ASIA CLEAN ENERGY FORUM 2025

Empowering the Future: Clean Energy Innovations, Regional Cooperation and Integration, and Financing Solutions

2–6 June | ADB Headquarters

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ADB

ENERGY FOR ALL :
European Models of Inclusive Access

02June 2025 | 1:30-3:30 p.m. (GMT+8)

In cooperation with

GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMÍA, COMERCIO Y EMPRESA
ICEX

AMBASSADE DE FRANCE AUX PHILIPPINES ET EN MICRONÉSIE
Liberté
Égalité
Fraternité

Business France

Embassy of Italy
Manila

ITA
ITALIAN TRADE AGENCY

L'UNION FAIT LA FORCE EENDRACHT MAAKT MACHT

respira by sener

Artificial Intelligence Energy Management

ADB

June 2nd 2025

Multidisciplinary engineering

Founded in 1956

Innovation, Quality and Independence

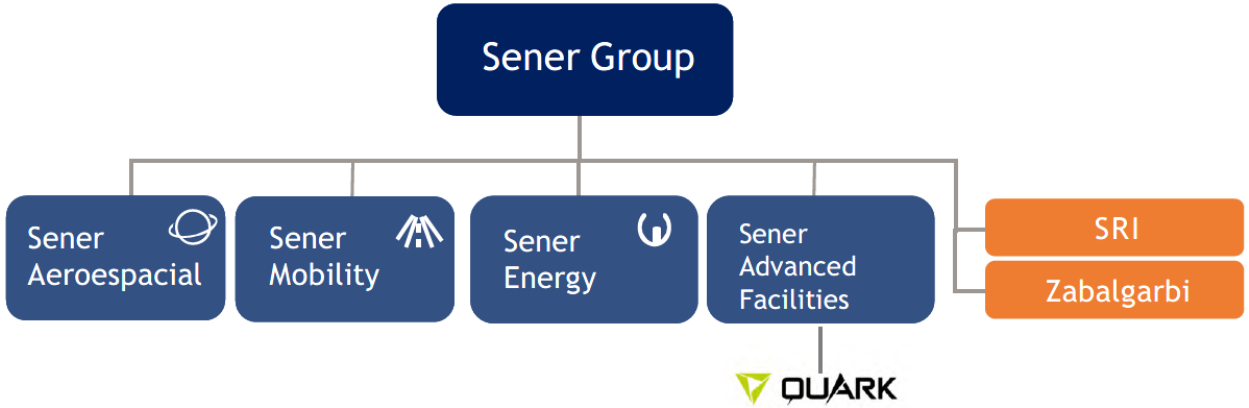
> 1.300 M EUR (Contracts 2024)

> 4.000 people

Offices in > 20 countries in 5 continents Projects in > 90 countries

#30 International design firm

> 80 patented families | R+D+i investment 10% of worked hours

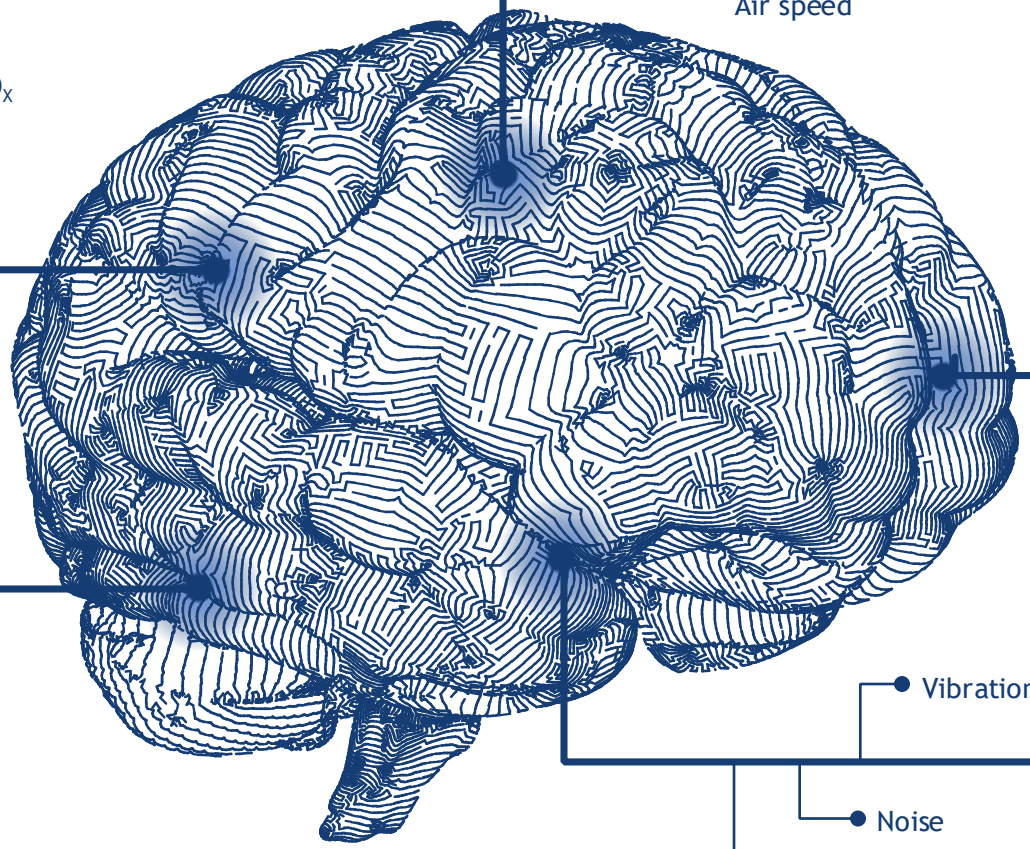


VIDEO

respira now breathe = ARTIFICIAL INTELLIGENCE × (THERMAL COMFORT + AIR QUALITY + ENERGY EFFICIENCY)

Respira® is a control system based on Artificial Intelligence that optimizes the operation and maintenance of air conditioning systems in buildings and large infrastructures. Thanks to its predictive algorithms, Respira® provides significant savings in energy consumption and improves environmental conditions in terms of thermal comfort and indoor air quality.

respira® can be understood as an intelligent and automatic virtual operator of the HVAC system as well as other systems.



ENVIRONMENTAL CONDITIONS

Determine the degree of comfort of users inside the facilities

- Pressure
- Temperature
- Humidity
- Air speed

AIR QUALITY

Establish minimum levels of air quality

- CO_2
- NO_X
- Particulate matter (PM)

OPERATING PARAMETERS

Link the facility's operating variables

- Occupancy
- Events
- Thermal loads of the facility

WEATHER FORECAST

Forecast of weather conditions

- Solar Radiation
- Rainfall
- Thermal conditions

MECHANICAL PARAMETERS

Enable predictive maintenance of the facility's assets

- Vibrations
- Noise
- Energy consumption

platform respira®

integration

All your data sources on a single platform.

management software

BMS/SCADA
Building Management System

Schneider Electric · Johnson Controls · SIEMENS

CMMS
Computerized maintenance management software

Energy Management
Energy management platform

Dexma

PV Management
Photovoltaic installation management platforms

respira by sener

communication protocols

BACnet · Modbus · OPC UA

external sources

meteorology
Meteorological APIs

AEMet · meteo.cat

Electric bills
Electrical billing platforms

datadis

additional devices

IoT
"Internet of Things" devices

IOT

concept respira

artificial intelligence and engineering to achieve energy efficiency

Sustainability, efficiency, comfort and air quality in your buildings and infrastructures

operation

Optimize the operation of your facilities to achieve maximum efficiency.

Manage the energy demand of your buildings and infrastructure with the lowest possible cost.

Thermal comfort and Air Quality with minimum energy consumption.

maintenance

Identify automatically early **anomalies in facilities**.

Avoid unnecessary overconsumption and prioritize maintenance tasks.

Receive warnings and an automatic evaluation of the impact of the failure.

investments

Automatically identifies energy saving measures.

Prioritize your investments based on the potential energy savings and the impact of the proposed measures.

plataform respira®

centralized energy management

The respira® platform has been designed by Sener engineers as a centralized energy management tool at the service of its clients.

1

• integrate

- Link your BMS, SCADA, energy management platform and/or ERP system. Integrate data from your network analyzers, environmental sensors or your photovoltaic installation. Everything on a single platform.
- Discover how technology can transform your data into energy efficiency and environmental improvements.

2

• Configure your project

- You have the control. In an easy and simple way, configure the different areas of your spaces, prioritize your assets and create your own energy map.
- Manage multiple locations simultaneously.

3

• analyze

- Become the guardian of your assets. Monitor your KPIs, consult dashboards and use our reporting system to keep everything under control. Complies with standard 50001 and identifies anomalies and points for improvement.
- Turn data into knowledge and knowledge into action.

4

• optimize

- Make your data work for you. Use our recommendations for efficient management of your installation. Make decisions based on data, transforming information into effective strategies.
- Take a step towards the future of efficiency, innovation and sustainability.

5

• Virtual operator

- With respira®, artificial intelligence becomes your ally for a sustainable future. Our AI analyzes and operates autonomously, recommending maintenance actions and strategic investments. All this without human intervention, reducing energy costs and improving environmental conditions.
- respira®: smart technology for a greener world.

platform respira®

tour of the screen platforms

login

Access the platform through a URL from any device and location. Protect your data with username and password.

locations

Explore and manage all your locations from a single access point. Register unlimited new locations.

monitoring

View your data in real time. Browse the different chart types, get summary tables for your reports and export the data in one click.

analytics

Discover patterns, understand behaviors and make decisions based on real data. Compare the actual behavior of your facilities with the reference baselines.

project configuration

Add and hierarchically organize the spaces of each location. Edit the comfort parameters and establish personalized schedules for each of them.
Graphically configure the single-line diagram of your installation and link your electrical analyzers.

devices & equipment

Manage your equipment and devices, edit their parameters and map their variables.

administration

Add new users and roles to the platform based on your needs. Assign permissions to each role. Choose what each of them can see/edit.

respira® Success cases

Transports Metropolitans de Barcelona

Barcelona Metro
(2020, Barcelona)

A railway network that serves the city of Barcelona and the municipalities of its metropolitan area. With its 12 lines, 189 stations and 170 kilometers, in 2023 it transported approximately 440 million passengers.

-1,3°C	**Indoor temperature** of the seasons in summer	25,1%	**Energy saving** annual average at the facility
+10,7%	**Satisfaction** of passengers in summer	-6,2 GWh	**Energy consumption** annual average at the facility
+20,9%	**Performance** of the fans	-1,676 ton CO2/year	**CO2 emissions reductions** annual average at the facility

aena

Manises Airport
(2022, Valencia)

An international airport that was awarded in 2022 as 'Best Airport in Europe' in the category of 5 to 10 million passengers by the International Airports Council of Europe.

+3,1%	**Indoor temperature** Time in aceptable range	23,9%	**Energy saving** annual average at the facility
100%	**Air Quality** In optimum category	-3,050 Kwh/day	**Energy consumption** Savings in summer
		-600kg/day	**CO2 emissions reductions** During summer period

respira® Success Cases

IBEROSTAR HOTELS & RESORTS

Iberostar Hotels & Resorts
(2023)

The leading hotel chain in responsible tourism with a portfolio that exceeds 100 4 and 5 star hotels in 16 countries on three continents (Europe, Africa and America).

