Innovation Company Showcase 4

ENERBEE

Jocelyne Wasselin CEO

Towards smart ventilation systems

IoT FUNDAMENTAL POWER CHALLENGE

*"connected "Things" will overpass **20 billion by 2020***" Gartner 2017

... *"it is energy harvesting technology that enables the*
extension of smart asset technology to billions of components"
TEGO Executive Director

Enerbee's energy harvesting solutions efficiently

❑ **answer the market needs for battery-less wireless sensing**
❑ **lower costs of maintenance and operations**

ENERBEE PATENTED TECHNOLOGY

6 PATENTS Family

PIEZO-MAGNETIC µ-GENERATOR

- **SPEED INDEPENDENT ENERGY GENERATION**

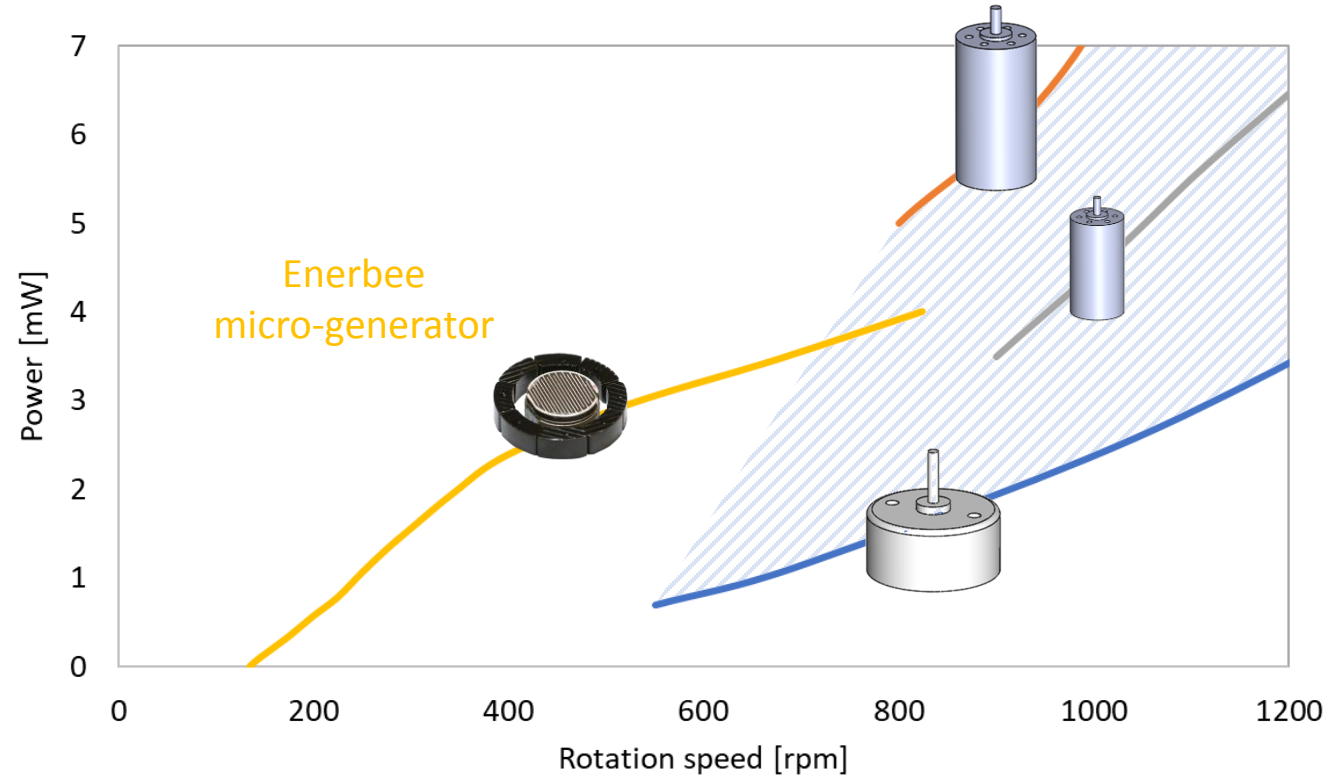- **VERY LOW COUNTER TORQUE**

- **ROTATION OR TRANSLATION EFFICIENT**

6 PATENTS Family

SMART POWER **MANAGEMENT**

- **SMART ENERGY MANAGEMENT ALGORITHMS**

- **DEDICATED STORAGE ROUTINE**

- **LOW POWER SENSORS MANAGEMENT**

ENERBEE

ENERBEE vs. ELECTROMAGNETIC

- At low rotation speeds (<800rpm), Enerbee technology outperforms electromagnetic technologies

INDOOR AIR QUALITY IS A MAJOR HEALTH BURDEN

2.6 million people died prematurely in 2016* from illness attributable to household air pollution

renewing air inside houses and buildings is necessary....but one needs to save energy and optimize air renewal!

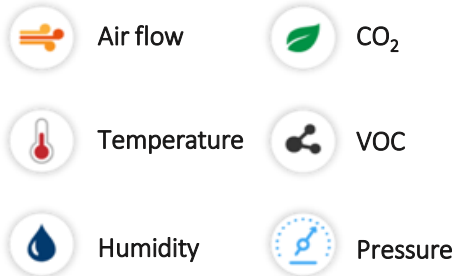**Based on figures from the Institute for Health Metrics and Evaluation (IHME)*

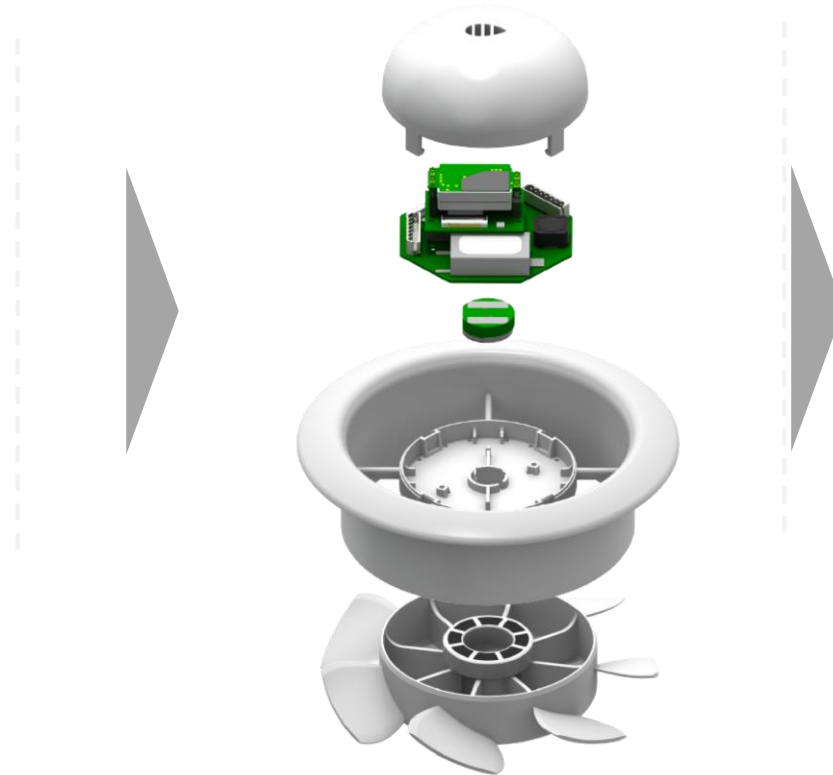ENERBEE

SMART BUILDING MULTI-SENSORS PRODUCT

MEASUREMENT

SMART VENT PRODUCT

DATA & ACTION

Energy Generation & Management

Air Quality and System monitoring SENSORS

- Air flow
- CO$_2$
- Temperature
- VOC
- Humidity
- Pressure

Air Flow Control

RF Communication

UI or BMS

Dynamic Air Flow Control , The **Best Indoor Air quality at Minimum Energy Point, healthy environment and 10 to 20% energy consumptions savings**

BUSINESS MODEL

CUSTOMERS

END-USERS

- HVAC OEM
- Building / Industrial Facility management

- Consumer
- Facility Management

ENERBEE

B2B HARDWARE SALES
(EPMC Module
+ NRE for reference design)

NEW FEATURES

$

Value

- **OPEX & MAINTENANCE COST REDUCTION**
- **CONTINUOUS INFORMATION DATA**

$$$$

Value

- **DIGITAL¨PLATFORM SERVICES**
- **New business models**

"For every dollar in equipment sales, we have the potential for eight dollars in sales of services."

Dane Taival, Vice President of Building Services and Customer Care for Trane

WHERE TO USE IT?

VALUE OF AIR QUALITY MONITORING FOR BUILDINGS

...In **renovation** and **new installation**

...As **surface mounted** or **in-duct**

...Capable of **exhaust** or **supply**

Indoor Air Quality - Our products answer the "fresh air" problem of modern, sealed buildings

Occupant Comfort - Real-time control of Humidity, CO_2 and VOC levels to create a much healthier and pleasant work and living space

Demand control - Running Demand Control Ventilation only when people are present reduces the wear and tear on the entire HVAC system

Energy Savings - Dynamic control and monitoring of HVAC systems lead to significant energy savings (up to 15-20%)
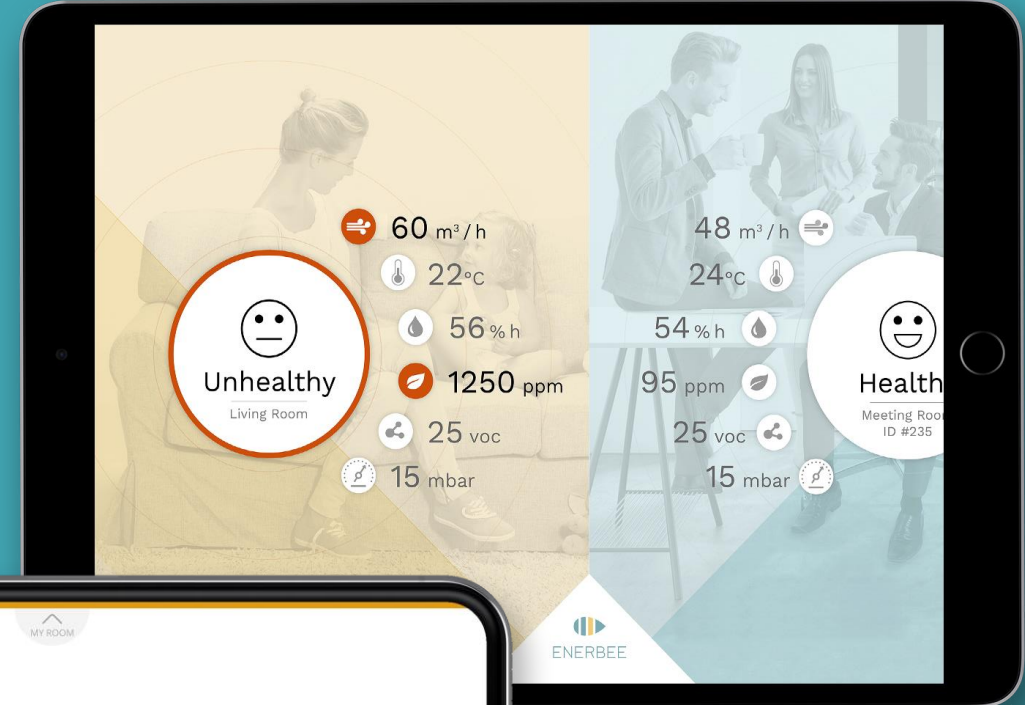
Predictive Maintenance – Identify unbalanced network, lower flowrate , and early failure
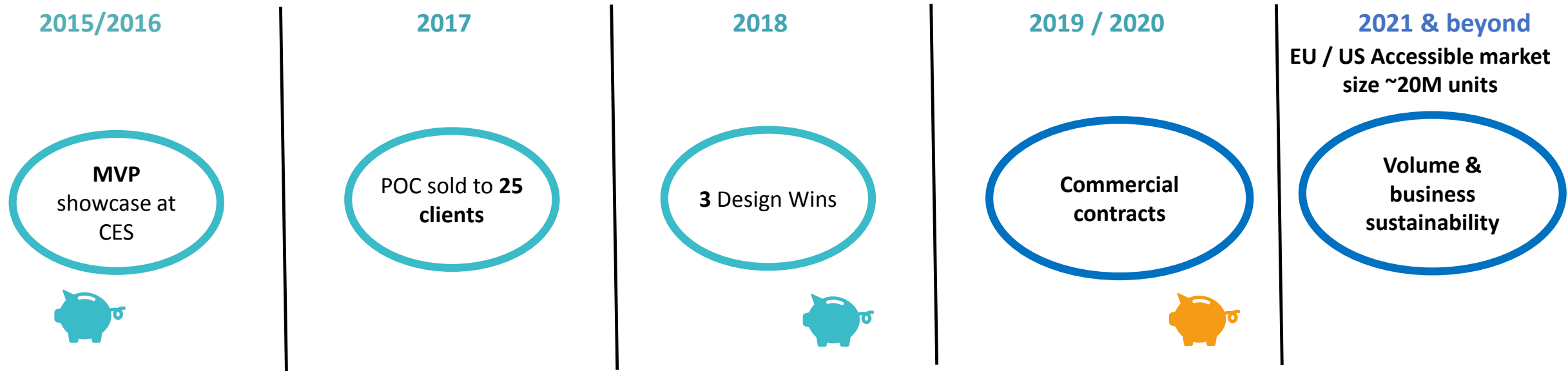
Reduced installation cost – Plug & Play

Flexibility – Trend in smart building "Mobility"

A FULL SET OF SMART DATA TO SERVE DIVERSE USE CASES.....

.... With NO NEED to CHANGE BATTERIES

ENERBEE DYNAMICS & PERPECTIVES

2015/2016

MVP showcase at CES

2017

POC sold to **25** clients

2018

3 Design Wins

2019 / 2020

Commercial contracts

2021 & beyond

EU / US Accessible market size ~20M units

Volume & business sustainability

Our ambition is to become the reference on the market of autonomous intelligent & communicating sensor for indoor air quality.

