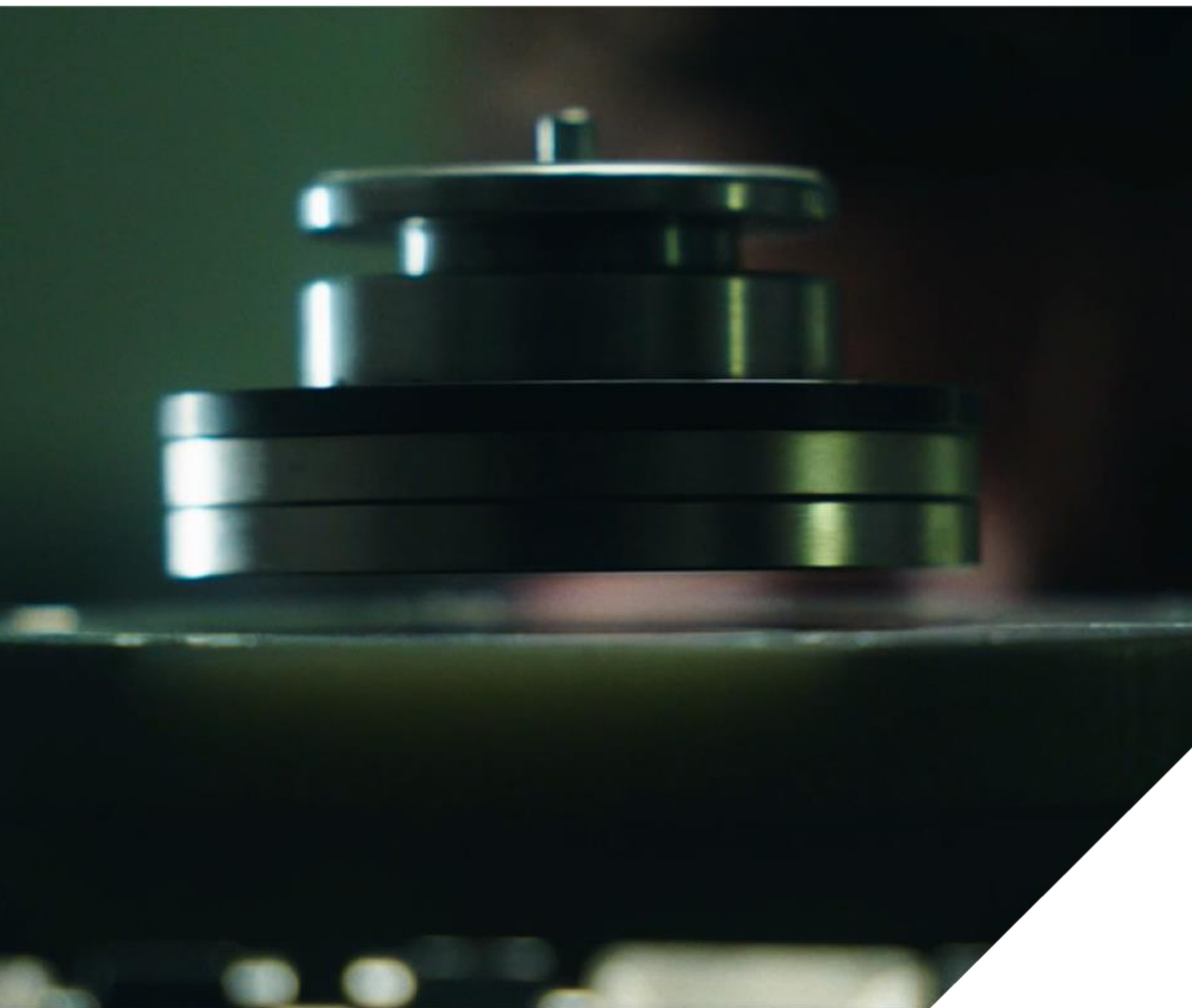


QUINTEQ

# Flywheel Energy Storage

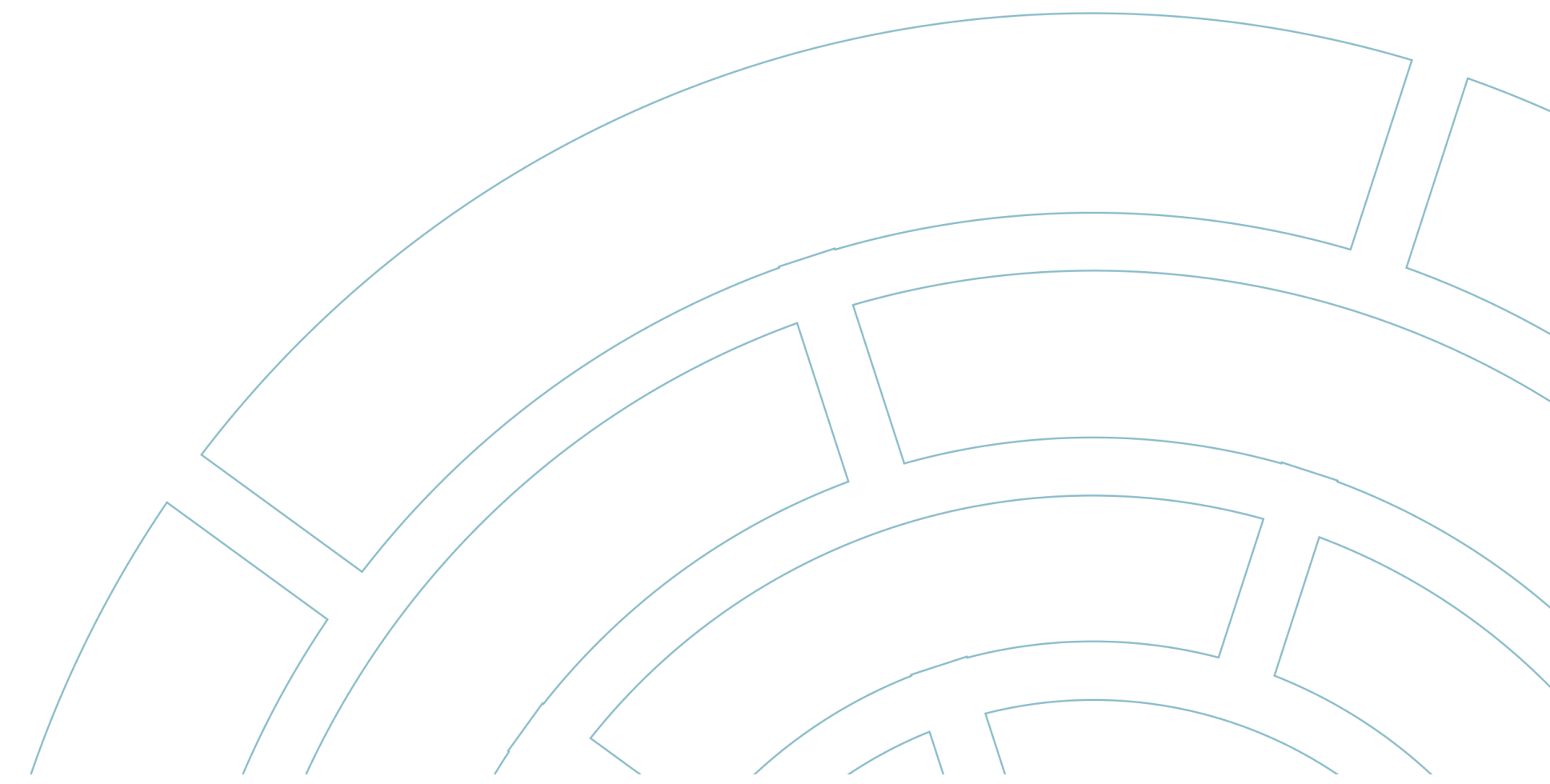
Empowering the energy transition





# Bottom line upfront

Introducing the world's most advanced Flywheel Energy Storage Solution,  
developed by the Boeing Company,  
brought to market by QuinteQ,  
made in the Netherlands.