Thermal comfort
88,5%

Total hotel consumption
5,19%

Air conditioning
20,8%

Fira Barcelona

Fira Barcelona
(2023, Barcelona)

One of the most important fair institutions in Europe, with two venues, Gran Via and Montjuïc, totaling 240,000 m² of space for events and exhibitions in various sectors of the economy.

100% **Indoor temperature**
In the range established by the client

+80% **Anomalies early detection**
time saved to detected the anomalty

45% **Energy saving**
annual average at the facility

SaludMadrid

Hospital Henares
(2024, Madrid)

This innovative approach improves both the safety and quality of life of patients and healthcare staff, setting a new standard in hospital management.

-24,0% **Virus**
Decrease of virus contagion risk.

23,0% **Energy saving**
annual average at the facility

99,1% **Air Quality**
of the time in acceptable category

92,5% **Thermal Comfort**
of the weather in acceptable range in summer

respira® service scheme

Choose the one that best suits your needs

ROI

(Return on Investment)

1 – 2 YEARS

consultancy

- ✓ consultancy initial, strategic plans, system standardization, evaluation of energy saving measures
- ✓ Specialized support through consulting work and training

plataforma respira®

basic

- ✓ Suitable for basic multi-building monitoring based solely on energy consumption
- ✓ Building classification analytics and anomaly identification

standard

- ✓ Suitable for advanced management of a building, with monitoring of all variables of the BMS or SCADA system
- ✓ Includes basic multi-building monitoring

advanced

- ✓ Suitable for advanced multi-building management

respira® virtual operator

- ✓ Efficient management through the virtual operator: Optimize consumption and keep energy costs as low as possible automatically
- ✓ Automatic identification of energy saving measures (MAE)
- ✓ Consulting service included. Monthly meeting to present results and interpret the identification of the identified MAEs

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The Pros and Cons of Embarking on a Smart Metering Programme

2nd June 2025

ADB

EDF international networks

LINKY: EDF's Advanced Metering Infrastructure (AMI) Programme - Key figures

Around 40 M
Linky smart meters installed

A 6-years deployment
within a budget of 4 billions €

A program tightly overseen by the French energy regulator
to prevent customer cost overruns.

A company project
not an IT project

1,5 million kilometers of electrical network
including 50% low-voltage lines that were previously unmonitored before the deployment of Linky

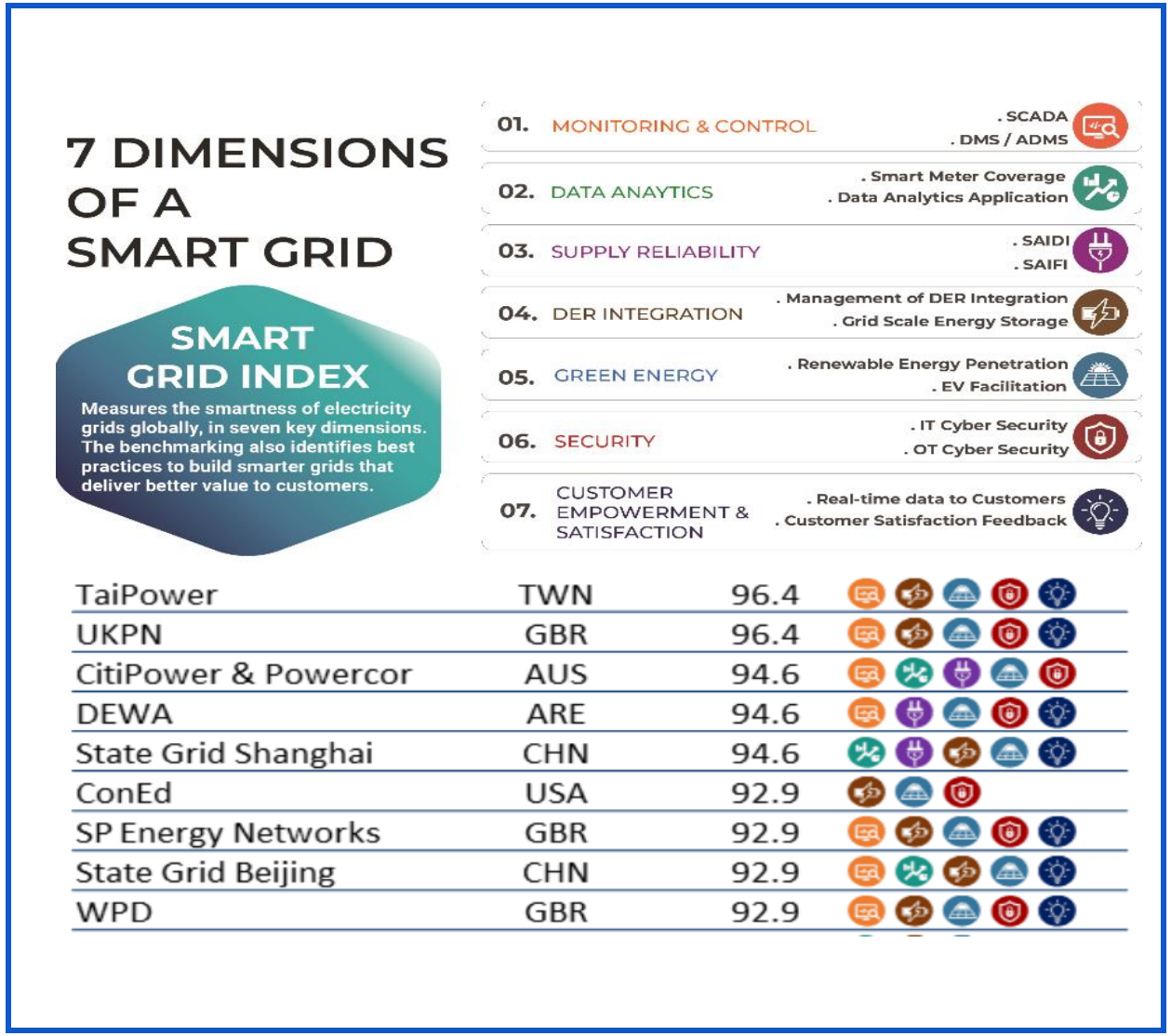
Over 1,500
network incidents detected remotely and quickly resolved, every month, using Linky data

The essence of LINKY

The rapid scaling of the project strengthened our negotiating position with suppliers and ensured delivery in line with the original design

The Iceberg of AMI Benefits

world's
smartest grid operator



TaiPower	TWN	96.4
UKPN	GBR	96.4
CitiPower & Powercor	AUS	94.6
DEWA	ARE	94.6
State Grid Shanghai	CHN	94.6
ConEd	USA	92.9
SP Energy Networks	GBR	92.9
State Grid Beijing	CHN	92.9
WPD	GBR	92.9

Usage of Data

7 DIMENSIONS OF A SMART GRID

SMART GRID INDEX

Measures the smartness of electricity grids globally, in seven key dimensions. The benchmarking also identifies best practices to build smarter grids that deliver better value to customers.

01.	MONITORING & CONTROL	. SCADA . DMS / ADMS
02.	DATA ANAYTICS	. Smart Meter Coverage . Data Analytics Application
03.	SUPPLY RELIABILITY	. SAIDI . SAIFI
04.	DER INTEGRATION	. Management of DER Integration . Grid Scale Energy Storage
05.	GREEN ENERGY	. Renewable Energy Penetration . EV Facilitation
06.	SECURITY	. IT Cyber Security . OT Cyber Security
07.	CUSTOMER EMPOWERMENT & SATISFACTION	. Real-time data to Customers . Customer Satisfaction Feedback

Utilities	Country/Market	Score %	Best Practices
Enedis	FRA	98.2	
TaiPower	TWN	96.4	
UKPN	GBR	96.4	
CitiPower & Powercor	AUS	94.6	
DEWA	ARE	94.6	
State Grid Shanghai	CHN	94.6	
ConEd	USA	92.9	
SP Energy Networks	GBR	92.9	
State Grid Beijing	CHN	92.9	
WPD	GBR	92.9	

