



# Smart batteries: Aggregate, Manage, Trade

27.11.2023

# Norway Grants „Green ICT“ program

This project aims to reduce energy sector carbon intensity while increasing the energy system's efficiency.

**Project name:** Demand response combination with energy storage system

**Amount of support:** 691 601€

**Implementation period:** 01.06.2021 – 30.11.2023

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*Norway Grants Green ICT program gives Fusebox and Pixii the unique opportunity to collaborate on a renewable energy field project.*

*The innovation of this project is to combine demand-side flexibility (demand response) with energy storage systems (modular batteries) into a hybrid solution.*



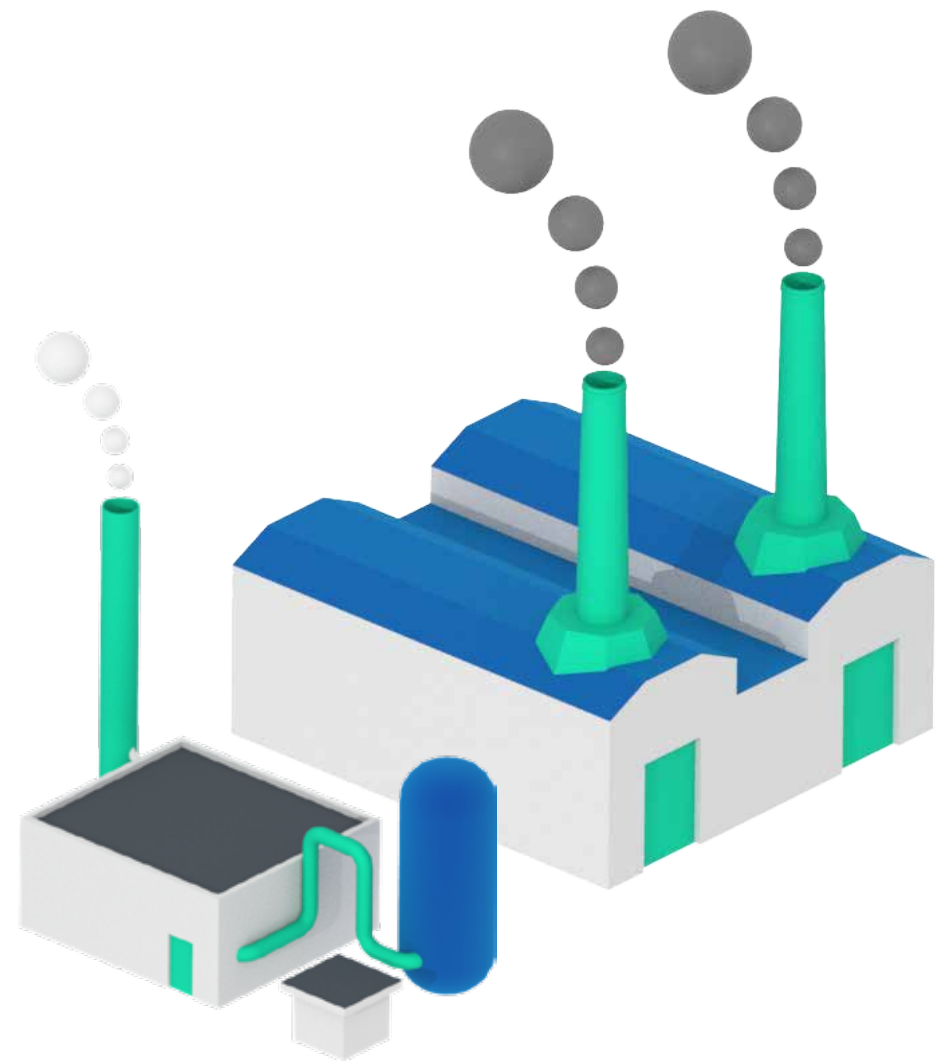
# General painpoints

Intermittent renewables will contribute **35%** of global electricity production by 2025 and **85%** by 2050.

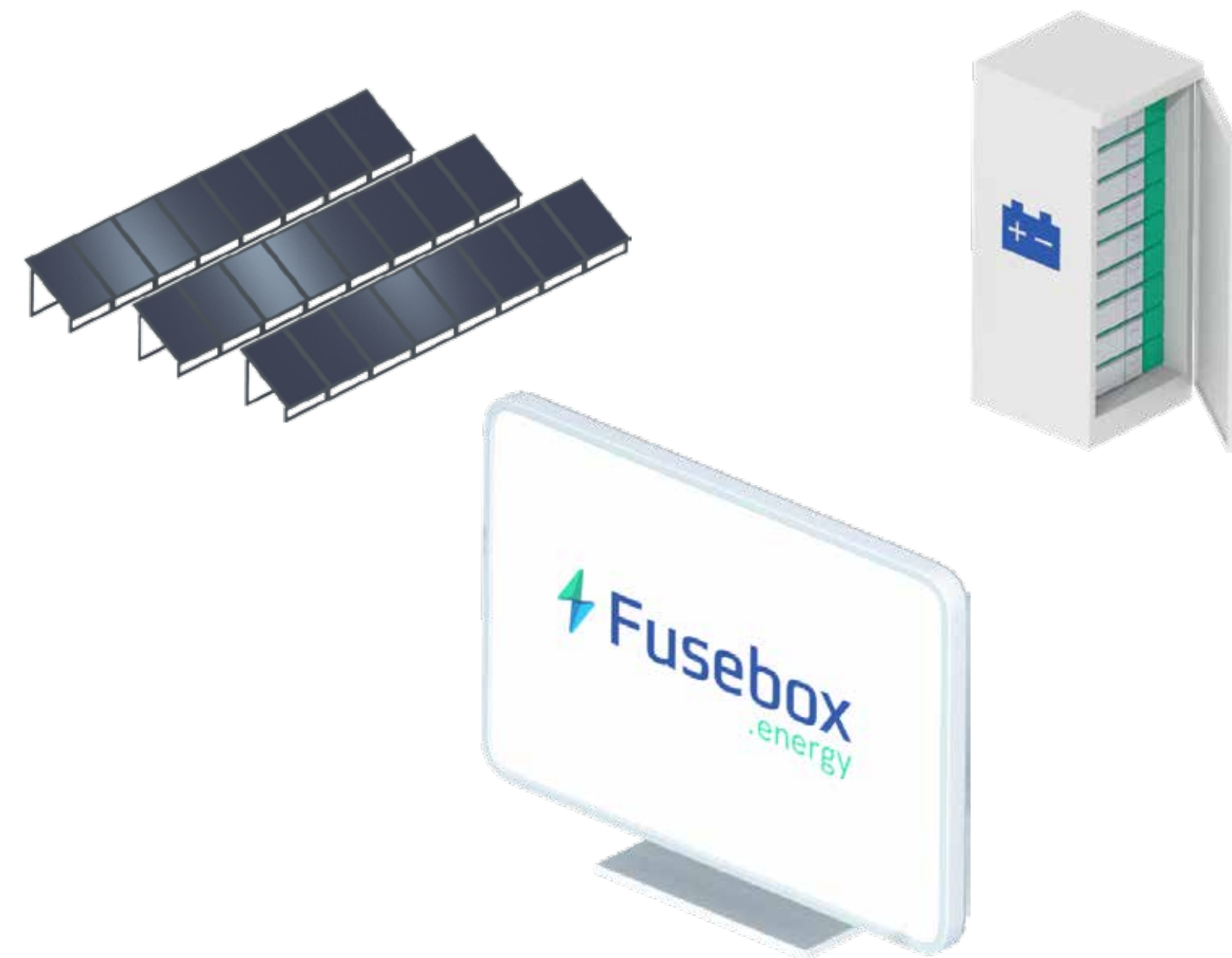
Electricity consumers, producers and utilities face urgent challenges

 Fluctuating prices Metering point charges Limited flexibility Reduced profitability DER management