PROBLEM

# No Transition is Painless



# Energy Transition Issues

## 1. Unpredictable and unstable power supply

Increase in renewable energy penetration leads to unpredictable and unstable power supply

## 2. Frequent high-power peaks

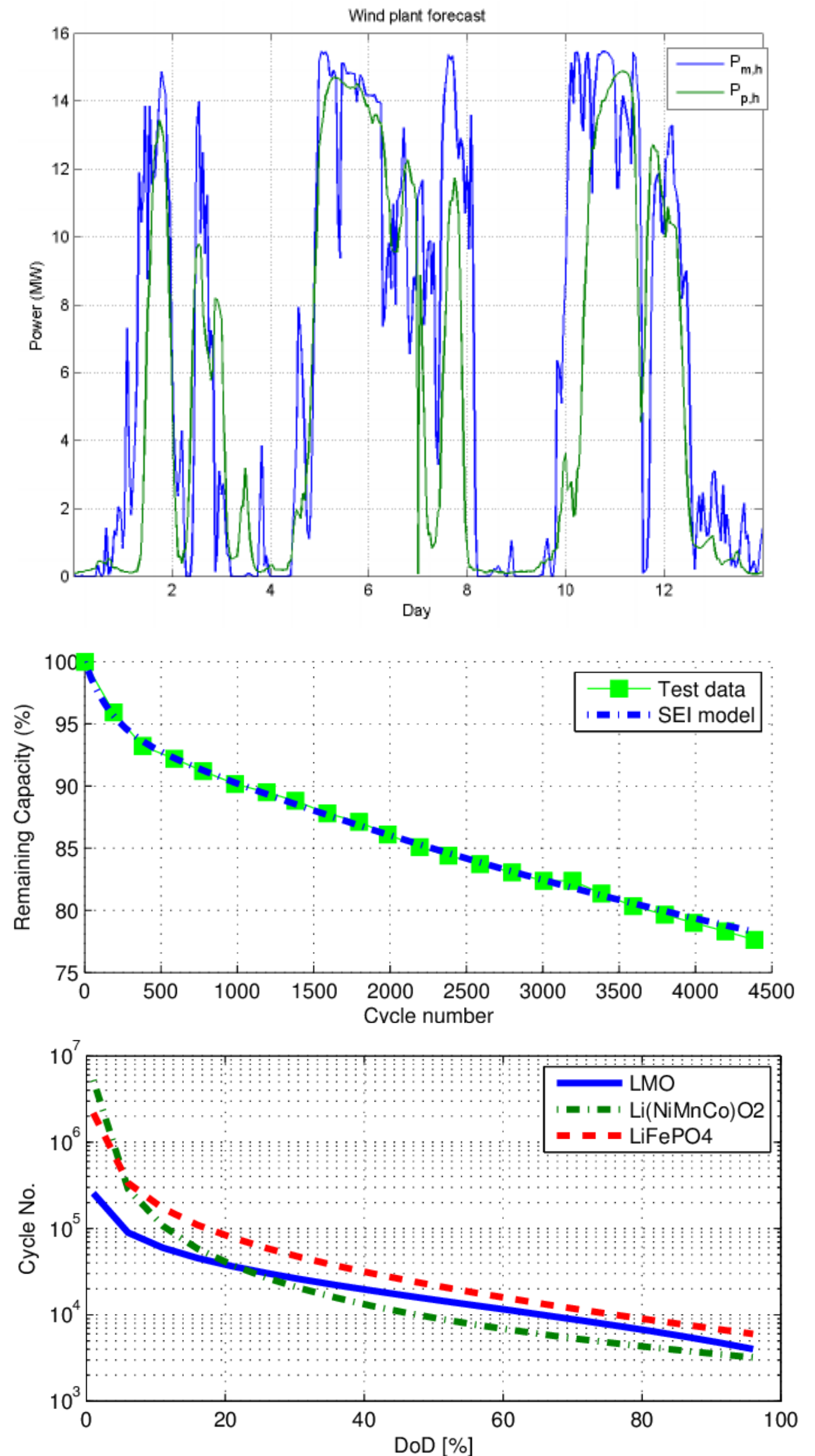
Uptake in electrification leads to increased demand for electricity, including high power peaks, occurring frequently.