The Iceberg of AMI Benefits

Ability to Track and Optimize Their Energy Use

Health Concerns Around Smart Meters

Privacy Concerns

Remote Meter Reading

Prepayment implementation

Non-technical losses reduction

Development of new services

Prosumer

The Iceberg of AMI Benefits

Ability to Track and Optimize Their Energy Use

Health Concerns Around Smart Meters

Privacy Concerns

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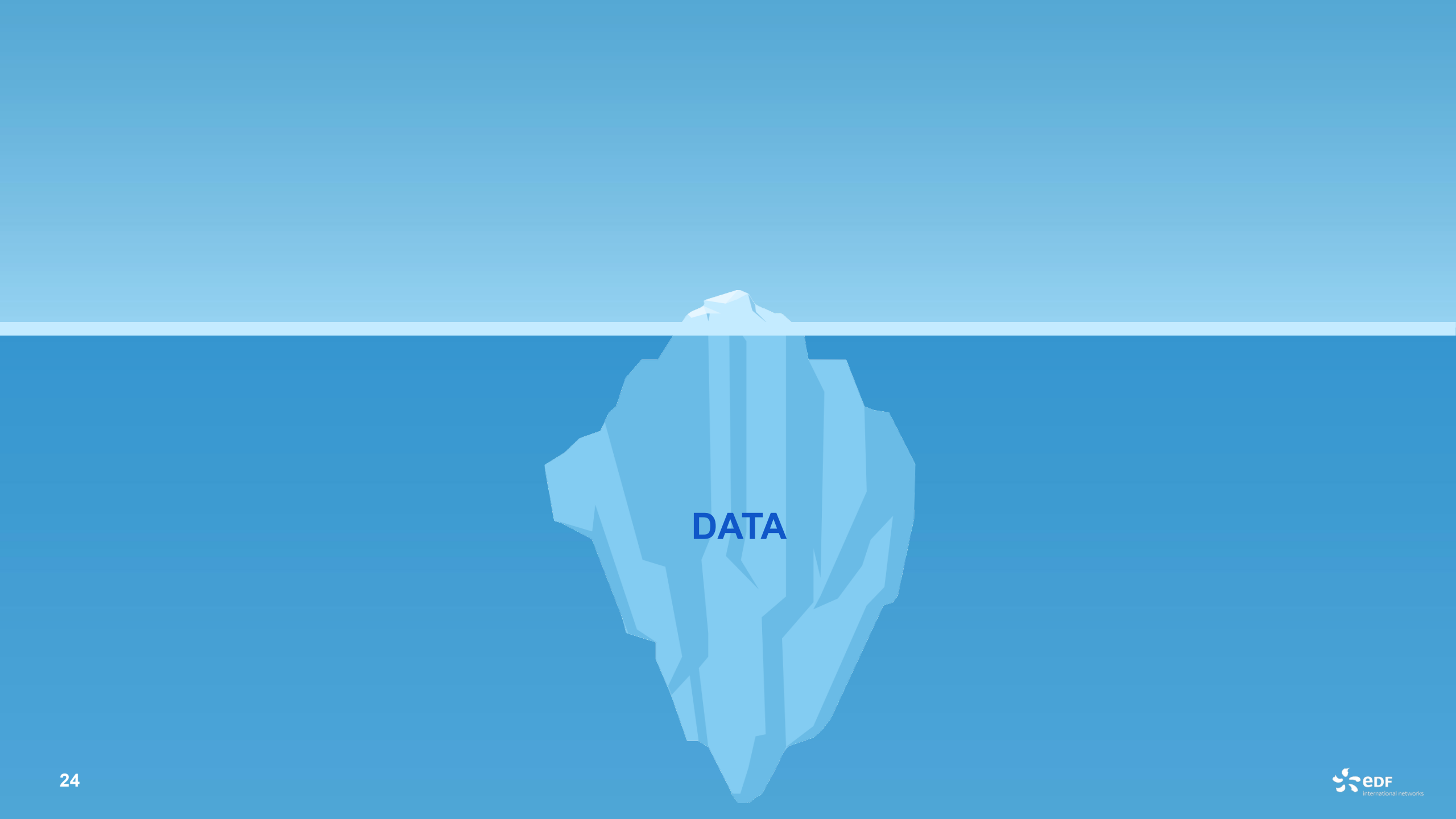
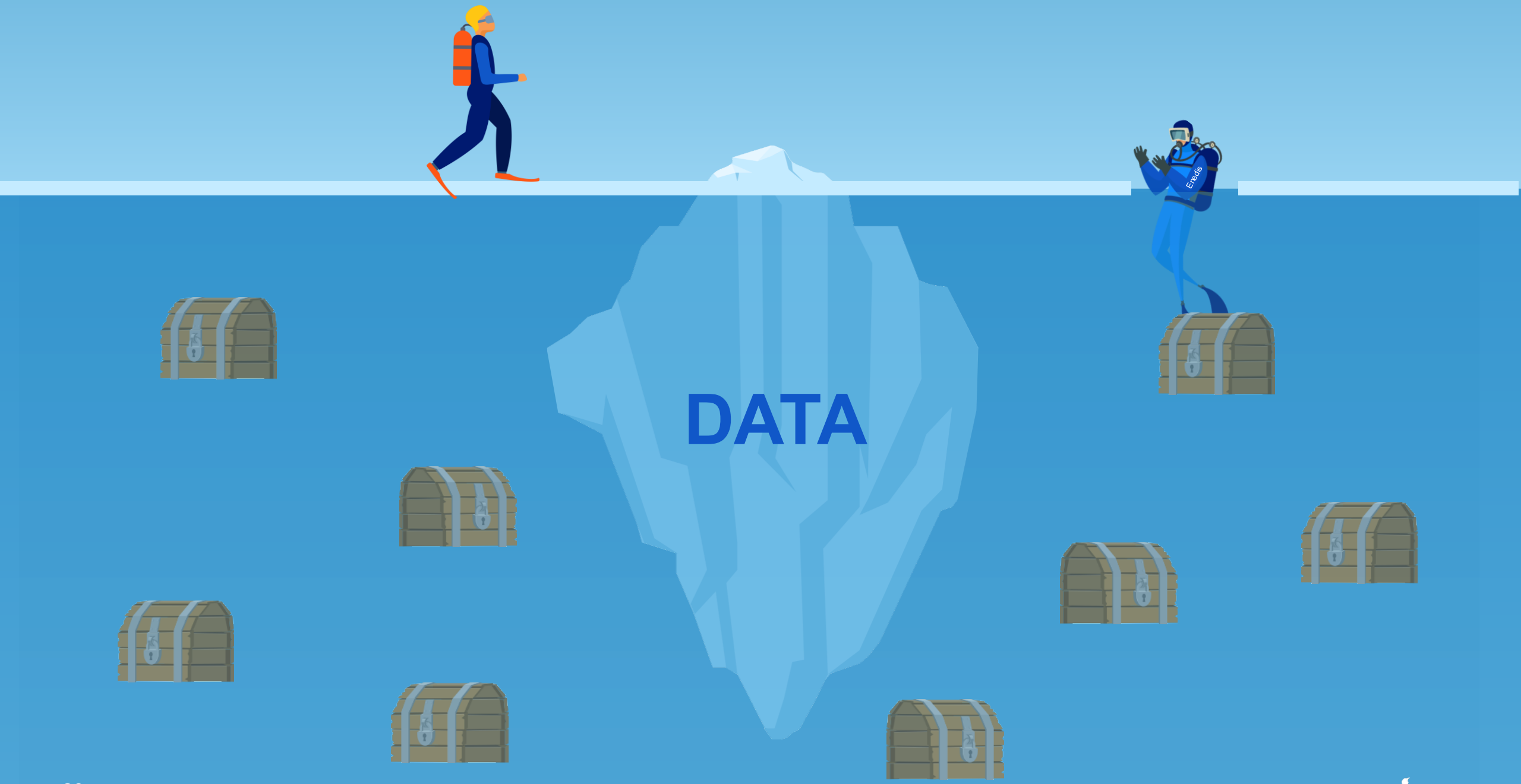
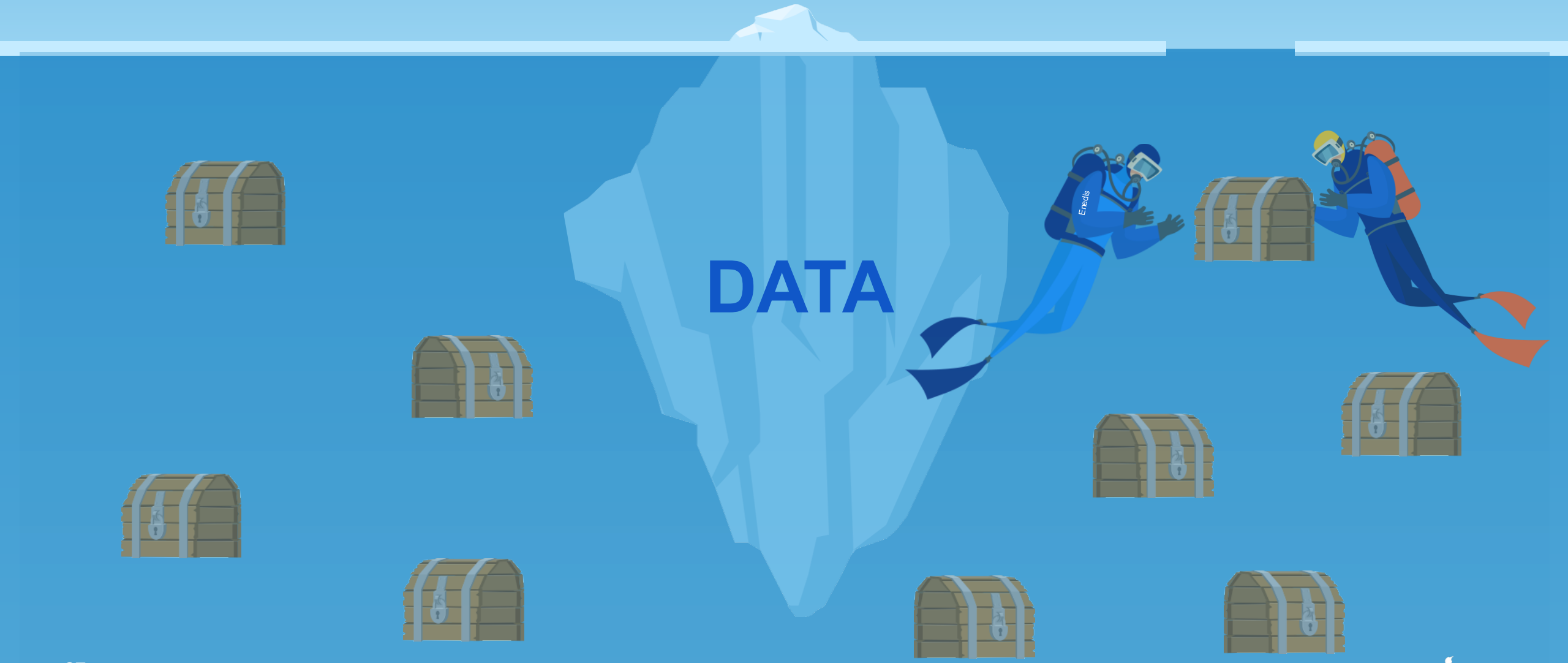
Development of new services

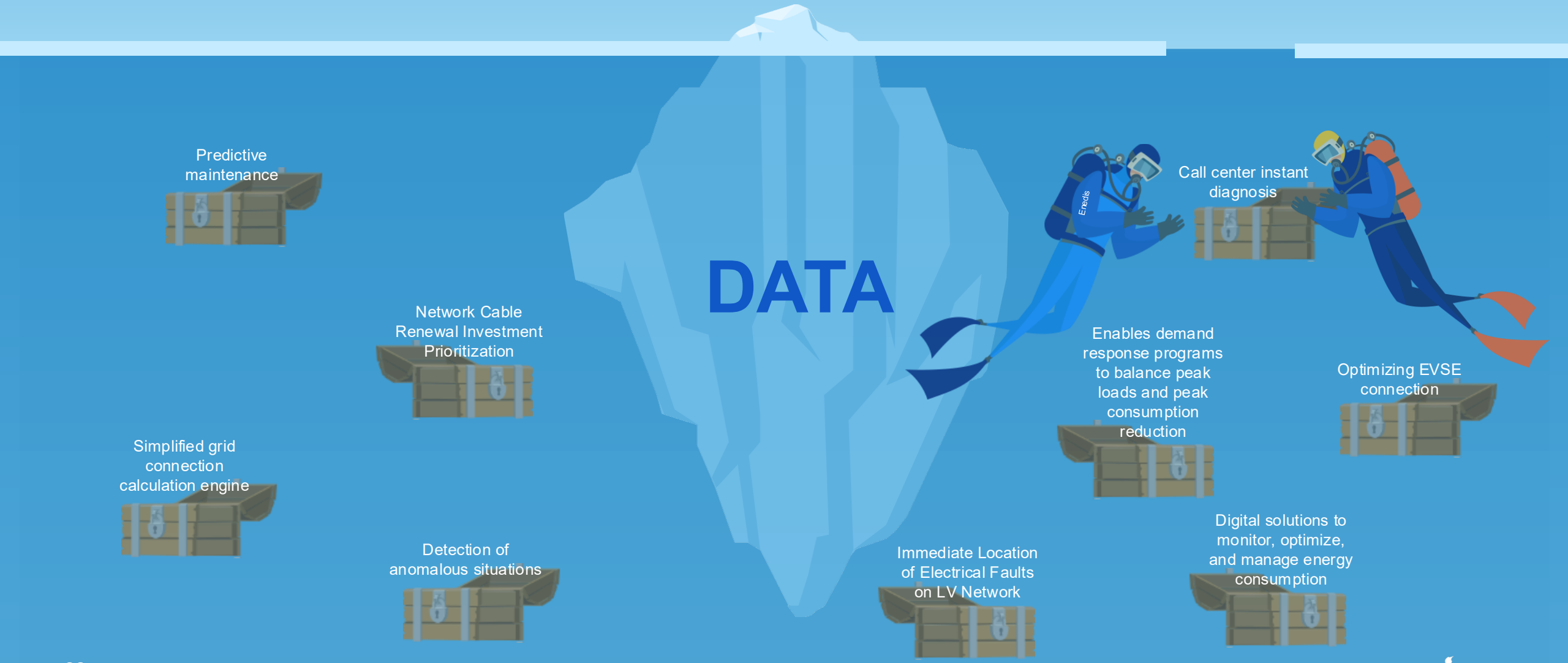
Prosumer


DATA


Enedis
DATA


DATA
E-redis


DATA
Enedis


Predictive maintenance
Network Cable Renewal Investment Prioritization
Simplified grid connection calculation engine
Detection of anomalous situations
DATA
Immediate Location of Electrical Faults on LV Network
Enedis
Call center instant diagnosis
Enables demand response programs to balance peak loads and peak consumption reduction
Optimizing EVSE connection
Digital solutions to monitor, optimize, and manage energy consumption