# The Solution

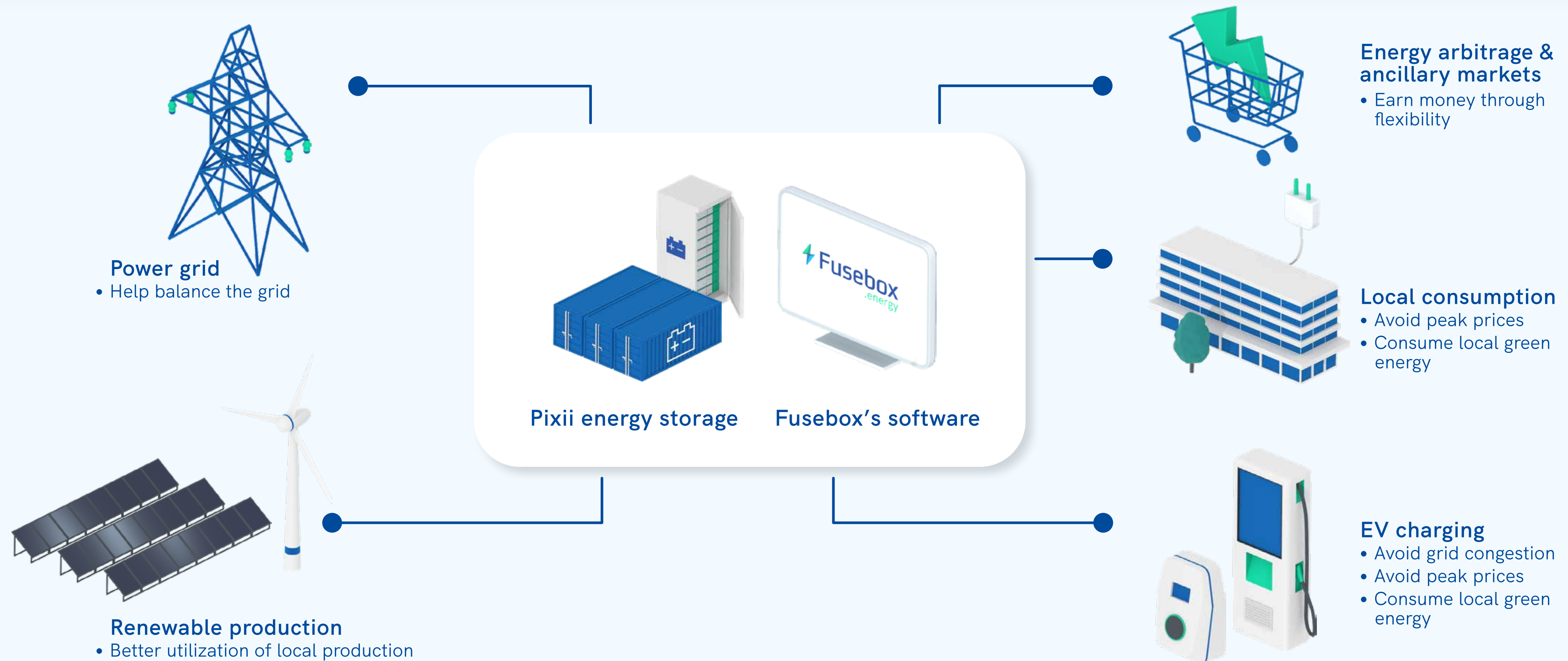


**SOLUTION<sup>1</sup>**  
Fossil fuel  
peaker plants



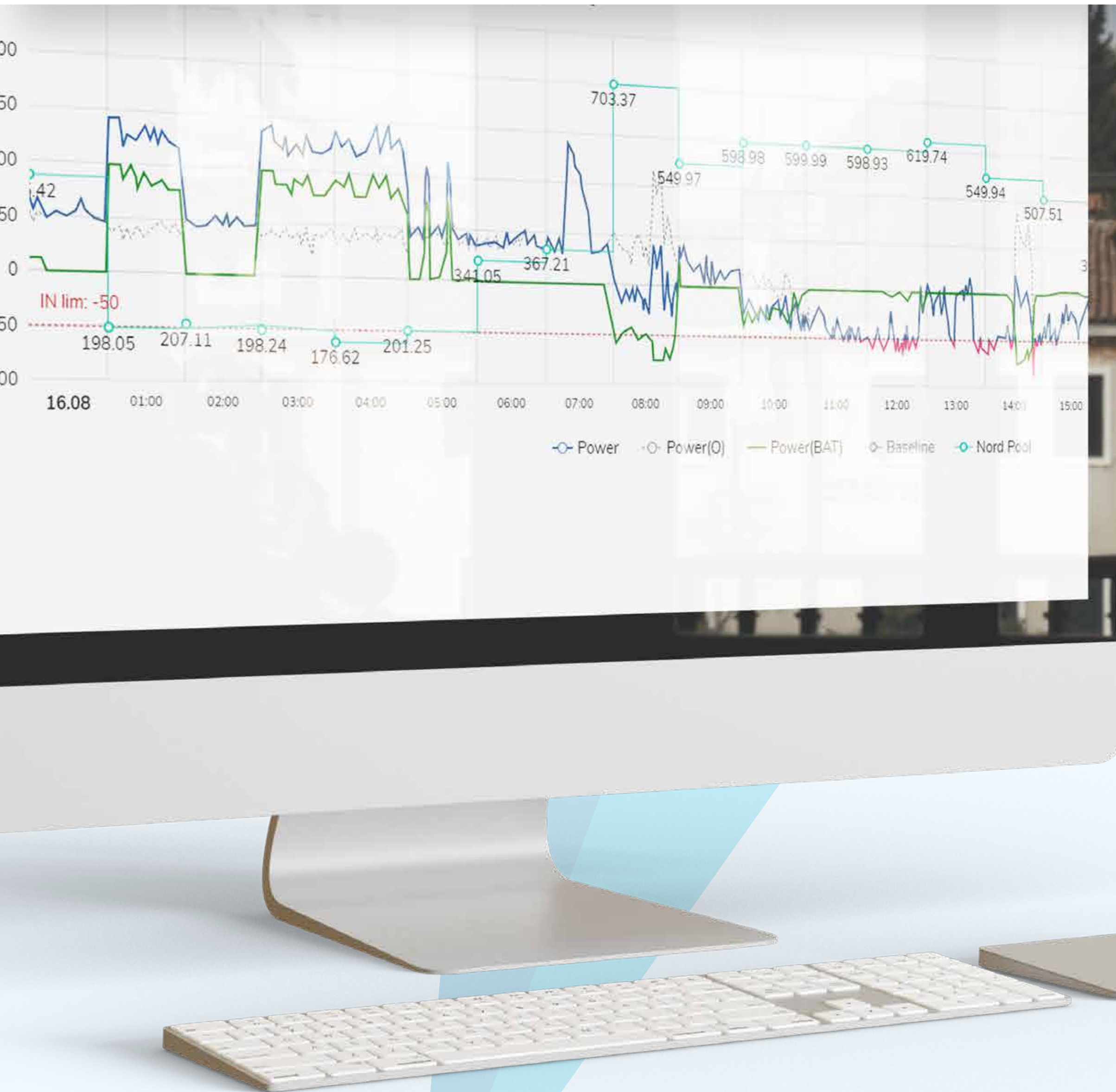
**SOLUTION<sup>2</sup>**  
Renewable generation with  
smart batteries

# Smart battery capabilities





# Smart battery benefits



## Software platform to make your batteries smart

- Maximize your connection point value
- Get access to all energy market services with ca 3x prices
- Better manage network restrictions
- Real-time data visualization with measurements accurate to 1 second
- Dedicated customer portal
- Automatic reporting





# Advanced Energy Storage

Speeding up the transition to green energy



# Norway's fastest growing tech company

50

Technology **Fast 50**  
2023 NORWAY

**Deloitte.**

<https://www2.deloitte.com/no/no/pressemelding-er/pixii-as-karet-til-landets-raskest-voksende-teknologiselskap.html>

