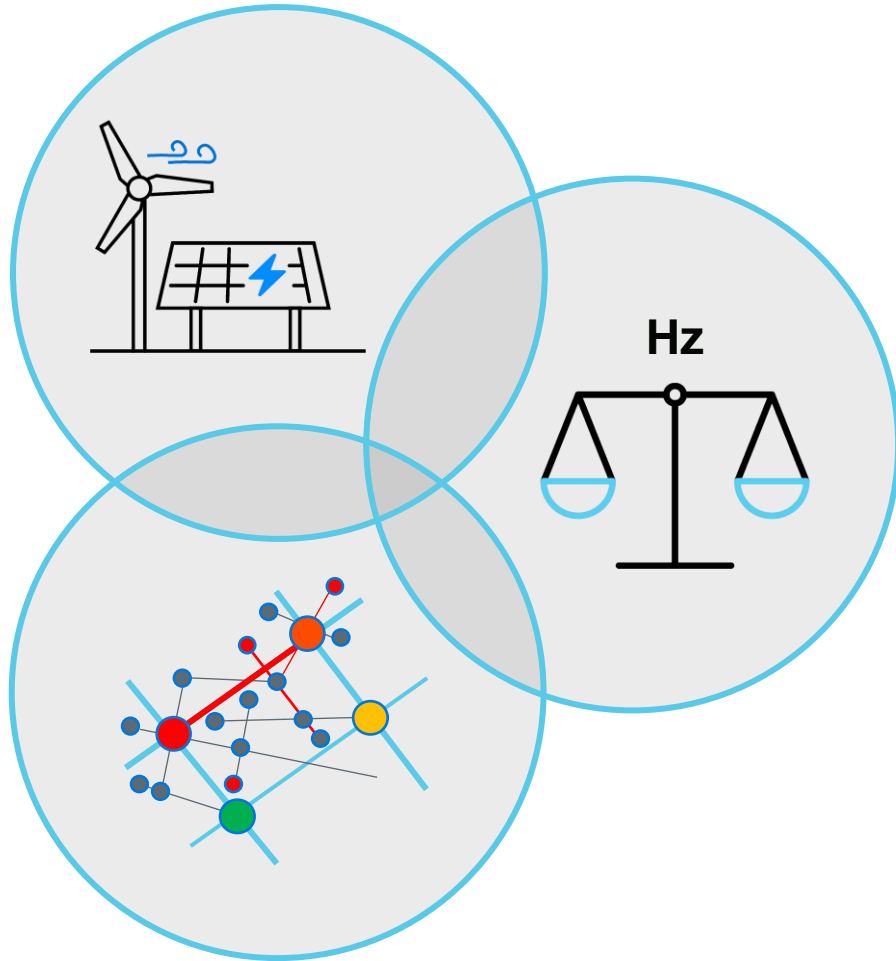


# Value stacking with BESS

Morten Schøyen Chief Product Officer, Pixii

# Flexibility is the key for decarbonization



## Energy resource utilisation

Harvest excess energy to avoid curtailment and waste of clean energy resources