Examples of Use Cases developed

01

Individual Ping:
Call center instant diagnosis

02

Grouped Ping:
Immediate Location of Electrical Faults on LV Network

03

Cartoline:
Predictive maintenance

04

DAD:
Network Cable Renewal Investment Prioritization

05

Capten:
Simplified grid connection calculation engine

06

AVEnir:
Optimizing EVSE connection

07

Non-Technical Losses Portal:
Detection of anomalous situations

08

Grid Efficiency:
Enables demand response programs to balance peak loads and peak consumption reduction

09

Datanumia:
digital solutions to monitor, optimize, and manage energy consumption

Embarking on a Smart Metering Program requires new operational roles and organizations

Changing the way of working

- **Work restructuring**
- **Review operational process**
- **Evolve skills**

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Pre-Forum Event: Energy for All: European Models of Inclusive Access

Investment Potential for **Energy Efficiency** and **Decarbonization** in Kazakhstan's Energy-Intensive Industries

2 June 2025

In cooperation with

ADB

RINA

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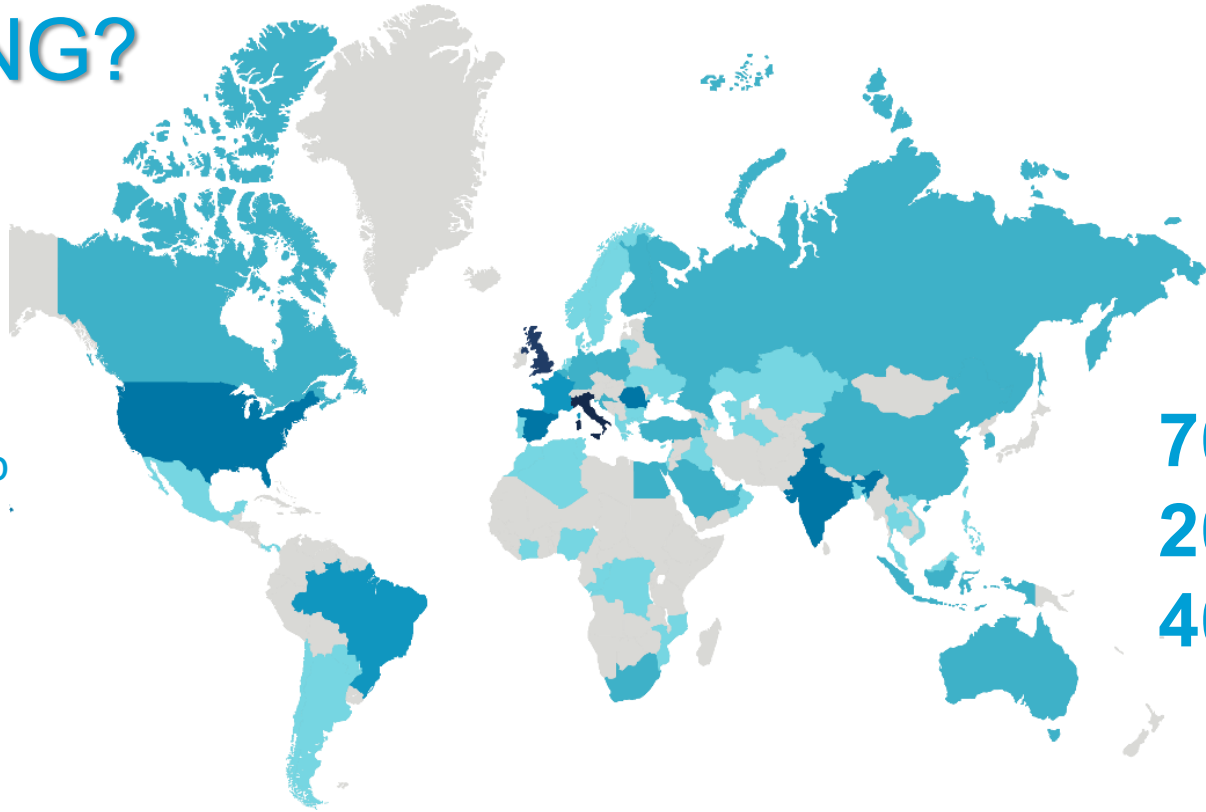
WHY RINA CONSULTING?

Committed to simplifying complexities with a focus on energy transition, ESG and digitalization

In 2000, we inherited the **know-how** of one of the world's first naval classification registries, the Italian Naval Registry, and we turned it into a **"business-to-society"** company, supporting customers in keeping up with changes and growing **sustainably**.



70+ countries

200+ offices

4000+ people

Our Markets

- Energy
- Marine
- Certification
- Transport & Infrastructures
- Inspection & Field
- Industry

RINA

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Our Customers

MULTILATERAL DEVELOPMENT BANKS

WORLD BANK GROUP

European Bank for Reconstruction and Development

European Investment Bank

IDB Inter-American Development Bank

ADB ASIAN DEVELOPMENT BANK

AFRICAN DEVELOPMENT BANK GROUP

IsDB البنك الإسلامي للتنمية Islamic Development Bank

CARIBBEAN DEVELOPMENT BANK

DONORS & DEVELOPMENT AGENCIES

AFD AGENCE FRANÇAISE DE DÉVELOPPEMENT

KFW Bank aus Verantwortung

European Commission

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

UNDP

The Project

The project was carried out across multiple industrial sites in **Kazakhstan**, targeting key energy-intensive regions.

- Cement and clinker production
- Metallurgy and related industries
- Transport and manufacturing
- Food industry
- Chemical production

Each selected company operated in a distinct sector and contributed with local data to assess nationwide investment potential in energy efficiency and decarbonization.

The Need

These “Early Adopters” underwent tailored assessments **to identify energy-saving measures and decarbonization opportunities**.
The audits combined site inspections, benchmarking, and investment appraisals, enabling the definition of sector-specific action plans aligned with international best practices and technological readiness levels (TRL ≥5).

<u>The tasks included:</u>

- Reviewing and analyzing current energy use practices to enhance industrial energy efficiency (EE), including energy audits and identification of technologies with TRL 7+ for selected energy-intensive industries.
- Building capacity of national stakeholders on energy assessments and cloud-based EA software.
- Conducting a sectoral analysis of investment needs to support national EE targets and BAT compliance.
- Facilitating stakeholder consultation and presenting the sectoral assessment.

The Problem

Financial conditions weaken the business case for clean energy (EE) projects/Initiatives

Weaknesses

- High capital cost of decarbonization projects
- Low energy prices reduce investment appeal
- High borrowing costs (15–18%) hinder ROI

Threats

- Lack of short-term profitability for RE
- Currency risks for foreign financing

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The Results

Barriers that can become Opportunities ?

Strengths that can develop resilience ?

Strengths

- Strong GDP growth in industrial sector
- Local capacity building through audits
- Growing awareness on energy efficiency

Opportunities

- Government subsidies/grants from IFIs
- Industrial competitiveness via TRL upgrade

RINA

Tips for REPLICABILITY

- Use of **cloud-based audit tools** to scale assessments
- Leverage **international-local consortiums** for technical training
- Incorporate **Competence Centers** for continuous knowledge transfer
- Simulate financial impacts **including shadow carbon costs**

To replicate this approach in similar contexts, it is crucial **to combine digital tools with strong local engagement**. Prioritizing **high-impact sectors and technologies with proven readiness ensures realistic outcomes**, while partnerships between international experts and local institutions can accelerate implementation.

LESSONS LEARNT

Local responsiveness varies—engage companies with **clear financial upside**
Align audits with **real financing mechanisms** from day one
Systematic **capacity building is essential** and appreciated by stakeholders

The project highlighted that financial feasibility is key to driving industrial interest in energy efficiency.

Regulatory gaps, limited technical skills, and lack of incentives remain persistent challenges, underscoring the need for systemic policy support and long-term capacity-building mechanisms.

ADB

CONCLUSIONS

The project delivered a **scalable framework for energy audits in heavy industry**
Key barriers are economic, technical, and institutional, but solvable
By demonstrating investment-grade opportunities, RINA enabled local stakeholders to visualize a path toward decarbonization
The analysis can serve as a replicable model in other transition economies

This approach is useful for regions like Asia with persistent asymmetries between countries and sub-regions.

RINA

Rocio Milagros RENNA & Emiliano PIRODDI

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Revolutionizing Low-Head Hydropower: The Promise of Turbulent Vortex Turbines

02 June 2023

In cooperation with

TURBULENT

ADB

The Problem

Despite the growing demand for sustainable energy, many remote areas remain underserved by current renewable solutions. 760 millions of people live without access to electricity.

Centralized (often fossil fuel-driven) energy systems fail to reach these areas, leading to expensive polluting alternatives, and exposing communities to frequent power outages.

Addressing With Hydro

Unlike other renewables with significant environmental impact, hydropower provides a non-intermittent, stable and reliable energy generation. However, traditional hydropower requires massive investments, has significant impact on the environment and provides a centralized energy source.

There is a gap for a reliable, eco-friendly, and decentralized energy solution that enhance network resilience and accessibility.

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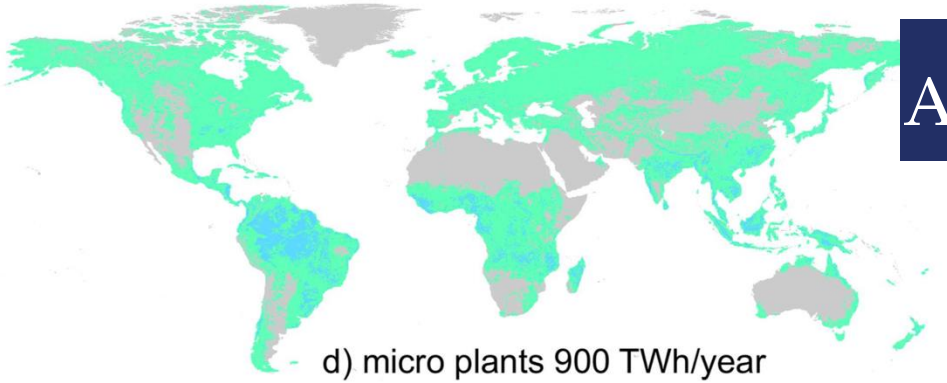


Our solution: low-head hydropower.

Installing a network of turbines instead of large dams.

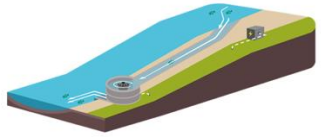
Total number of locations for Micro: N = 8.0 × 106, for Mini: N = 2.7 × 106

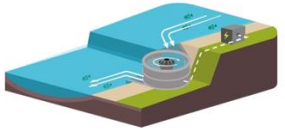
(O. A. Hoes, et al, 2017.)

