | Our team's insight and experience combined with the confidence in Tractebel's expertise among South African regulators ensured clear added value for Koeberg's owners. The local and home-based teams we assembled continue to ensure our services are tailored to local realities while reflecting international best practice.

#### **DECOMMISSIONING IN BELGIUM**

**Challenge** | Tractebel was contracted to act as architectengineer for the decommissioning of radiopharmaceutical production facilities in the former Best Medical Belgium. This involved cleaning-up highly contaminated areas in four buildings and dismantling two cyclotrons successively used to produce radioisotopes.

**Solution** | We are involved in defining the clean-up and decommissioning strategies, drafting required documentation and following-up on decommissioning activities. Our teams are also involved in modifying existing facilities to complete the dismantling along with the safe, efficient and cost-effective management of radioactive materials.

# RADIOACTIVE WASTE DISPOSAL IN EASTERN FRANCE

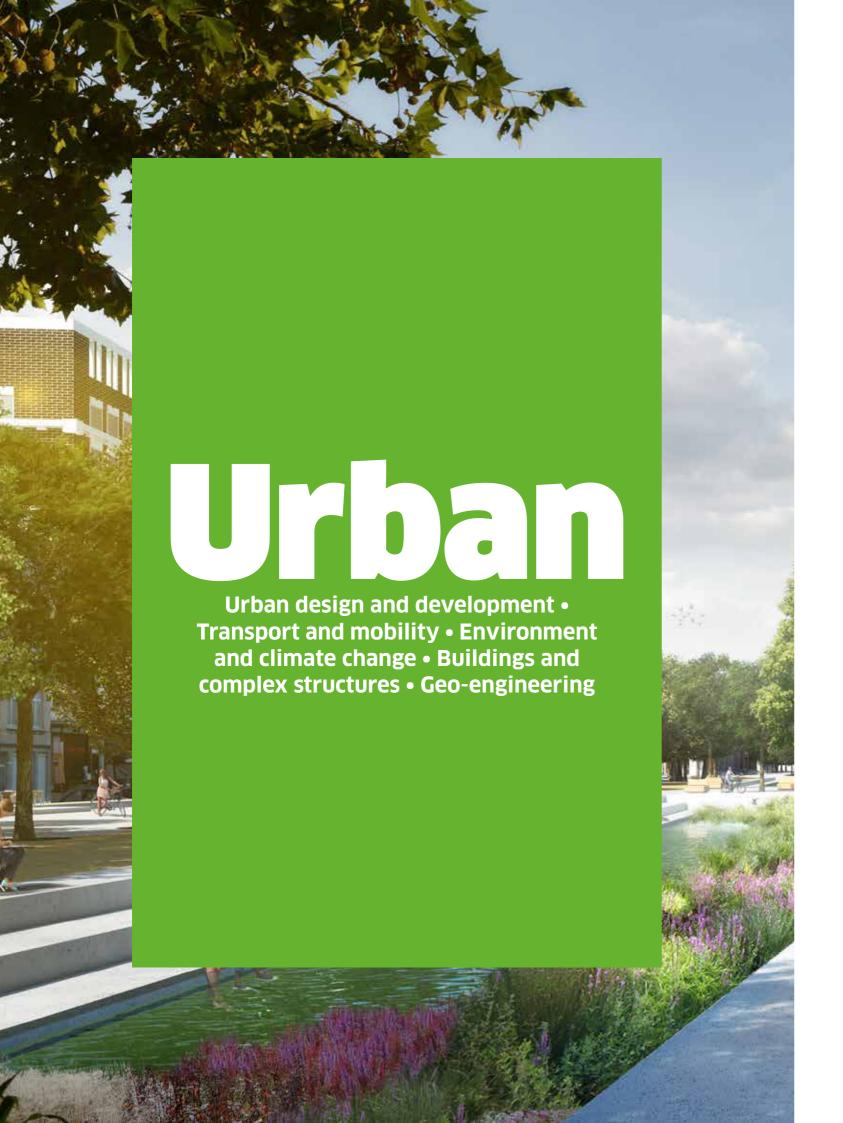
**Challenge** | Disposal of radioactive waste remains an engineering challenge for nuclear plants worldwide. The French National Agency for Radioactive Waste Management (ANDRA) contracted Tractebel to advise on CIGEO, a new deep geological repository to safely receive and store nuclear waste in Eastern France along the border of the Meuse and Haute-Marne departments.