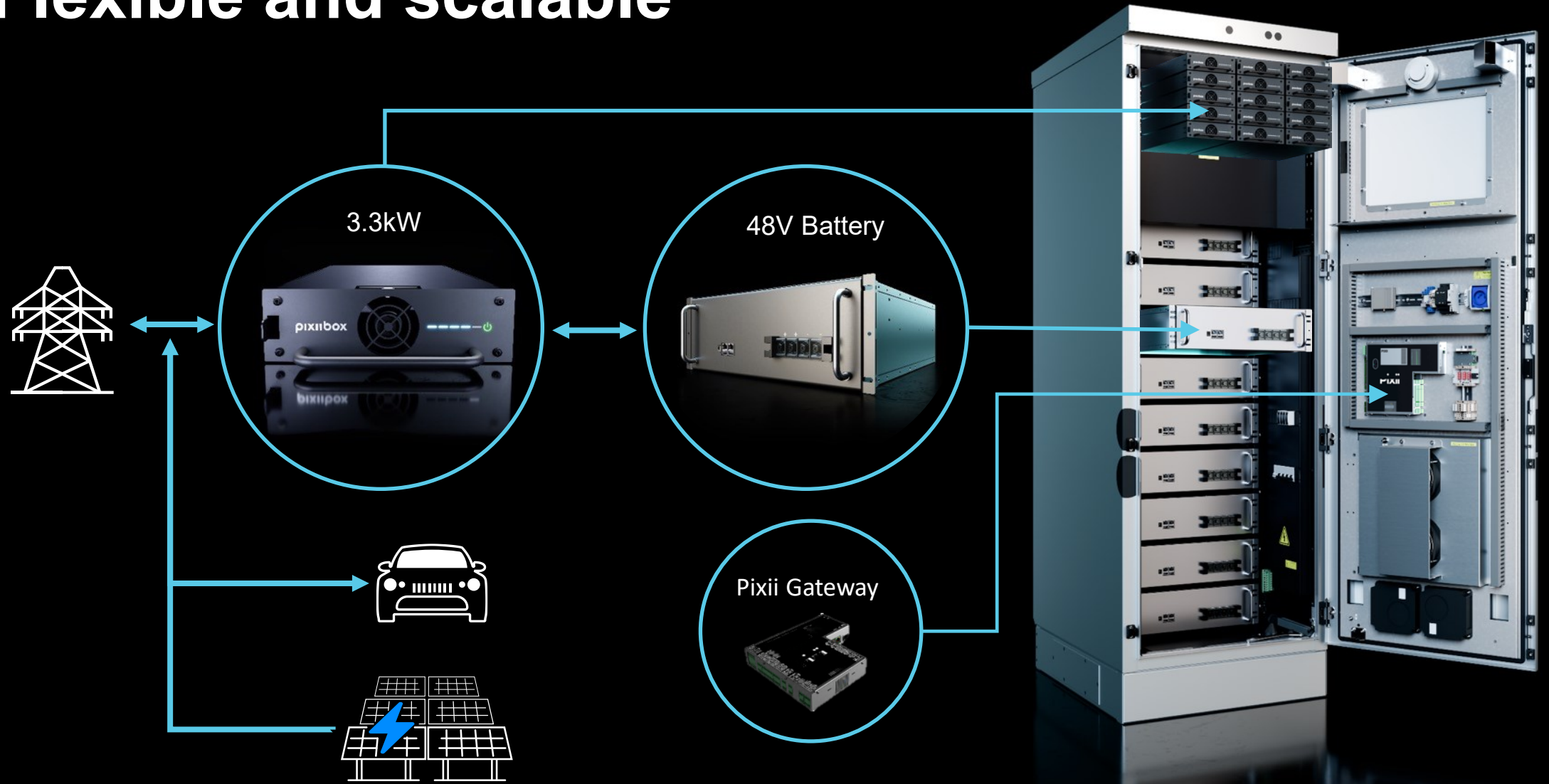
## System stability

Compensate for sudden imbalances between power generation and consumption to avoid large frequency change and system collapse

## Grid utilisation

Remove grid congestions by distributed “buffering” of energy for higher utilisation of the grid