Old Paradigm

Hydropower as a invasive, environmentally harmful, high-cost energy source with long lead times.

Single turbine in river/canal with gradual drop.

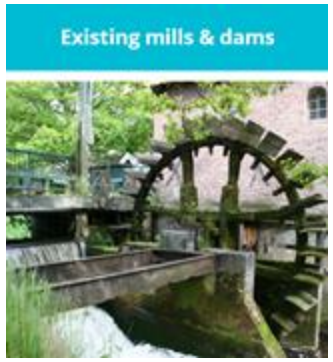


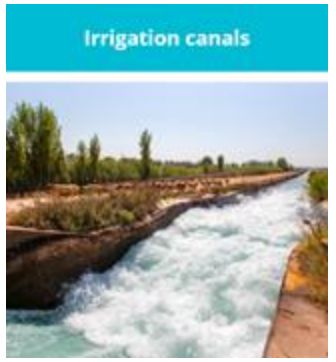


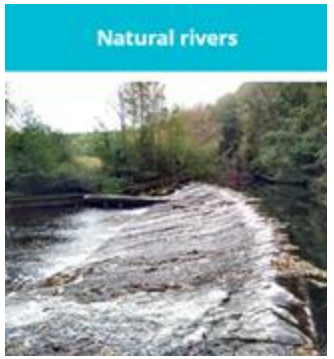
Single turbine in river/ canal with sudden drop.

The Turbulent Transformation

Sustainable, decentralized hydropower: fast deployment, user-focused, eco-friendly. Tailored to local needs, operational in months.







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Our solution: The Vortex Turbine

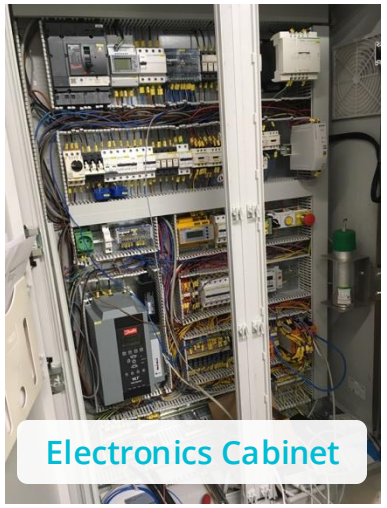
Leveraging The **Untapped Hydropower** Potential of **Low-Head** Waterways.

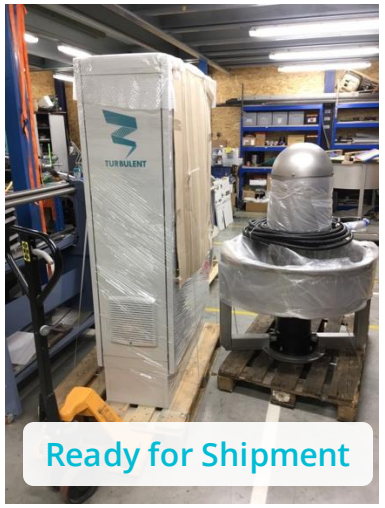
- On-grid as well as off-grid, each individual unit generates up to 500,000 kWh per year per turbine.
- Our standard range includes 5 models from 15 to 90 kW. They can be installed in clusters along a river, scaling the installed capacity up to 2 MW.
- A reliable and constant energy source, 24 hours/day, 365 days/year, addressing the intermittency of weather dependent energy sources like wind or solar.
- Turbulent has already impacted **thousands** of people in remote or rural communities, schools, hospitals, farms, and is aiming to grow this number exponentially.

Designed and made by Turbulent


Core incl. Generator-Gearbox


Impeller/Rotor


Electronics Cabinet



Ready for Shipment

Installed on location by Turbulent & local partners


Vale Das Lobas, Portugal


Versailles, France


Mathioya, Kenya

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WE MAKE IT HAPPEN

15 team members from **8** different nationalities work together from **3** different continents towards the same mission.

Management

Pieter J. - CEO

Pieter held several CEO positions within the field of renewables, but the main highlight is CEO of Vortex energy, which was sold to the BlackRock group in 2021

Frederik R. - COO

*"I ensure that the company's operations run smoothly and efficiently, **I am eager to roll up my sleeves.** I challenge top management with a sense of humor."*

Walter B. - CCR

*"I worked on **four continents**, established dear friendships and good networks, which I also lean on to the advantage of Turbulent." I have confidence in **how to make things happen**.*

Luc B.- Head of R&D and IT

*"My superpower is the **perseverance** to keep going for a cause I believe in, and eagerness to tackle engineering challenges.*

Office

Vera D. – Office Manager

*"My acing skill is my down-to-earth mentality, **seeing problems as challenges**, bringing structure and giving support when needed."*

Operations

Ronald V. – Mechanical Engineer

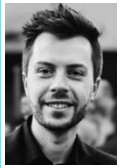
*"I consider myself a quick learner and **jack-of-all-trades** with a strong believe in - and **relentless drive for quality**"*

Arne C. – Electrical Engineer

*"I'm extremely proud of the achievement of my team, and our **victory of the Australia solar challenge 2023**."*

Daniel H. – CAD Engineer

*"Multiple years of experience allow me to leverage tools in my **repertory to be ahead** on design, preparation, and structure for all of our turbines and workflows."*



Glen V. – Electro-Mechanical Eng.

"I'm excited to continue my journey in the engineering world, driven by my commitment towards innovation and sustainability."

Bart V. - Software Engineer

*"I am proud to be able to apply my specialization in **IOT technologies** to power a green future with Turbulent."*

Marketing

Andrei B. - Marketeer

"I have a gift for transforming complex concepts into mass appealing material"

Sales

Maria Z. – Business Developer

*"Able to combine technical skills with people skills, I can also apply different **cultural codes** depending on the region I am working with."*

Samuel L. – Technical Sales Engineer

*"My proudest moment was the **successful design** of a flood protection infrastructure which continues to effectively **safeguard the community** to this day."*

Kathleen C.–Business Dvp. Mozambique

*"Exposure to diverse industries, and companies of various sizes, allows me to act with a **multifaceted lens**, offering innovative and flexible strategies."*

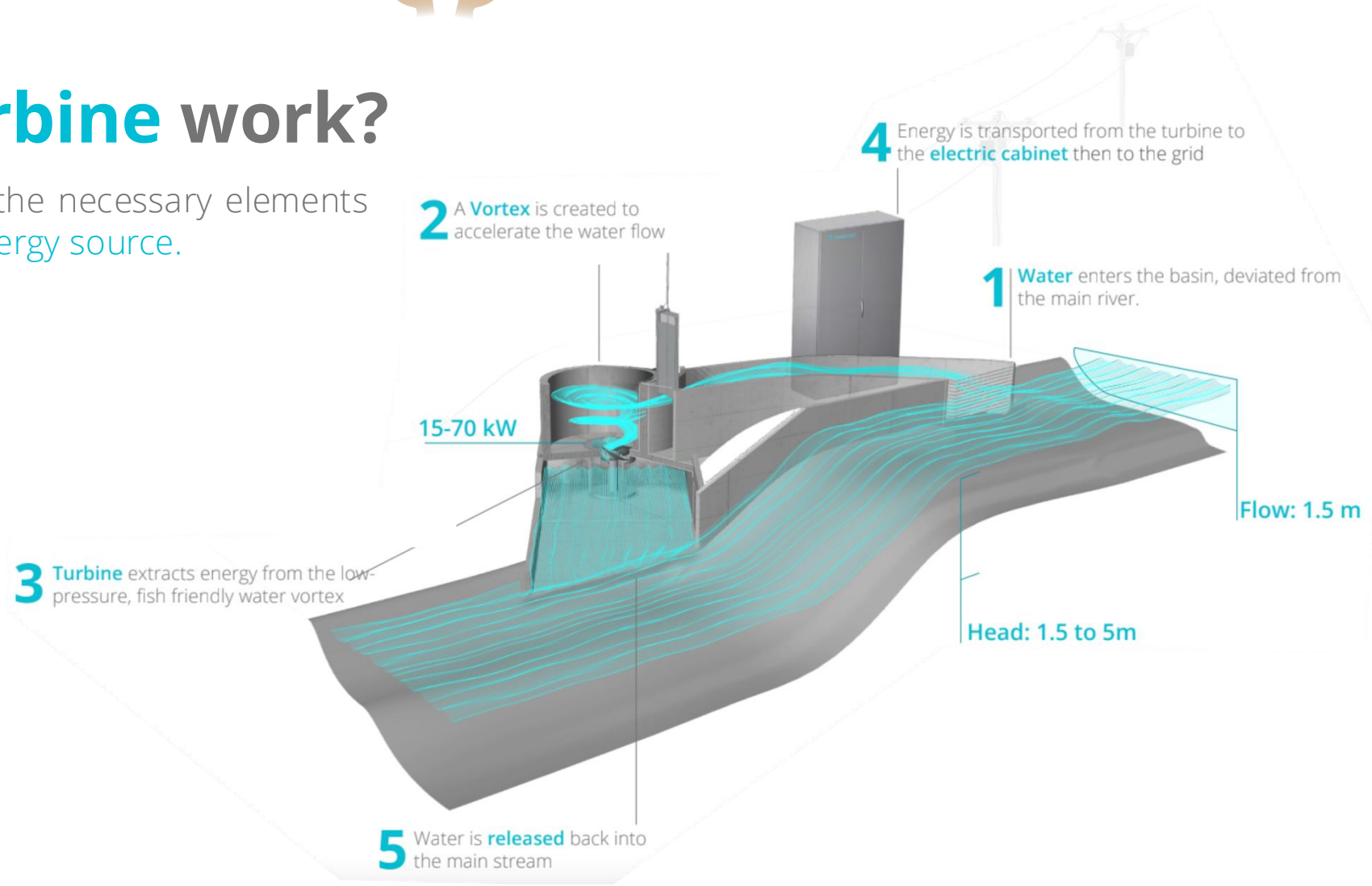
Lasantha Jayasinghe– Sr. Project Manager

*"From Asia to Africa and Europe, I transform streams into dreams, **empowering communities** globally with innovative green micro hydro energy solutions—this is my greatest passion."*

How does our Turbine work?

We develop projects that include all the necessary elements to turn waterways into a profitable energy source.