ENERBEE

THANK YOU FOR YOUR ATTENTION

www.enerbee.fr

OPTIMITIVE
EFFICIENCY THINKING

AI-based OPTIMIZATION SOLUTIONS

For Digital Business Transformation and more

Javier A. García – CEO & Founder

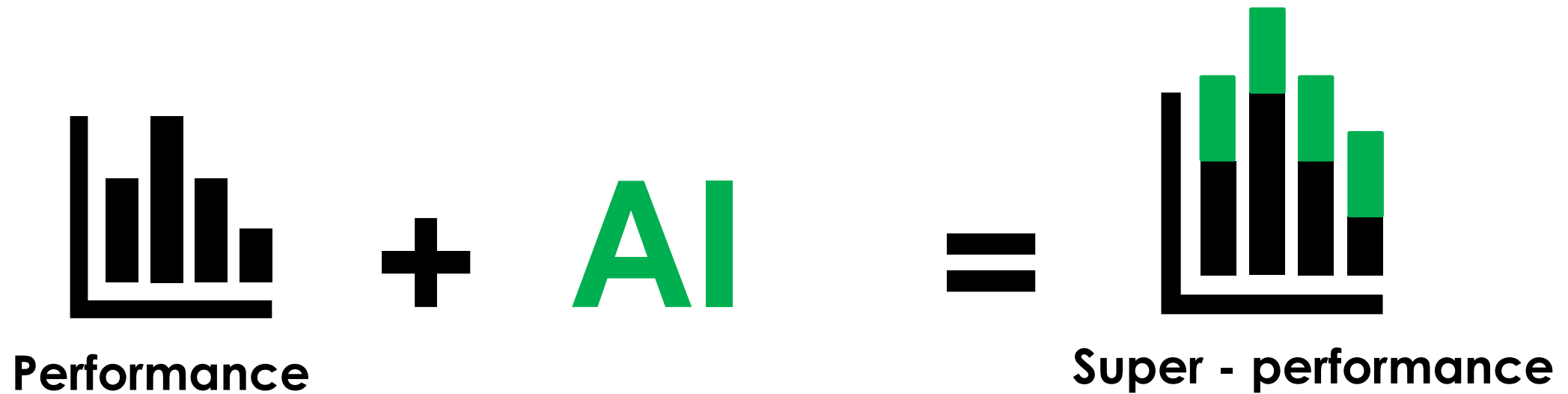# Humans try to make the right decisions …

… at all times

OPTIMITIVE

But factors change in real time …

… and human decisions are sometimes far from perfect

OPTIMITIVE

Results depend 10% of what happens and 90% of what we control

Performance + **AI** = **Super - performance**

Artificial Intelligence is here to help us

OPTIMITIVE

OPTIMITIVE has already achieved AI-optimized decision making in **Process Industries**

OPTIBAT

MAIN MARKETS
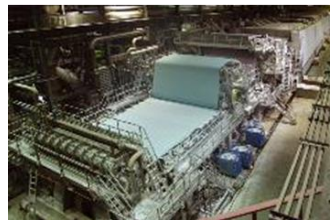
- Power generation
- Cement production
- Oil and gas
- Chemical
- Paper production

MARKET DRIVERS

- ➤ Digital Transformation
- ➤ Industry 4.0
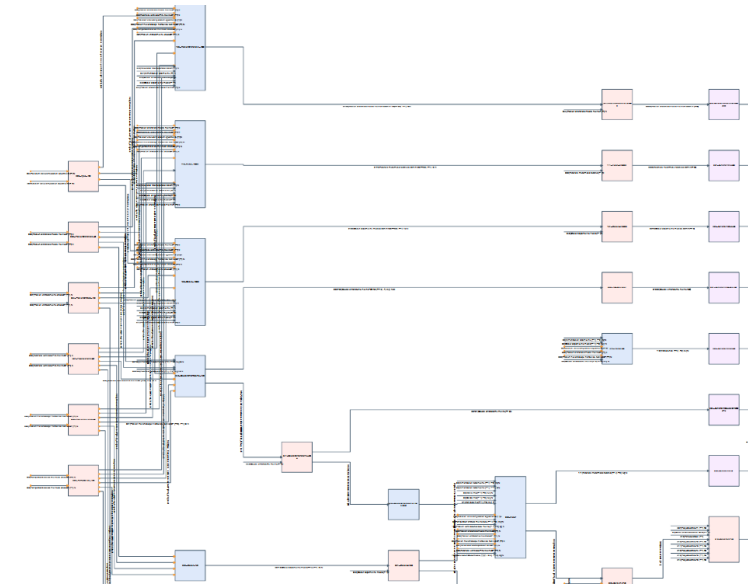
OPTIMITIVE

OPTIBAT Learns, Adjusts and Reports

OPTIBAT
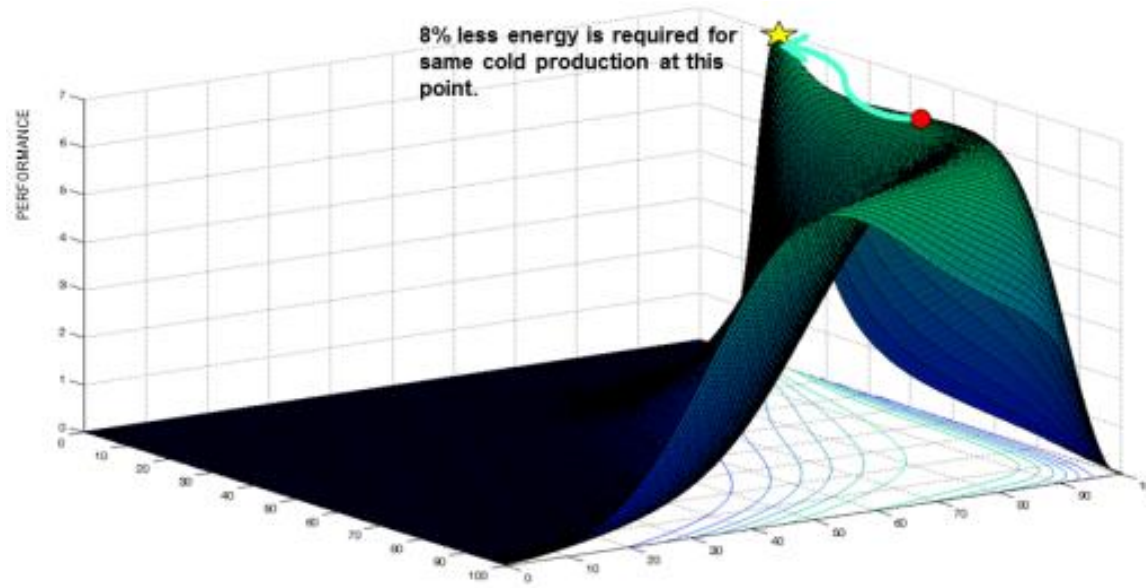
- Artificial Intelligence based Real Time Optimization
- Constantly monitors, analyses & improves

Sends back improved set-point data

OPTIMITIVE

OPTIBAT has real adaptive intelligence

OPTIBAT® learns sophisticated Mathematical Models …

8% less energy is required for same cold production at this point.

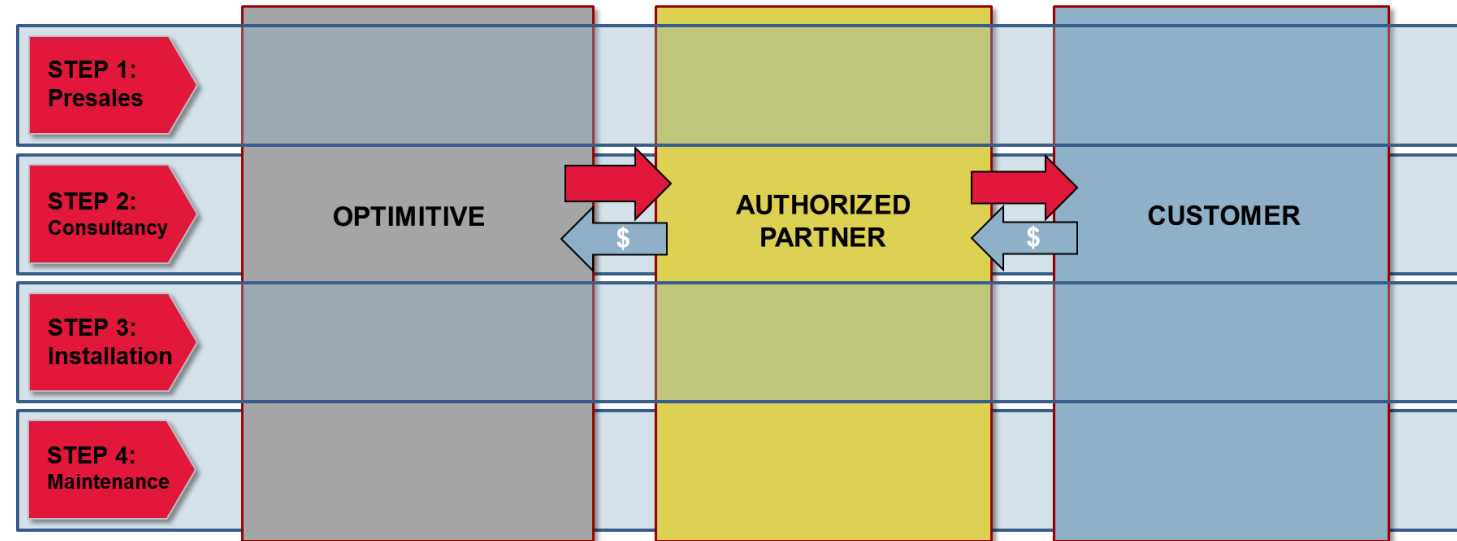… and adjusts settings with Optimization Algorithms

OPTIMITIVE

Benefits for Industrial Processes

- ✓ **Throughput**

- ✓ **Product quality**

- ✓ **Energy saving**

- ✓ **Runnability**

- ✓ **Stability**

OPTIMITIVE

OPTIBAT® is a growing business in Process Industries

3 Global Partners

Running Business Model

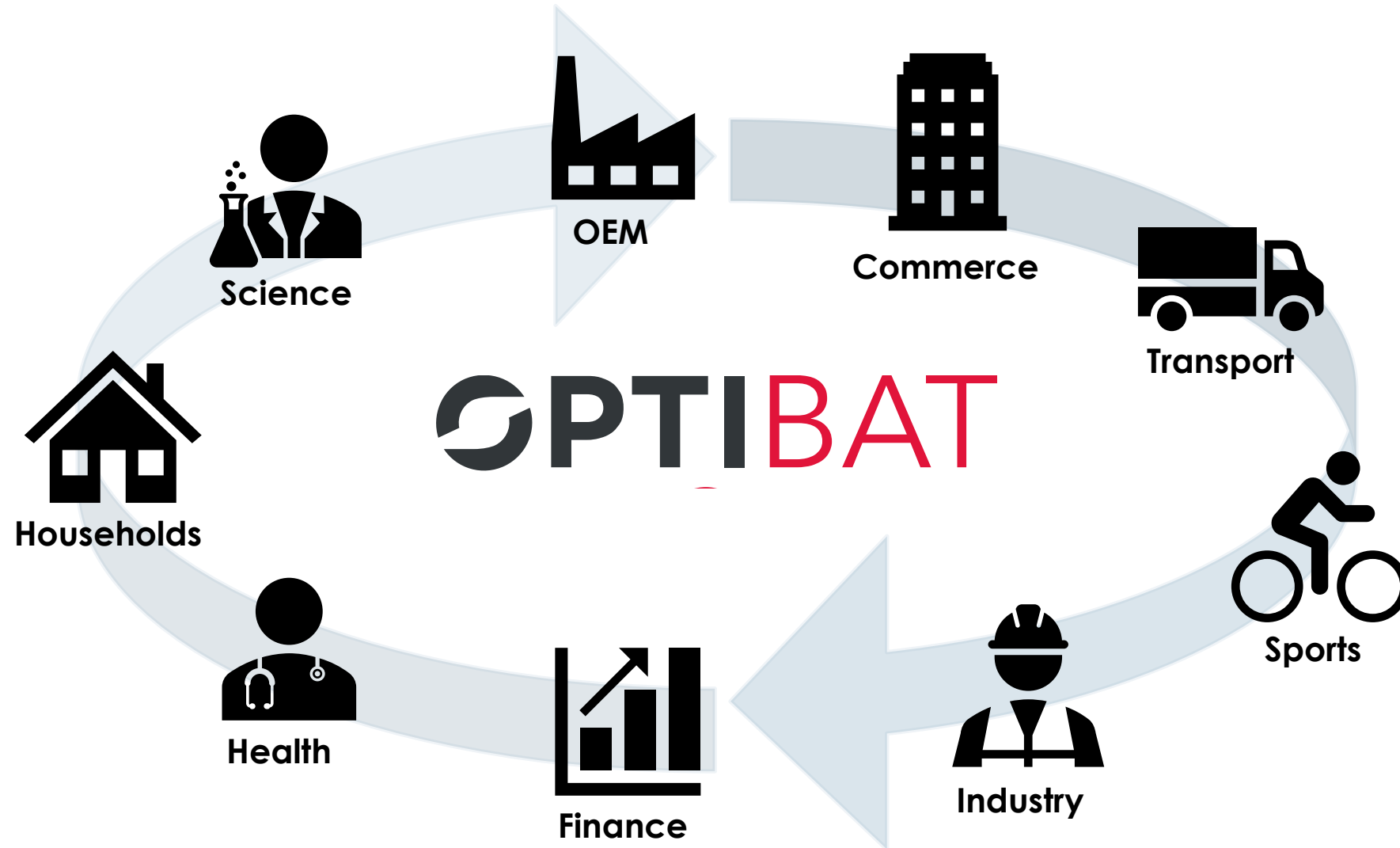| STEP 1: Presales		
STEP 2: Consultancy	OPTIMITIVE → ← $ AUTHORIZED PARTNER → ← $ CUSTOMER	
STEP 3: Installation		
STEP 4: Maintenance		