# Flexible and scalable

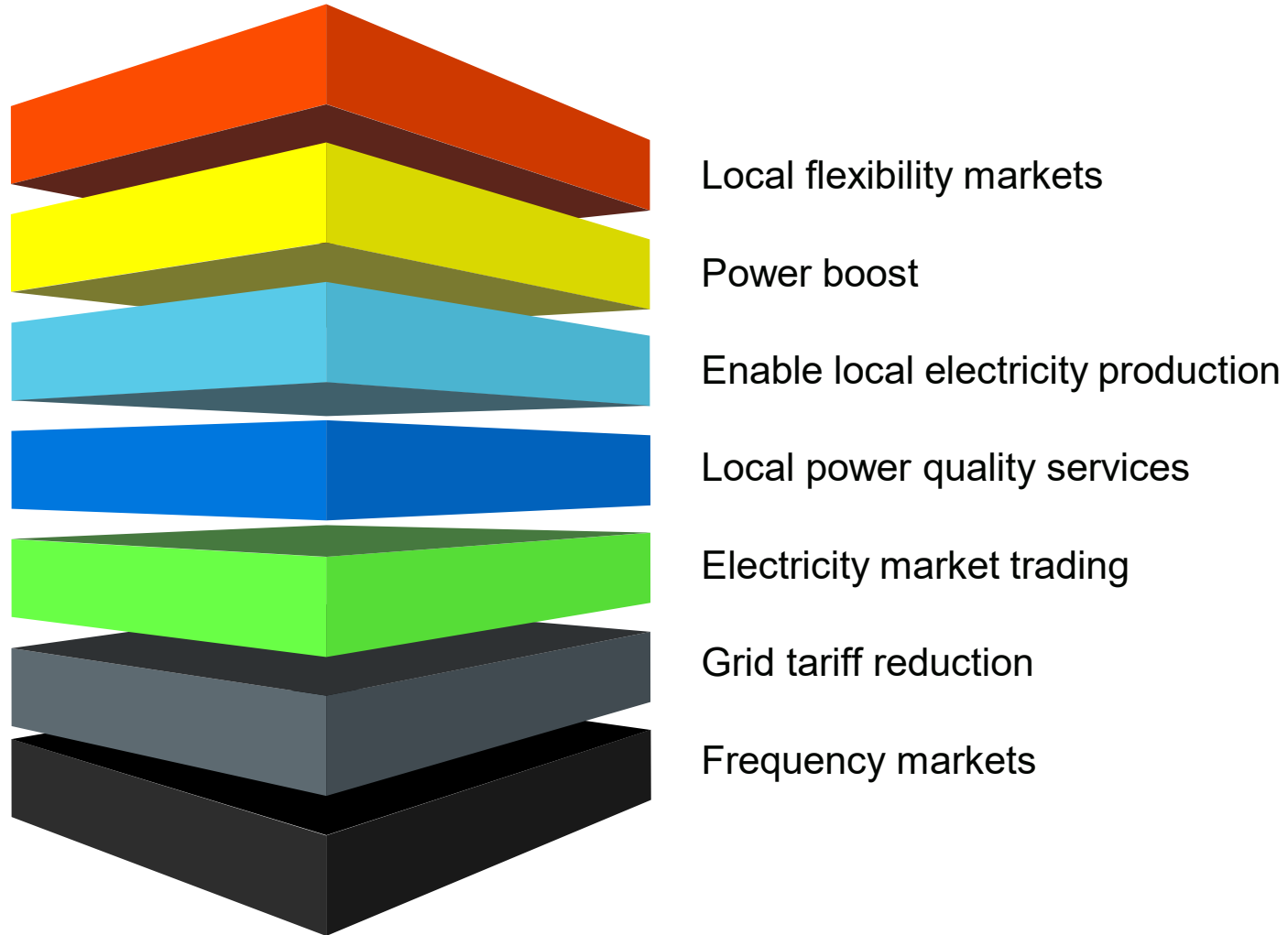


MODULAR ENERGY STORAGE

# One core module - wide range of products



# Value stacking enabled by distributed BESS



# Value chain & roles

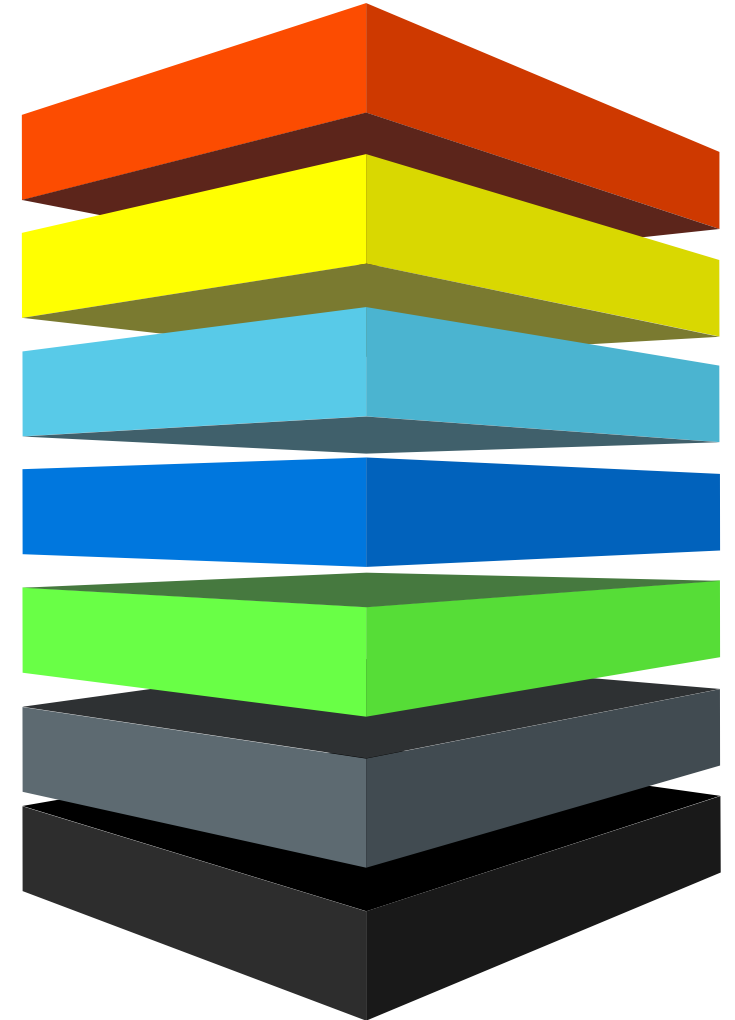


**Aggregator, BRP and possibly third-party actors work together to ensure optimum allocation in market**

The aggregator bundles smaller asset into a single, larger entity big enough for market participation.