- Turbine Core
- Electrics
- Cabling
- Sluice Gates
- Trash Racks
- Civil Works Blueprints



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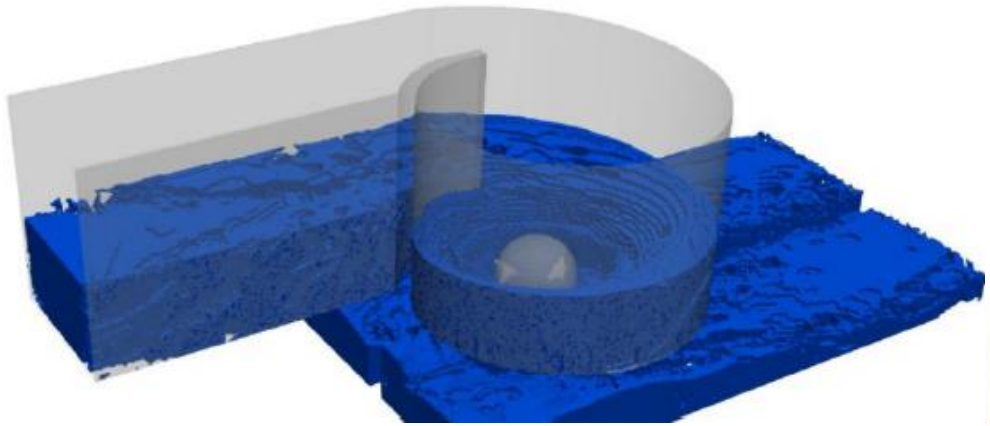
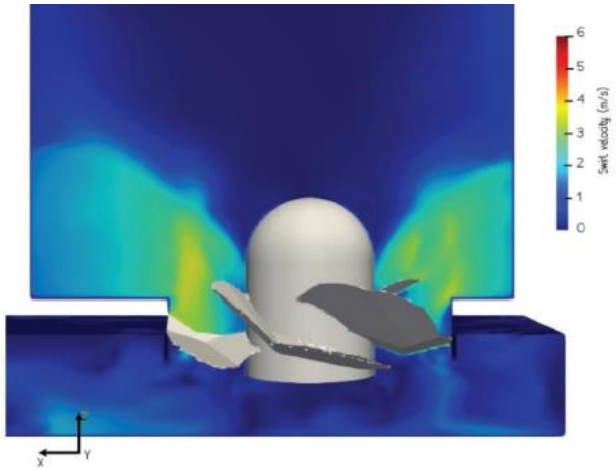
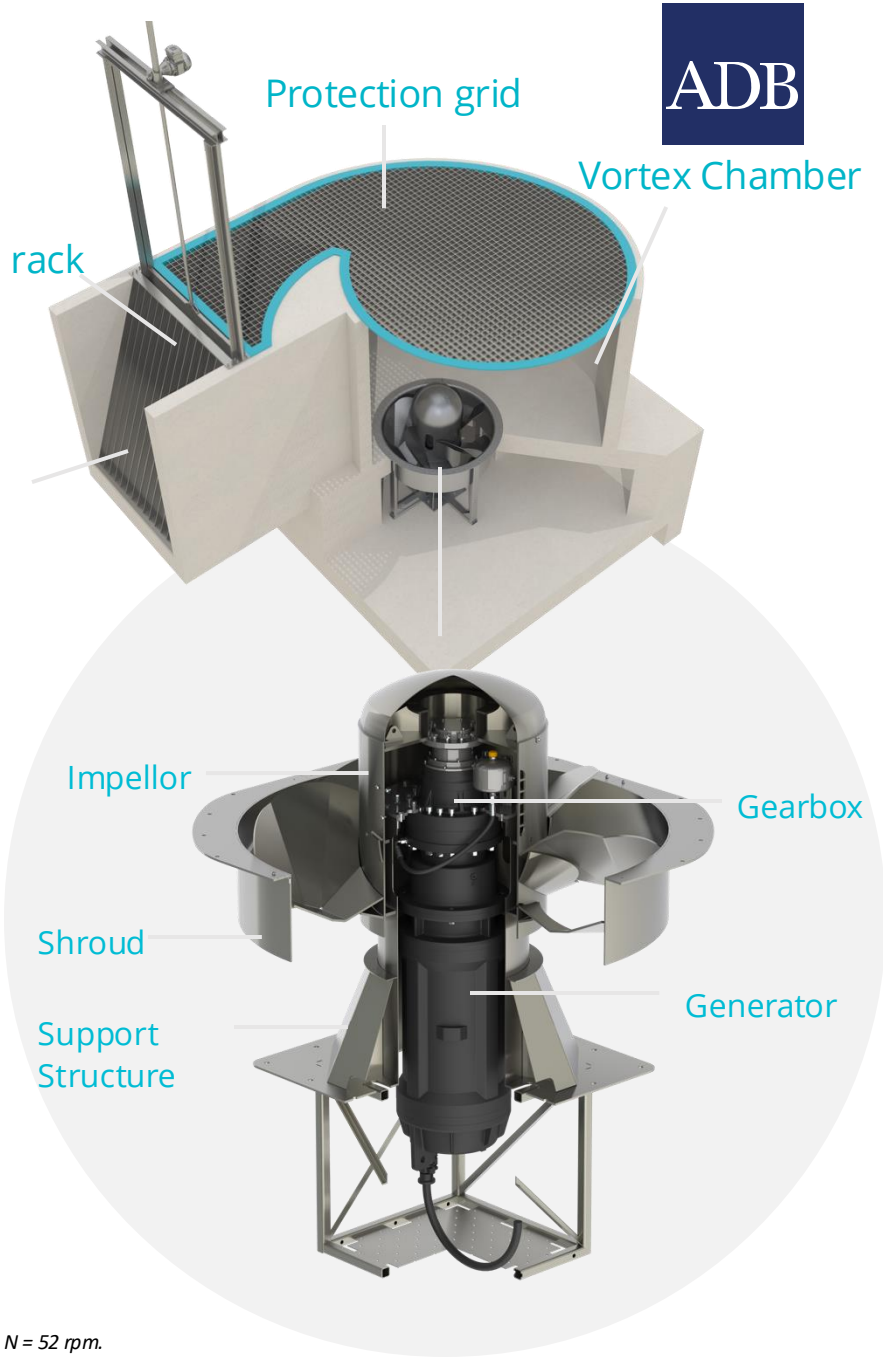
Vortex Turbine Principles

Harnessing energy from a controlled vortex

- Utilizes a very low-pressure gradient and pre-rotates the flow
- Applying the natural principle of a vortex.
- the rotational speed Increases towards the center
- Leads to the use of smaller turbine rotors,
- Small relative velocities (and low impact forces) are maintained for fish that pass through the system.



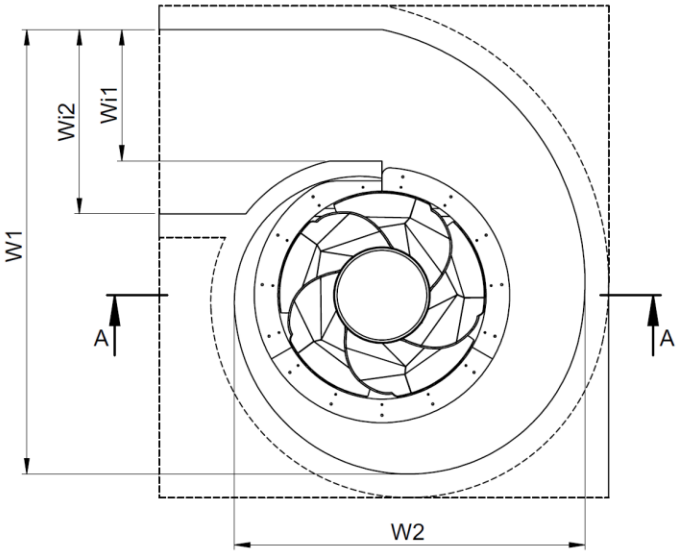


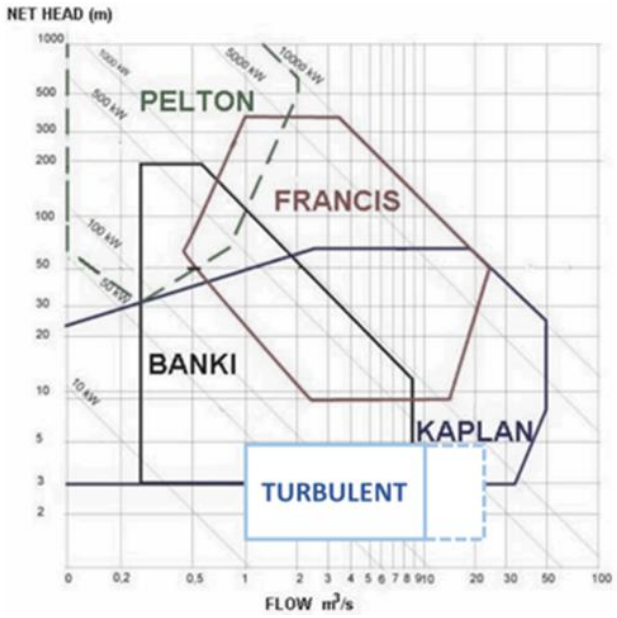


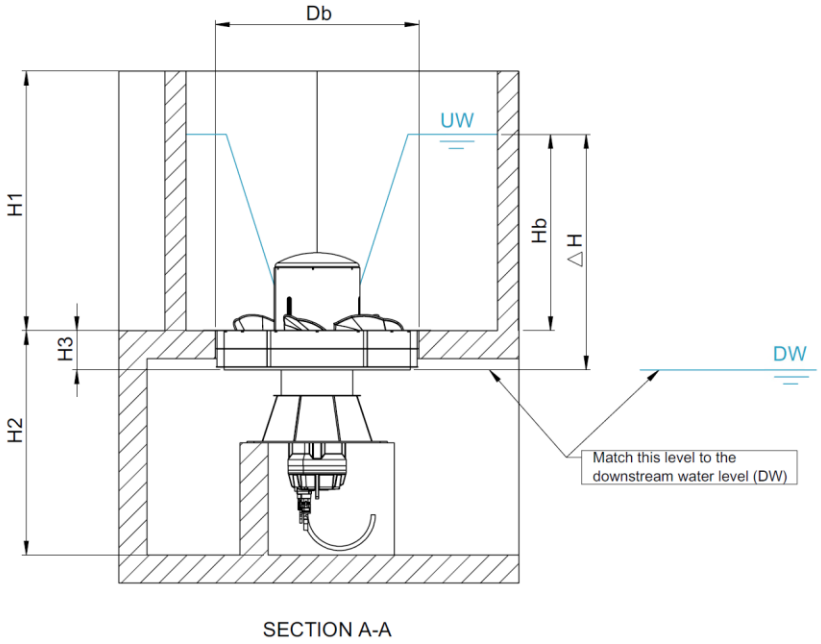
Two-phase flow CFD results showing the free surface of the vortical flow in the scroll and the distribution of swirl velocity c in a cross-section of the turbine, at Q = 1.1 m3/s, Hsys = 1.1 m, N = 52 rpm.

Turbulent Turbine: Technical Parameters

- Working range
  - Flow: 1.1 – 5 m^3/s per turbine
  - Head: 1.3 – 3.5 m per turbine
- Power output: 15 kW to 90 kW per turbine unit
- Performance across varying flow
- Water to wire efficiency up to 77%
- Utilize submersible induction generator
- Multiple installation: Cascade and Parallel
  up to 1-2-3 MW projects
- Multiple solutions:
  - On-grid, Off-grid and On/Off-grid







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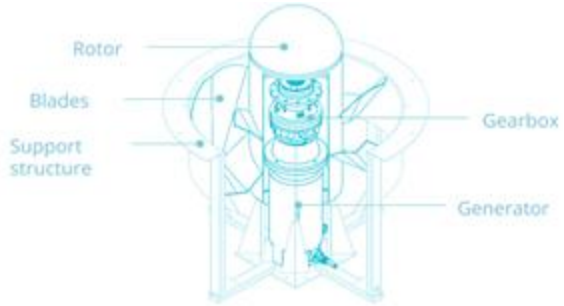

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Our Advantages

Turbulent's **vortex** turbines provide a **patented**, exclusive design to generate clean power, 24/7 in rivers and canals, optimized for sites overlooked by traditional hydropower.