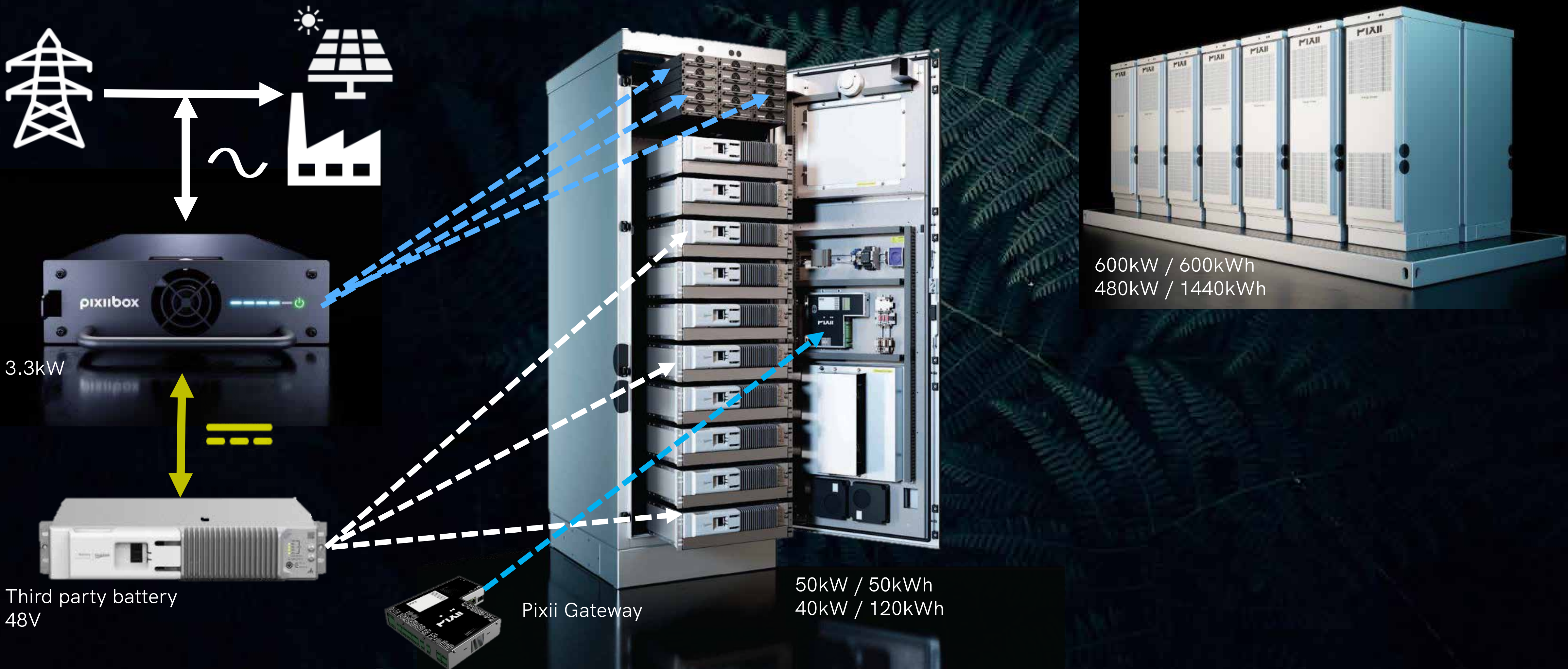


Pixii Corporate presentation



# Modular Energy Storage

Flexibility made simple





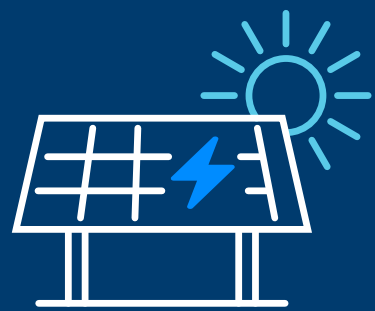
# Functions & benefits



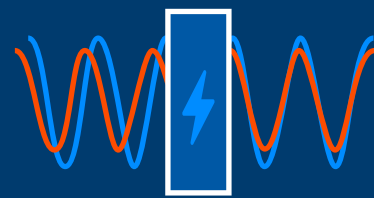
SAVE  
COST



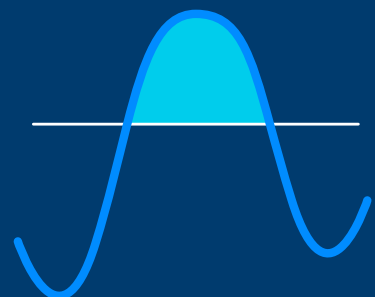
Time-of-use



PV self-consumption

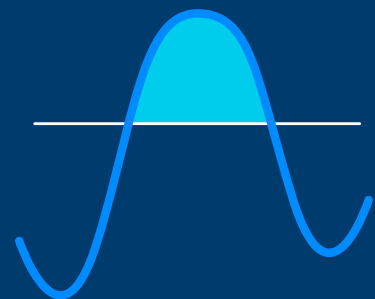


Reactive power  