BRP is the entity responsible for maintaining electricity balance of production and consumption portfolio

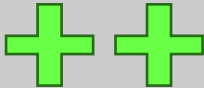



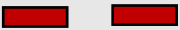
## Value stack



A satellite-style map of Europe with a blue dot and white lines highlighting Romania. The map shows the continent of Europe with a blue dot and white lines highlighting Romania. The text "Power market in Romania" is overlaid on the map.

# Power market in Romania

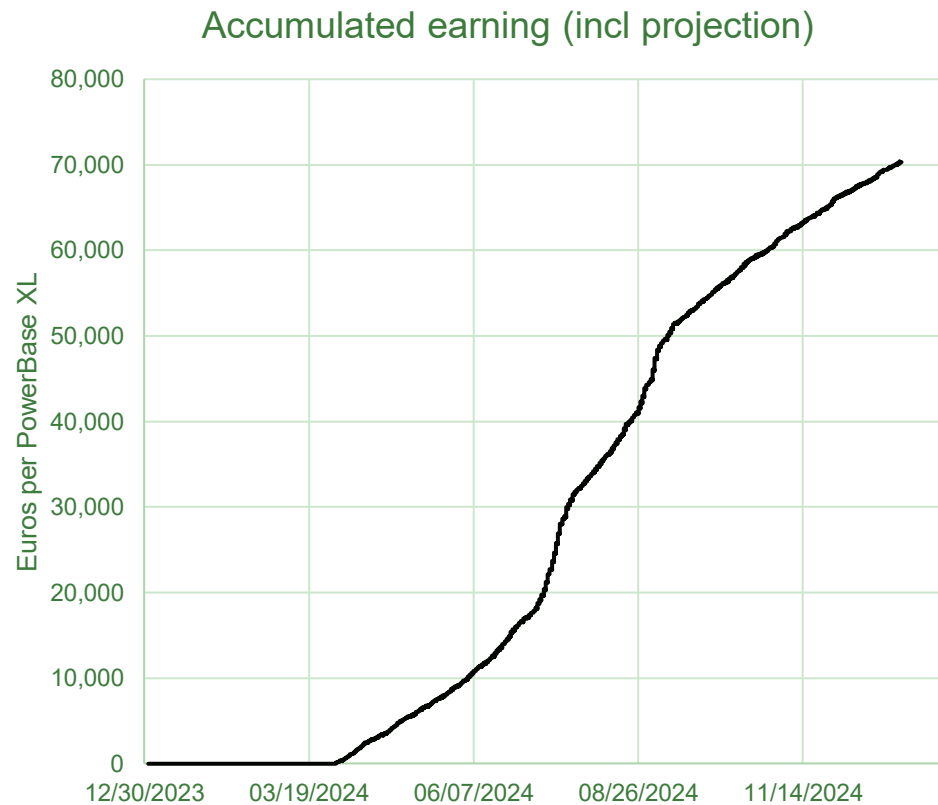
# BESS benefits in the Romanian Power Market

