



TURBULENT

Untapped

Hydropower

• Providing decentralized clean energy 24/7
not disturbing nature nor people.

“Looming risk of more turbulence for global energy markets” (*)

“Don’t expect big oil to fix the energy crunch” (**)

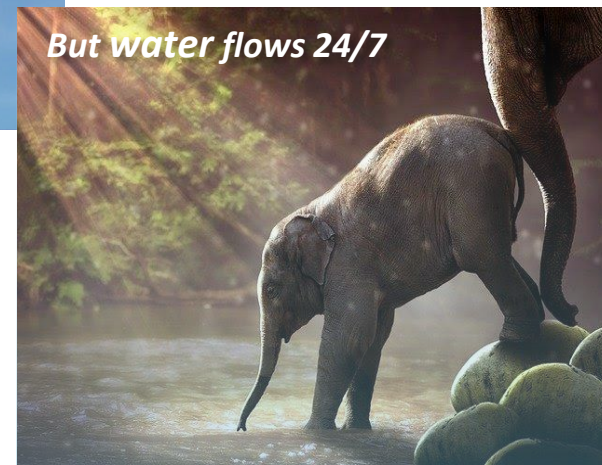
- Rebound of consumption of fossil fuels will cause second biggest absolute increase in CO2 ever (*)
- We are not investing enough to meet future energy needs (*)
- To reach a goal of “net zero” emissions by 2050 a more than tripling of clean-energy investment by 2030 is needed (*)
- Markets are vulnerable to shocks and the intermittent nature of some renewable power (**)
- Fossil fuels satisfy 83% of primary-energy demand and this needs to fall towards zero (**) [as to battle climate change]

(*) *World Energy Outlook, October 2021, International Energy Agency*

(**) *The Economist, October 16th-22nd 2021*



Hydropower addresses the problems of intermittent supply with most renewable power



Mega Hydropower is a giant in renewable, but has quite some flaws

Hydropower is the giant of low-carbon electricity

- It's currently larger than all other renewables combined.
- An equivalent of 20,000 GW is annually obtainable from our waterways, rivers and canals.
- It currently has a 55% higher contribution to the energy mix than nuclear.
- It's systemically more flexible and secure.
- Takes care of the base-load

Hydropower is a mature technology,

but typically with a high-ranging cost structure because it often involves large centralized projects:

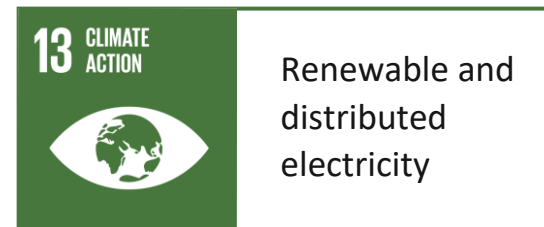
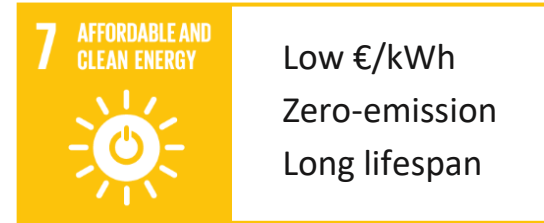
- The largest cost being intensive civil works, including earthworks, tunnelling and dam and powerhouse construction.
- Large hydro has a tremendous ecological and social cost.
- Long lead times 5- 10 years

To unlock more of the available Hydropower
a solution is needed to:

- Have access to sites nearby the end-users.
- Limit costly and intensive civil works.
- Be environmentally friendly to the nature and respect the ecological river flow.
- Be socially responsible and don't replace people nor flood their fertile lands.

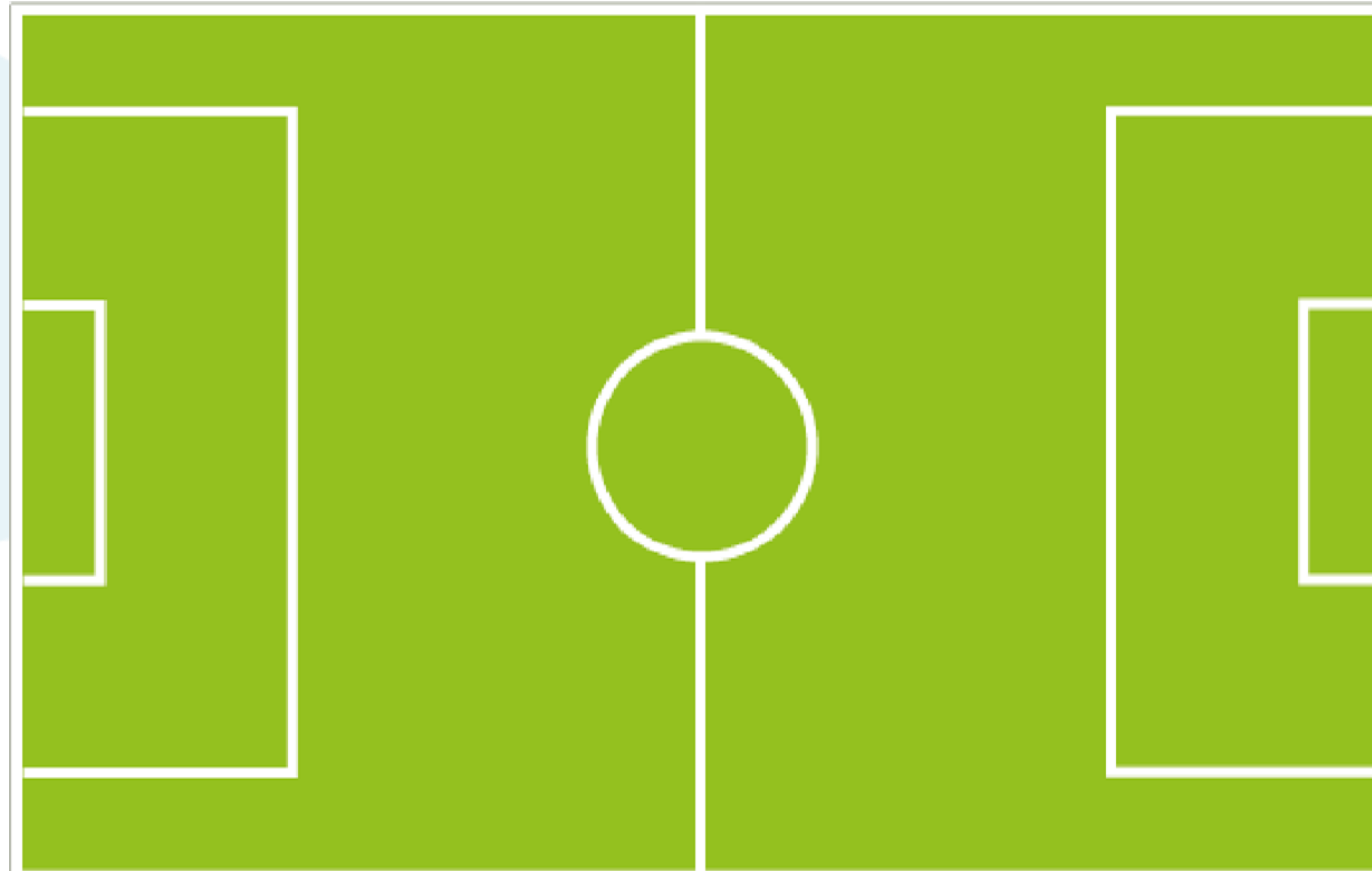
So this is where the Turbulent micro-turbine technology shines:

- **Proven and patented** technology (TRL9) with a Focus on low head (height difference 1 to 5 m) and designed for low flow (1 to 10 m³/s) or more if put in parallel
- **Short Lead** times: 4 to 6 months
- Off-grid, Turbulent turbines do replace dirty and dangerous diesel generators.
- Turbulent ensures the stability of the grid by supplying a **base-load** and preventing power shortages..
- Turbulent's technology is **favorable for nature** and biodiversity in contrast to large hydro.
- Turbulent keeps the **costs low** while at the same time its turbines are easily implemented.
- Turbulent creates jobs for **local communities** instead of displacing them or harming their fertile lands.



Turbulent has developed a compact and efficient turbine, with a very low space footprint

1 football field of solar panels, 450 kW solar =
1 Turbulent turbine of 70kW



Turbulent reshapes the hydropower supply chain

Finding a suitable locations

Using our in-house geographical site location tool, we use satellite data from NASA and ESA to pinpoint potential sites for low head hydro.

Site study and hydrology

This tool also analyses the available flows and ensures confidence when choosing a design flow. We output a bank-approved feasibility study.

Turbine design

Our turbines are assembled from standard components with sheet metal blades. The blades can be modified after installation in case the flows change due to climate change.

Civil works construction

Turbulent turbines work with a free outflow and don't require extensive works below the water level. This simplifies the construction and opens up protected sites for development.

Turbine manufacturing

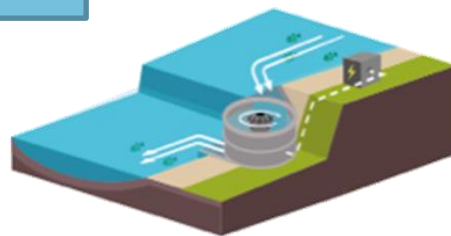
Turbulent turbines can be assembled locally and many of the metal parts can be made in the target country. This way logistics are simplified, import costs are reduced, and a repair and maintenance team will be organized locally with the manufacturer.

IPP partners

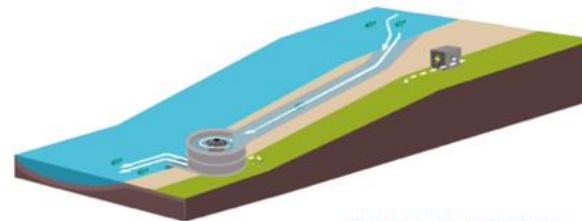
Turbulent works together with IPP partners to develop energy generating projects close to end users. Our unparalleled low electricity cost, the low visual impact and amount of noise, makes for an excellent business case.

Achieving sustainability goals

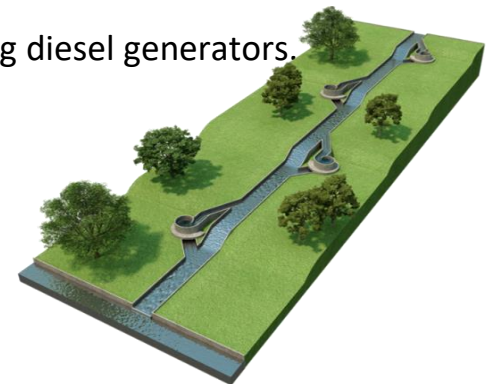
Turbulent turbines replaces the off-grid dirty, noisy, unsafe, expensive CO2 emitting diesel generators.