**Solution** | We developed the preliminary and final design of subsystem nuclear surface facilities and underground infrastructure. Our successful delivery reflected the two integrated design platforms we developed, involving more than 100 engineers and draftsmen. This project has made Tractebel a clear leader in France for complex nuclear building and systems design.

#### **NEW BUILD IN CHINA**

**Challenge** | The Taishan nuclear power plant in Guangdong province provides essential electricity to fuel China's power supply. Our challenge was to complete civil engineering studies for two new European Pressurised Reactor (EPR) units.

**Solution** | With more than 50 experts, engineers and draftsmen, Tractebel provided innovative civil engineering solutions during the basic, detailed design and construction phases. Our effective collaboration with French and Chinese stakeholders enabled us to meet project milestones for reactivity, efficiency and productivity.





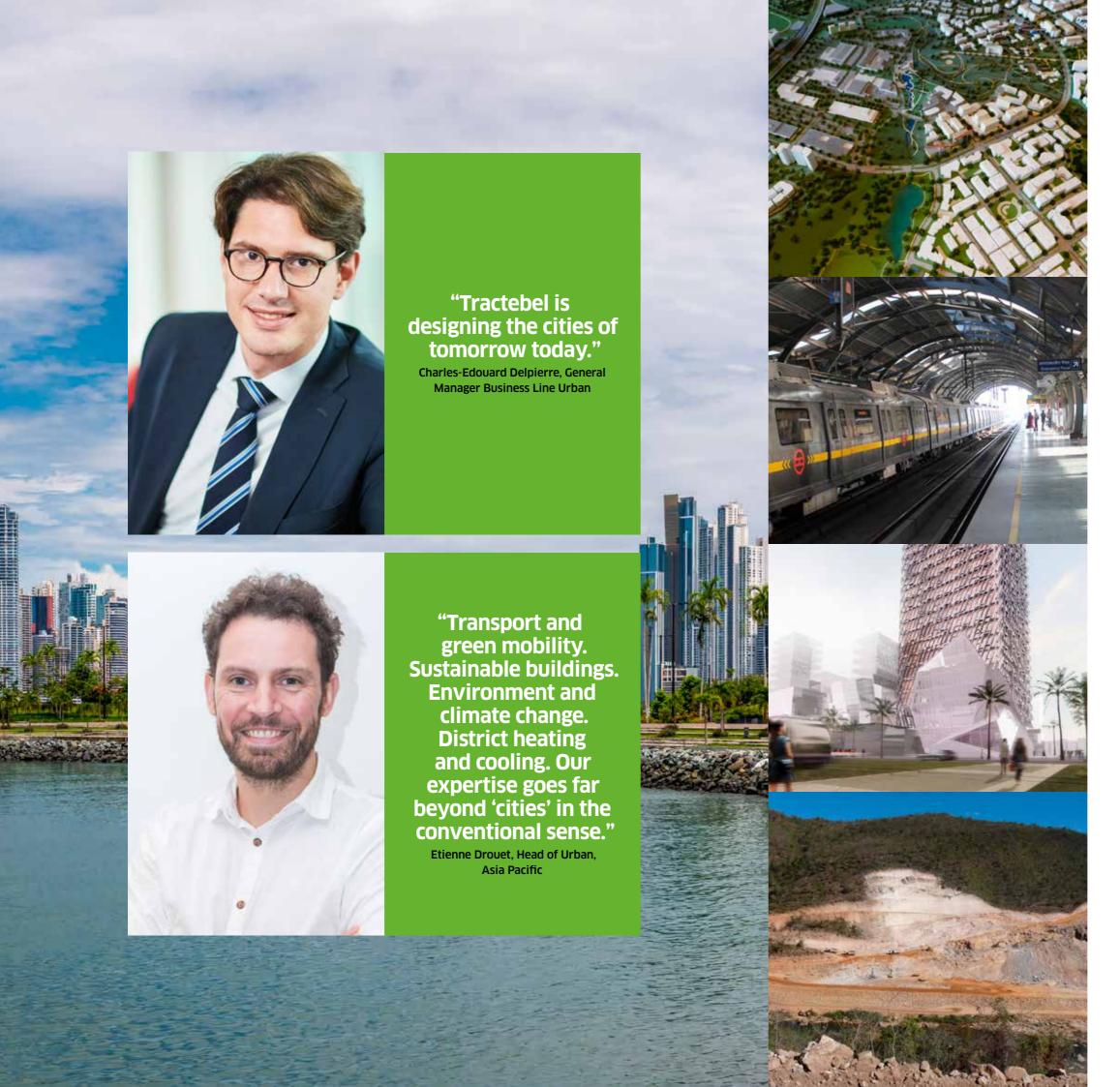
in 84 countries 1000 urban experts

Our experts are committed to designing solutions that make urban environments more livable, sustainable and integral to the zero-carbon transition.

As partners with our clients in pursuit of this mission, we are reimagining the way urban environments are built, used and maintained in countries around the world. From master plan and conceptual design to execution, Tractebel's over 1 000 urbanists, engineers and environmental experts offer smart, balanced solutions you can trust.