Market	Product type	Description	BESS potential
Wholesale	Day ahead Intraday	The day-ahead electricity market is a platform where electricity is traded one day before the actual delivery and the intraday. Participants, including power generators and consumers, submit their bids for selling or buying electricity for each hour of the next day. The market operator then matches these bids to determine the market-clearing price and the schedule for electricity delivery.	
Primary frequency regulation reserve	FCR	Defined as decentralized automatic regulation with static characteristics, distributed over a large number of generator groups that ensures the rapid correction (within 30 seconds at most) of the differences between production and consumption at a frequency close to the reference value	
Secondary frequency-power regulation reserve	aFRR	Defined as the centralized automatic regulation of the frequency (exchange power with frequency correction) to bring the frequency/exchange power to the record values in no more than 15 minutes.	
Fast tertiary reserve	mFRR	power reserve provided by generator groups that are qualified to synchronize and charge the load in a maximum of 30 minutes	
Slow tertiary reserve	mFRR	defined as the power reserve provided by generator groups that have a start-up and load-taking time of less than 7 hours	

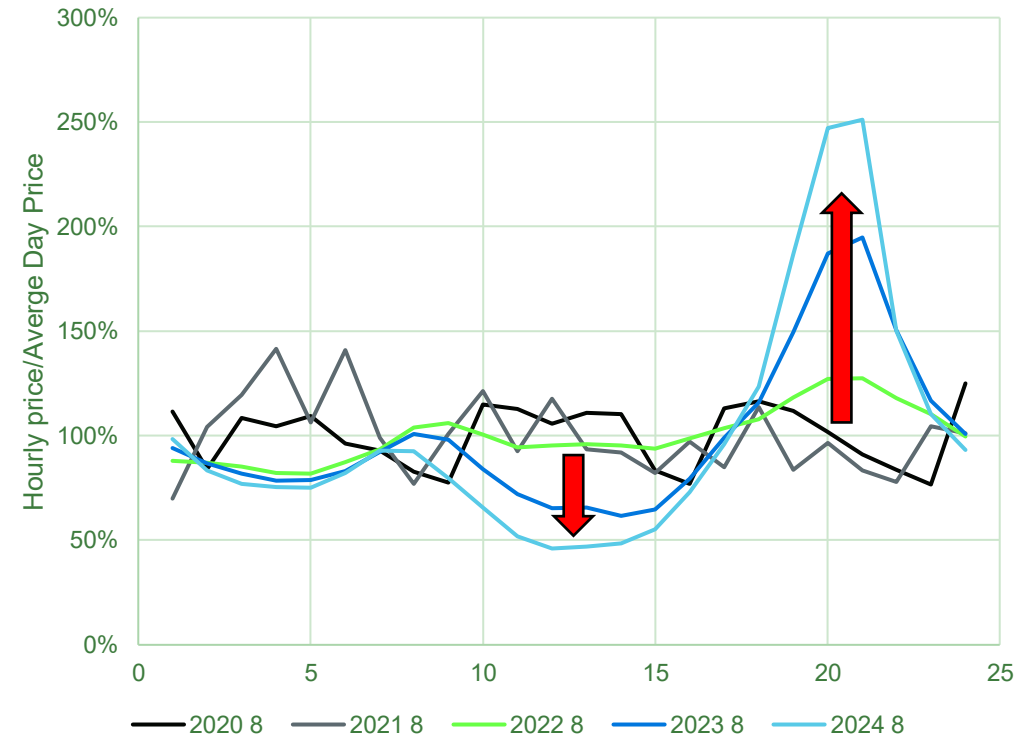


# Day ahead arbitrage is emerging as a significant revenue source in Romania

## Arbitrage potential



## The Romanian power market is developing a “duck curve”



# Secondary frequency-power regulation reserve automatic Frequency Restoration Reserve

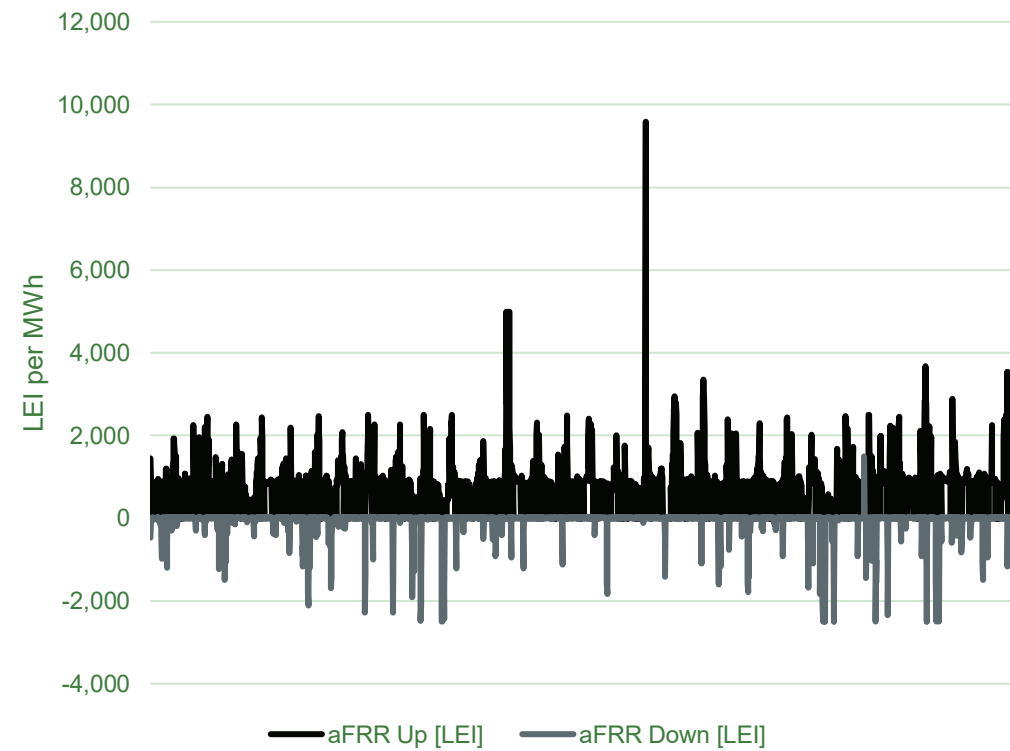
## Market design

- Romania is part of the European PICASSO project
- Each bid consist of two elements
  - **Capacity Price:** Price per MW aFRR availability
  - **Activation Price:** Price per activated MWh

## Capacity Price

- From Entso-E Pixii sees the prices fluctuates between 65-80 RON per MW/h, equal to 13-16 €/MW/h
- <https://newtransparency.entsoe.eu/>