compensation



Peak shaving

BOOST  
POWER



Peak shaving



Phase balancing

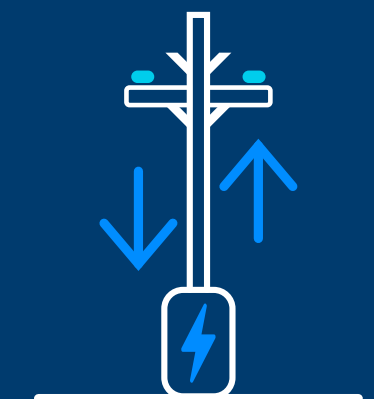
SELL  
FLEXIBILITY



FFR



FCR-D



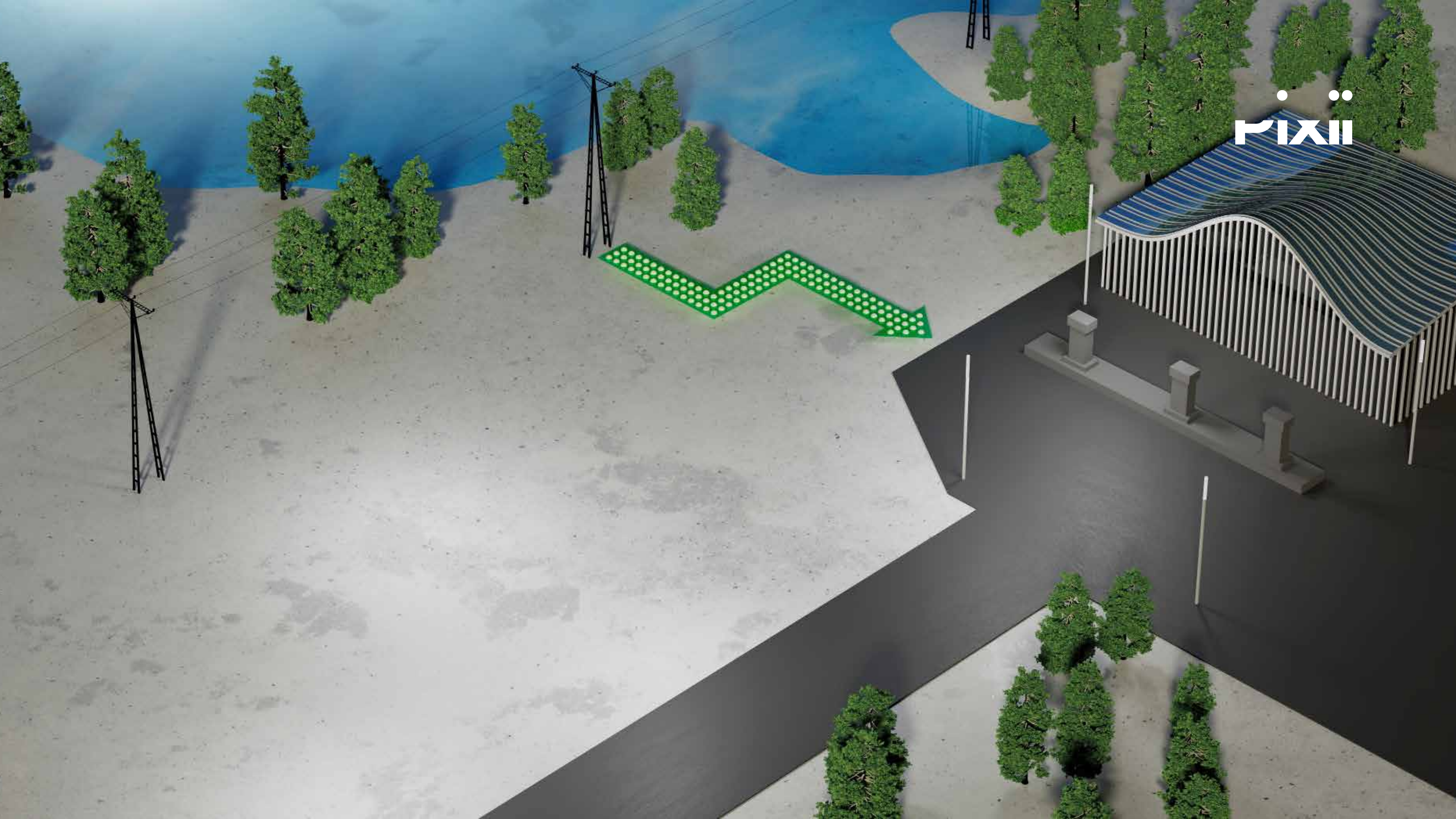
Local grid  
decongestion



Energy arbitration

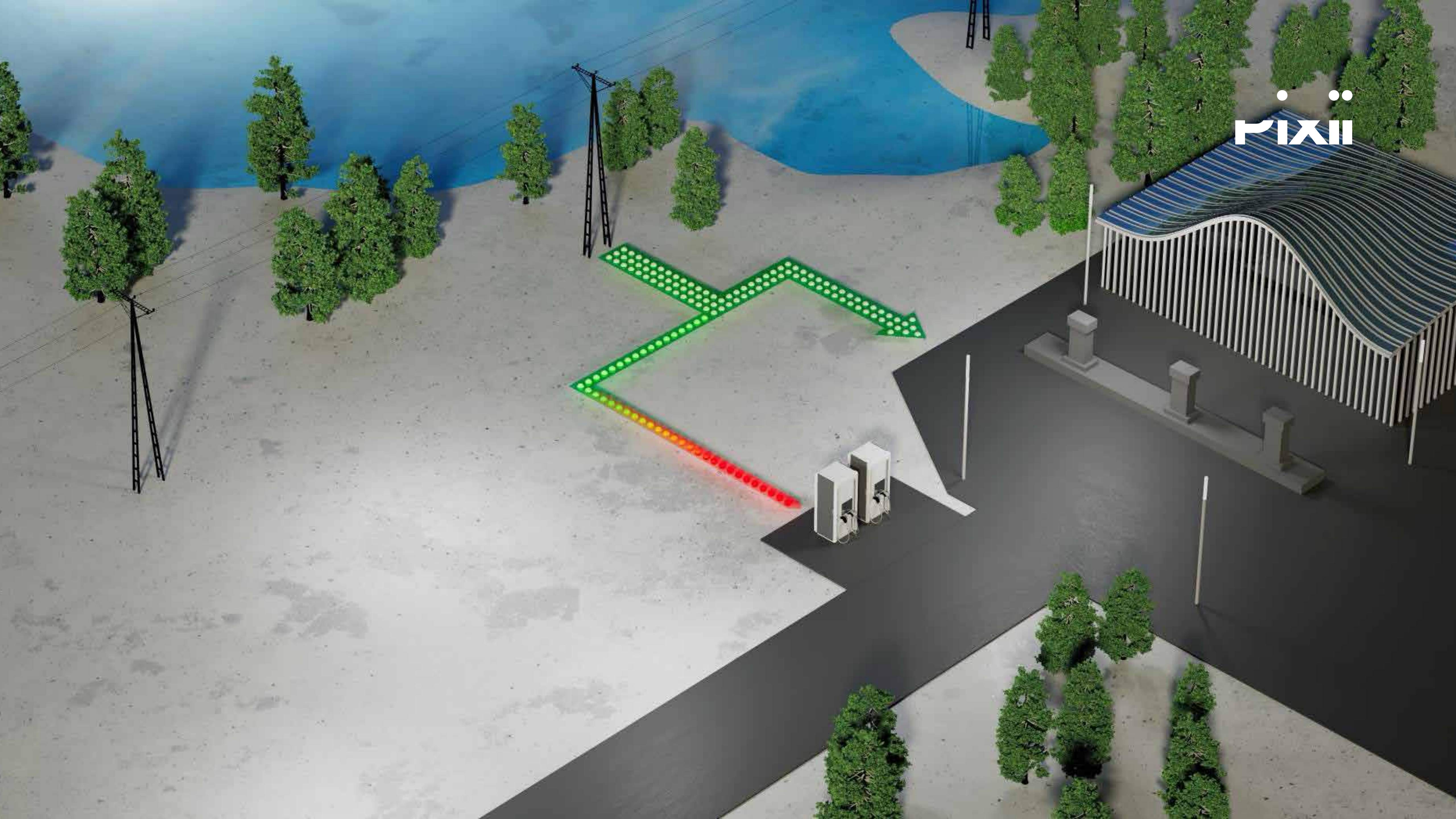


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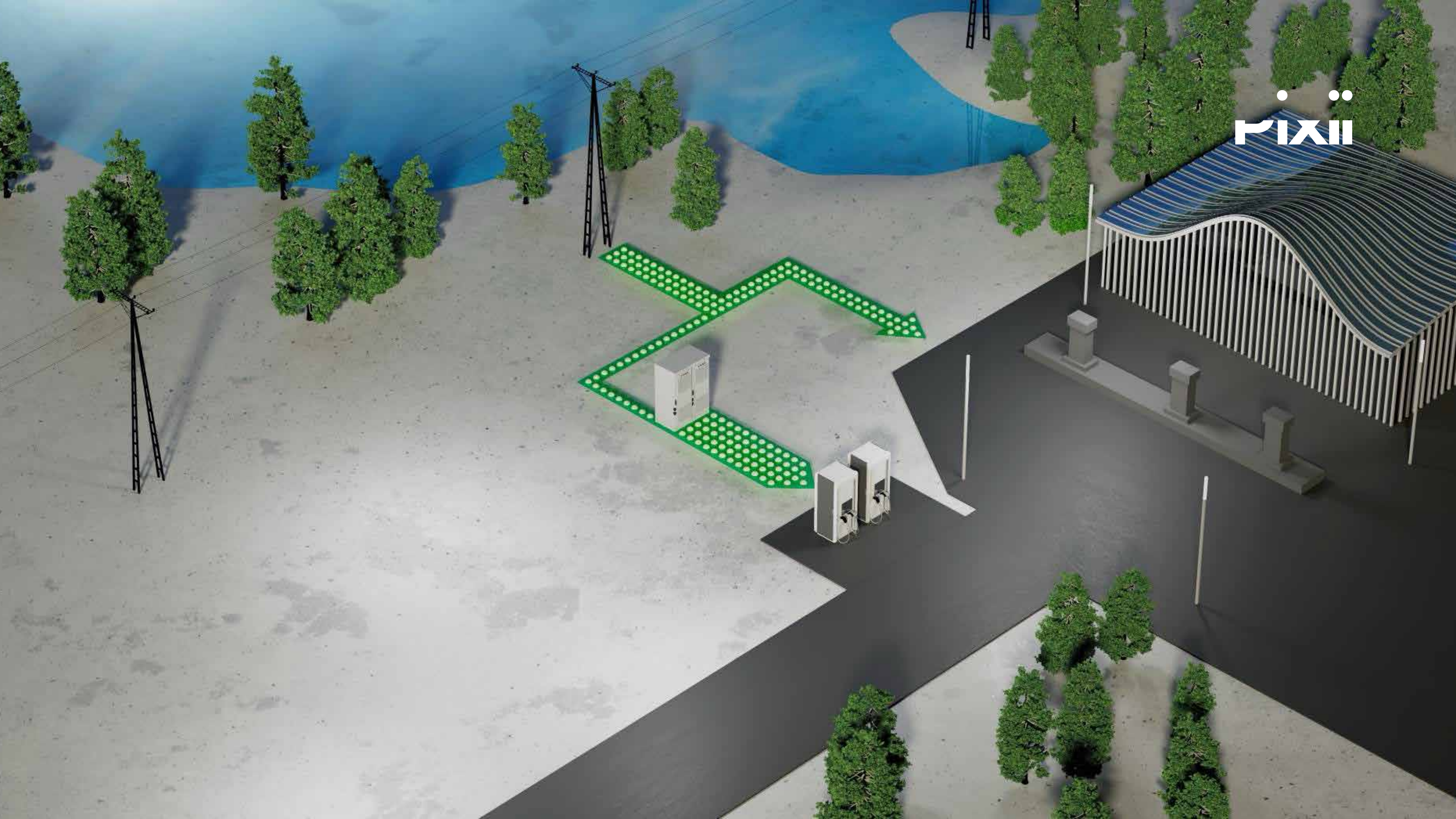