Operations in Europe, North America, Asia, Middle East

OPTIMITIVE

P&L growth plans in Process Industries

	2018	**2019**	**2020**	**2021**
Revenue (m€)	0.6	2	6	16
EBITDA (%Revenue)		41%	56%	71%

OPTIMITIVE

Process Industry is only the first step for OPTIBAT®

OPTIBAT® aims to be the "Optimizing Intelligence"

Working in Real Time behind the operation of many Cyber-Physical Processes and Systems
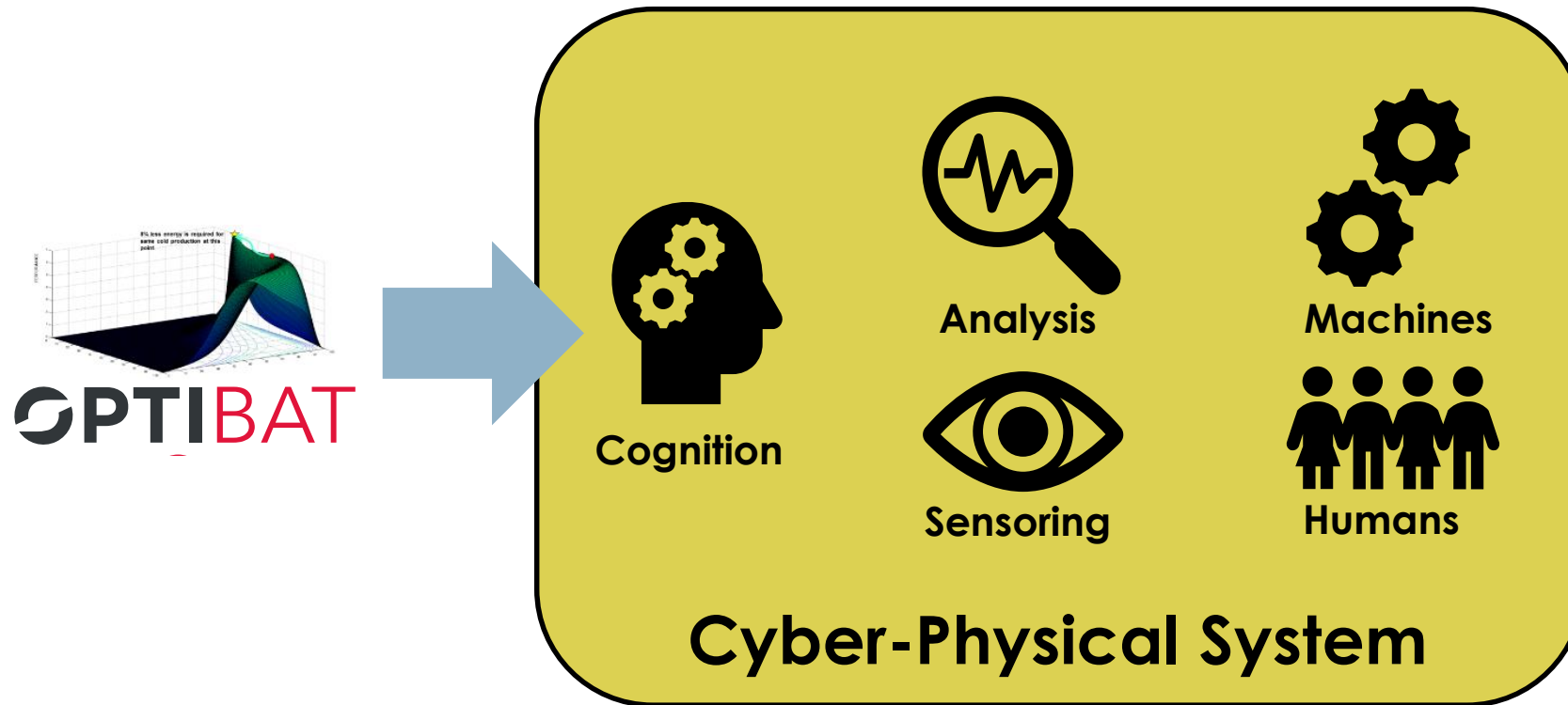
OPTIMITIVE to target progressively markets of Cyber-Physical optimization

Business Models

EMBEDDING OPTIBAT IN OEM EQUIPMENT

INSTALLING OPTIBAT AS A RETROFIT IN EXISTING EQUIPMENT

LICENSING OPTIBAT TO COMPANIES (B2B) AND USERS (B2C)

PROVIDING TRAINING AND CONSULTANCY

Figures can reach x10 to x100

Organization

COMMON GROUP

- IP Management
- Corporate Services

PER SECTOR/VERTICAL

- BUSINESS PLANNING
- COMMERCIAL MODEL
- BRANDING
- PARTNERSHIPS

OPTIMITIVE

FUNDRAISING   Series-B open

- Series B Round of EUR €4.0m to €5.0m (equity-only) by Q4 2019 in tickets of min €1.0m;
- €2.1m already subscribed

Allocation of the Series B Round:

Human resources

30%

- Financing of strategic pilot projects
- Development of a network of partners

International expansion

30%

- C-Level structure for growth
- Business Development worldwide

Technology

40%

- Filing of patents
- Consolidation of Product Leadership position
- Product Vision implementation

OPTIMITIVE

OPTIMITIVE

EFFICIENCY THINKING

THANK YOU!

Javier A. García
javierg@optimitive.com

www.optimitive.com

HIGH EFFICIENCY

WAVE ENERGY
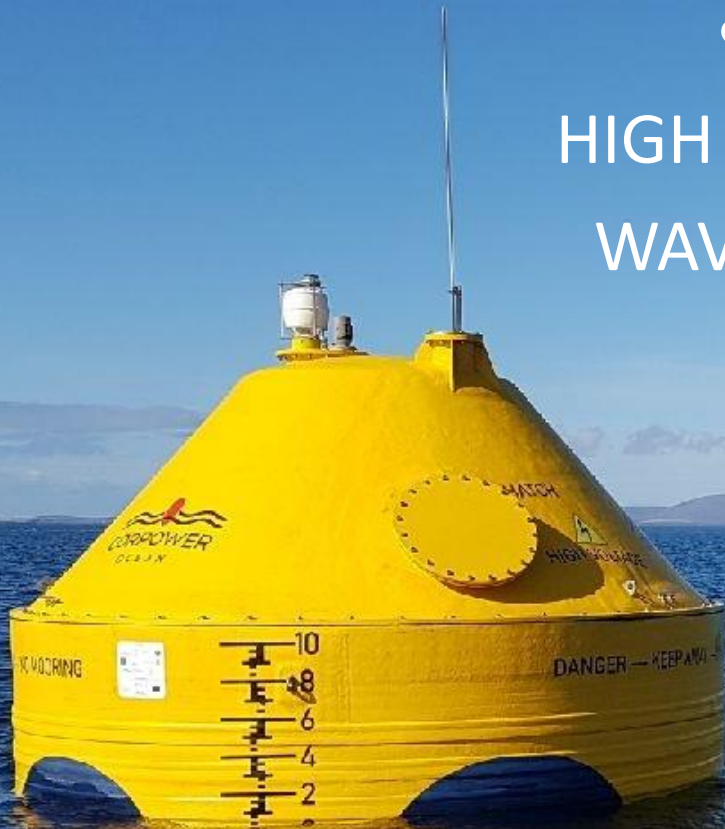
ENABLING 100% RENEWABLES

- Most concentrated form of renewable energy enabling **large amounts of energy** with **less equipment**

- Production profile is more **consistent and complementary** to wind and solar, providing higher average revenue potential per MWh.

- Provides **grid balancing** enabling 100% renewable electricity systems. Reducing energy storage needs.
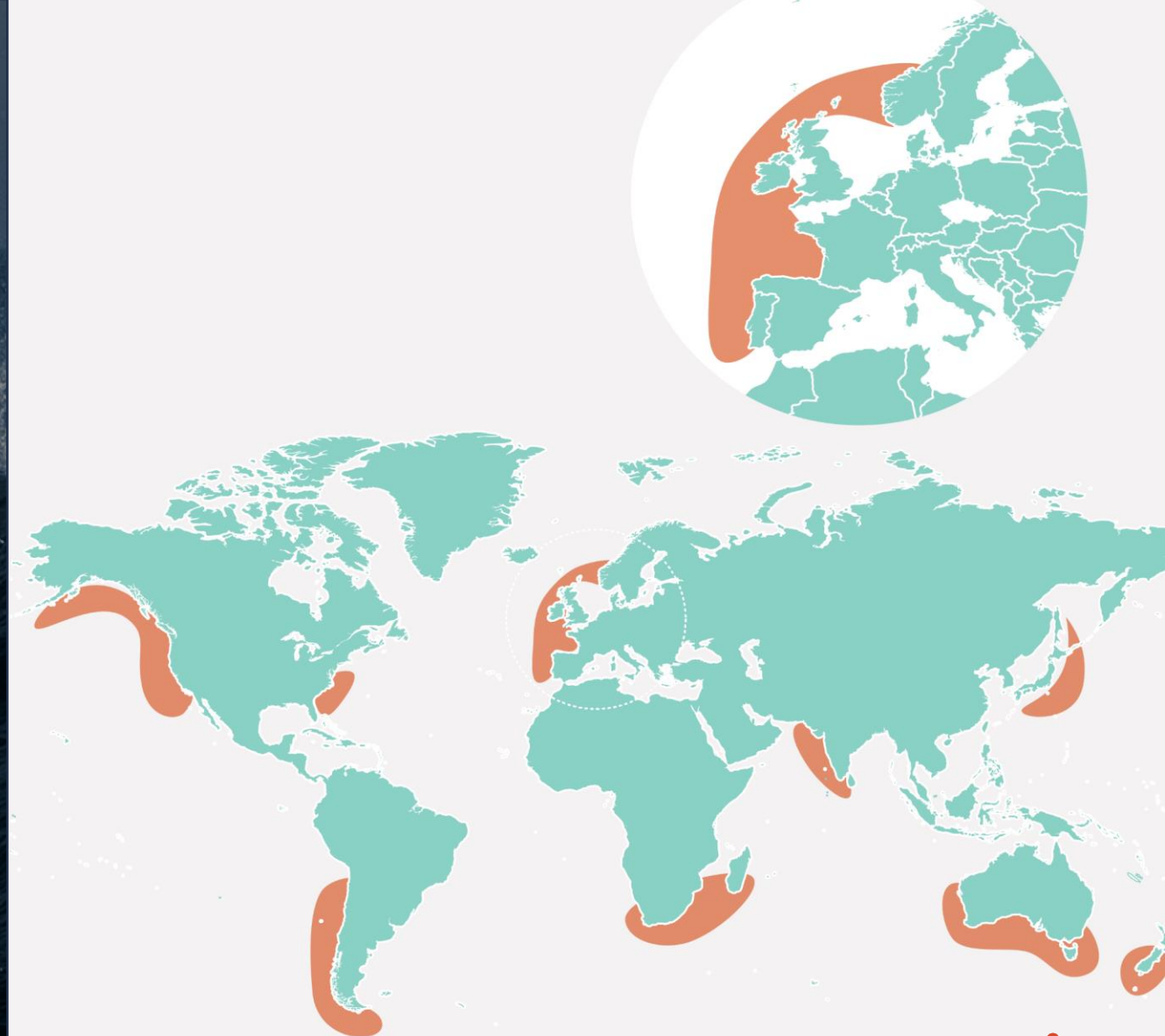
CORPOWER
O C E A N

<u>Wave Energy Challenge</u>

Survive
AND maximize
revenue-to-cost

=

<u>CorPower Solution</u>

Minimize peak load
AND maximize average
annual load

CORPOWER
OCEAN

10 MWh / ton

A. Babarit, J. Hals

"Numerical benchmarking study of a selection of Wave Energy Converters".