## 3. The need to operate, stabilize and balance the (micro) grid

Existing electricity infrastructure is not equipped to handle these changes and requires the introduction of flexible and distributed energy assets to operate, stabilize and balance the (micro) grid.

## 4. Current battery solutions can't address these changes

Battery solutions do not have sufficient cycling capability and lifetime to address all these changes and challenges.



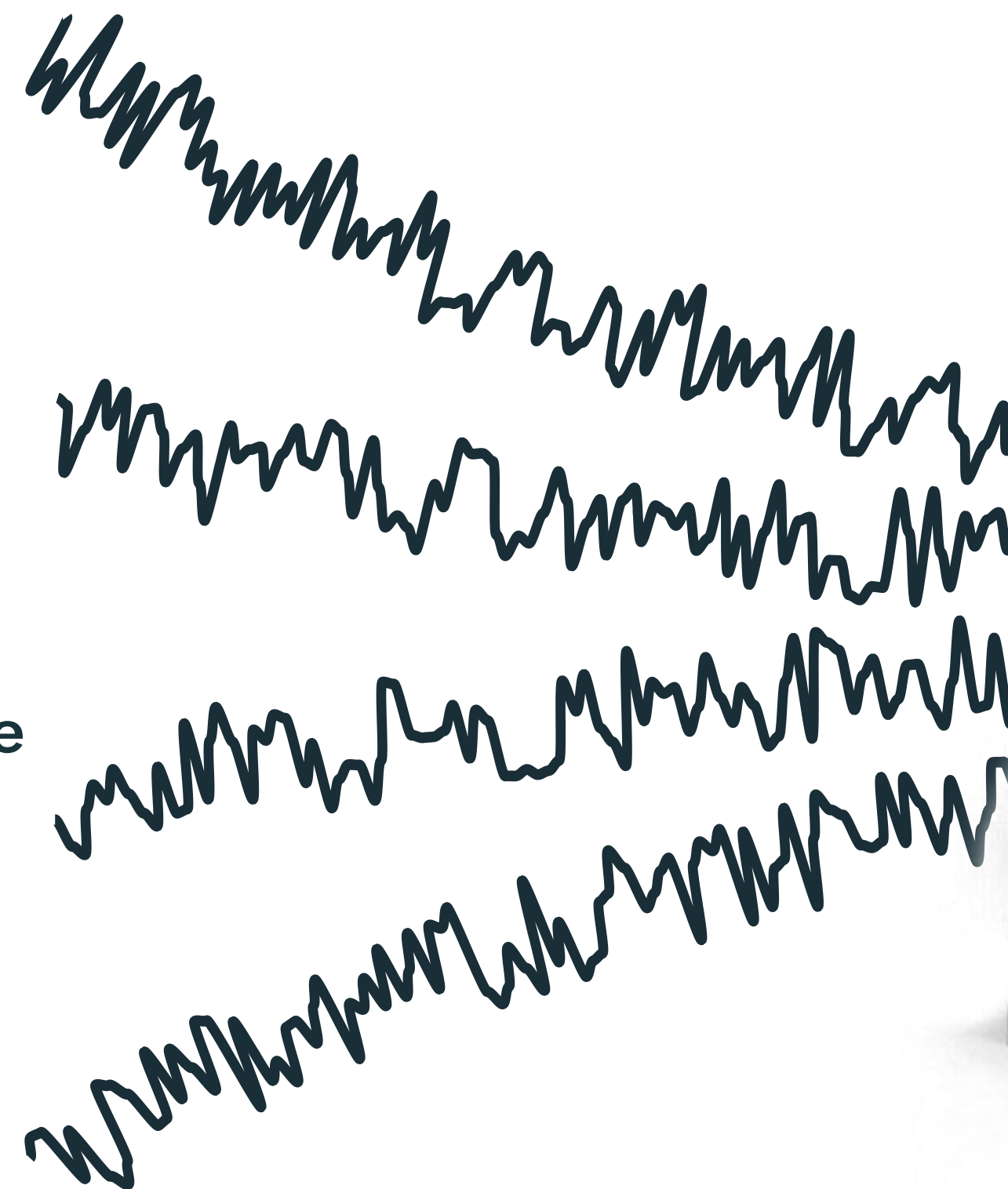


# QuinteQ Energy Transition Solution

QuinteQ can be the shock-absorber in the Energy Transition

Through its high and deep cycling capability at EUR0.03/kWh cycling cost.