KEY PRODUCT ADVANTAGES

Cost-effective: unmatched LCOE* per kWh (EUR 0.04-0.06) with economical storage solutions.

Fish-friendly: Backed by scientific research, our turbines are safe for aquatic life.

Durability: Resilient to natural river debris and extreme weather conditions. Expected to last 100+ years.

Efficient: highest plant factor leading to fastest payback time compared to fossil fuels and solar with batteries.

Intelligence: Advanced IoT-based control and real-time monitoring dashboard for maintenance. GIS software to find sites.

Sustainable: One 100 kW Turbine leads to a 900-1000 ton of CO_2 reduction per year compared to an equivalent diesel generator.

Portability: modular design for swift transportation and installation, within 48 hours.

Compatibility: Ideal for hybrid projects, integrating seamlessly with other renewable sources.

*The levelized cost of electricity (LCOE) is a measure of the average net present cost of electricity generation for a generator over its lifetime.

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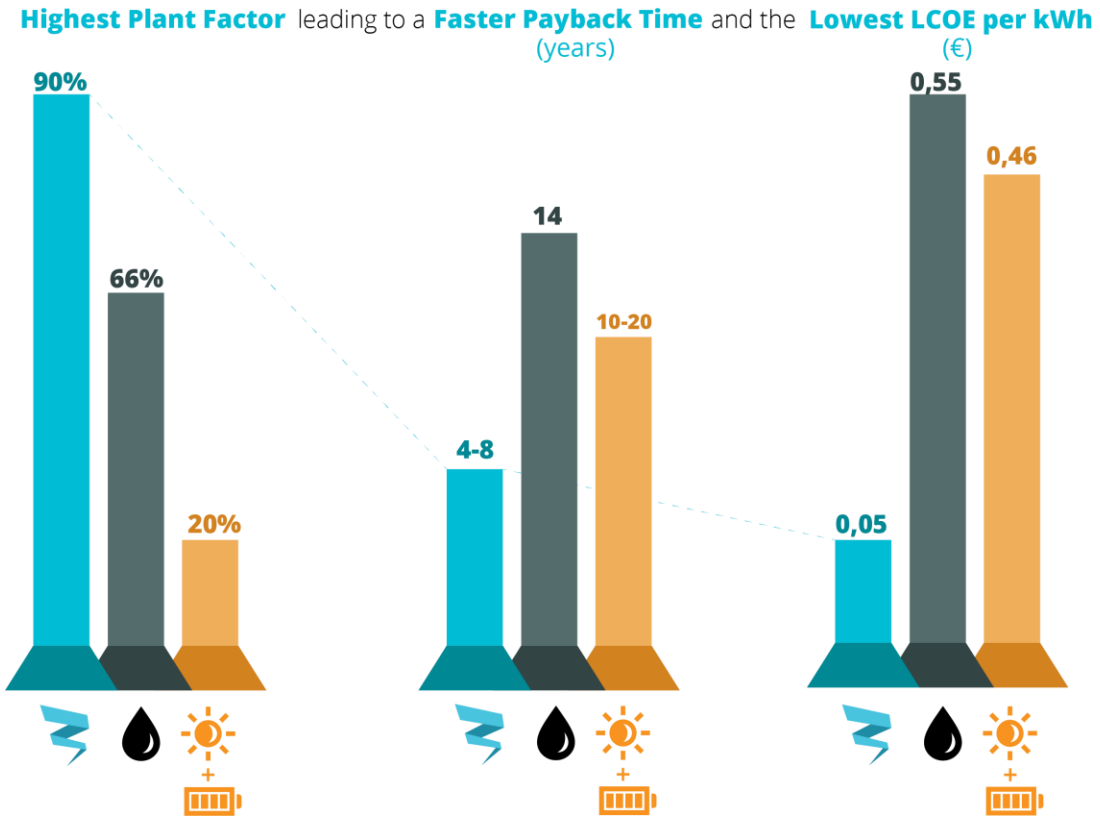
Unmatched LCOE (EUR 0.04-0.06) per kWh with economical storage solutions.



Plant Factor: the total energy produced by a plant compared to the full capacity. Our turbines are able to reach up to a 90% plant factor.

Payback Time: number of years until the initial investment is totally recovered. Our turbines range from 4 to 8 years.

LCOE: levelized cost of energy: net present cost of electricity generation for the turbine over its lifetime. The LCOE of Turbulent is from 0.04 to 0.06 euro.

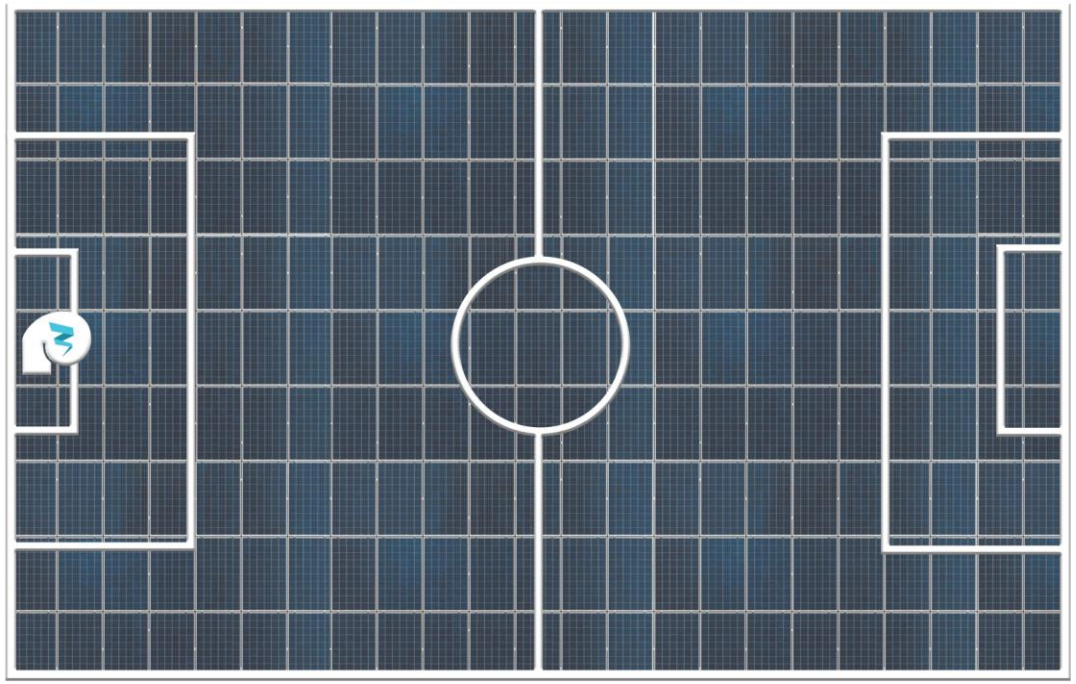
Turbulent Turbines

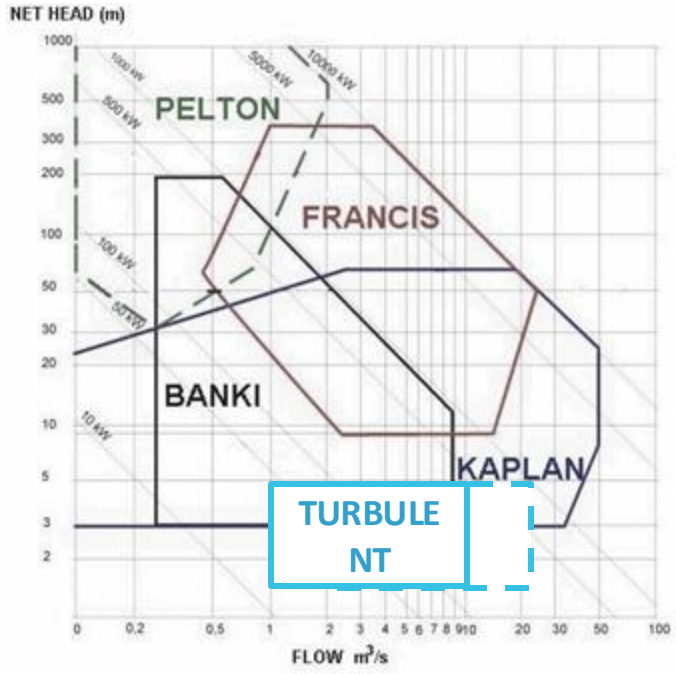
Diesel Generators

Solar With Batteries

A compact solution within our sweet-spot for low-head sites.

One Turbulent turbine of 70kW, producing up to 600 MWh a year, smaller than a goal, would require the equivalent of an entire football field of solar panels (equal to 420 kW).





Initial inspection and gearbox oil change
(after the 1st 150 h)

Small maintenance:
gearbox oil change, checking fasteners and leakage
(every year)

Installation and Commissioning

Large maintenance:
genset replacement
(every 10 -15 years)

Electrical cabinets check: (every year)

Medium maintenance:
seal replacement and bearing re-lubrication (every 3 years)

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A few of our installed and ongoing projects.

Taiwan (installed)

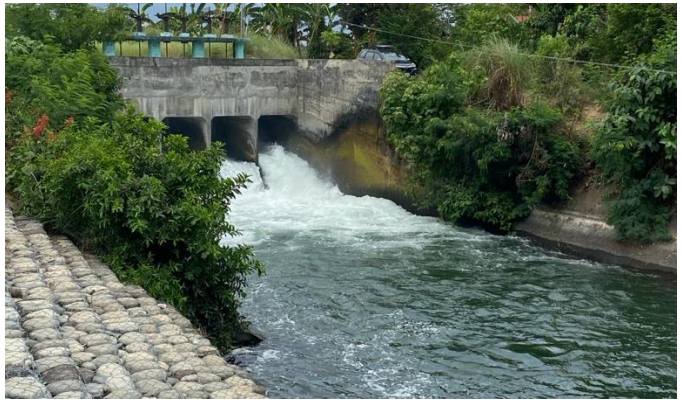
Vortex Plant

Murang'a, Kenya (installed)

Vortex Plant

Finexpo ,Philippines (in progress)

Vortex Plant



Blaj, Romania (in progress)

Vortex Plant

Irritech, South Africa (in progress)

Vortex Plant

Colombia (in progress)

Vortex Plant

Case Studies Rural Electrification Project in Kenya

With a local Mini-grid operator to:

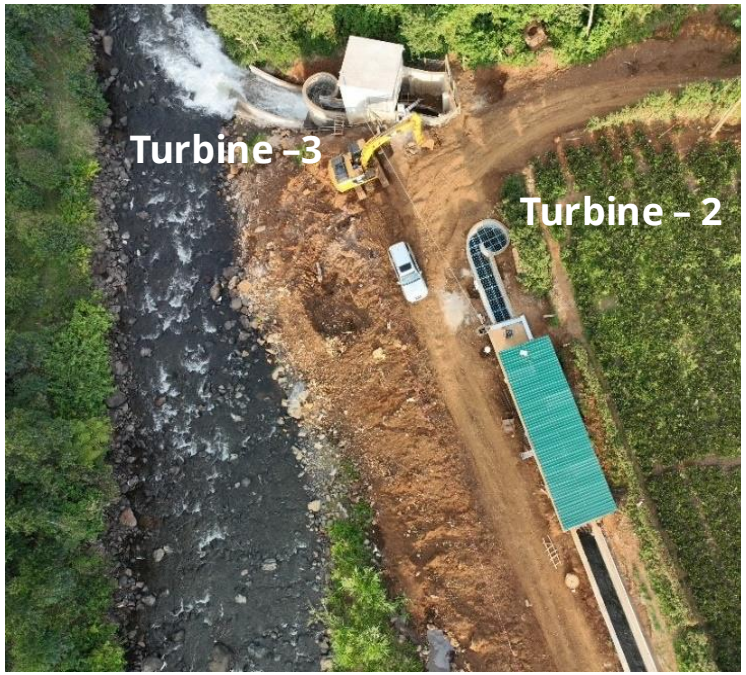
Provide electricity to 500 houses, businesses, and a Tea factory