Matching structural efficiency of modern wind turbines

Absorbed energy / mass (MWh/t)

2.5

2

1.5

1

0.5

0

Small bottom-ref.
heaving buoy

Bottom-ref.
submerged
heave-buoy

Floating two-body
heaving converter

Bottom-fixed
heave-buoy array

Floating
heave-buoy array

Bottom-fixed
oscillating flap

Floating
three-body
oscillating flap

Floating OWC

CorPower
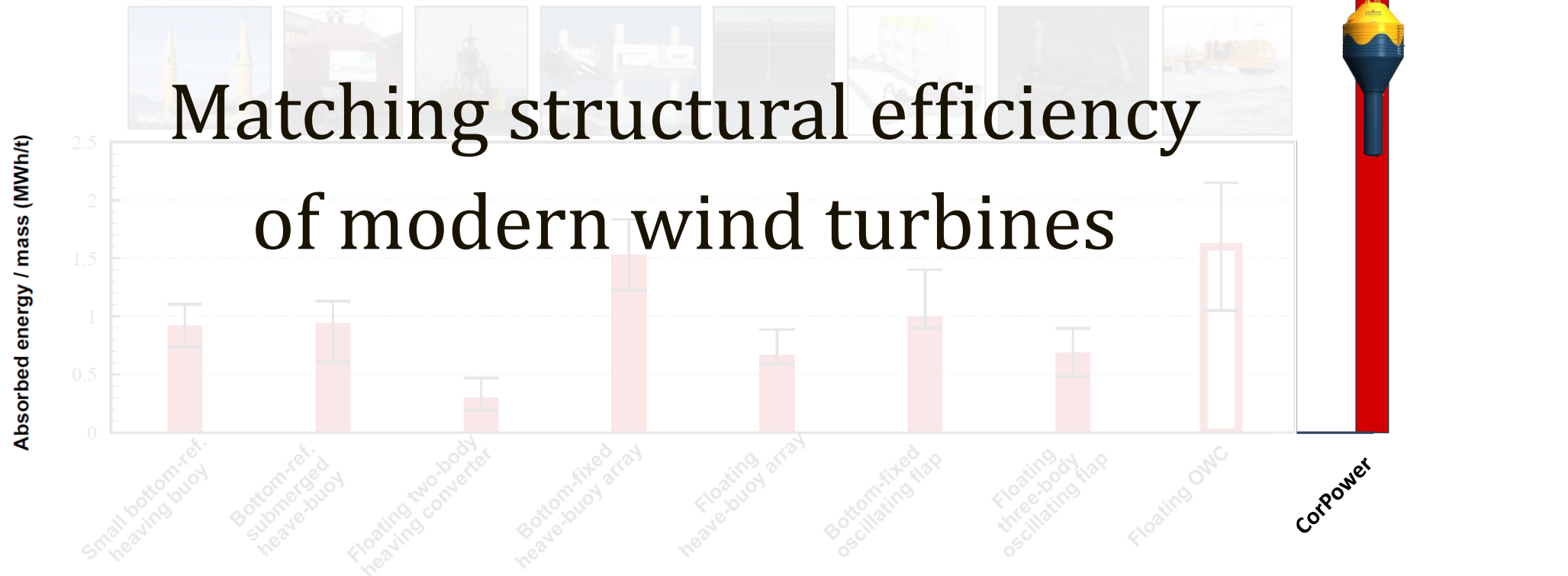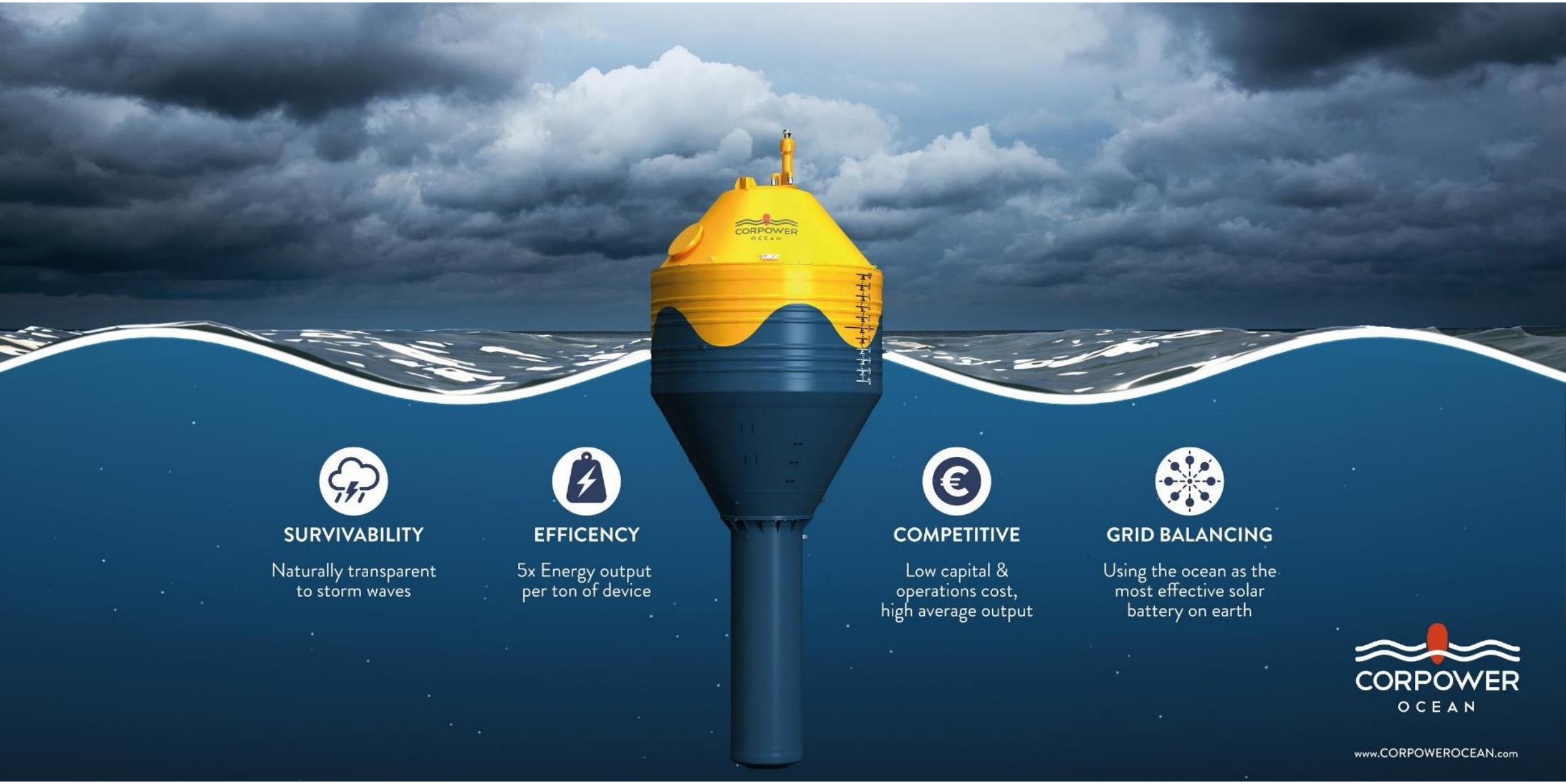
SURVIVABILITY
Naturally transparent to storm waves

EFFICENCY
5x Energy output per ton of device

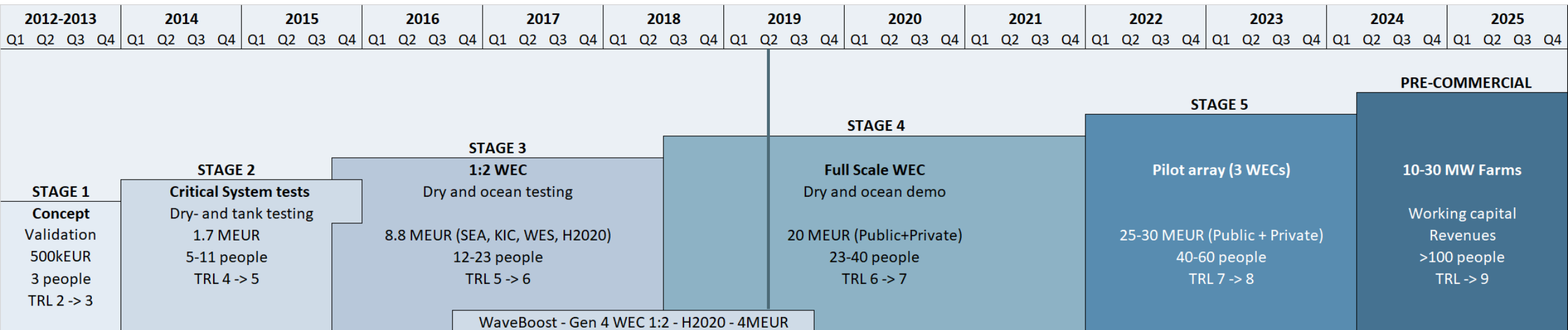**COMPETITIVE**
Low capital & operations cost, high average output

GRID BALANCING
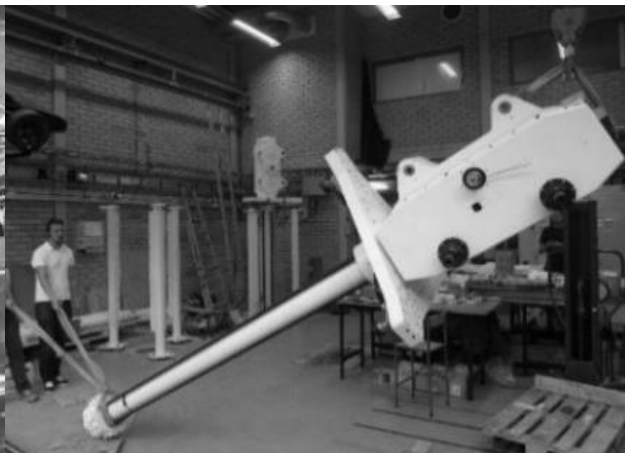Using the ocean as the most effective solar battery on earth

CORPOWER
OCEAN

www.CORPOWEROCEAN.com

STRUCTURED PATH TO MARKET

2012-2013				2014				2015				2016				2017				2018				2019				2020				2021				2022				2023				2024				2025			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

PRE-COMMERCIAL

STAGE 5

STAGE 4

STAGE 3

STAGE 2

STAGE 1

STAGE 1
Concept
Validation
500kEUR
3 people
TRL 2 -> 3

STAGE 2
Critical System tests
Dry- and tank testing
1.7 MEUR
5-11 people
TRL 4 -> 5

STAGE 3
1:2 WEC
Dry and ocean testing
8.8 MEUR (SEA, KIC, WES, H2020)
12-23 people
TRL 5 -> 6

STAGE 4
Full Scale WEC
Dry and ocean demo
20 MEUR (Public+Private)
23-40 people
TRL 6 -> 7

STAGE 5
Pilot array (3 WECs)
25-30 MEUR (Public + Private)
40-60 people
TRL 7 -> 8

PRE-COMMERCIAL
10-30 MW Farms
Working capital
Revenues
>100 people
TRL -> 9

WaveBoost - Gen 4 WEC 1:2 - H2020 - 4MEUR

Product verification in 5 stages according to IEA-OES / equimar best practice.
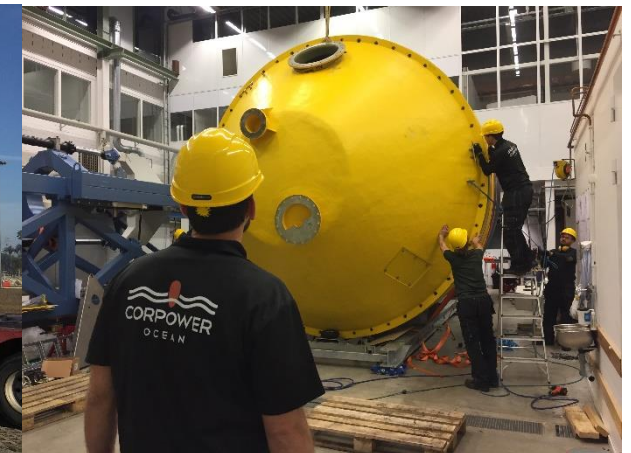

Scale 1:30   Scale 1:3   Scale 1:2   Scale 1:2

CORPOWER
OCEAN

North Sea
Location: Offshore Mo in Rana
Project Size: 100 MW
Customer: Confidential

West Wave
Location: Ireland West Coast
Project Size: 5MW + (30-90MW)
Customer: ESB

Rosscarberry Wave Wind
Location: Ireland, South of Rosscarbery
Project Size: 30 MW wave, 90MW wind
Customer: Simply Blue Energy

WaveHub Cornwall & Wales
Location: Hale + Pembrokeshire
Project Size: 10MW + 30MW wave (+wind)
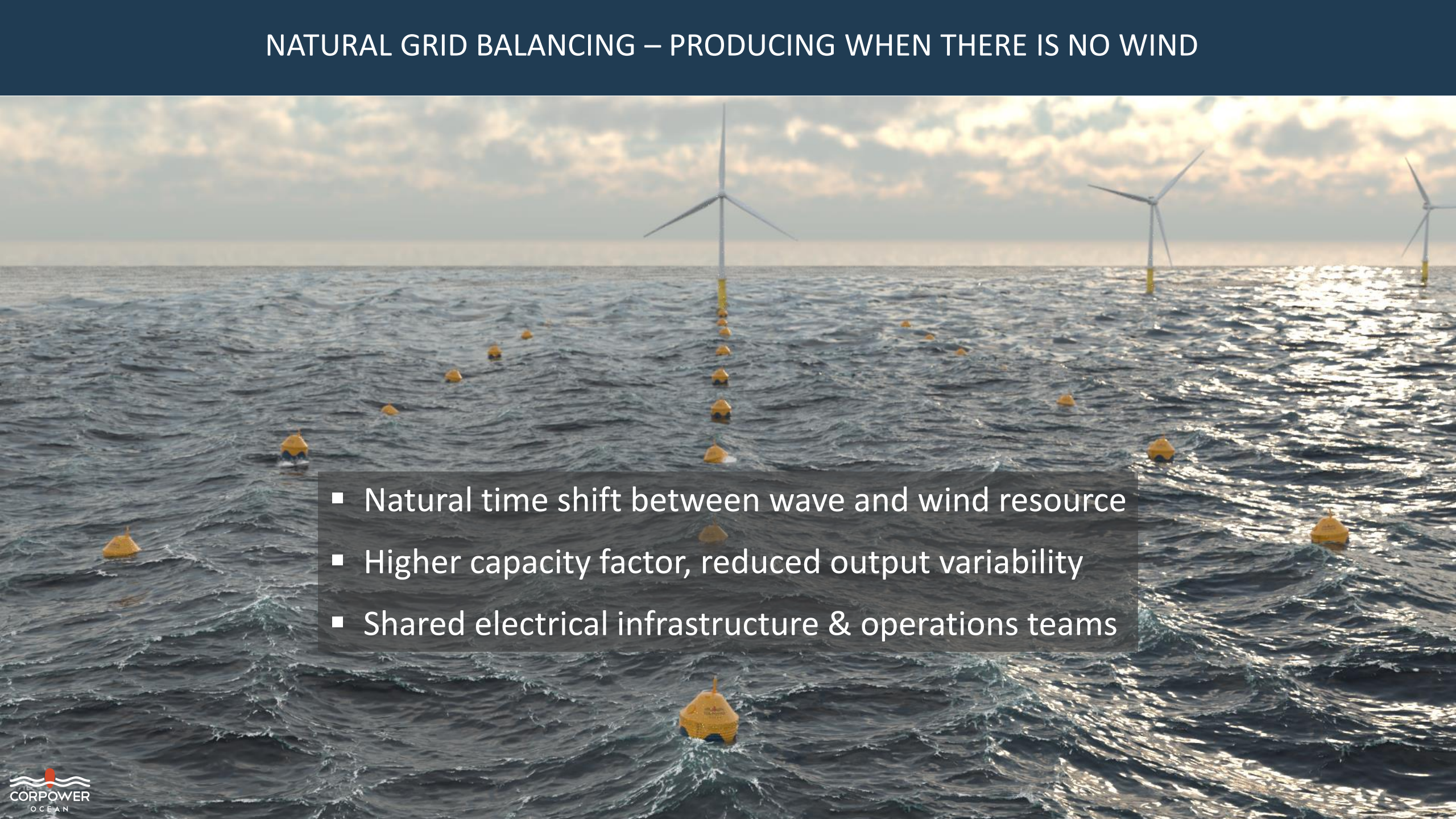Customer: Simply Blue Energy