## aFRR marginal activation prices in August 2024

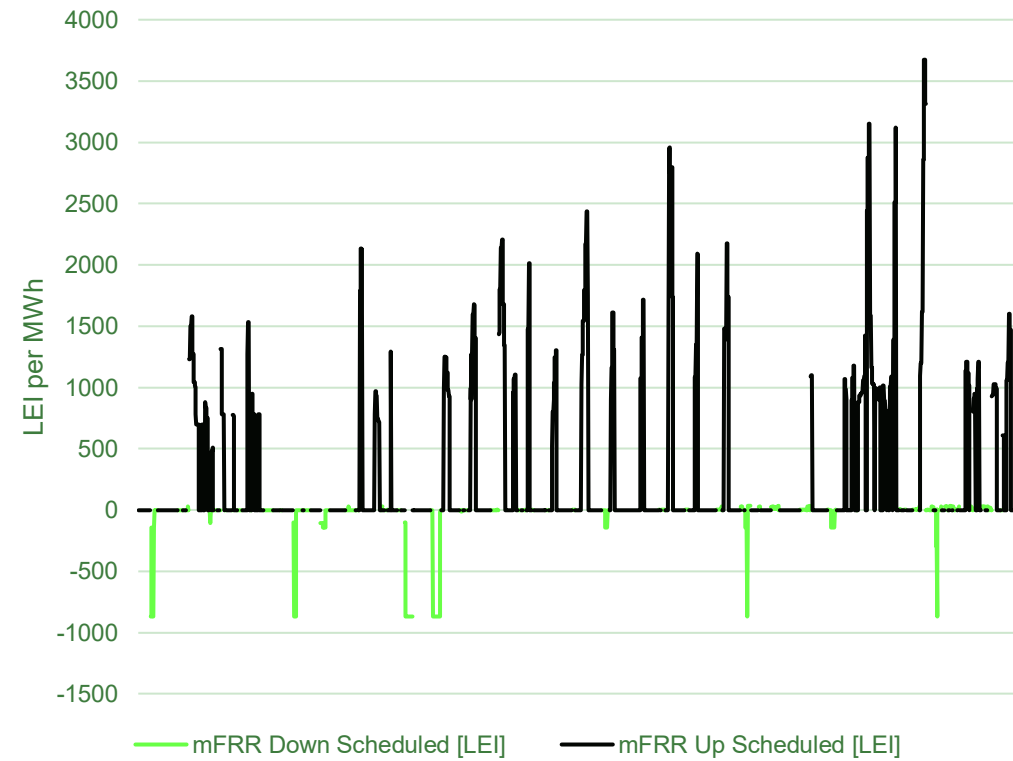


# manual Frequency Restoration Reserve

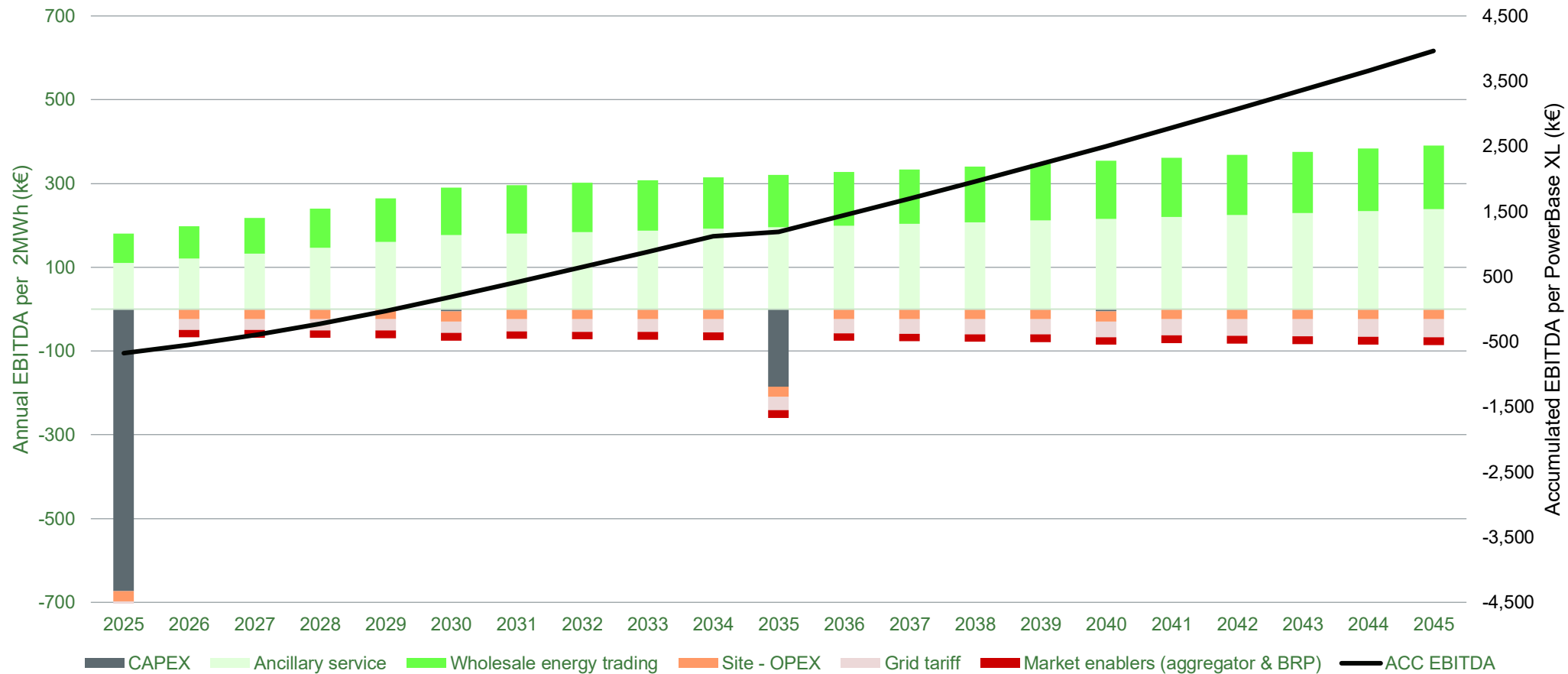
## Market design

- Romania is part of the European MARI project
- Each bid consist of an **activation price**, Price per activated MWh.

