10th Edition
Energy Storage
SUMMIT 2025

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All-in-One Battery Optimization: AI-Supported Fully Autonomous Analytics, Trading, and Connectivity

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The Only All-in-One Platform Targeting the Widest Market Coverage Across Europe

All-in-One Solution
Combines trading and battery optimization under one system

European Presence
Active in all major energy markets

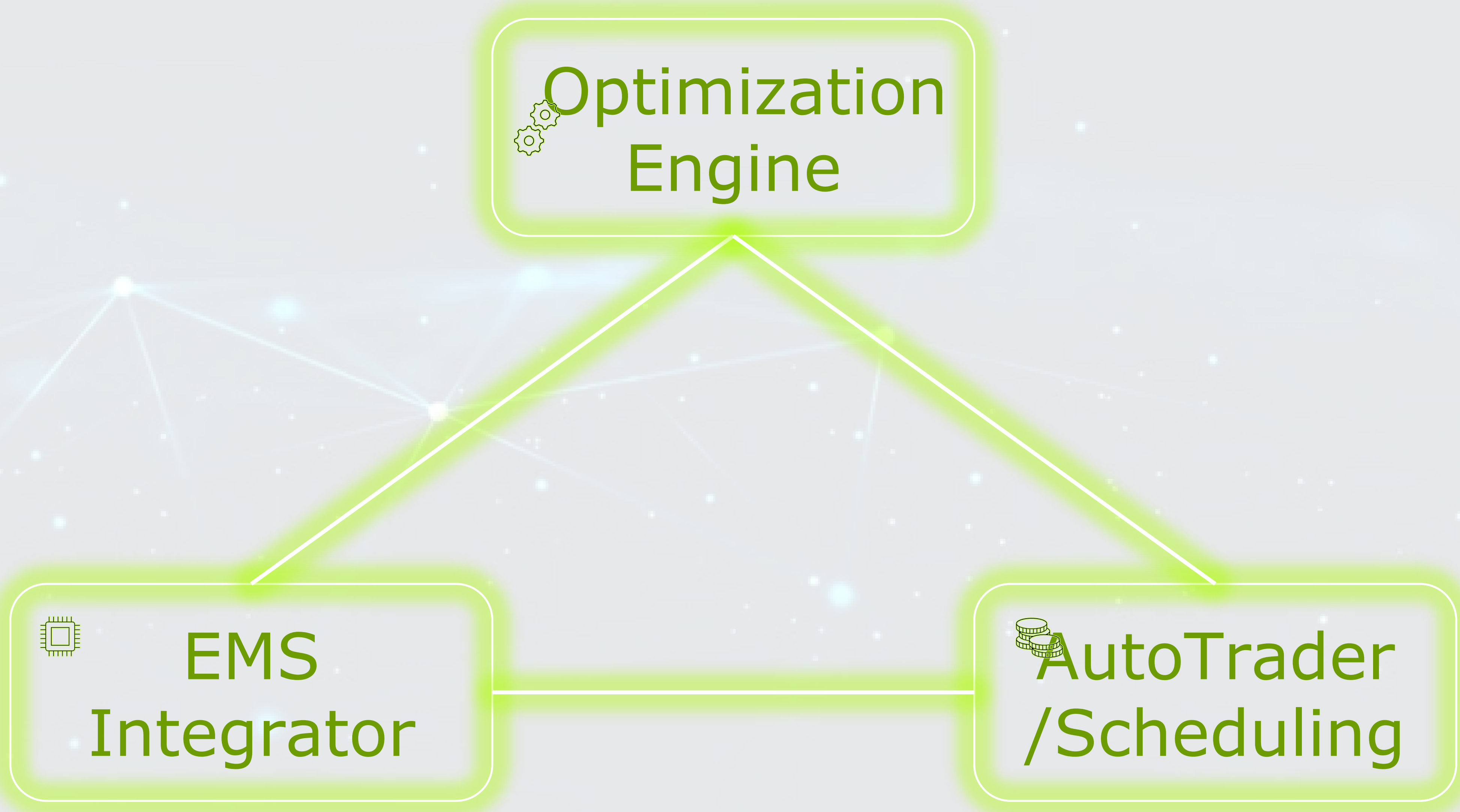
Algo-Trading
The most trader-friendly algo trading suit with the broadest market coverage