Viana do Castelo
Location: Portugal, Viana do Castelo
Project Size: Stage 1: 30MW Stage 2: 70MW
Customer: Confidential

2023 Targets:

+100 MW orders
300 MW conditional orders

CORPOWER
OCEAN

- Natural time shift between wave and wind resource

- Higher capacity factor, reduced output variability

- Shared electrical infrastructure & operations teams

- The worlds most effective wave energy converter proven at sea

- Key enabler for the transition to 100% renewables – natural balancing beats storage

- Attractive funding mix – mostly non-dilutive - limited equity to bankable product

- Dedicated team and board - exceptional experience to commercialise ocean energy

THANK YOU

Patrik Möller, CEO
+46 701 772101
patrik@corpowerocean.com

$508,367

BAY AREA

$1,019,217

STATE OF CALIFORNIA

$20,346,672

UNITED STATES

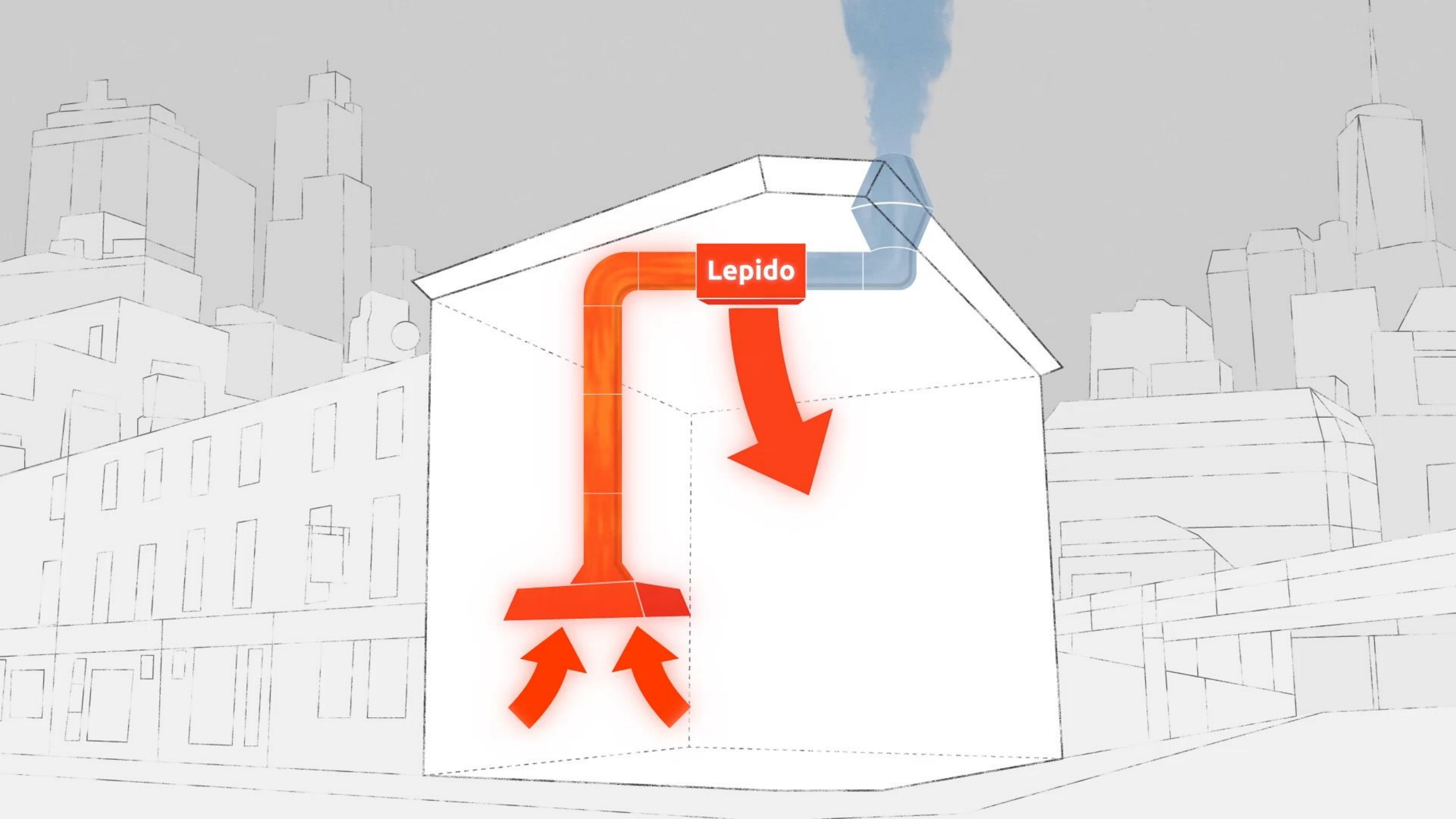$20,348,672

EUROPE

WHERE OTHERS SEE THIN AIR
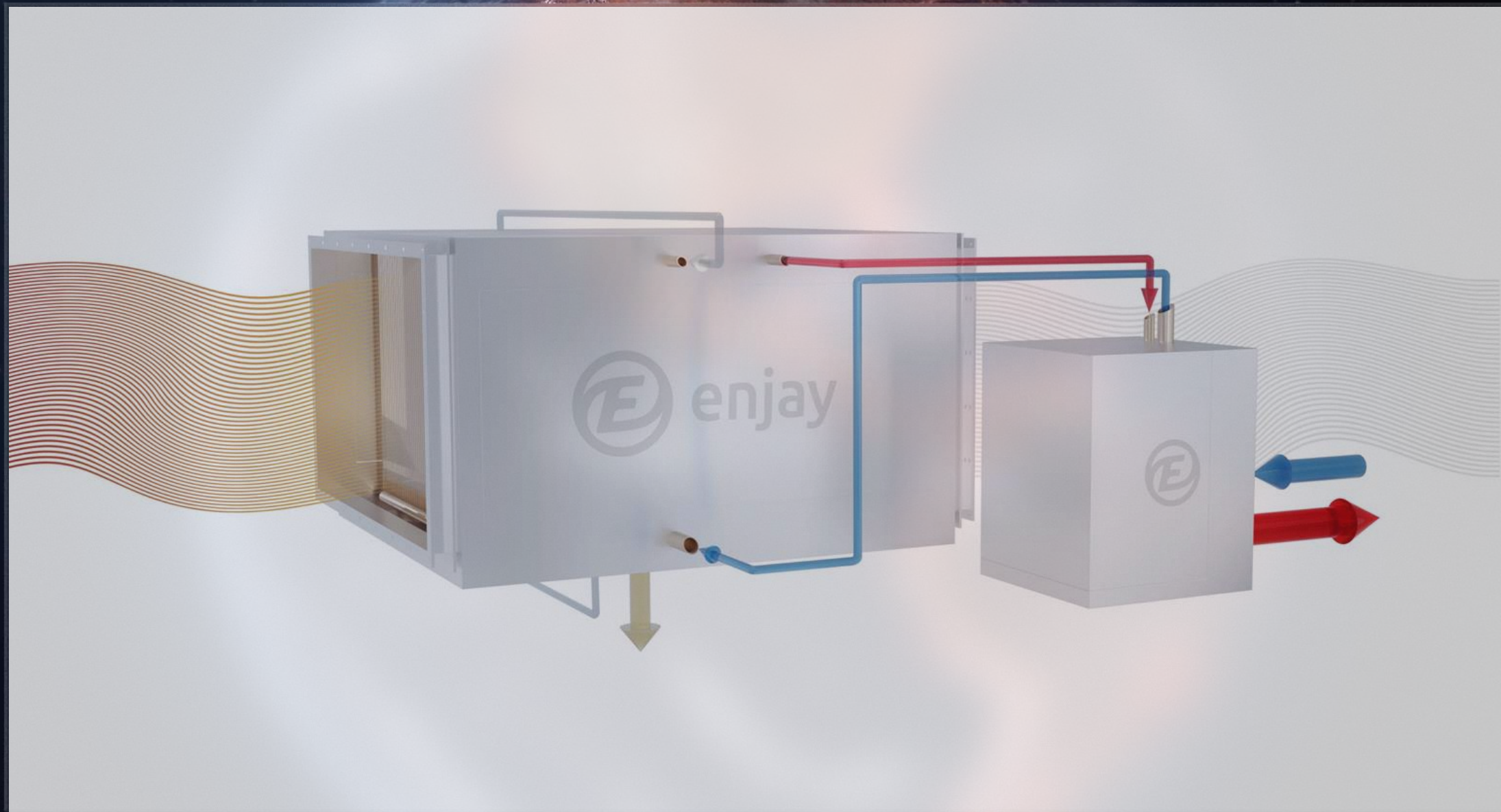
WE SEE POTENTIAL
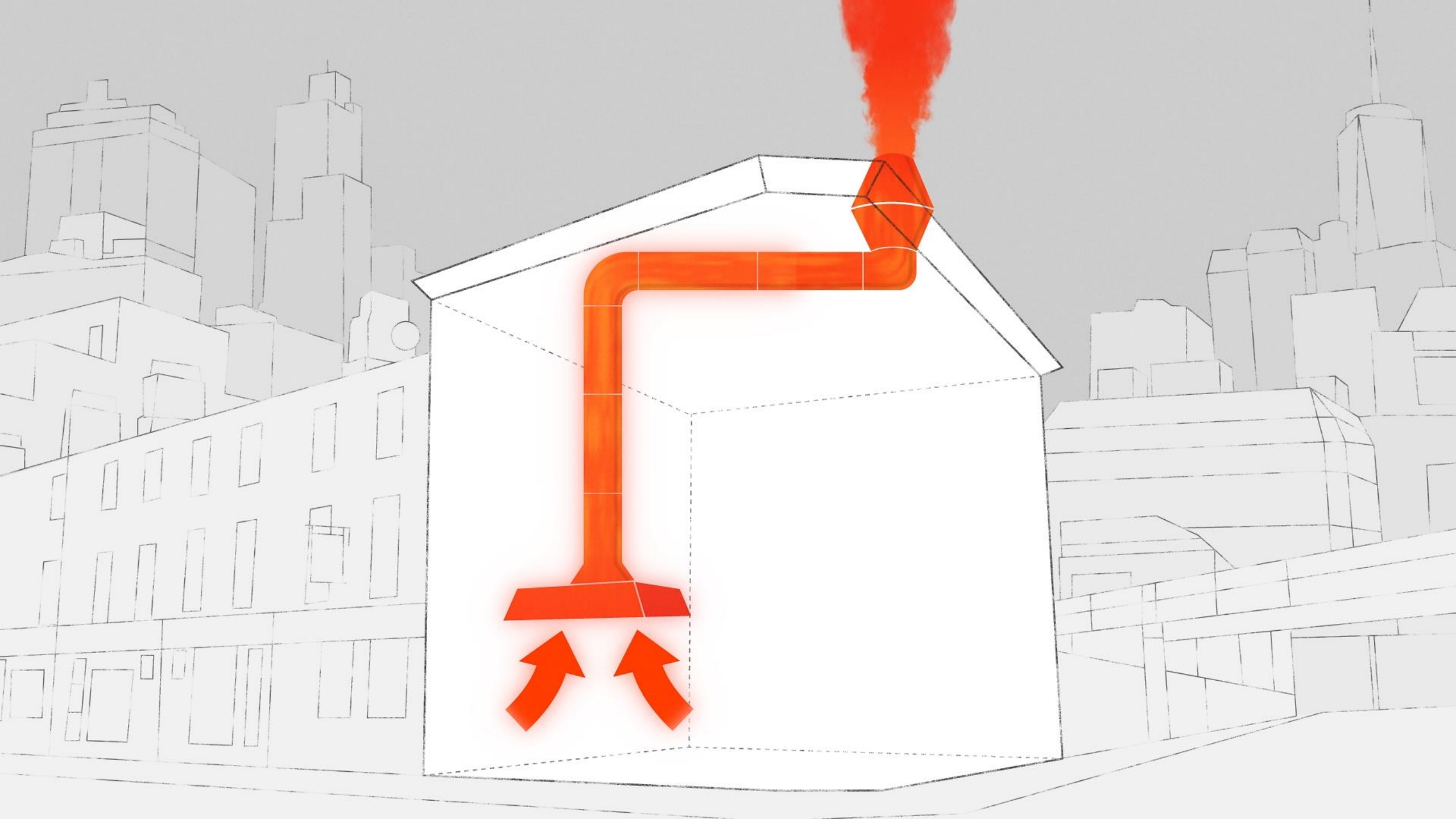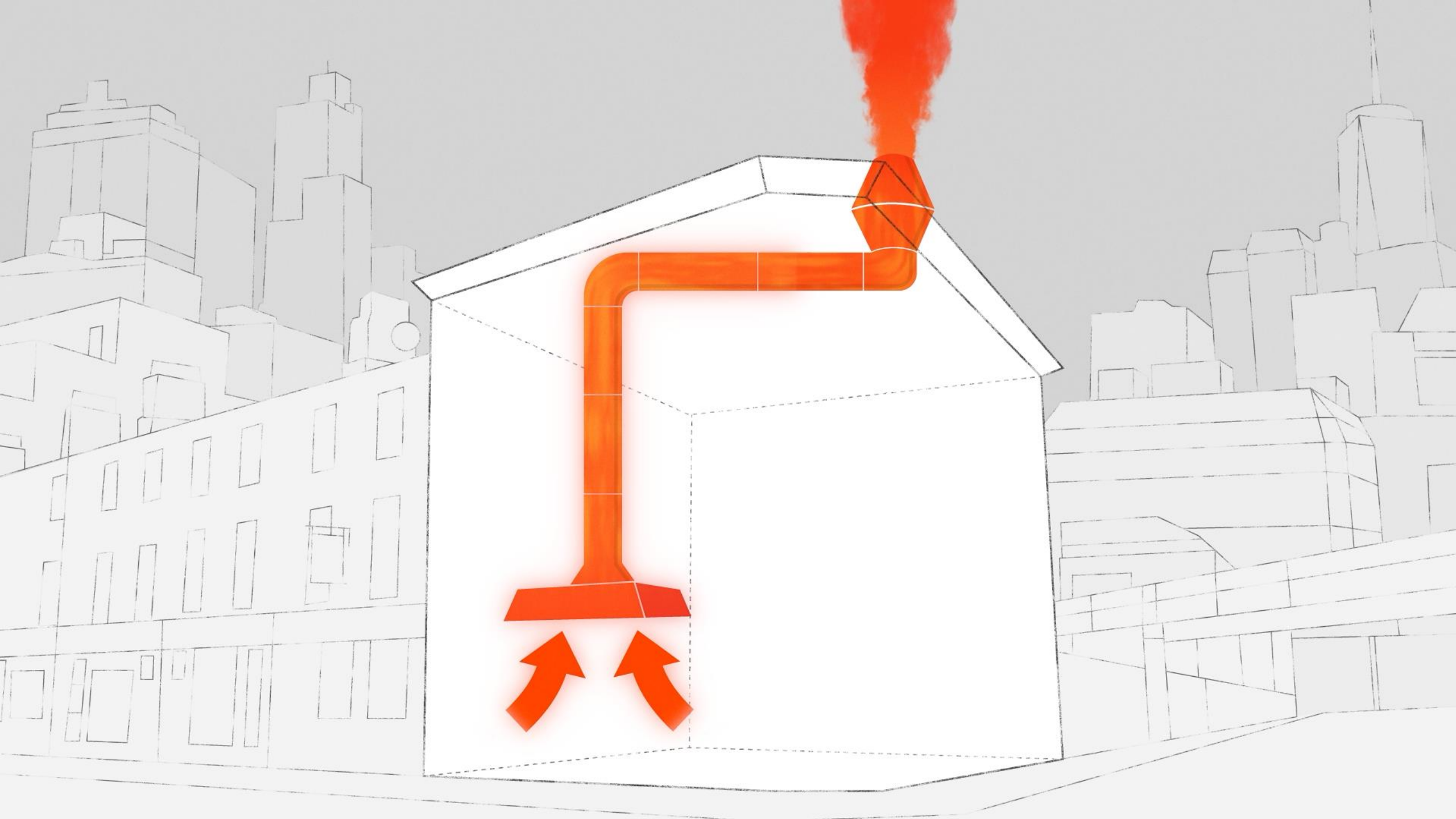
WE DID IT!
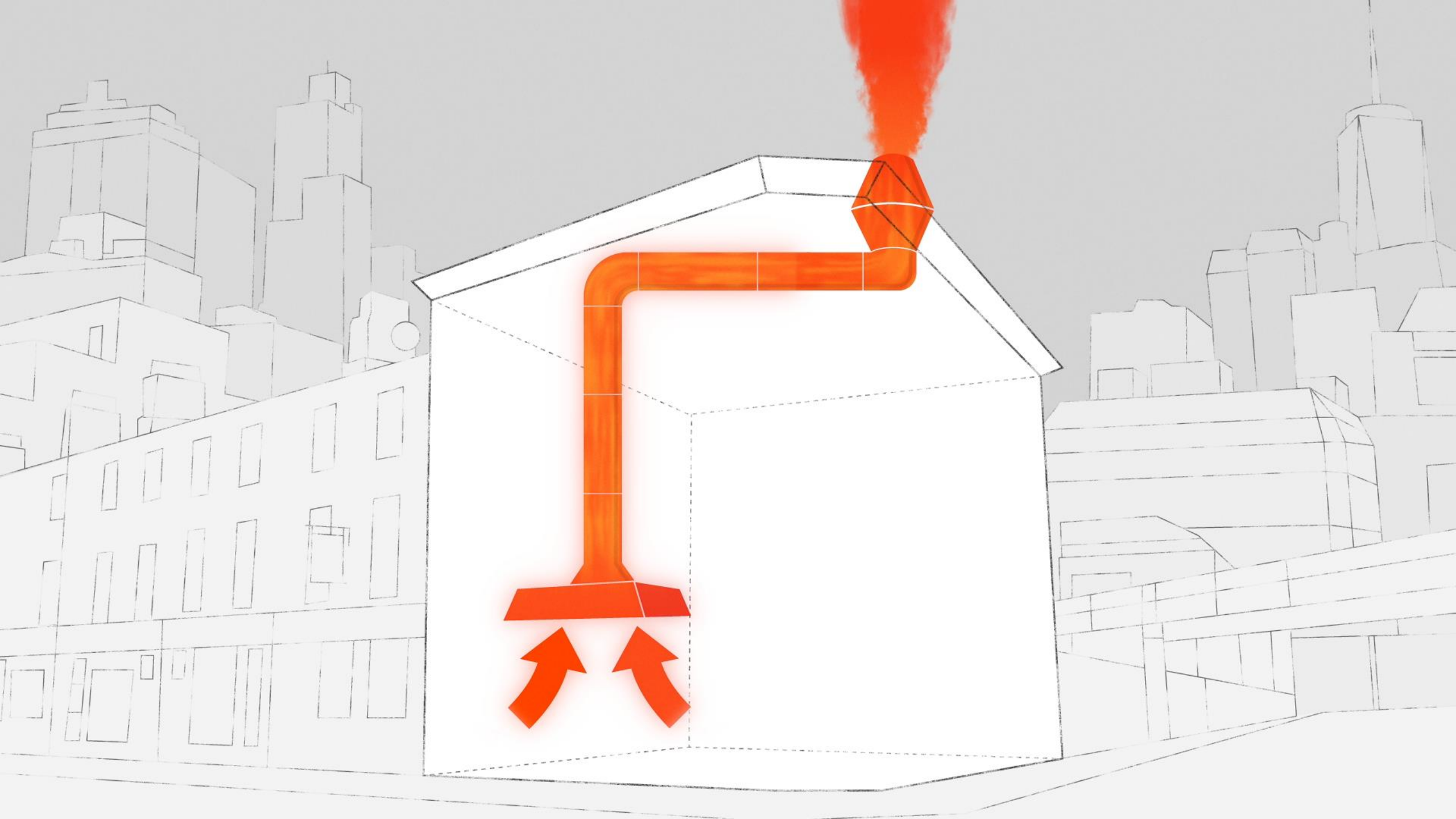
Lepido