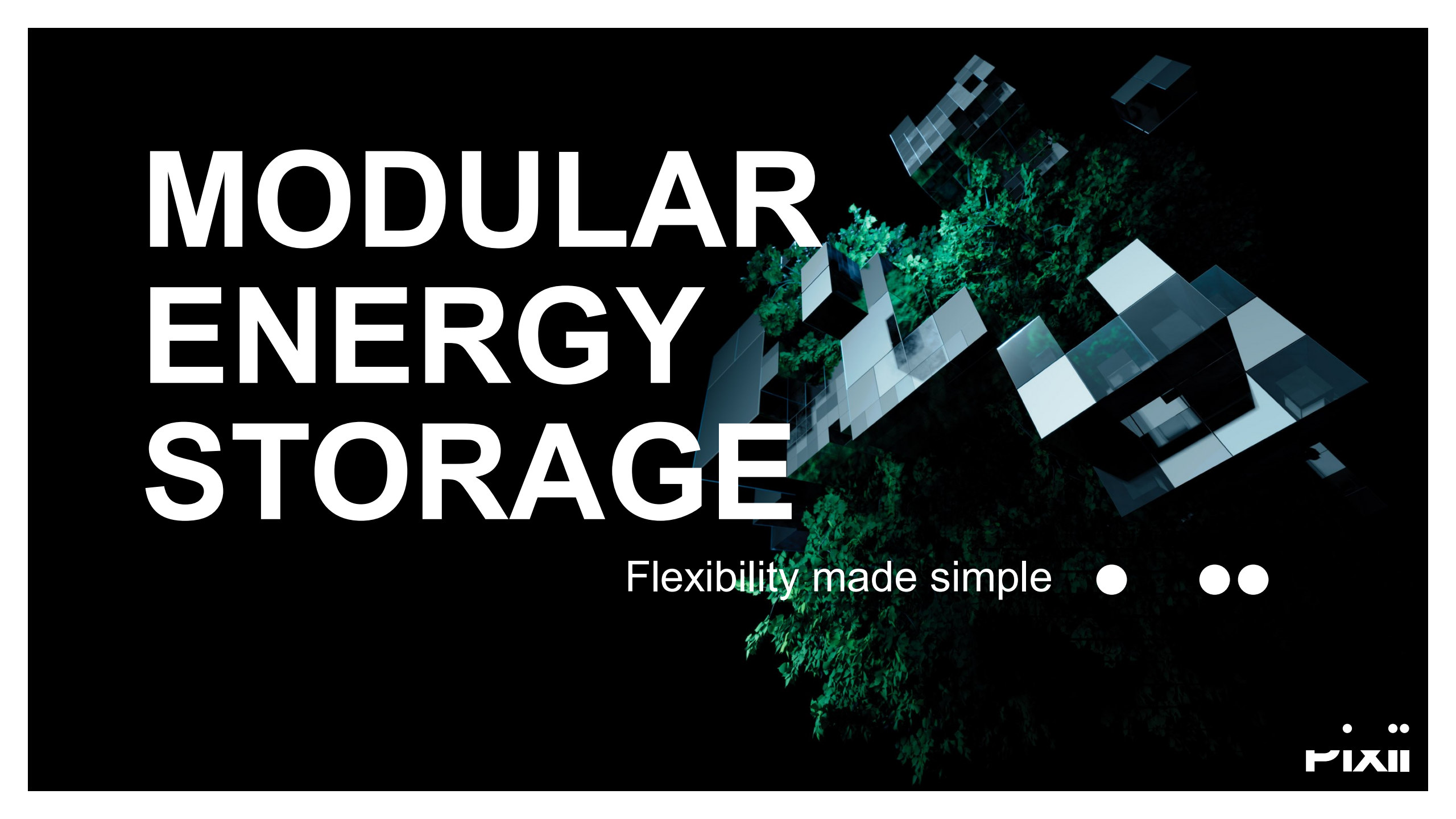
## mFRR marginal activation prices in August 2024



# Pixii's analysis shows great potential for BESS in Romania



# MODULAR ENERGY STORAGE

An aerial photograph of a modular energy storage facility. The facility consists of several large, rectangular, metallic-looking modules arranged in a grid pattern. The modules are illuminated from below, creating a bright green glow that highlights their structure and the surrounding area. The background is dark, suggesting a night or low-light environment, with some green foliage visible around the modules.

Flexibility made simple