ON LAND, SHORT BYPASS / DROP

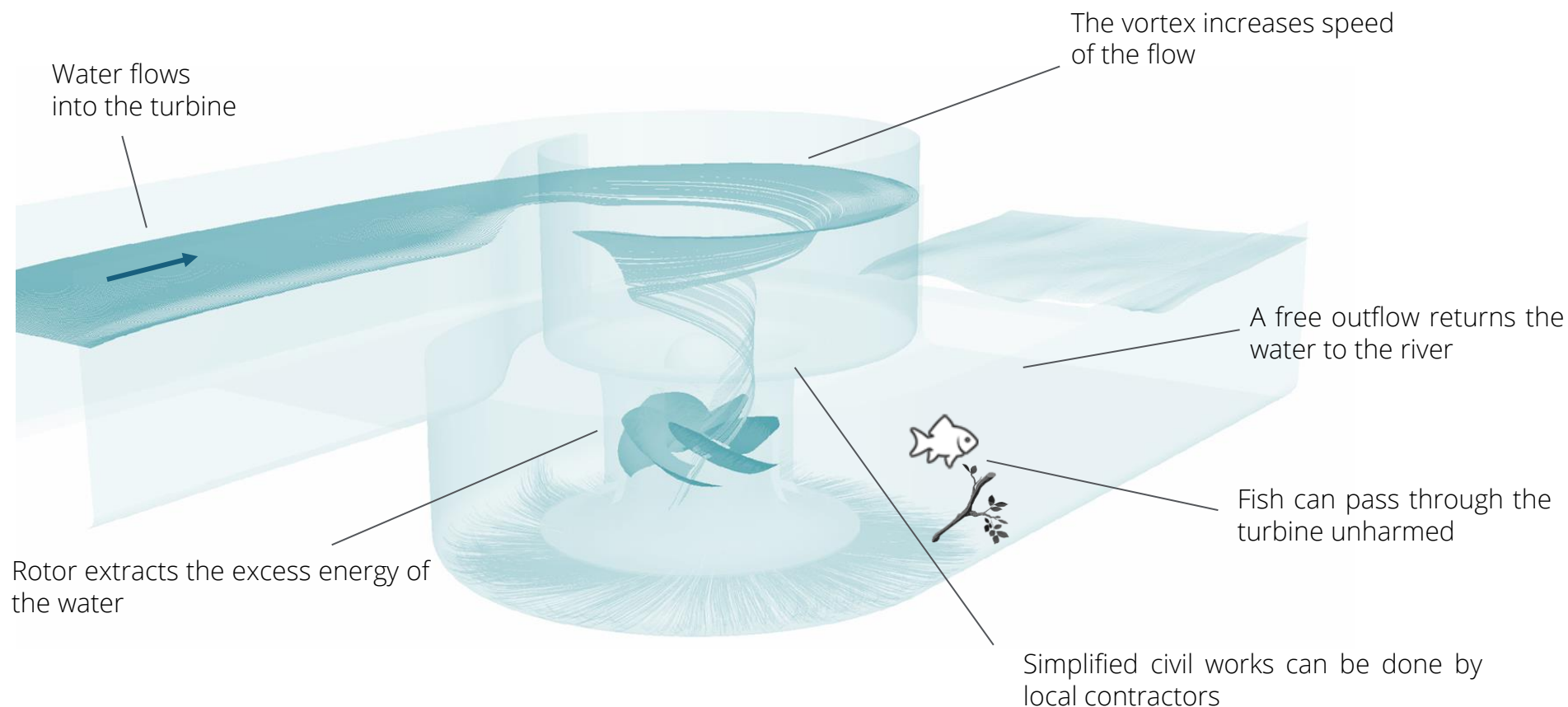


ON LAND, LONG BYPASS



So how does a Turbulent turbine exactly work ?

Click on the illustration to view our video.



IN THE MEDIA

Technology designed in collaboration with KU Leuven

Recognized by MIT for its promising innovations

Impressive media coverage: >20.000.000 views & 20.000 leads



Turbulent's patented technology

Turbulent's Vortex turbine is **the best-in-class** low head hydro solution through extensive R&D on the turbine
The turbine is **smaller, lighter, cheaper, easier to install**, than any other hydro turbine.

Fish-friendliness has been considered from the start.

Existing patent:

- Turbulent owns a quite extensive patent: the specific model and shape of our Turbulent Turbine, the proportions of all its components, all the way from the shape of the vortex-basin to the impeller and to the hub. It includes the relative position of the components and the blade shape, all this in broad ranges to counter copying. The turbine is defined in the patent as both an impact and reaction type in order to cover the whole spectrum.

Under review:

- Our geographical site identification system
- Variable inlet for our Turbine
- New concept for 3-phase off-grid
- Double sealing solution for gearbox
- Extra types of blades

Pilot / reference projects



Green School

Bali Indonesia



Chicken farm

Donihue Chile



Green house

Estonia

POWER
OUTPUT

15 kW

15 kW

5 kW

SCENARIO

River

Irrigation canal

River

CUSTOMER

Community

Farm

Private

HEIGHT

1,8 m

1,7 m

1,6m

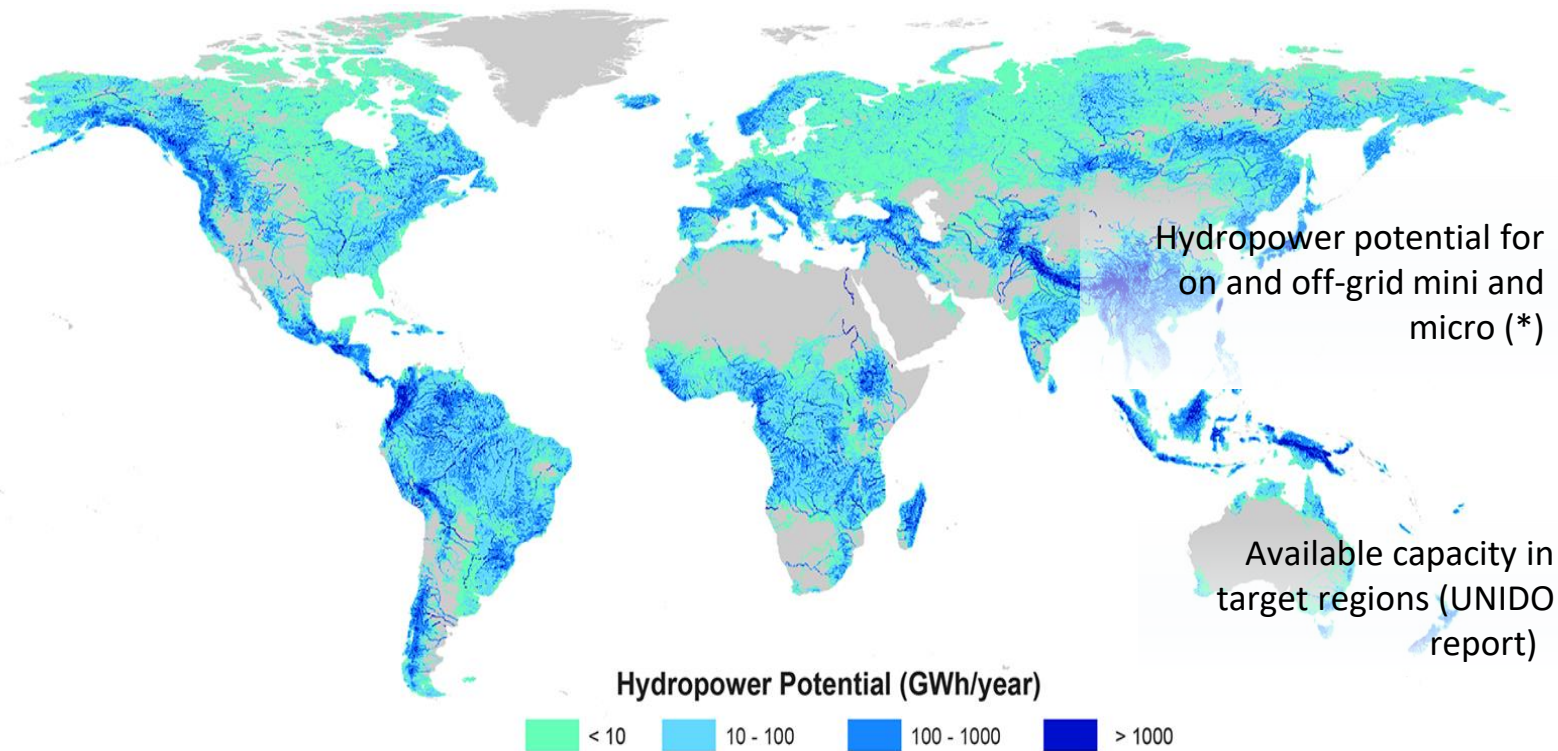
CAPACITY
FACTOR

92%

80%

84%

Market potential for micro hydropower solutions



Assuming Turbulent can capture 3% of its focus market

Total Available Market *
On/off-Grid = 1.6 Trillion \$

Serviceable Available Market
Low head/Low flow
On-Grid = 158 Billion \$
Off-Grid = 402 Billion \$

Serviceable Available Market
Turbulent target regions
On-Grid = 14 Billion \$
Off-Grid = 50 Billion \$

Serviceable Obtainable Market
Turbulent target regions
On-Grid = 400 Million \$
Off-Grid = 1500 Million \$

Sources:

* Delft University of Technology study: Hoes et al. "Systematic high-resolution assessment of global hydropower potential," PLoS One, 2017.