Digital innovation is core to Tractebel. Our urban modelling experts use computerised simulation tools to benchmark and enhance designs for cities, districts and buildings. This ranges from high-level quick-scan simulations at the concept stage to more complex modelling packages at the detailed design phase.





#### **DESIGNING TO ZERO-CARBON IN AUSTRALIA**

**Challenge** | Greater Springfield is one of Australia's newest cities with big, green ambitions. The city selected Tractebel to assess its governance and smart city maturity to meet its ambition to become a zero net energy city by 2038.

**Solution** | With our 360° cityscan tool, we developed an integrated and holistic sustainability plan for the city. It highlighted city strengths and values that needed protection while identifying exciting new "green" investment opportunities, including for energy generation and low-carbon buildings.

#### **CONNECTING TWO LARGE CITIES IN INDIA**

**Challenge** | Delhi-Meerut Regional Rail Transport System (Delhi-Meerut RRTS) corridor is an 82 km long, rail corridor. This will be India's first rapid rail line, and one of the three rapid-rail corridors planned under the Phase-I project of National Capital Region Transport Corporation (NCRTC).

**Solution** | Our experts received a two-year contract to provide technical assistance in consortium with Seoul Metro (Korea). The objective of the consulting service is to review the overall project design from the operation and maintenance perspectives and assist development of the operation and maintenance plans and other related aspects for the RRTS. The system is expected to be operational in 2025.