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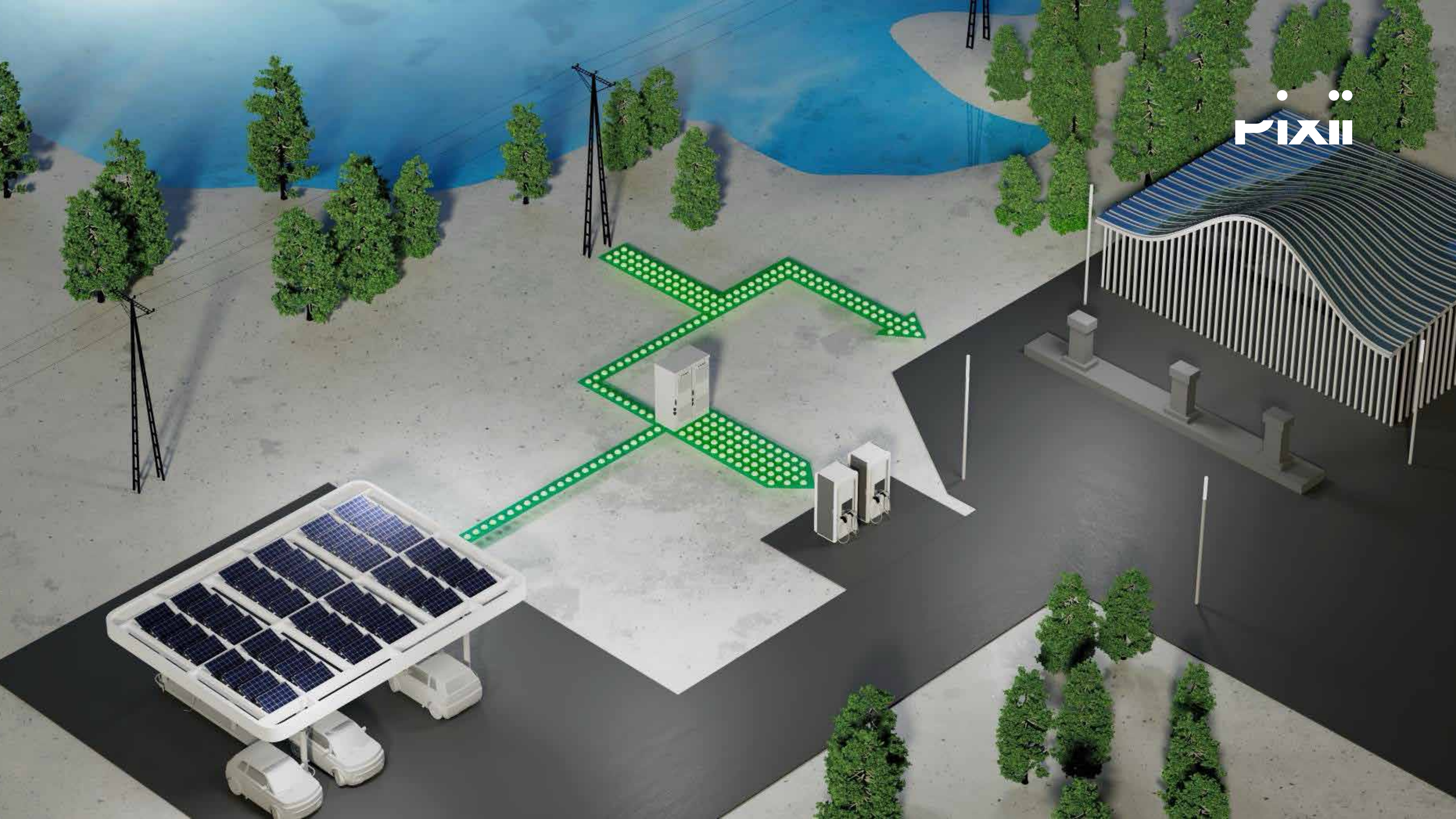


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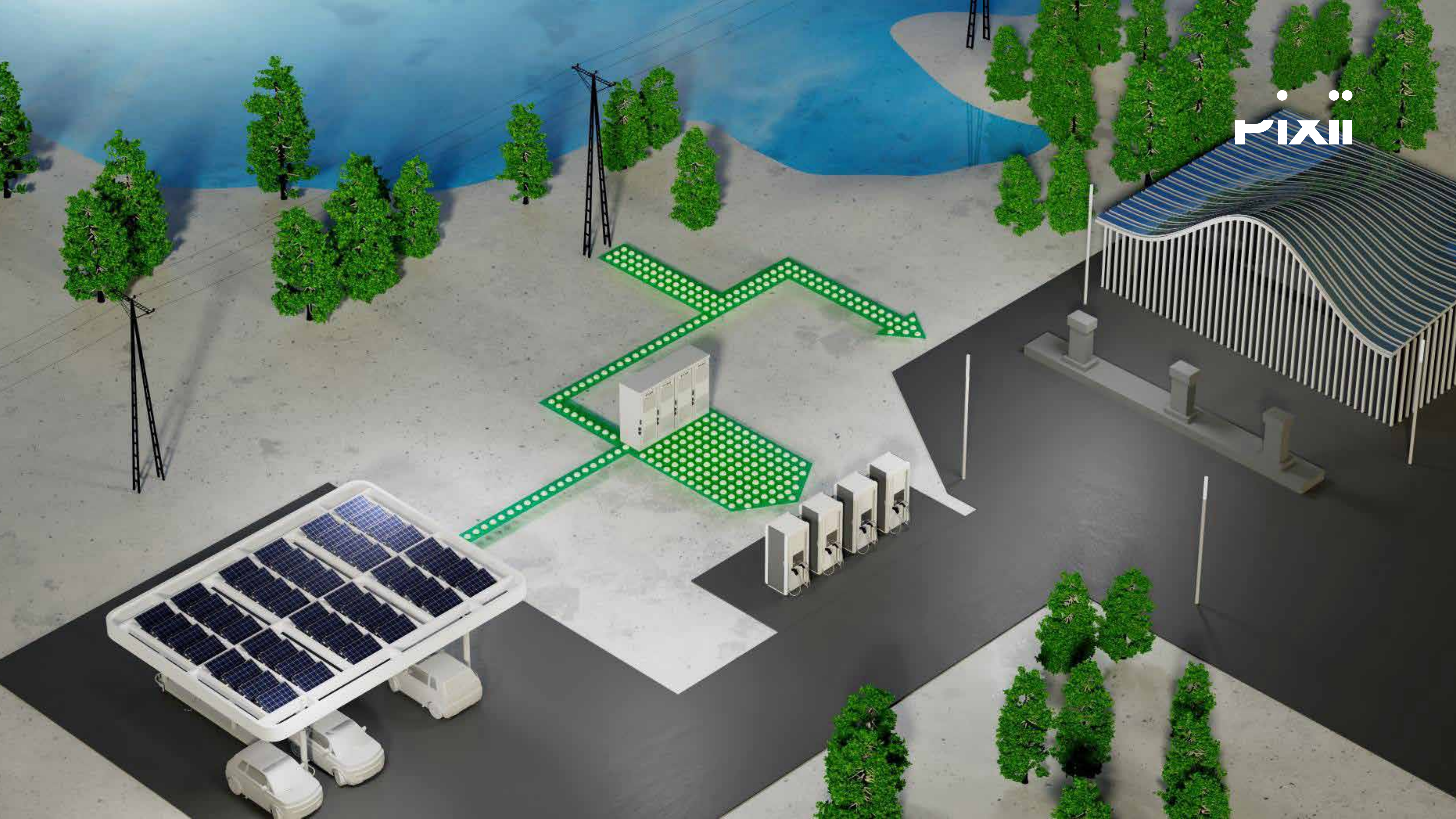