** World Hydropower Capacity Evaluation, L.J.J. Meijert, R.J. van der Enff, O.A.C. Hoes, H. Mondeel, K.E.R. Pramana, N.C. van de Giesen

Market trends

Instead of large rivers with dams, many small watercourses will play an important role in the renewable energy mix, and such to the advantage of **Turbulent**.

Energy Decentralization

Investments in **distributed energy sources** will increase 75% by 2030, (Frost & Sullivan)

Privatization

Distributed energy infrastructure will open up market for many **private players [IPPs]**.

Renewables generated 38% of the EU's electricity in 2020, overtaking fossils

Climate goals will force out electricity produced from fossil fuels.

Sustainable Development Goals

10% of the world population still has no access to electricity.

Turbulent's Value Proposition both on- and off-grid

Unlocking new opportunities close to end consumers

- In-house geographical site location tool identifies potential sites.
- Optimized workflow for feasibility study using open data
- Low height requirement from 0.5 – 5 m
- Low flow need from 0,5 – 10m³/s

Flood proof and robust technology

- Robust components.
- Erosion resistant design allows for dirty water.
- Simple civil works
- Fully submersible system will survive every flood.

Reliable and constant energy

- Constant energy suitable for productive end-use.
- Adds base-load to existing intermittent renewable technologies.
- IOT monitoring and control system to operate a decentralized hydropower system.

Eco-friendly and socially responsible

- Does not need to displace people nor submerge their lands.
- Vortex system is fish-friendly and respects bio-diversity.
- Observes the ecological flow and produces almost no noise.
- Occupies little space and does not disrupt the landscape.
- Very little rare-earth metals used.
- Very low carbon footprint along the whole lifecycle.

Go to market

Focus on promising locations and establishing partners world-wide

Clients

- Value added resellers
- Independent Power Providers (IPP)
- Energy Service Companies (ESCO)
- Off-Grid (crop and fish farms, schools, hospitals, communities)

Regions

- Moderate to low risk
- High cost of electricity
- Favorable legislation
- Favorable topology
- Target regions: EU (Germany), UK, Indonesia, The Philippines, Taiwan, Colombia, Kenya and Eswatini.

Current pipeline

Code name	Amount (EUR)	Energy need (kW)	Stage
SW	1.458.000	500	High Commitment
SVN	130.000	40	Quote/contract discussion
D-g	76.500	15	Quote/contract discussion
KE	500.000	140	High Commitment
PH	1.000.000	600	Quote/contract discussion
CL	90.000	30	First Commitment
LBN	500.000	400	Permits awaiting
TW	760.000	500	High Commitment
USA	66.000	20	Permits awaiting
COL	450.000	100	High Commitment
SA	750.000	300	First Commitment
PNG		30	First Commitment
Com	100.000	15	Permits awaiting
KE	100.000	30	High Commitment
MX	120.000	30	First Commitment
DRC	120.000	15	First Commitment
MX	1.000.000	350	First Commitment
KE	1.000.000	300	First Commitment
TW	375.000	210	High Commitment
DRC	250.000	100	First Commitment
SK			First Commitment
CM	200.000		First Commitment
KE	150.000	15	First Commitment
CH	250.000	70	Permits awaiting
IR	250.000	100	Permits awaiting
BE	76.500	15	First Commitment
Bla	150.000	100	First Commitment
VT	55.000	15	First Commitment
IVO	300.000		First Commitment
UK	200.000	50	First Commitment
AND	250.000	150	First Commitment
Fre	250.000	200	Permits awaiting
10.977.000			

Go to Market by building Partnerships

Looking for trust-worthy partners who:

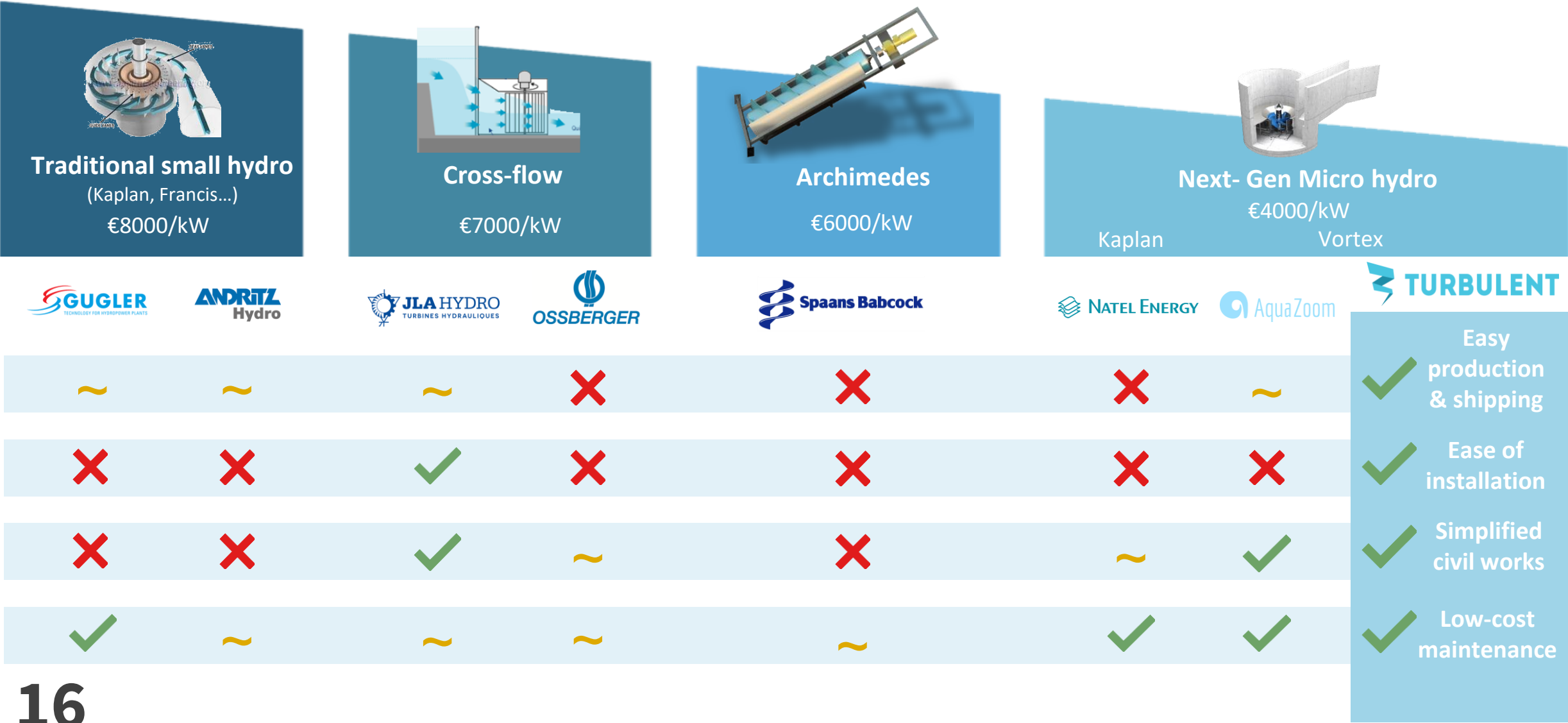
Know local regulations, have a solid network