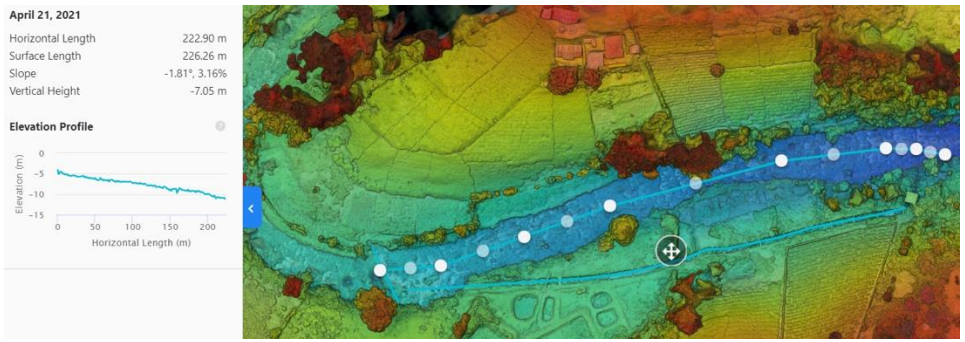
Reduce 1130 tons of CO_{2eq} to diesel generator

Improve livelihood of communities

Average flow: 5.81 m^3/s

Gross head: 7.5 m





Topography and river longitudinal profile of the River

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Case Studies Untapped And Hidden Hydropower Azores

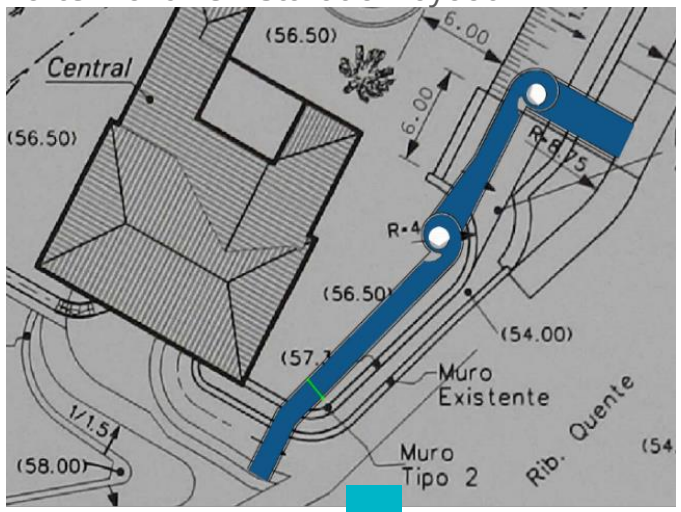
Client: Local IPP

Generate power from a residual head in existing HPPs

Reduce 350 tons of CO_{2eq} to diesel generator

Tuneis hydropower plant
-Installed capacity after a 1.6 MW Francis turbine
-Nominal flow 2.3 m^3/s with a head of 3,6 m

Vortex Turbine installation layout



Civil work for installation of Vortex Turbines near completion

Case Studies Refurbishing old mills

About 27,000 water mills suitable for small-scale hydropower

Client: Private Individual

B&B business selling to the grid

15 kW installed capacity

Reduce 127 tons of CO2eq to diesel generator

Old Francis Turbine

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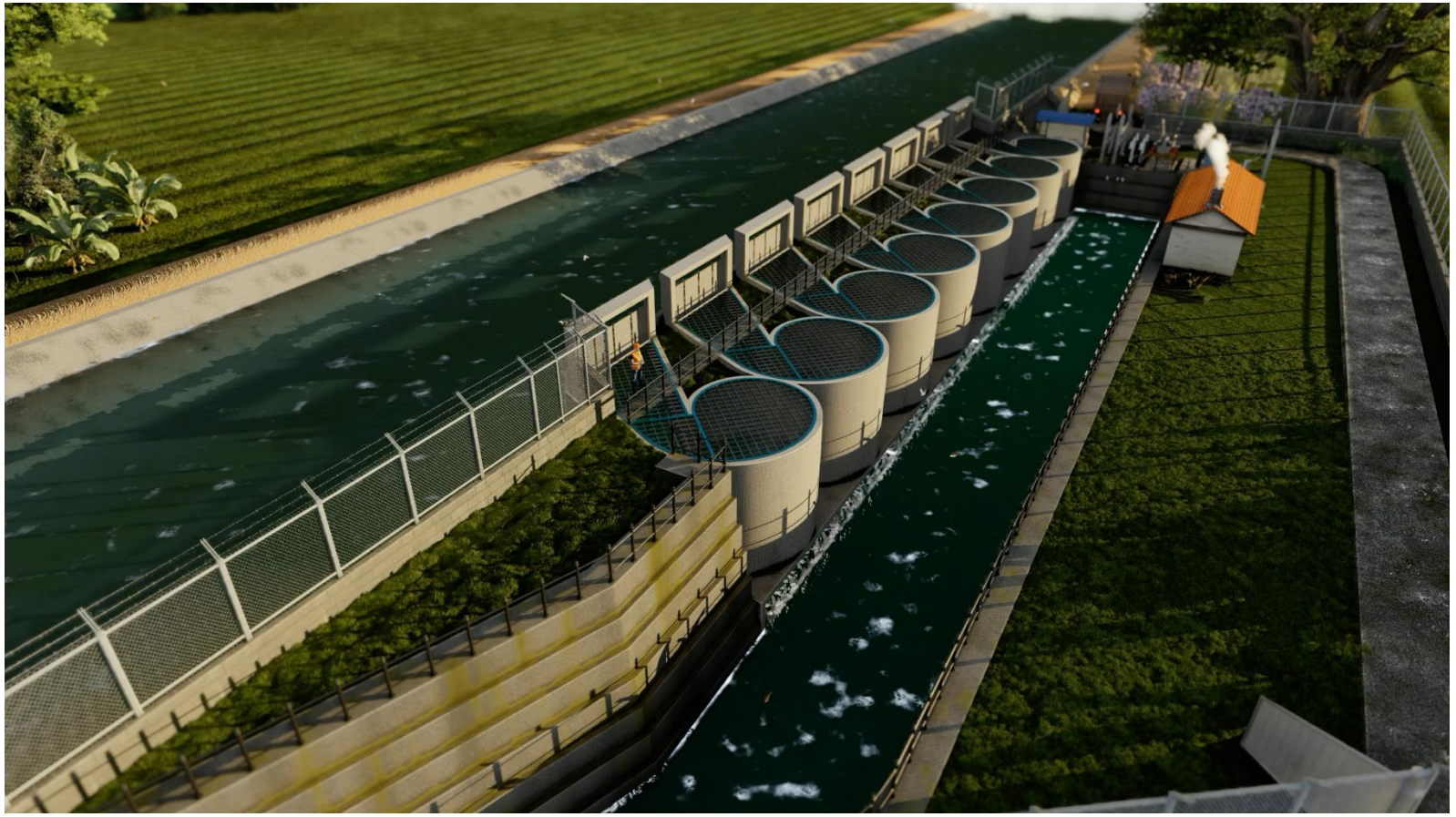
Turbulent in The Philippines



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Our global footprint.

Extending our reach

Sales: 45 turbines sold globally

Recent acceleration: 32 turbines sold 2024

Global Footprint

Global Presence:

Present on 5 continents.

Strategic Focus

Priority projects:

The focus is put on larger-scale multi-turbine initiatives.

Location	kW
Versailles, France	5.5
Eparcy, France	30
Otepää, Estonia	5.5
Bali, Indonesia	13
Donihue, Chile	15
Vale das Lobas, Portugal	5
Azores, Portugal	60
Finexpo, Philippines	140
ARIS, Philippines	720
Idaho, USA	35
Virginia, USA	15
Murang'a, Kenya	110
Thailand	50
DRC	30
Taiwan	160
Denver, UK	8
Papignies, Belgium	15
Stoumont, Belgium	15
Blaj, Romania	230
South Africa	75
Colombia	150
Cameroon	ST
Rwanda	ST
Brazil	ST
Dominican Republic	ST

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Recognized globally

Founded by 2 students from the KU Leuven in 2015, Turbulent today has reached a global audience of over 100M users, won numerous awards for its achievements, made the headlines of national and international press and was the subject of several scientific and academic publications.

Scan to access our media mentions

and scientific papers.

MIT Technology Review · START IT @KBC · Cleantech Flanders · CTCN Climate Technology Centre & Network · (2021) Inclusieve Ondernemen · G·STIC · Funded by the Horizon 2020 Framework Programme of the European Union · imec · istart · VLAIO · World Economic Forum · SolarImpulse Foundation

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Making an impact on SDG's.

Turbulent creates jobs and contributes to local capacity building

Turbulent contributes to less poverty by improving quality of life

Economically

Socially

Turbulent introduces resilient infrastructure through simple civil works

Turbulent's solution fits very well in a smart, urban environment

Watch our video about our Kenya project and discover how we walk the talk

Turbulent's turbines are eco friendly

Turbulent helps mitigate climate change with zero CO_2 emission power

Turbulent improves the quality of the water

Turbulent brings cheap, clean energy with a long life span

Environmentally

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Mitigating the CO2 footprint.

One 100 kW Turbine leads to a 900-1000 ton of CO2 reduction compared to a diesel generator generating the same output.

- We plan to install 10 MW of clean power by 2028, avoiding 200,000 tons of CO_2 compared to the equivalent installed power of diesel generators.

0t CO_2
10MW/5Y

200,000t CO_2
10MW/5Y

1 First Contact
(1-2 Days)

2 Collecting Info and Initial Study
(1-2 Weeks)

750€*

Feasibility assessment

- Pre-feasibility study
- If feasible: Draw engineering study proposal

3 Client qualification
(1 month)

4 Engineering Study
(1 month)

10 000-40 000 €

The signature of an engineering study results in:

- Site visit
- Hydraulic analysis
- Topography
- Dimensioning of turbines
- Civil works concept design
- Financial projections
- Draw final project proposal

5 Final Project Proposal & Signing Contract
(1 Week)

6 Detailed Engineering, Ordering Components, Production
(4 to 6 Months)

Project Price

The signature of a project results in

- Electro-mechanic equipment
- Engineering days
- Civil Works supervision
- Installation and commissioning
- Project management

This price is to be paid in a 10-40-40-10% payment structure

7 Transport
(1 to 2 Months)

8 Installation & Commissioning
(2 Weeks)

9 Operational plant & Maintenance plan

*Deductible from engineering studies

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Thank you!

Questions? Let's connect!

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Panel Discussion
Q+A