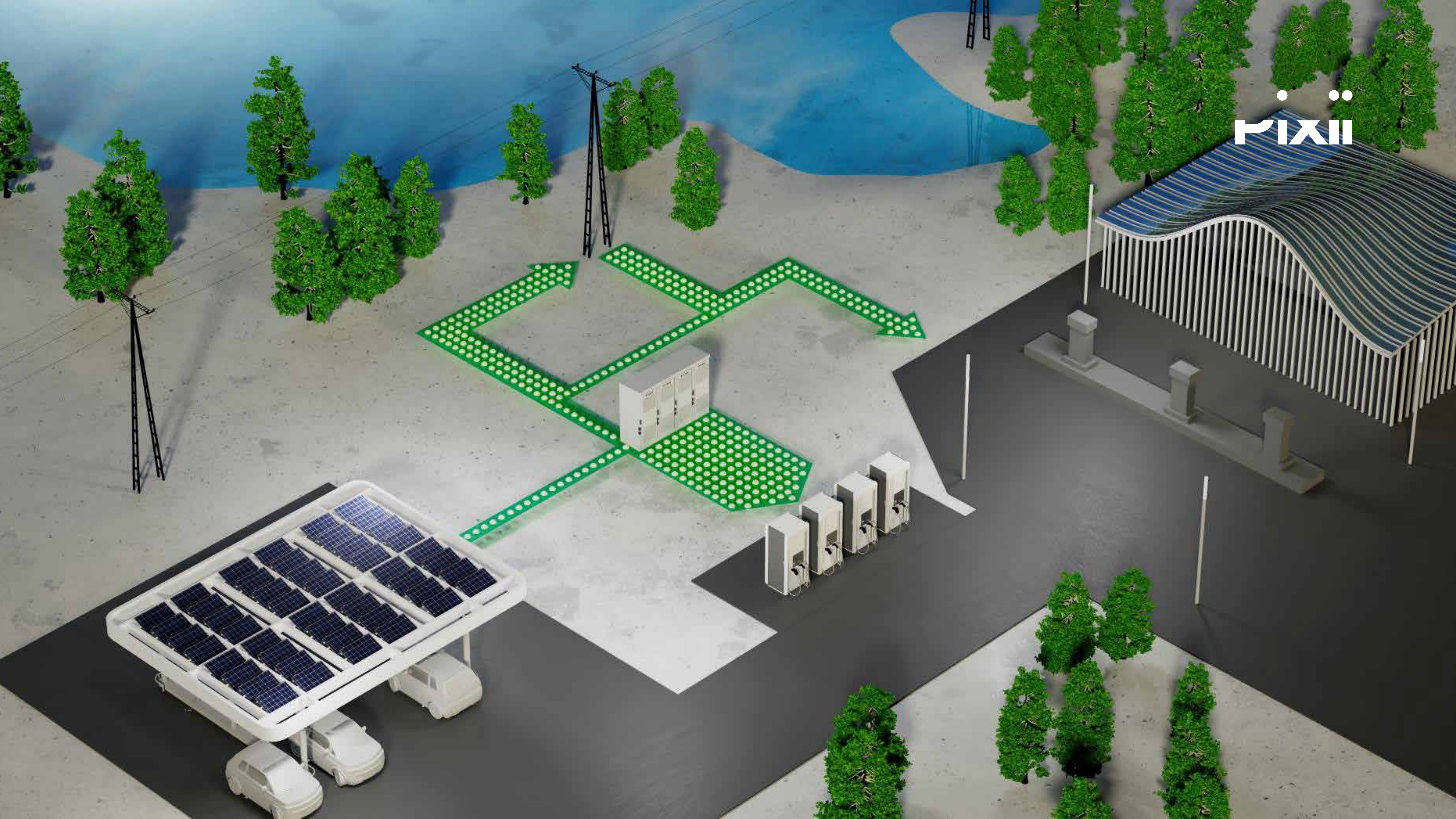
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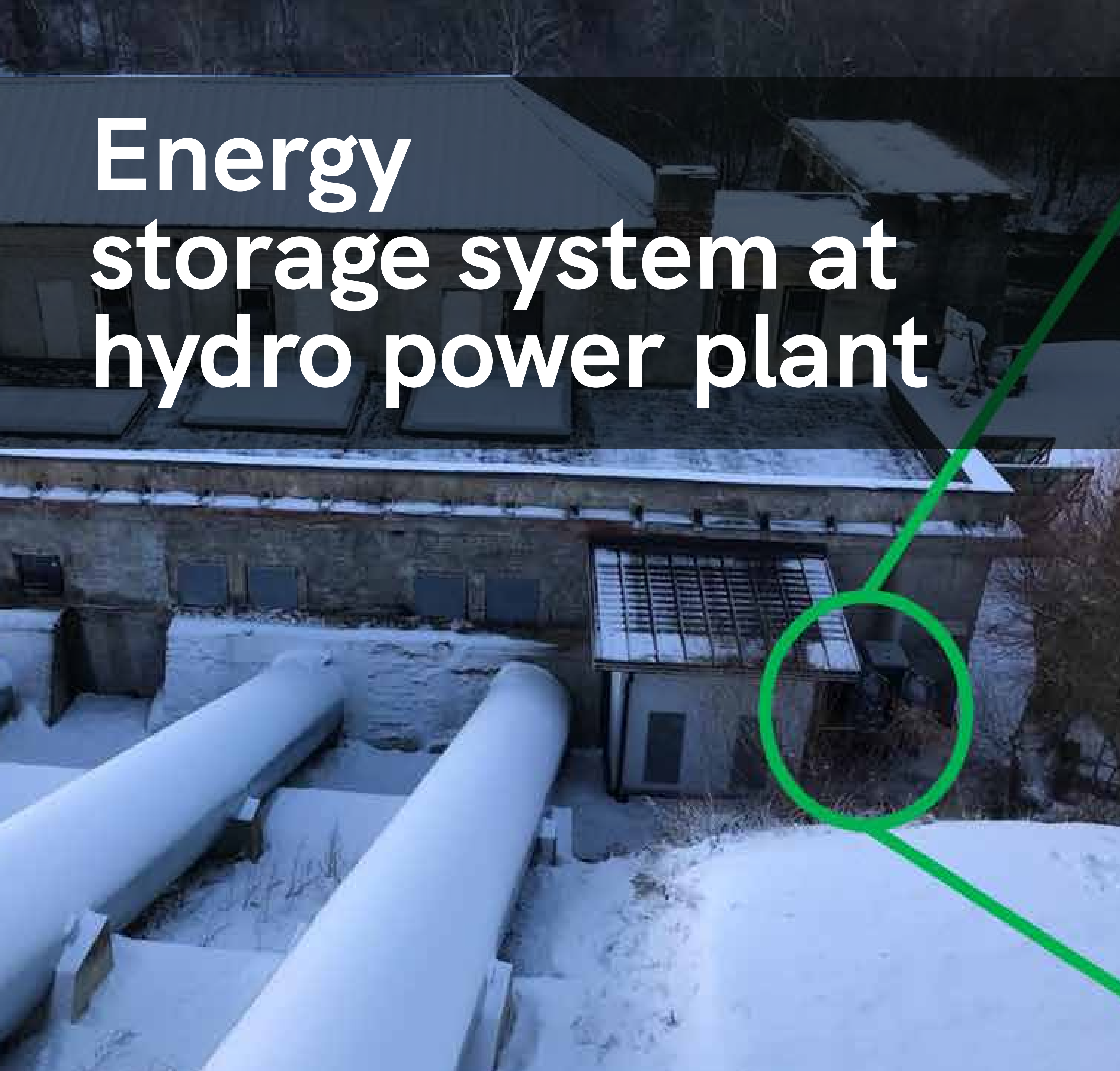