Buy our Turbines and thus become value adding resellers or IPPs who:

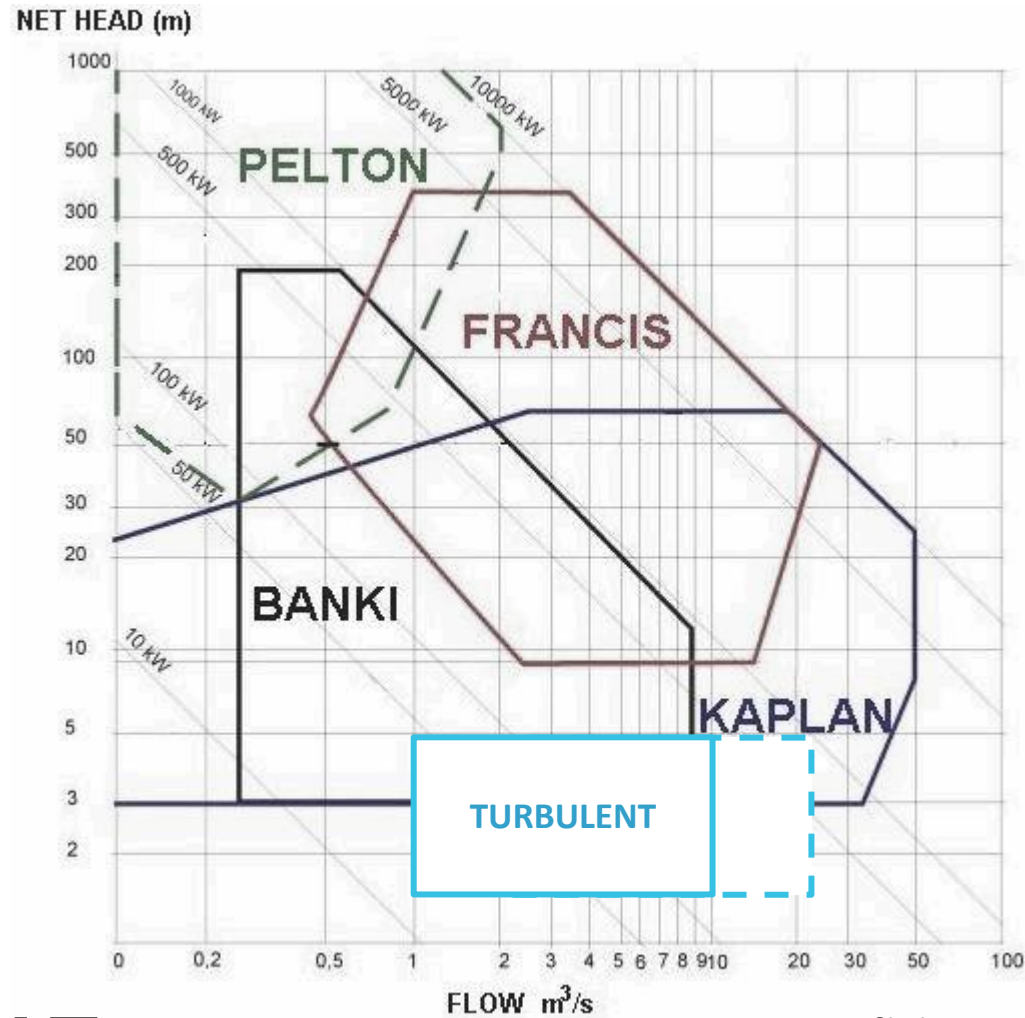
- Sell energy to IPP (Independent Power Producers), or sells it as an ESCO (Energy Service Company)
- Negotiate on-grid PPA's (Power purchase agreements with large and bankable consumers)

Turbulent is currently negotiating partnerships in UK, Eswatini, The Philippines and Taiwan

Competitive landscape



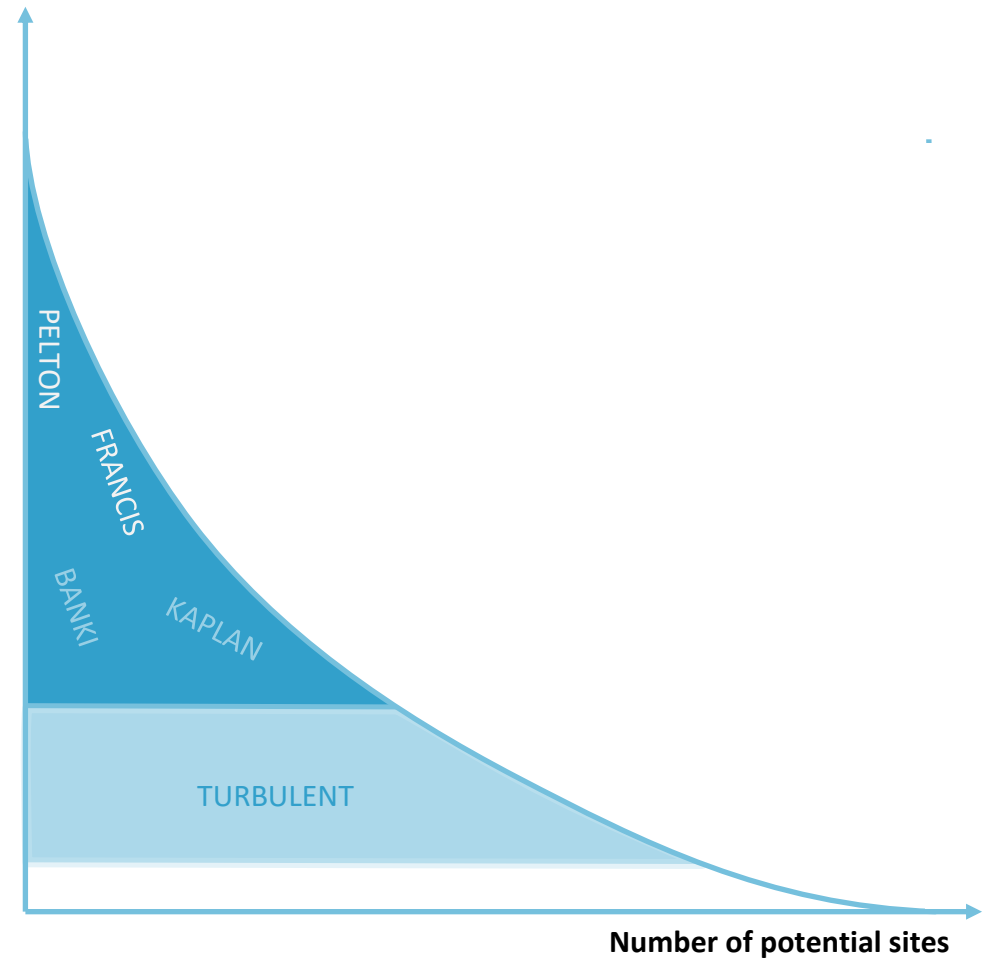
Turbulent head on with competing turbines