Proven Expertise
Managed >20 TWh of algo-trades in the last 12 months

We are Not an Optimizer
We Empower Optimizers with Cutting-Edge Technology

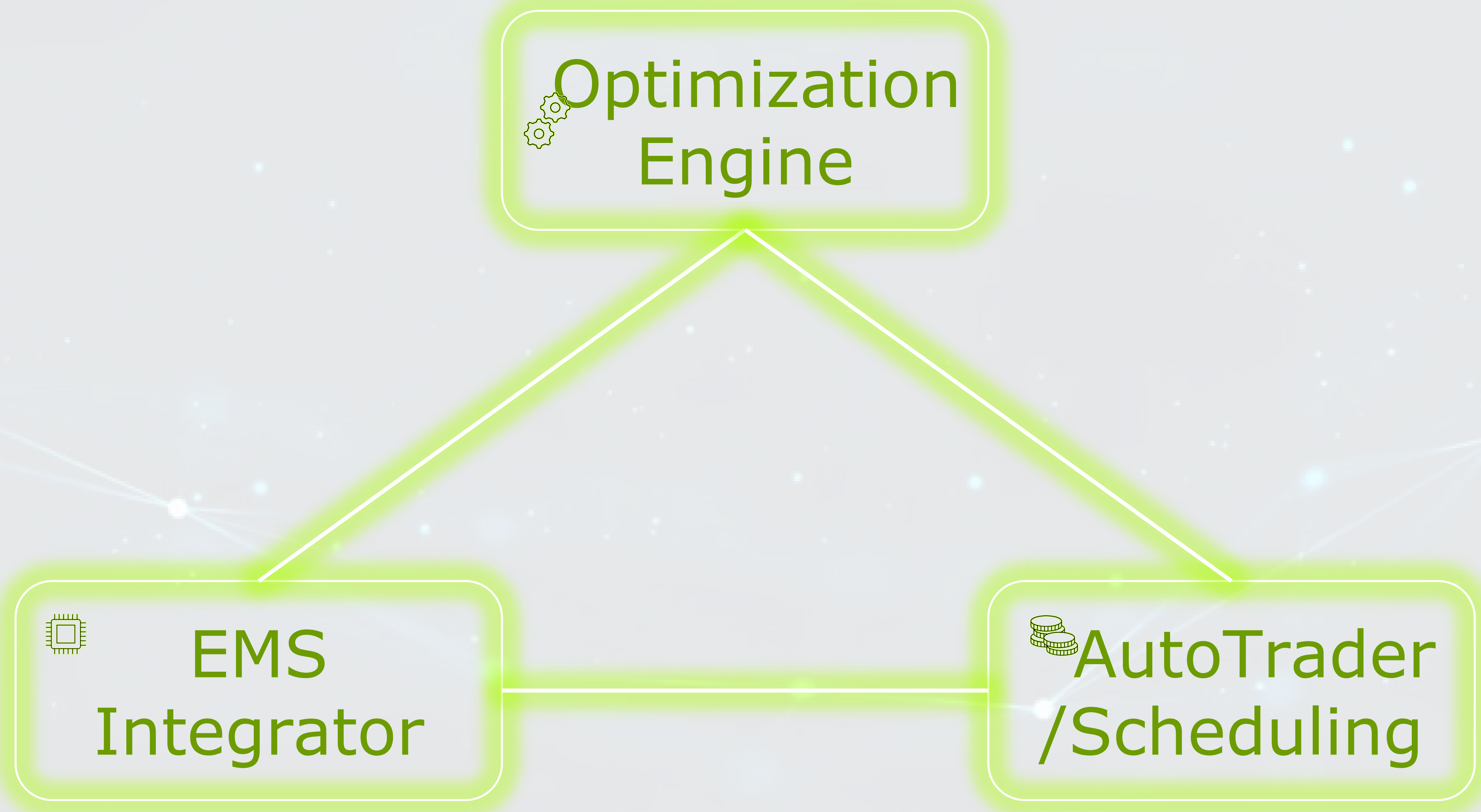
Technologies for
- Optimizers
- Aggregators
- Route-to-market providers
- Asset Owners

to manage **batteries and short-term trading** effectively



Our role is to **equip optimizers** with advanced technology for trading and battery management, not to act as a trading entity

The Daily Operation of Battery Assets Requires Three Components to Work in Harmony



So, How does this **harmony** work exactly?