#### **GOING GREEN AND GOLD IN MOROCCO**

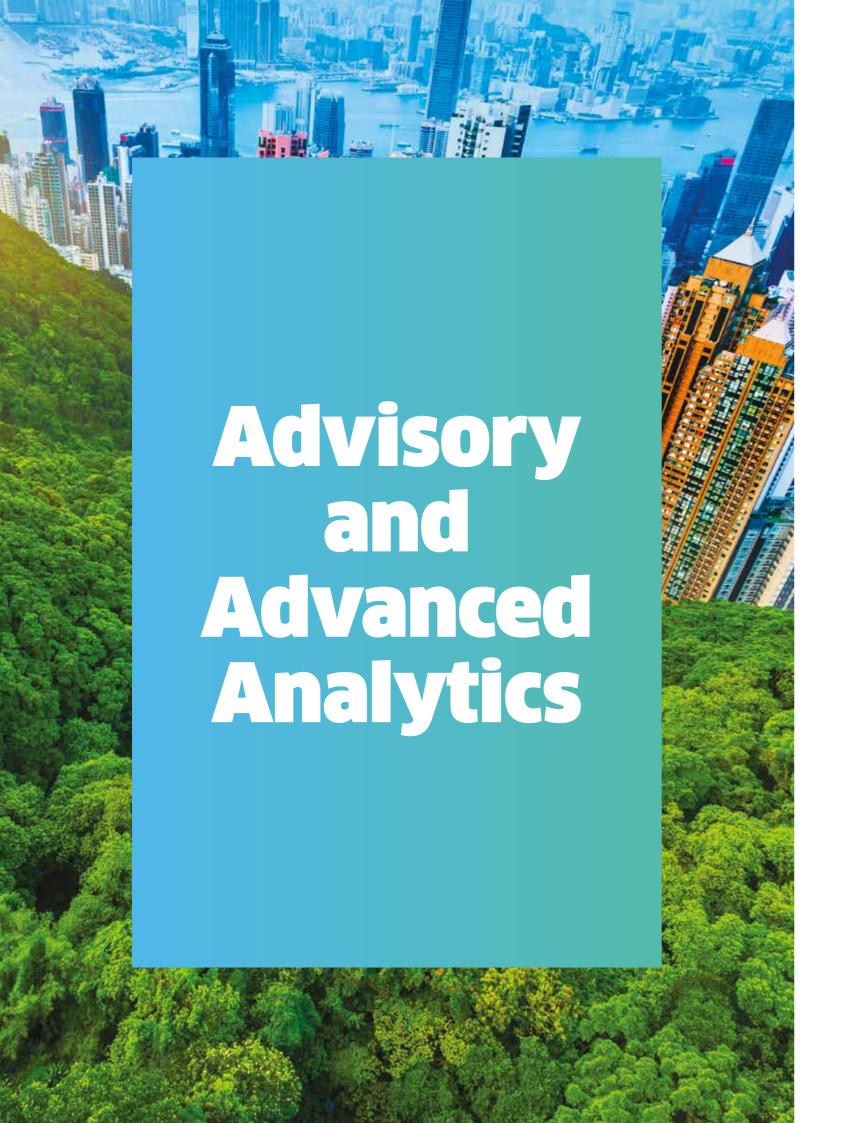
**Challenge** | The Finance City Tower is a landmark building in Casablanca recognised for its ecological performance and futuristic design. Tractebel was contracted for civil engineering, MEP and acoustic studies to ensure the construction delivered on its green potential.

**Solution** | Using the latest in digital technology, our team took up the immense challenge posed by the tower's outstanding geometry. The 3D models we designed fulfilled all the technical and architectural requirements to ensure this now iconic tower obtained the "LEED Gold" certification from the World Green Building Council.

#### **GOOD AND GREEN MANAGEMENT IN BRAZIL**

**Challenge** | The government of Minas Gerais state called on Tractebel to ensure sound environmental management and good community relations to construct a multiple-use dam system. It needed to irrigate 35 000 hectares of crops to support a population of 600 000 people.

**Solution** | We brought together a top engineering team with trusted experience managing environmentally and socially sensitive projects of this scale. Our experts effectively engaged local communities, ensuring the open and clear communication required to deliver on the project with minimal disruption.



2 OOO O

1 000 clients representing 25 % of Fortune 500 companies

Sometimes, world-class engineering solutions alone are not enough. Especially when energy projects impact the fate of nations and the sustainability of entire communities. The Advisory and Advanced Analytics division of Tractebel, along with three other businesses, joined forces to form ENGIE Impact in 2019.

By combining strategy, policy, data science and technology expertise, ENGIE Impact reshapes how organisations approach sustainability and achieve their zero-carbon ambitions. We offer global, multidisciplinary teams that can accelerate the sustainability transformation of corporations, cities and governments.

With big data and the latest analytics, ENGIE Impact tackle the world's most complex energy challenges. From energy to water and from waste to infrastructure, we offer sustainability solutions and services to capture value and make organisations more competitive and future-proof.





#### **REIMAGINING ENERGY FOR ARBY'S**

**Challenge** | Energy is the third largest controllable expense for Arby's, the American restaurant chain with over 3 000 locations worldwide. They challenged us to produce energy savings that could also reduce their carbon footprint.

**Solution** | We produced \$50 million in savings with a fully data-driven energy and sustainability programme. Our experts identified exciting new opportunities to reduce Arby's energy and water consumption.

#### **HELPING AUDI TO BECOME CARBON NEUTRAL**

**Challenge** | Audi's factory in Brussels is one of Europe's most advanced automobile manufacturing sites, and has launched production of the E-tron full electrical vehicles. They challenged us to identify solutions to integrate renewable energy into the factory's power supply and investigate the potential for thermal energy storage versus battery storage, consistent with Audi's commitment to reduce their carbon footprint.