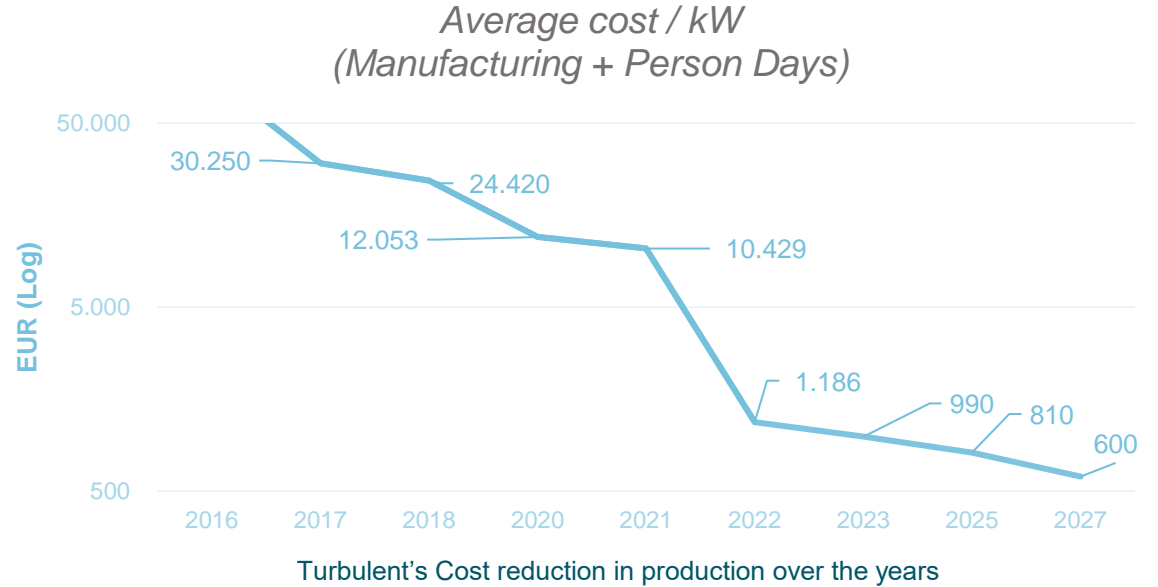
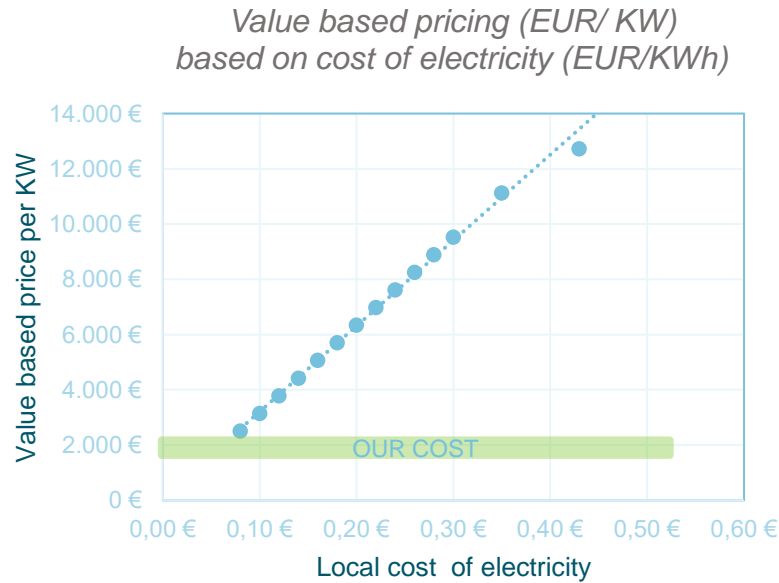
Single set up

Serial set up

NET HEAD (m)