# Energy storage system at hydro power plant







# Energy storage at Shopping Centre

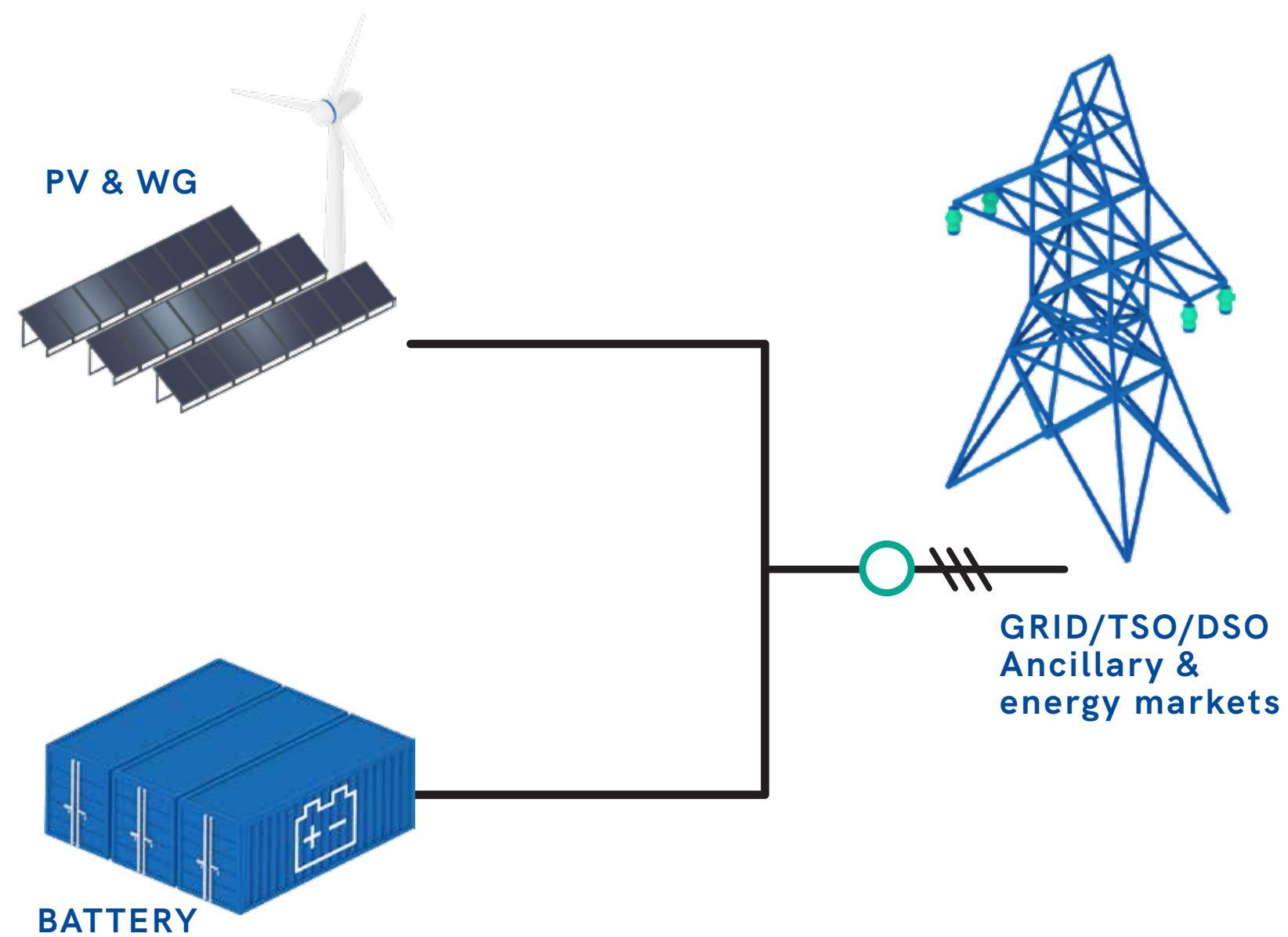
PIXII



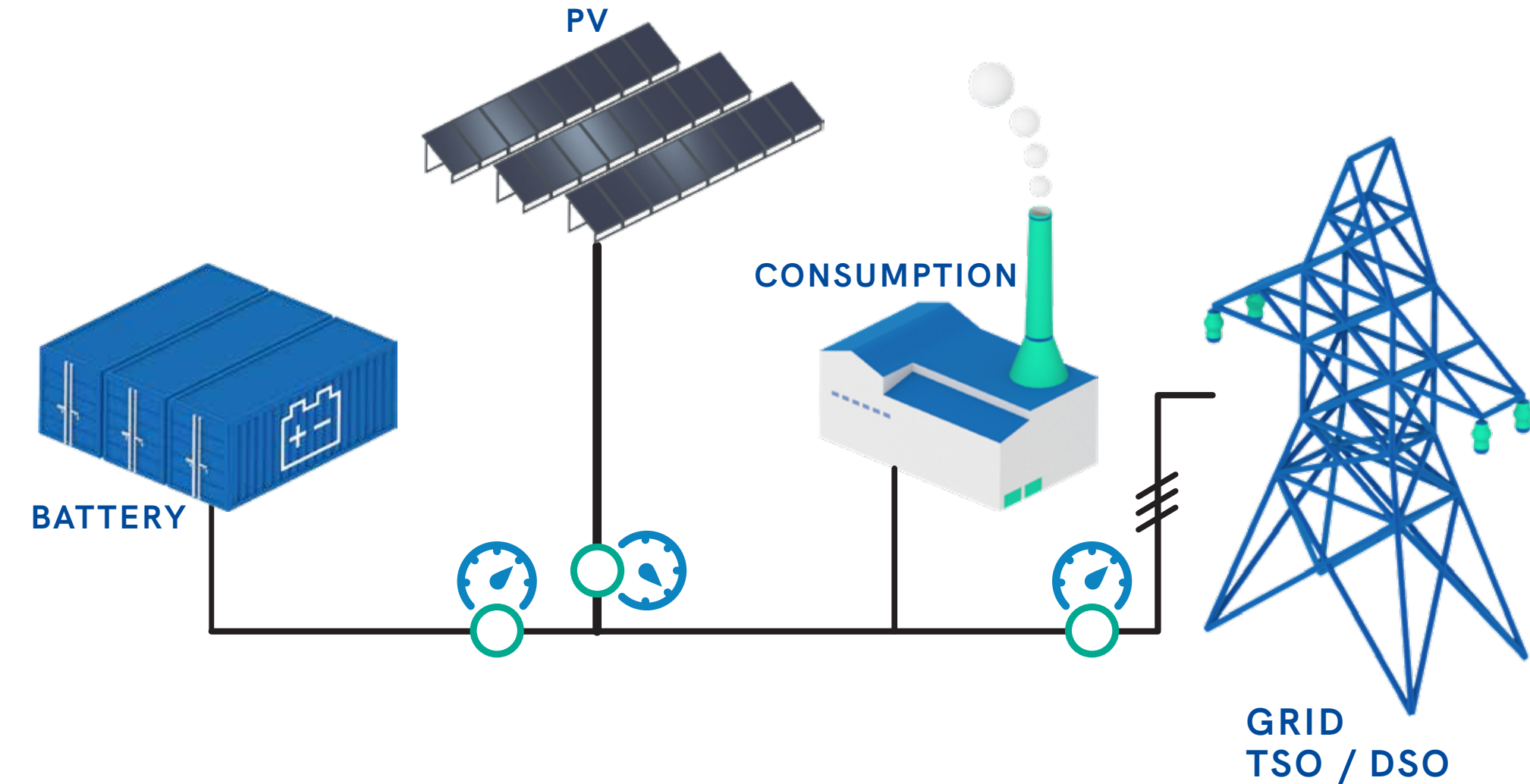


# Grid-scale vs Commercial

## Grid-scale batteries



## Behind the meter batteries






# Business models

A large, stylized green lightning bolt icon pointing upwards and to the right, positioned behind the text for Model 1.


## ANCILLARY MARKETS Model 1

Creating revenue streams through the provision of ancillary services to the local TSO.

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## ENERGY ARBITRAGE Model 2

Generating additional income through energy arbitrage.

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## MINIMIZING ENERGY COSTS Model 3

Reduce energy cost through optimization of charge/discharge timing and local consumption shaving and shifting.



# Business case 1



## Ancillary markets

Creating revenue streams through the provision of ancillary services to TSO.

### What you need

- **Integration with TSO:**
  - mFRR, aFRR bidding and FCR bidding and control
  - real-time telemetry capabilities
- **Integration with Assets:**
  - real-time telemetry with control and monitoring capabilities

### What we do

- Price strategy, bidding, market result monitoring, and scheduling
- Dispatch and regulation
- Reporting, settlement, and billing
- Support & training