**Solution** | After completing a robust assessment of the factory's energy use and capabilities, our experts identified renewable energy options for on-site production and energy storage. Wind and solar power proved especially good solutions as well as thermal storage through the use of painting tanks as energy buffers. Beyond the technical analysis, our experts also provided advice on the regulatory and permit requirements to bring these solutions to life.

#### TRANSITIONING TO ZERO-CARBON

**Challenge** | A global agri-food player wanted to be known for more than their iconic food products. They aspired to become a zero-carbon company by 2040 and turned to us to realise their big ambitions.

**Solution** | Our experts optimised their electric, heat/steam and cold energy demand and processes to dramatically reduce their carbon footprint at manufacturing sites. For two factories located in Europe, our interventions reduced CO2 emissions by 116 000 tons.

#### **GREEN SECURITY FOR IS BANK**

**Challenge** | is Bank is one of Turkey's most digitally advanced banks. The bank chose us to design and build an energy efficient and seismically isolated data centre to secure its digital assets.

**Solution** | With our architectural and structural engineering, is bank now has the first LEED v4 gold data centre in Turkey. It boasts the status of the first ever Tier IV constructed facility and is gold certified for its Tier IV operational sustainability.



55 years of experience

280 specialised engineers and technicians, 77 countries assisted

We firmly believe in the virtuous circle of operational assistance and the upstream research and development that feeds it. With ENGIE Laborelec, we invest in research and innovation in promising energy technology.

From carbon capture and storage to smart energy and the cities of tomorrow, we assess, de-risk and prototype innovative solutions for the future. Our large array of testing equipment enables measurement on-site and in our specialised labs.

Our subject-matter expertise in niche technical domains is sought after worldwide. Grid scale batteries and smart-charging electrical vehicle stations, industrial cybersecurity and additive manufacturing are all areas where our research has produced transformative results for clients.





#### **MICROWAVE HEATING STRATEGY**

**Challenge** | In conventional transformation processes, material or feedstock firing is achieved through combustion of traditional fuels. With the DESTINY project, the European Commission challenged us to develop an alternative heating strategy.

**Solution** | Together with industrial partners and academic centres, we are developing a pilot-scale mobile oven to process raw materials using microwave heating. Besides a significantly smaller carbon footprint, the microwaves solution is far more flexible and scalable than conventional technology.

#### **UNLOCKING LOCAL ENERGY COMMUNITIES**

**Challenge** | Unlocking the power of local energy communities (LECs) remains a challenge for regulatory and economic reasons. With the ROLECs project, our challenge is to identify new energy business models that prioritise decentralised renewables while avoiding additional costs to public infrastructure.

**Solution** | Our experts will explore how to trigger the large-scale roll out of LECs with minimum impact on energy systems. Research will focus on how best to engage communities in local energy projects and integrate the models into community life. Ten pilot sites will serve as living labs for the project.

#### **BUILDING ON OPV'S POTENTIAL**

**Challenge** | Half of all energy consumption in France comes from the building sector. The French port of La Rochelle challenged us to use our organic photovoltaic (OPV) technology to reduce the carbon footprint of a local secondary school as a test for the nation.

**Solution** | Conventional solar panels could not be installed on the roof without significant structural changes. But by using organic PV technology with lightweight and flexible modules, we succeeded in turning the school into a solar powerhouse. Today, ENGIE is commercialising the technology for wide-spread use.

#### **TIDAL ENERGY TAKE-OFF**

**Challenge** | With POWERKITE, the European Commission is exploring tidal energy technology in oceans. They challenged us to design, build and deploy a so-called power take-off system (PTO) for a novel tidal energy collector.

**Solution** | We developed full-scale components for the turbine, generator, seabed power electronics, array transformer and subsea export cable. Our design has the potential to double the market potential of tidal power and decrease by 60 per cent the cost of energy produced compared to other tidal energy converters.

# Visionary culture

Becoming a world leader in sustainable engineering solutions and zero-carbon transitions requires far more than expertise and experience.

It demands cultivating a culture where people work as imaginative builders, infusing innovation energy into the very heart of our business. To encourage the unreasonable, bypass barriers and

challenge conventions. This is exactly the kind of culture we are building to meet the challenges of an ever-changing world.

"Thinking outside our organisation to seek understanding of the demand was crucial to the success of our project."