- 1 Unpredictable and unstable power supply
- 2 Frequent high-power peaks
- 3 The need to operate, stabilize and balance the (micro) grid
- 4 Current battery solutions can't address these changes





# Meet QuinteQ's Flywheel

- high-speed vs. mass
- Compact, containerized solution, suitable for temporary projects
- Unique bearing system for zero friction and maximum efficiency
- Peak durations of seconds to minutes (depending on power required)

## Other USP's

- Endless cycles, 30 years lifetime
- Fast response for balancing & frequency regulation
- Modular, adaptable to local puzzle. 100kW to MW per solution
- Kinetic battery, not chemical, fully recyclable

 1.5m x 1m x 1m

 2000 kg

 <0.1%/hr stand-by loss

 C20

 <3ms response time





# Market applications



## Microgrids

- Peakshaving and frequency regulation in small, variable grid

**Enable energy transition in microgrids**



## Construction sites

- Enable high power applications in small grid connections

**Reduce need for generators**



## Port electrification

- Peakshaving harbour cranes to free up +60% of grid connection

**Optimize grid connection for higher utilization**



## Rail & lightrail

- Enable regenerative break energy to peakshave traction peaks of departing metro's, trams or trains

**Reduce energy loss and lower peak load to optimize traction network**





QuinteQ  
energy storage

Other developments



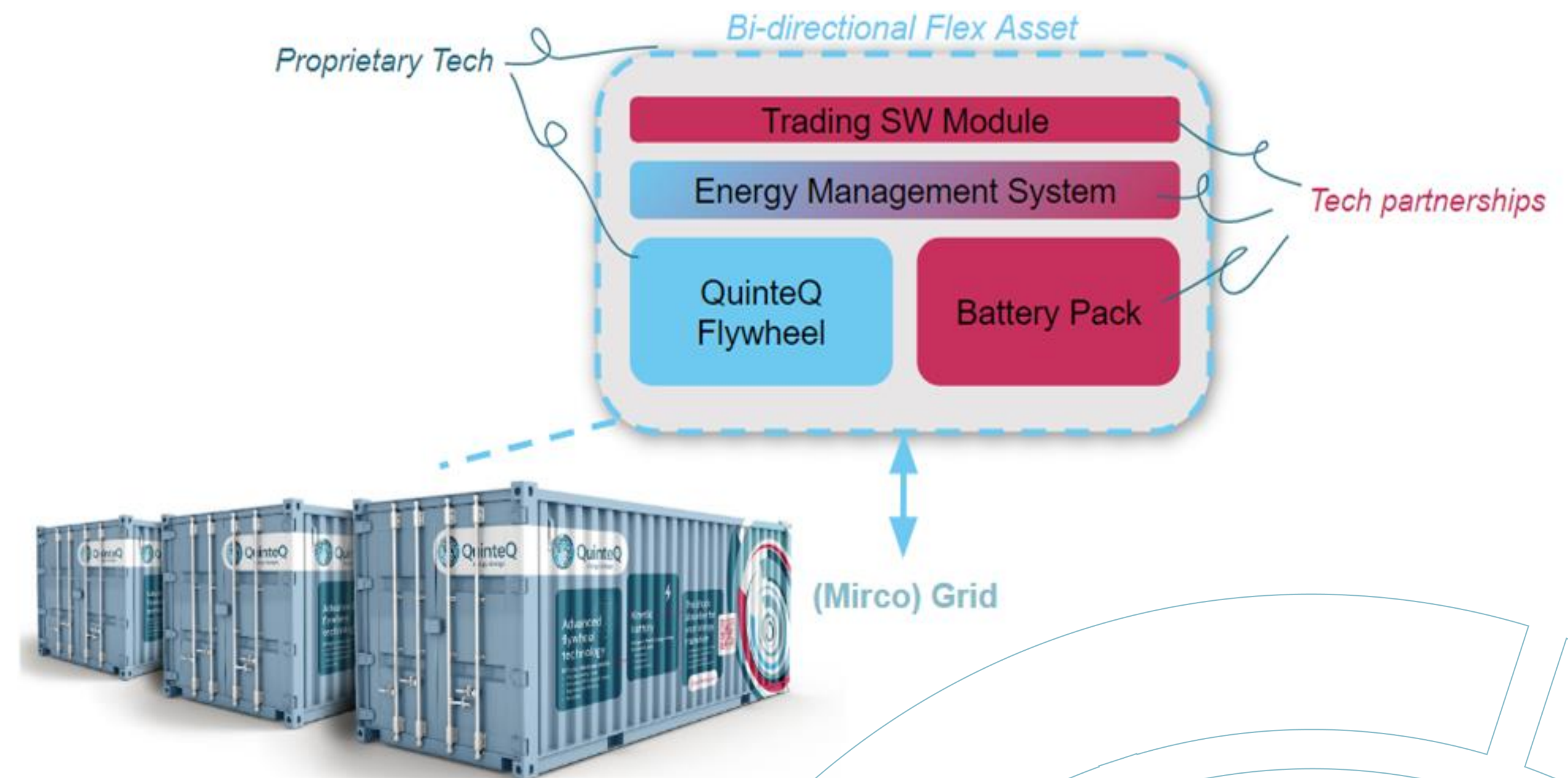
# Combining complimentary storage technologies