Pricing and cost



Value based pricing model

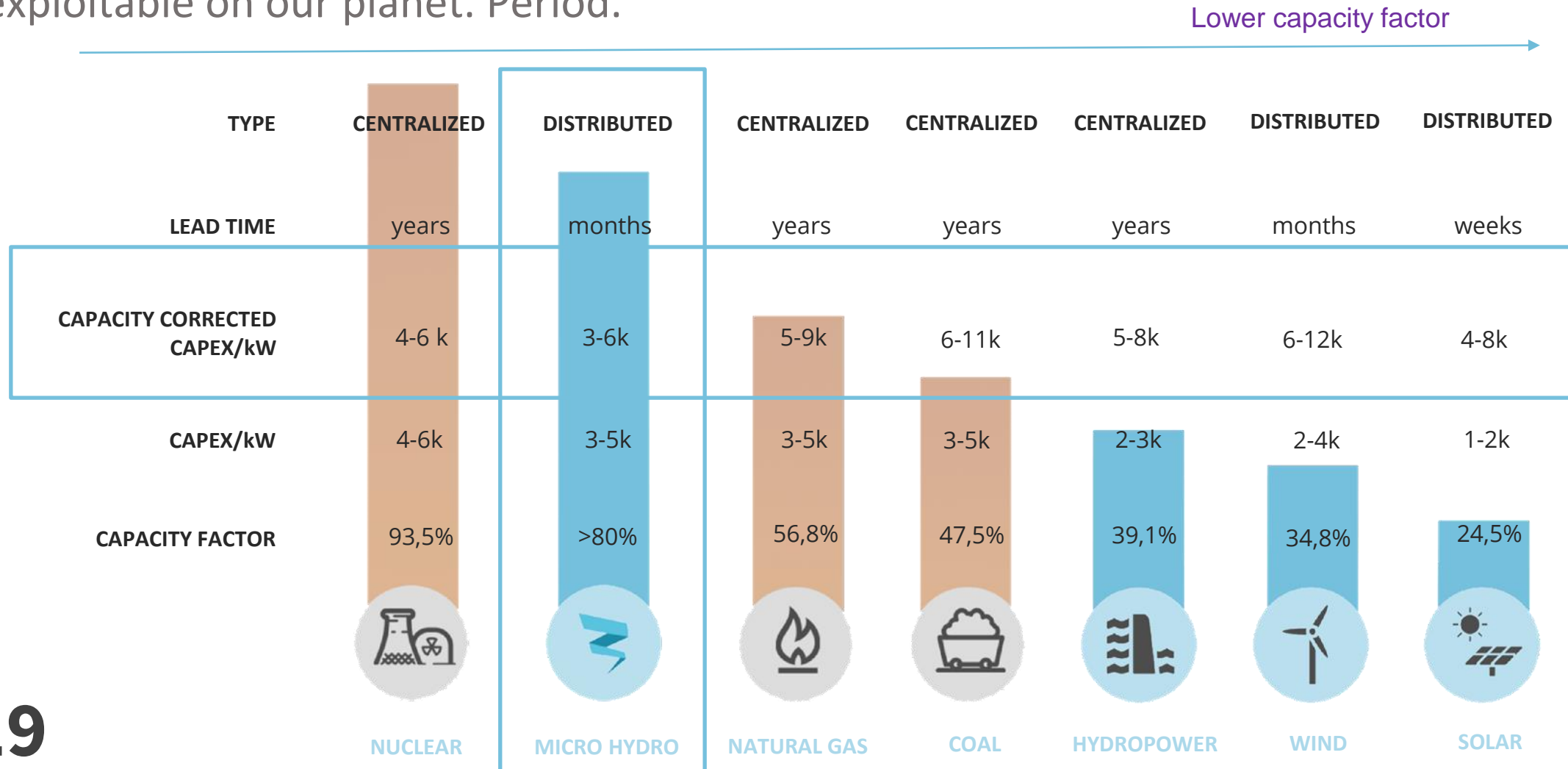
- Taking into account cheap civil works (€ 800/kW)
- Creates a high margin potential for off-grid projects in terms of value
- 5-7 years payback times market practice offers healthy margins down the line
 - On-grid installations (3-5 kEUR selling price range)
 - Off-grid (5-8 kEUR / kW selling price range)

Turbulent's production cost

- Our cost price has come down considerably since Turbulent's inception
- Current cost price per type installation (70 kW)
 - € 1200/kW – type 1 on-grid
 - € 1600/kW – type 2 off-grid

Cost comparison

Turbulent's micro hydro is - given its capacity factor - the cheapest source of energy exploitable on our planet. Period.



Revenue Streams for Turbulent

Current

Feasibility
Study



Build and
deliver Turbines



Maintenance
and Monitoring



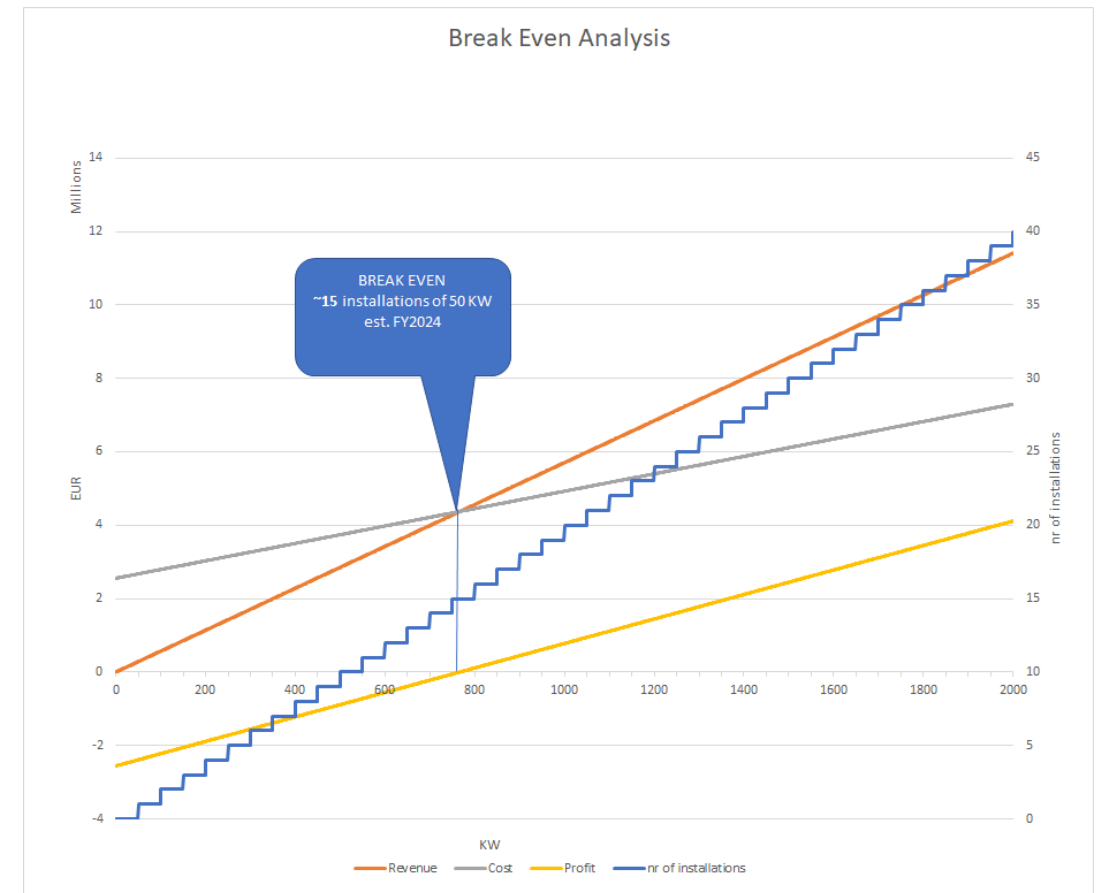
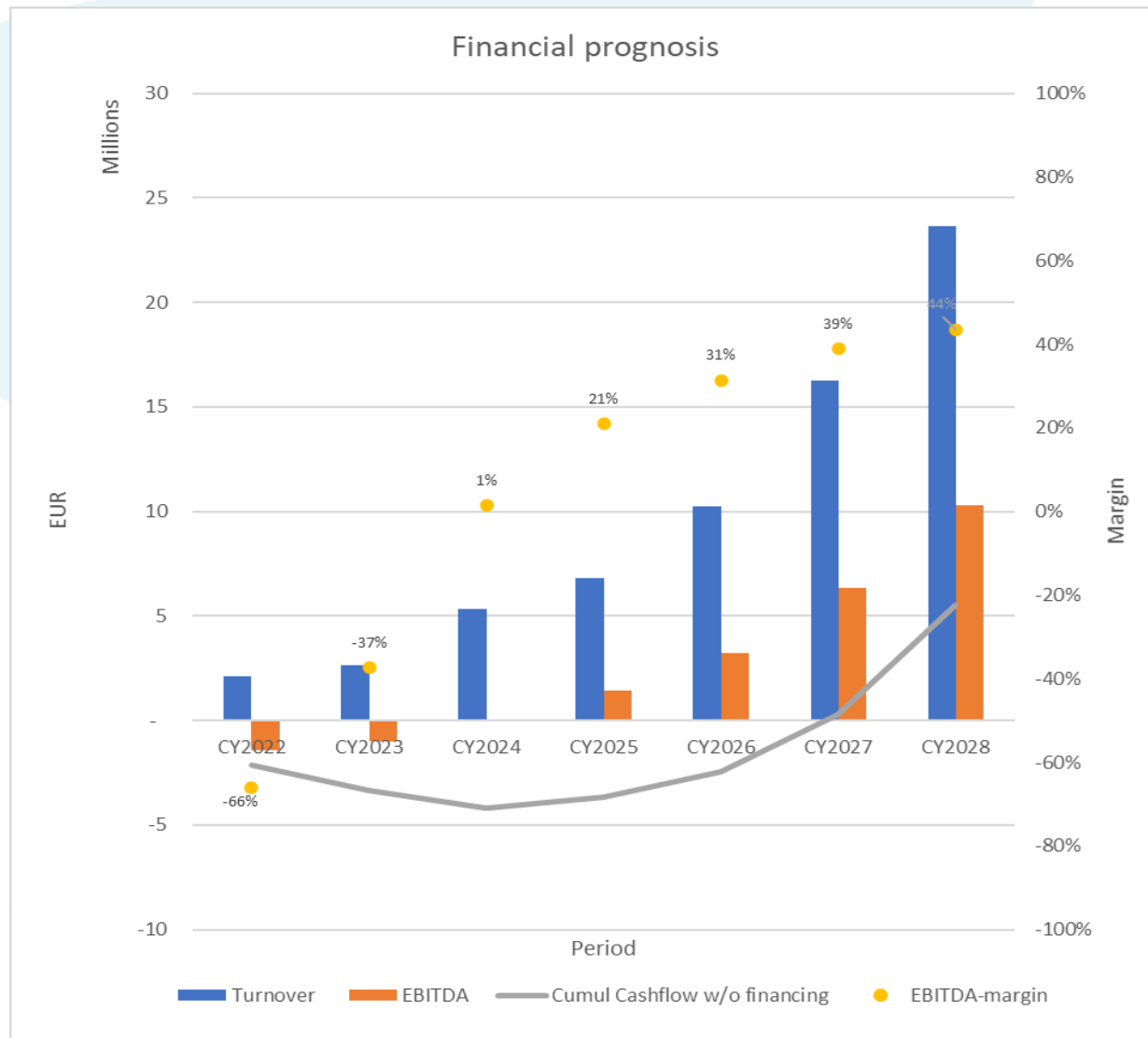
Potential