Bruno Ribeiro, Project Manager, Dow Chemical

# Fuelling innovation, "glocally"

We assemble diverse, multi-disciplinary teams for clients from across our markets where people can voice unorthodox views and develop creative solutions. This diversity fuels the innovation that

powers our best and brightest solutions. It also fuels our "glocal" mentality, enabling us to deliver world-class solutions adapted to local needs with local perspective.

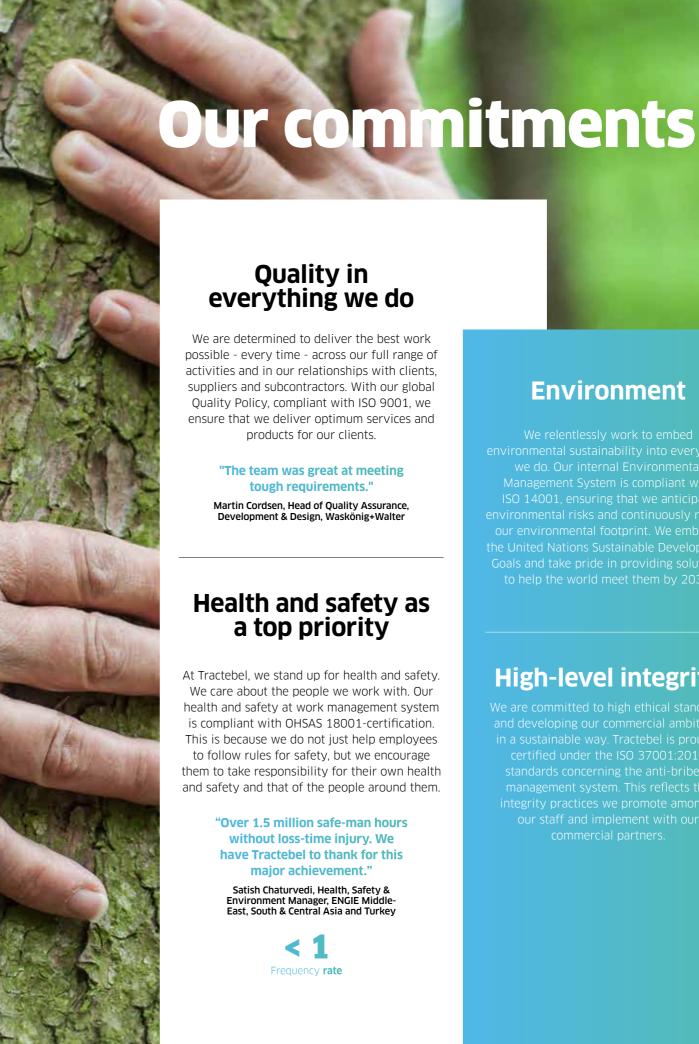


"People with different cultures, backgrounds and expertise challenge each other at Tractebel. This diversity creates the dissent that inspires the breakthrough ideas we're known for."

Rashmi Verma, Associate Vice President -**Transmission & Distribution, India** 

"One of my Tractebel teams included an Indonesian hydro civil engineer, British environmental specialist. Indian biogas expert and German solar PV experts. Our diversity is our strength." Anggiat Sitorus, Product Manager -Renewables, Indonesia.





# Quality in everything we do

We are determined to deliver the best work possible - every time - across our full range of activities and in our relationships with clients, suppliers and subcontractors. With our global Quality Policy, compliant with ISO 9001, we ensure that we deliver optimum services and products for our clients.

> "The team was great at meeting tough requirements."

Martin Cordsen. Head of Quality Assurance. Development & Design, Waskönig+Walter

### Health and safety as a top priority

At Tractebel, we stand up for health and safety. We care about the people we work with. Our health and safety at work management system is compliant with OHSAS 18001-certification. This is because we do not just help employees to follow rules for safety, but we encourage them to take responsibility for their own health and safety and that of the people around them.

> "Over 1.5 million safe-man hours without loss-time injury. We have Tractebel to thank for this major achievement."

Satish Chaturvedi, Health, Safety & Environment Manager, ENGIE Middle East, South & Central Asia and Turkey

Frequency rate

#### **Environment**

### **High-level integrity**



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