$1,245,000

$15,000,000,000

Customer demand

rather than

Technical idea

"The more money our customers save, the larger the environmental impact"

60 tons / restaurant

1,500,000 restaurants in Europe

= 90 million tons CO$_2$ eq

Every year

International scale-up

MIMBLY

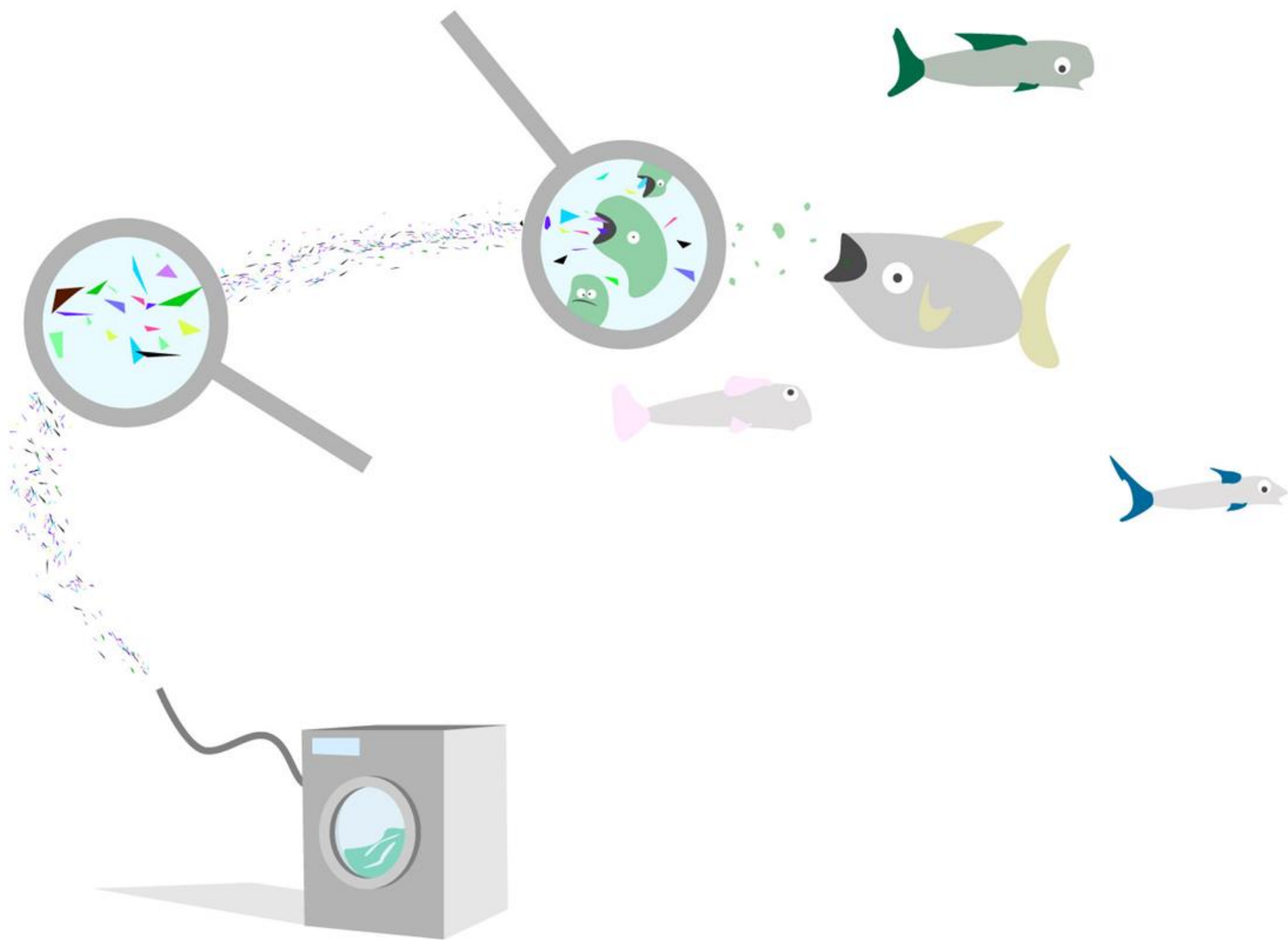## Creating sustainable water solutions

Isabella Palmgren
CEO & Founder

= 25%

Mimbox

💧 **50-90% Water Recycling** 💲

💙 **Captures Microplastics**

🔌 **>30% Energy Savings** 💲
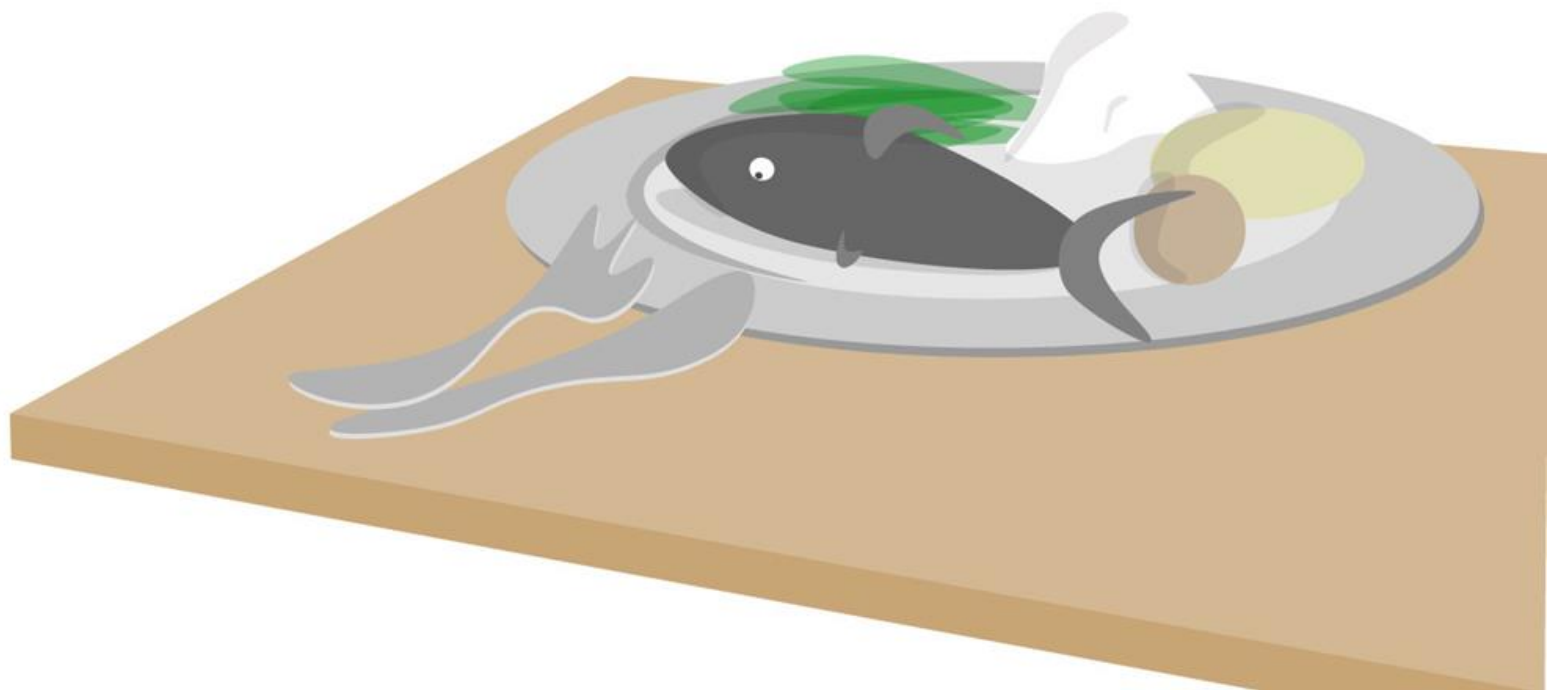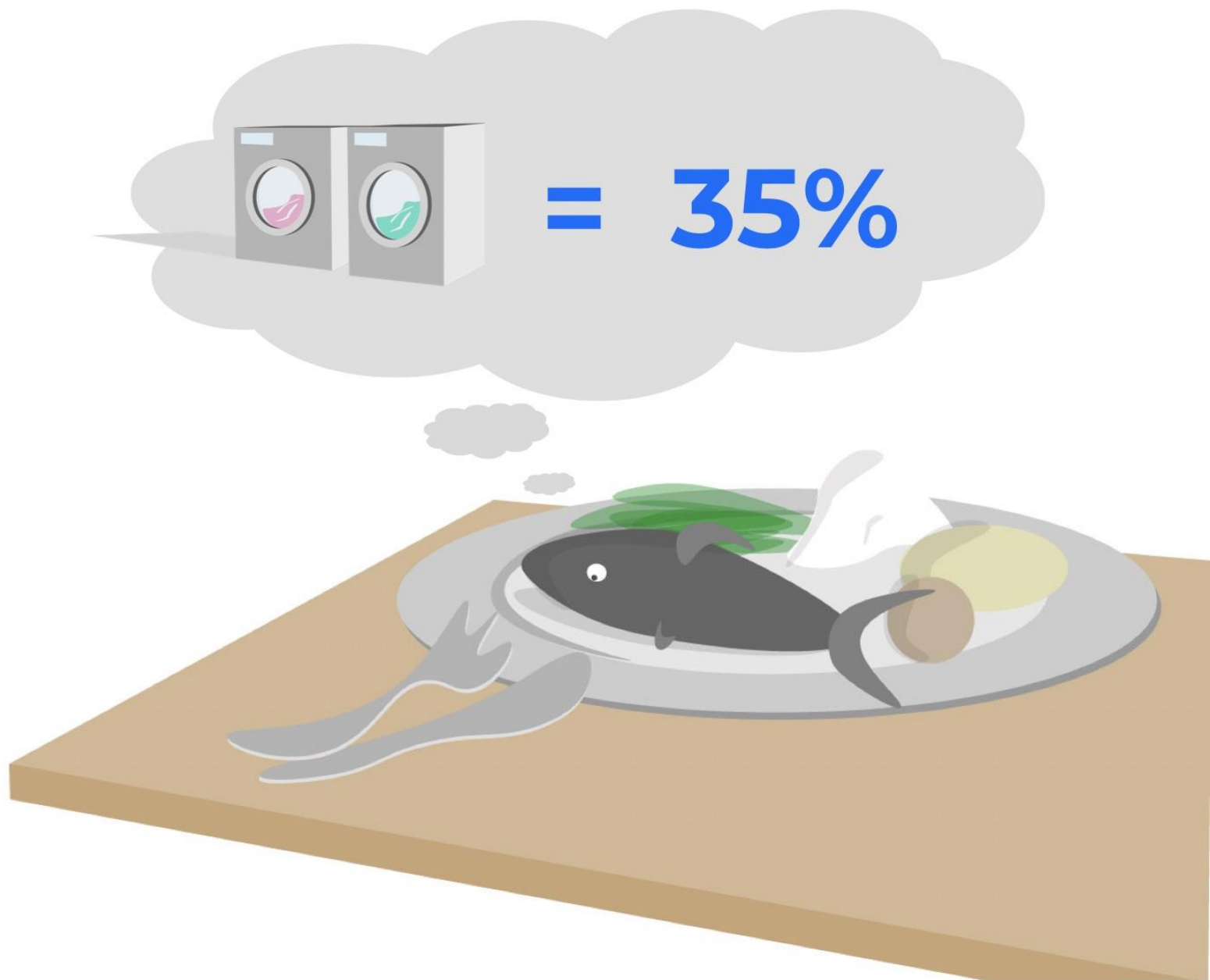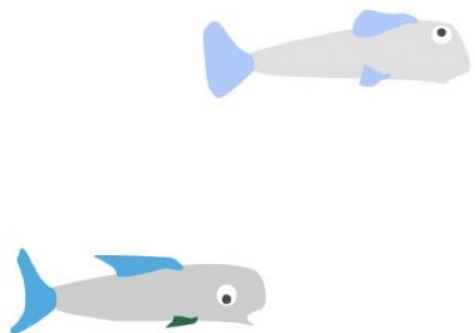
The Mimbox is smart, simple and easy to use.

Data
from the Mimbox

Mimbox
add on solution
to wash sustainably

Commercial

Housing
Hotels
3000 €

DIST

IP-License

OEM
Households
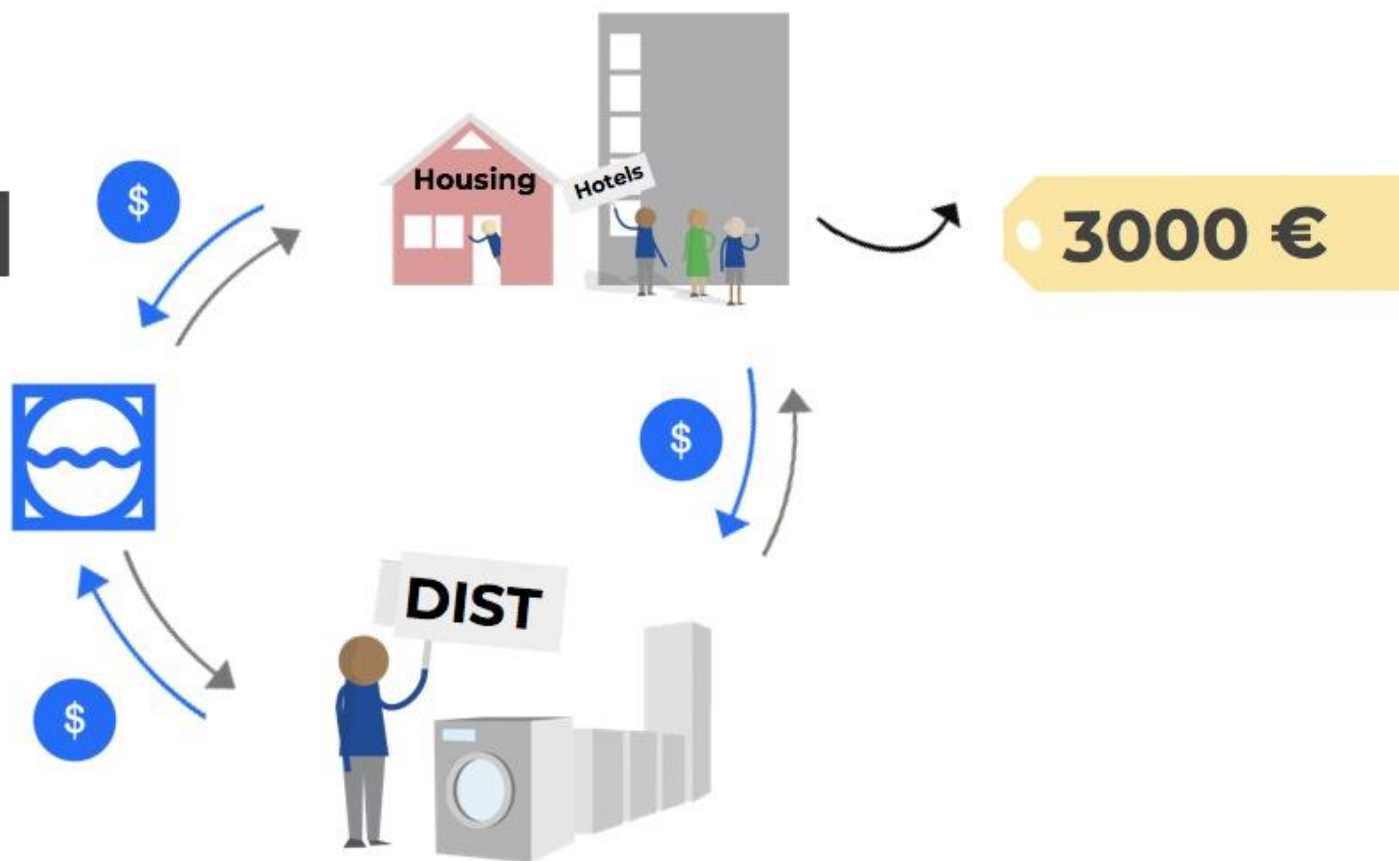
Early market traction

- **14** pre-orders with LOI
- **77** pre-orders in total
- **Paid Pilots** trials in 2018 & 2019

Commercial Washing machines   **50** **Million**

Residential Washing machines   **840** **Million**

Market entry
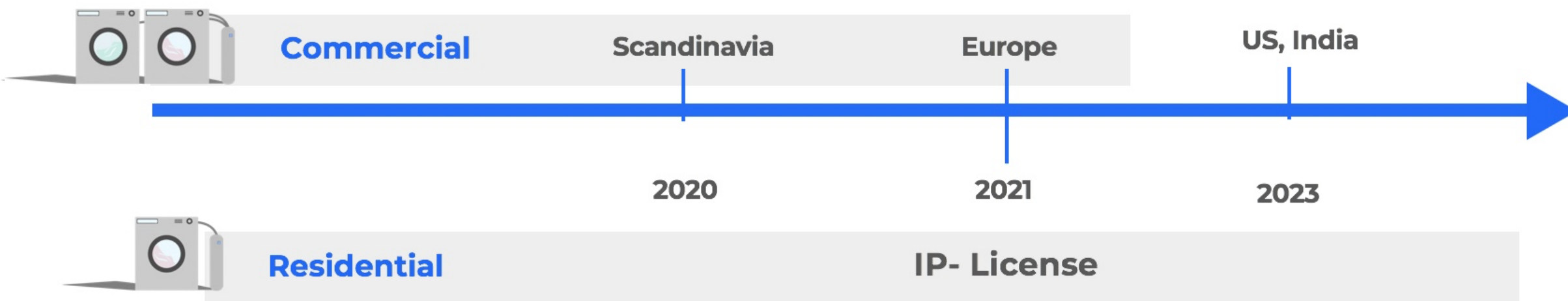
Commercial

Scandinavia

Europe

US, India

2020

2021

2023

Residential

IP- License

Isabella Palmgren

Founder
Bsc, Bioengineering
Msc, Entrepreneurship

**Background in
sales & consulting**

Nicolas Maxant

Technology
Msc, Chemical engineering
Msc, Entrepreneurship

**Background in
chemical engineering**

Robin Griffiths

Business development
B.A, Finance.
MSc, Entrepreneurship

**Background in finance
and sustainability**

Emil Vestman

Design
Bsc, Industrial design eng.
MSc, Industrial design eng.

**Background in
behavioral design**

Advisors

PODAB
Professionell tvättstugeutrustning

**Swedish
Energy Agency**

IKEA BOOTCAMP

eit

Andreas Stubelius

Swedish Energy Agency
*Expert in business dev. &
Funding*

Business advisor

Linda Hedenblom

Chalmers Ventures
*Exp. in Funding &
Management*

Business coach

Roger Gustavsson

Thordab AB
Founder and CEO

Technical advisor

Jimmy Nilsson

PODAB
CEO

Industry advisor

30 K
Mimboxes

45 million m³ of water

114 GWh of energy

47 000 tons of CO2

1800 t of microplastics

$ 30M€

MIMBLY

Join us

in revolutionizing the water industry.