Working with a partner
network in selected
countries (facilitate
sales and after-sales
service)
offer ESCO services

IT. GIS
IoT monitoring
River data monitoring
River Studies
Tidal applications
Pumped storage

Further cost reduction:
Supervised local
production of
hardware
Outsourcing of
engineering

Financials



- Continued **growth** with **16 projects** won up until now.
- Expected growth till 2027 CAGR ~50%.
- Healthy EBITDA-margin evolution from 2024 onwards of 21 to 43%.

Strategic Roll out

Scaling up

- To expand our network of partners in all target regions.
- To heavily invest in sales & marketing.
- To establish partial local production.

€ 1.5 M

Research & Development

- To develop IT for a scalable IOT turbine solution.
- To develop IT for local data monitoring (for instance water quality and the river ecology indicators).
- To further elaborate the IT of our location tool to license it.

€ 0.5 M

Further professionalization

- To optimize and automate our engineering & production processes as to lower the costs.

€ 0.25 M

Net Working Capital

- In order to grow as fast as we plan (accounts receivable)

€ 1.75 M

€ 4.0 M

November 2021

- Building an international sales team
- Start outsourcing engineering

March 2022

- Close funding with investors

September 2022

- Establish first local production
- Start selling commercial GIS tool

December 2022

- Proof of Concept of IoT solution
- Identified and contracted partners in 10 countries
- Three cluster projects of 1.5 mio €

2023

- Explore IPP position in collaboration with partners

Meet the people making Turbulent happen

Management



CEO

Dr. Walter Buydens

*Pioneering environmental consultancy
Founder, ERM Belgium (1994-2007)
Managing Director,
Royal Haskoning DHV Qatar (2009-2014)
CEO, Vito Middle East (2014-2020)*



CCO

Dr. Maria-Elvira Zeman

*Sales and Marketing
International Business Development,
Materialise (2006-2020)*



CTO

Geert Slachmuylders

Founder & inventor



COO

Luc Berben

*IT and engineering manager
Technology director, Materialise (1994-2011)
Program manager, Cegeka (2012-2014)*



CFO

Koen Vanden Boer

Co-founder, Watz (2011-2015)

Board of Directors



Luc Sterckx
~President~

CEO, EDF Luminus (2004-2011)



Laurent Jouret
Inventures



Basile Aloy
Victrix



Geert Slachmuylders



Jasper Verreydt

Meet the people making Turbulent happen

Advisory Board



Prof Dr
Mohan Munasinghe

*Chairman MIND
2021 Blue Planet Laureate
Vice-Chair IPCC
1990-2008
Sri Lanka*



MSc
Bernadette Kawera

*River Basin Developer,
WASH practitioner
The Netherlands,
Ruanda*



Prof Dr
Miroslav Marence

*Hydropower
and water storage
Prof IHE and TU Delft
Austria,
The Netherlands*



MSc
Bart Hilhorst

*Sr Water Resource Manager
at Water for
Life Solutions
Uganda, Qatar*

Investment rationale



ESG compliant investment

Providing decentralized clean energy 24/7 not disturbing nature nor people but committed to all of the 17 sustainable development goals

Large global traction

Enormous energy market. Requests from all over the globe



Best in class technology

Double the capacity factor compared to closest competitor

Scalable growth strategy

Sourcing parts and engineering, Approaching markets with local partners



Game changer

Untapped clean-energy that provides reliable energy 24/7 in a social, economic and ecological justified way

High value markets

Multiple segments of end customers in distributed energy market



Passionate team

Combining passion, experienced management and strong investors

Be part of our **innovative,**
ecological, social and **profitable**
approach to develop green energy

**“Climate tech will produce 8 to 10 Teslas,
a Google, an Amazon and a Microsoft”**

Bill Gates, CNBC, Oct 10 - 2021



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