### Results

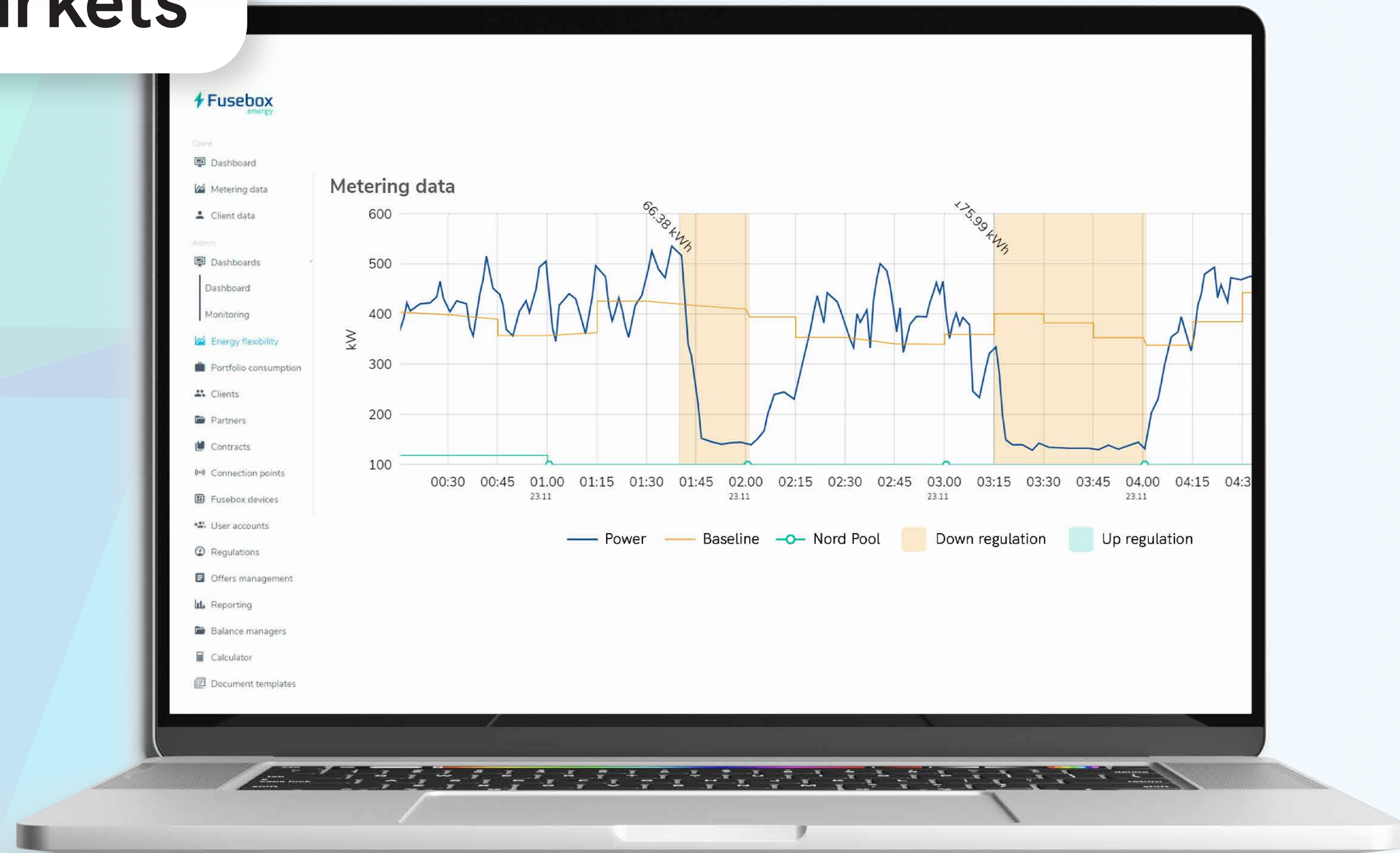
- New revenue stream
- Expanded market options
- Increase revenue
- Maximized earnings by managing energy market volatility and balancing services



# Business case 1



## Ancillary markets





# Business case 2



## Energy arbitrage

Generating additional income through energy arbitrage, with revenue sharing for asset owners.

### What you need

- Energy storage capability
- Real-time telemetry connections with TSO assets

#### **Optional:**

- Cooperation between renewable and demand-side resources (small & medium-scale assets)
- TSO integration for improved arbitrage via ancillary services for increased price difference

### What we do

- Activate energy arbitrage scheduling based on prices
- Implement reporting and billing
- Consider PV and wind production in operation choices

### Results

- New revenue stream
- Expanded market options
- Increase revenue
- Maximized earnings by managing energy market volatility and balancing services



# Business case 2

## Energy arbitrage





# Business case 3



## Minimizing energy costs

Minimizing energy costs by peak shaving and load shifting (demand response) together with load covering by the battery during high price hours.

### What you need

- Utilization of Controllable demand side Assets (Medium and Small-Scale)
- Real-time Telemetry Integration with Assets

#### Optional:

- Cooperation of battery load and renewables

### What we do

- Optimization module considers energy prices and technical constraints
- Utilizes energy price data
- Manages power flows and curtailment
- Automates reporting and billing

### Results

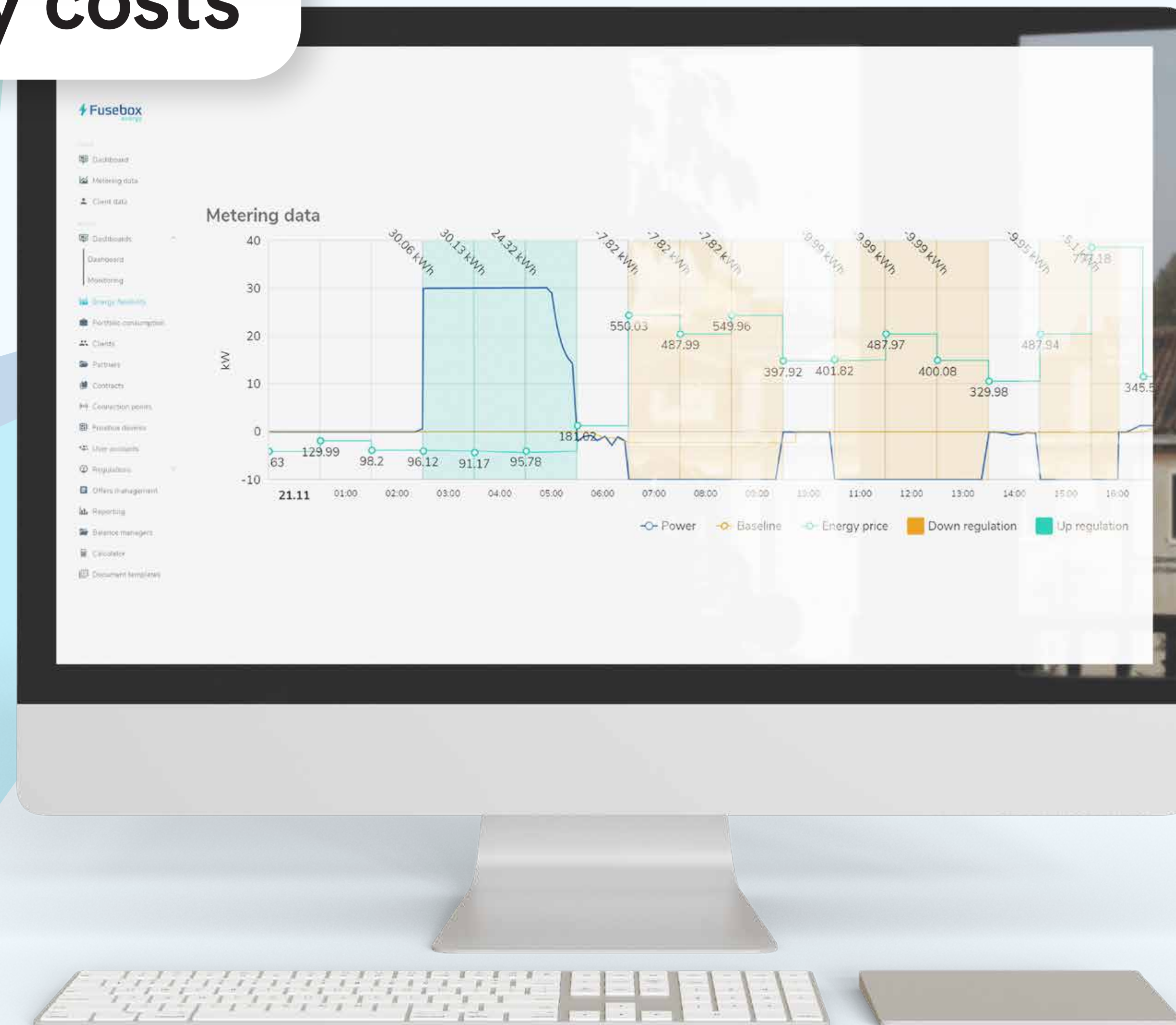
- Cost savings



# Business case 3



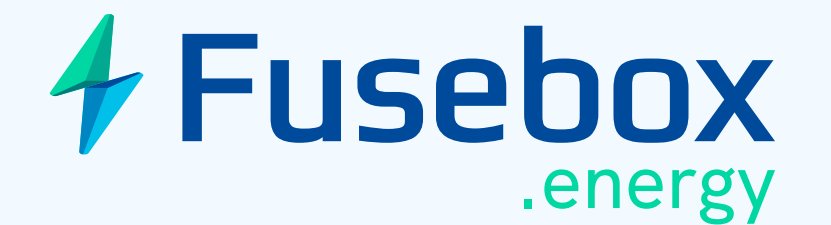
## Minimizing energy costs





# Thank you!

## Interested to know more?



Drop us a line



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