Isabella Palmgren
isabella@mimbly.se
www.linkedin.com/in/isabellapalmgren

Digital Engineering

Innovation Showcase

Cleantech Forum, Stockholm – May, 2019

Summary

Digital Engineering helps its clients understand and minimise the impact that the weather has on their business

Company overview

EPRI
ELECTRIC POWER RESEARCH INSTITUTE

WESTERN POWER DISTRIBUTION

Bloomberg

sse

nationalgrid

SP ENERGY NETWORKS

Powerlink QUEENSLAND

New York Power Authority

Rte

Skills

Expertise in:

Weather simulation
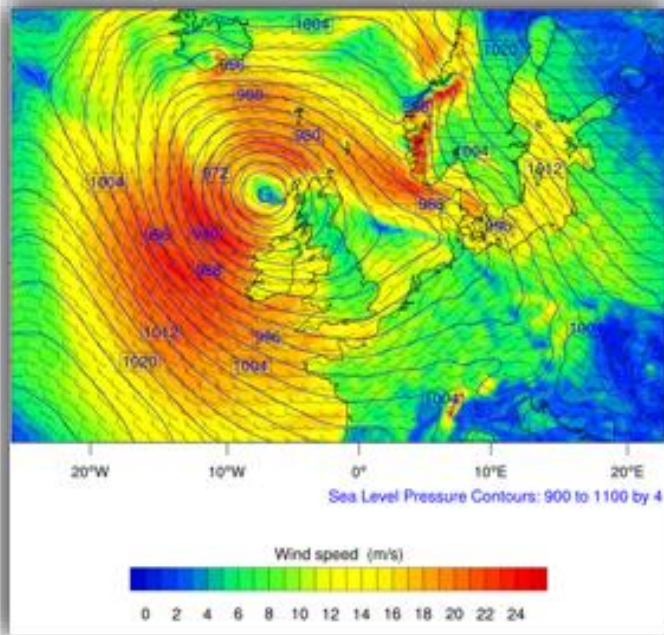
Data analytics
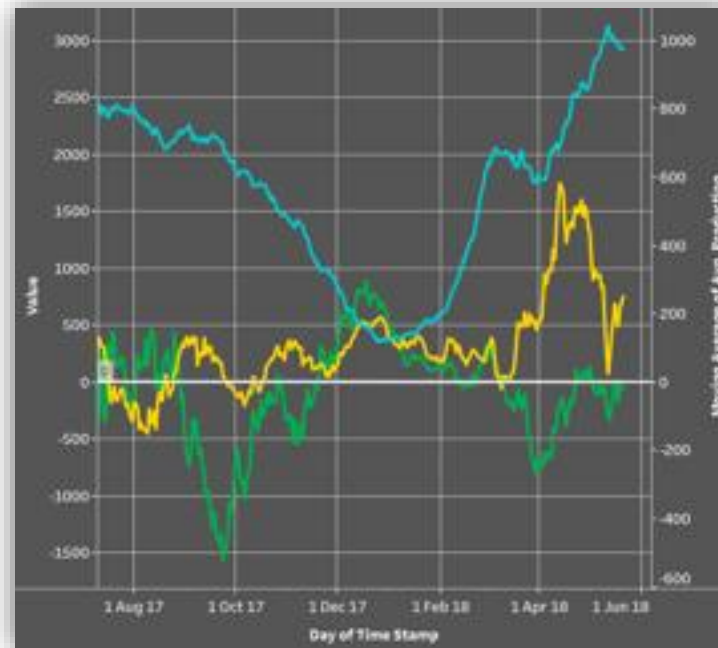
Engineering modelling
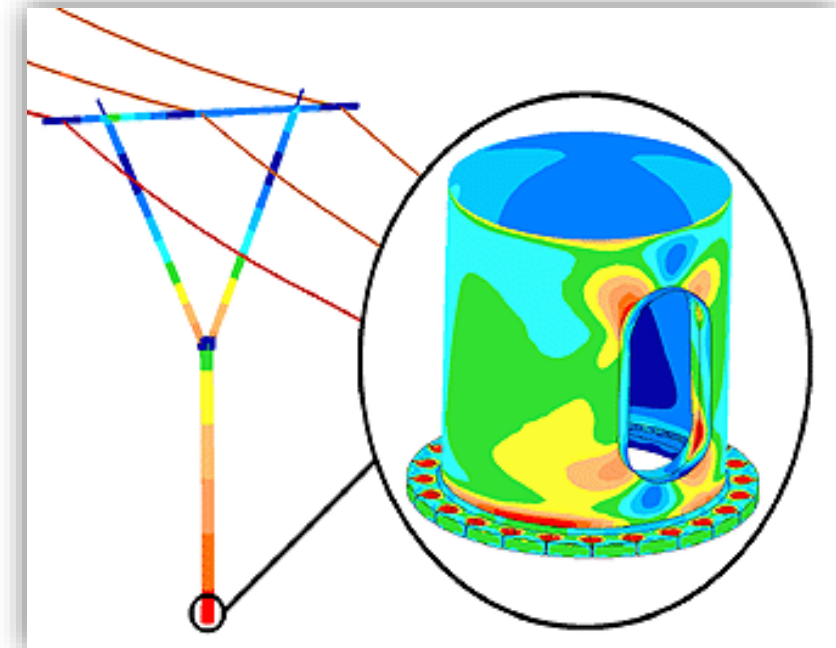
Focus

For the past 4 years Digital Engineering has focussed on the electricity industry

I will focus on one high value application

The electricity industry

Think about the electricity industry…

Imagine one image that reminds you of it…

How much transmission circuit
is there, per person, in the
developed world?

(4 billion people)

The global transmission network

In the developed world, there is 1m of transmission circuit for every person!

In the UK, it's roughly half a metre

To put that into context, there is 7cm of motorway per person

Ageing Infrastructure

- 75% of US transmission network is over 25 years old

- Some of it is over 100 years old

- The UK network was built in the 1970s with a lifespan of 60 years

- Transmission infrastructure is approaching end of life

Age of transmission network in US

■ Less than 25 years old ■ More than 25 years old

https://www.energy.gov/articles/infographic-understanding-grid

Big Decisions
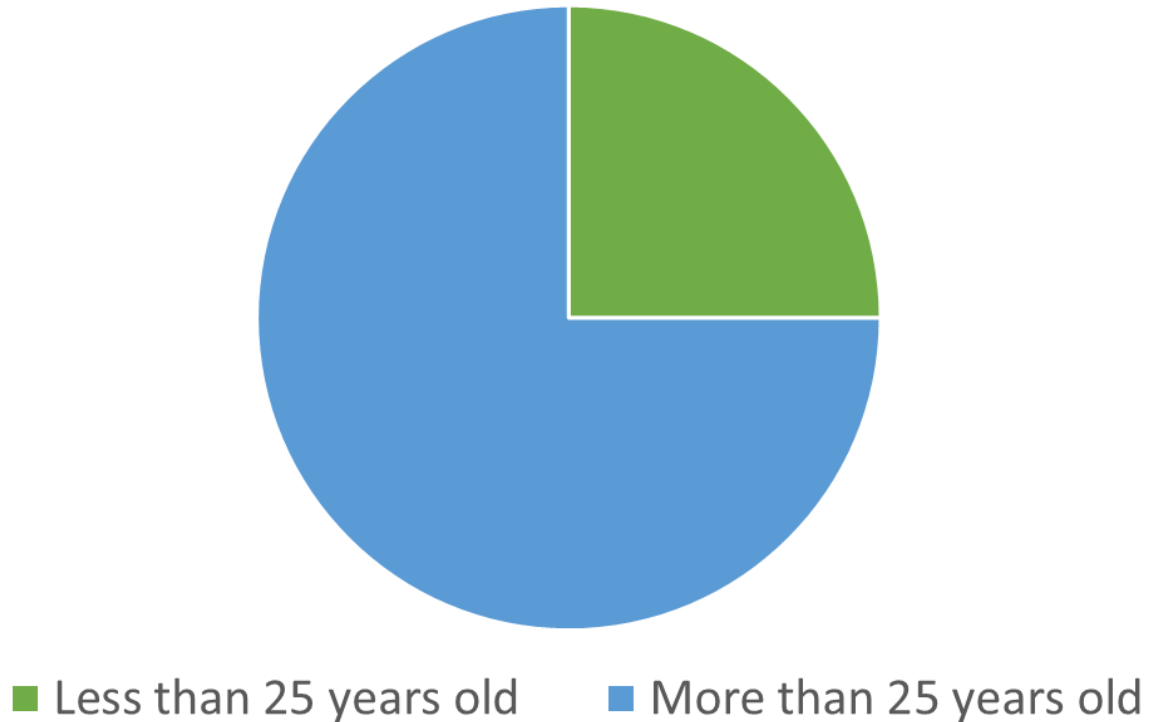
To replace the wires alone costs £400,000 per km

There are roughly 4 million km of lines in the world

To replace them all costs £1.6 Trillion
£1,600,000,000,000

Asset Management

Effective asset management is essential

The key data is asset condition

Without asset condition data, asset management is guesswork

What ages overhead lines?

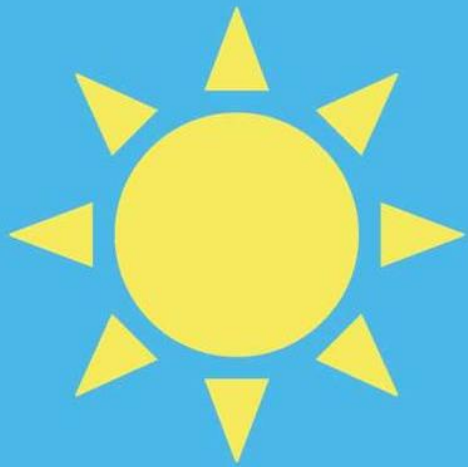What causes overhead lines to degrade?

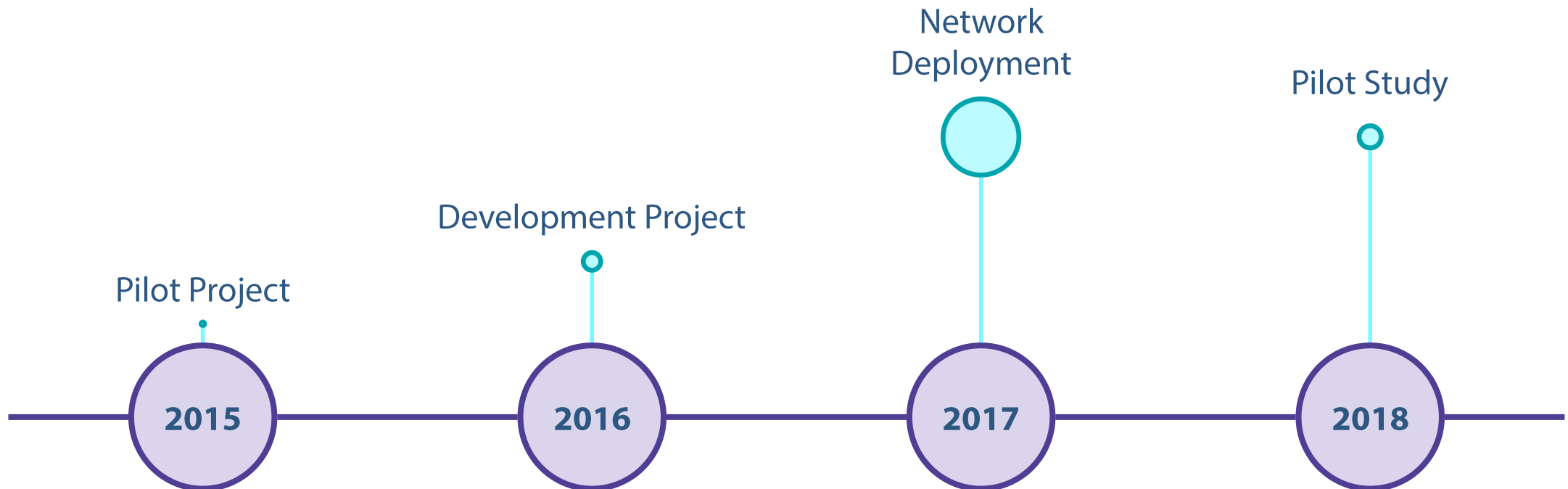(They spend 100% of their time outdoors)

The weather

We use weather simulations and data analytics to generate asset health information

In a fraction of the time, and at a fraction of the cost of traditional methods

Digital Engineering

Powered by data. Driven by innovation.

Overhead line showing signs of deterioration.

Classification of wind exposed overhead line spans

Environmental conditions play a major role in the deterioration of overhead line (OHL) conductors and fittings, influencing how long they can reliably operate before they need to be replaced.

This research project used advanced weather modelling techniques and mechanical response models, to more accurately assess the risk of overhead lines deteriorating due to wind exposure.

One of our findings was a greater variation between the mode and severity of the wind exposure calculated by the new model, compared to our current classification system. Importantly, when the new model was compared against actual defect reports for OHL circuits, we found an improved correlation between the two.

Another contributing factor to OHL deterioration is pollution. So we've begun to explore the potential of a new model that combines the effect of both wind and pollution on OHLs. The result will be the trial of a new classification system that uses advanced weather and pollution models, alongside mechanical wear models and asset condition information.

All of this will mean we can manage our assets more effectively. We'll have a greater understanding of how the environment contributes to the deterioration of conductors and fittings, and will be able to target spending on those assets at the highest risk.

More detailed environmental data will help us make better decisions when it comes to capital investment priorities. The estimated benefit is a reduction of around £20m on capital expenditure over the RIIO T2 period.

Innovation in numbers

3,444
Line spans analysed across 15 OHL routes

£20m
Reduction in RIIO T2 costs

https://www.nationalgrid.com/sites/default/files/documents/P1880%20Elec_tx_annual_summary_241017_revised.pdf

National Grid UK

Overhead line showing signs of deterioration.

Classification of wind exposed overhead line spans

Environmental conditions play a major role in the deterioration of overhead line (OHL) conductors and fittings, influencing how long they can reliably operate before they need to be replaced.

This research project used advanced weather modelling techniques and mechanical response models, to more accurately assess the risk of overhead lines deteriorating due to wind exposure.

One of our findings, a greater variation between the severity of the wind exposure identified by the new model, and the current classification system. Further, when the new model was compared against actual defect reports for OHL circuits, we found an improved correlation between the two.

Another contributing factor to OHL deterioration is pollution. So we've begun to explore the potential of a new model that combines the effect of both wind and pollution on OHLs. The result will be the trial of a new classification system that uses advanced weather and pollution models, alongside mechanical wear models and asset condition information.

All of this will mean we can manage our assets more effectively. We'll have a greater understanding of how the environment contributes to the deterioration of conductors and fittings, and will be able to target spending on those assets at the highest risk.

More detailed environmental data will help us make better decisions when it comes to capital investment priorities. The estimated benefit is a reduction of around £20m on capital expenditure over the RIIO T2 period.

Innovation in numbers

3,444
Line spans analysed across 15 OHL routes

£20m
Reduction in RIIO T2 costs

Recent Case Study – Summary

Provide data credible data on asset health

At a fraction of the cost

Enabling better asset management decisions

Summary

Managing the worlds transmission assets is a trillion pound problem

Our service provides key data

Which saves electric companies millions of pounds

Next Steps

We are a small business with a limited reach

We have great solutions to a big problems

We are looking for partners to help us roll out our services worldwide

Any Questions?

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