



# Energy for Climate-Resilient Cities

Energy

Anticipation & mitigation of climate change risk to create more energy secure environments

## A Resilient Energy Focus

Our expertise covers all types of energy production, as well as energy distribution and energy efficiency. We are also recognised for our leading role in the *Decarbonisation*, *Decentralisation* and *Digitalisation* of energy known as the **energy transition**.

In helping our customers face climate change in relation to energy, our activities fall into three areas of energy focus:

### Energy Generation & Transmission

In urban environments, the majority of activities depend on energy generation and its distribution. Climate change related extreme weather conditions have the potential to disrupt operations (continuity), and have long-term effects on the **performance of infrastructure** (capacity and efficiency).

With the threat this poses to cities (total blackouts), our experts focus on assessing and addressing the exposure of energy infrastructure to climate related risks, analysing vulnerabilities and proposing strategies anticipating climate change in new project design and **back-up systems**, as well as in existing structures & power transmission systems.

In the energy field, long-term changes in climate and short-term increases in climate variability are increasingly impacting generation and consumption of electricity. At Tractebel, key energy issues impacting city resilience such as access to energy, security of supply, a sustainable energy production mix and new levels of energy efficiency helping to reduce emissions, are constantly being addressed.

## Energy Consumption

Considering urban population growth and the impact of climate change on systems; whether extreme heat or cold, energy demand will drastically increase in the coming decennia.

Energy consumption must be properly evaluated to define the needs of future energy generation, in terms of local constraints (technical, legal and financial), risks and opportunities.

We have the expertise to simulate multiple energy scenarios taking into account energy needs (impacted by change drivers like energy efficiency actions, sector energy growth, population growth...). Comparing these scenarios helps to **establish a clear energy roadmap to meet the energy demand at short, mid and long-term horizons** considering:

- Energy efficiency actions by sector
- Mature and innovative solutions to reduce energy consumption

## Energy Transition

Developing a resilient energy future in cooperation with major stakeholders (municipality, citizens, energy departments, the industrial sector, etc.) is a critical step towards dealing with climate change and secure energy supply, in a positive, collaborative and sustainable manner.

**The Energy Transition is the gradual shift: from the current non-sustainable energy system:**

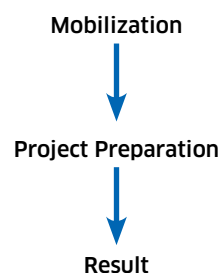
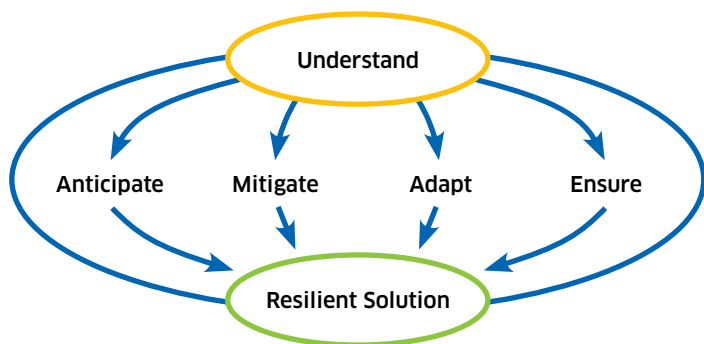
- Not efficient
- Fossil driven
- CO2 intensive
- Polluting
- Dependence in supply
- Energy system costly to adapt
- Centralized
- Expensive
- Not for everyone

**to a more desirable carbon free, clean and affordable future:**

- Efficient
- Sustainable
- CO2 free
- Clean
- Based on local resources
- Resilient
- Decentralised and centralised
- Affordable
- Access to everyone

The concept of decentralised grids can be applied at district, city or even regional levels.

**Tractebel** covers the full process-cycle both for sector-based and cross-sectorial analysis, planning, design and implementation of climate change adaption actions to help build the resilience of specific assets, sectors, areas or complete territories. Steps include stakeholders engagement, vulnerability and risk assessment, masterplanning and development of a resilience strategy, and finally the project preparation and implementation.



## Some of our References

## Urban Climate Resilience

### Climate resilience in the national Power Sector - Turkey

**Objective:** A country-level assessment to quantify risks of climate change induced reduced river runoff, increased seasonality and increased air/water temperatures, impacting electricity generation (thermal and hydropower) and adaptation investment needs, plus identify viable mitigation solutions..

**Result:** Quantification of the potential effects of climate change on the reliability of power generation and transmission assets and investment needs with an initial assessment of the most technically-robust and economically-viable mitigating solutions for future resilience.

### Lifou island: 100% RES roadmap towards 2020 - New Caledonia

**Objective:** Making the Pacific island, in a project co-constructed with the local grid operator and the local authorities, a showcase of energy transition with renewable energies, batteries and biofuels - as an energy resilient island to extreme weather events, namely high wind speeds and tropical storms.

**Result:** To ensure an optimum grid stability with low environmental impact, several RES technologies were proposed to reach the vision of 90% RES in 2020:

- PV total capacity: 5470 kW
- Wind turbine total capacity: 825 kW
- 4.87 MW stationary battery

### Energy Transition in the Antofagasta and Atacama Regions - Chile

**Objective:** Development for CORFO (Chile Government Development Agency) of a systemic energy vision and sustainable pathways to meet the energy demand (mostly mining sector) of the northern regions of Antofagasta and Atacama in 2035 - with a secure, stable and independent 100 % RES with a high energy storage capacity.

**Result:** Acceptance and approval of adaptive pathways by key stakeholders CORFO and mining industry (for whom reliability of supply is a key issue). Electricity and hydrogen will be the dominating energy vectors in 2035 for the renewable energy vision, with hydrogen supplying more than 40 % of the energy needs of Antofagasta and Atacama.

### Evaluation of the Hydropower Sector Climate Resilience Guidelines and Jirau HPP Case Study - Brazil

**Objective:** Hydropower is strongly dependent on climate conditions and on hydrologic conditions of the river basins where the power plants are located. The study assessed possible impact of climate change on performance of Jirau HPP and tested the World Bank Guidelines applicability. The assessment considered business and energy security.

**Result:** Assessed possible impact of climate change on performance of Jirau HPP; tested applicability of the World Bank Guidelines. Improvement suggestions provided to WB.



Energy



Energy generation



Energy transmission



Energy consumption