## Hybrid energy storage system

- High power and energy capacity by combining a flywheel and sodium-ion
- Modular, configurable, compact, containerized
- Real-time energy management, trading and transaction platform
- A market-disruptive product lifetime reducing TCO

## Why sodium-ion?

- Abundant raw materials, reducing cost and resource concerns
- Sodium batteries are less reactive than lithium batteries, reducing safety risks





# A configurable solution



## Flywheel

- Enable high-frequency power peaks with small grid connections
- Peakshaving tower and port cranes
- Frequency stabilisation in variable (micro)grids

**Optimises available grid connection**



## Sodium - ion

- Energy buffer in case of energy shortage
- Perfect for high energy demand
- Load shifting renewable energy and reducing curtailment
- Enabling energy trading for on-grid microgrids

**Additional energy for on grid and off grid solutions and load shifting**



## Integrated flywheel & sodium - ion

- For energy shortage and variable power demand
- Complementary technologies for complex challenges

**Hybrid solution for variable power and high energy demand**



# How we bring our energy storage systems to market

- Direct business-to-business sales
- **Leasing & rental** options for businesses where ownership is less relevant
- **Energy storage as a service**; an all-inclusive service that reduces maintenance and utilization management
- Business model for customers is a combination of fuel savings, avoiding grid expansion and enabling electrification where it would otherwise not be possible







We are QuinteQ



# Meet the team

## Company

- Formed in 2016, launched in 2019
- Based in The Netherlands
- QuinteQ has over 200 Boeing patents exclusive, worldwide license.

## Team

- Development & production
- Funding & finance
- Sales & marketing
- Small core-team enhanced with strong partner network

## Organisational culture

- Collaborative
- Entrepreneurial
- Responsible

**Mission:** To empower the energy transition



Paul Vosbeek  
**CEO**



Wouter Biemans  
**CTO**



Thieu Mooren  
**CFO**



Darin Olson  
**CSO**



Timo Pael  
**Business Development**



Stefan Hartl  
**Lead Engineer**



Andre Lucas  
**Power Electronics  
Engineer**



Iris Hijne  
**Software Engineer**



Jeroen Goudswaard  
**Electromagnetic  
Engineer**



Jaap van de Vorst  
**Ip Specialist**



Sanne Wassink  
**Business Development**



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