And what are the **key points** to consider?

A simple example : Focus on only intraday trading

10MW, 10MWh Battery

in the continuous intraday market, **orderbook changes constantly**.

fast optimization is essential for finding the best buy-sell combinations for arbitrage

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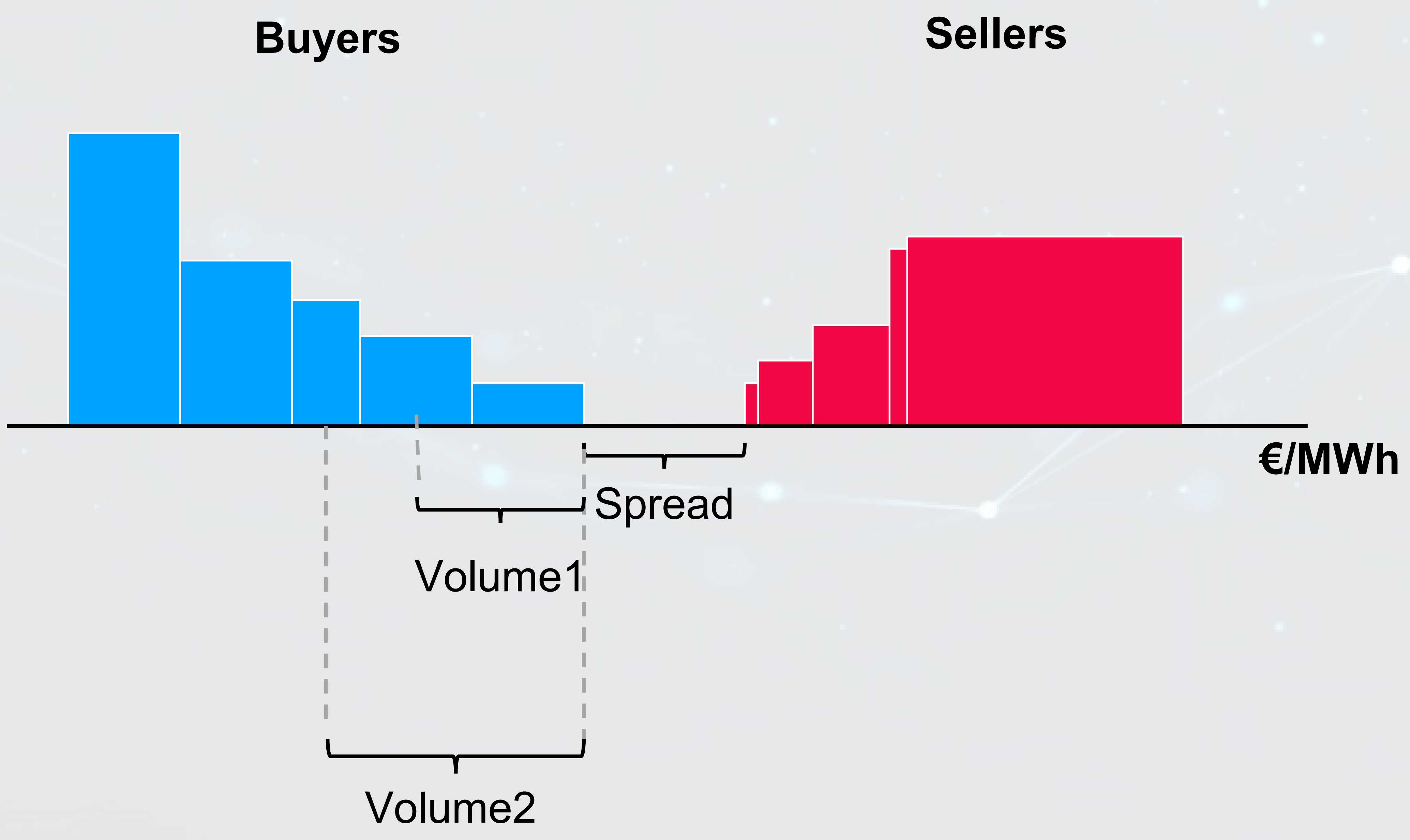
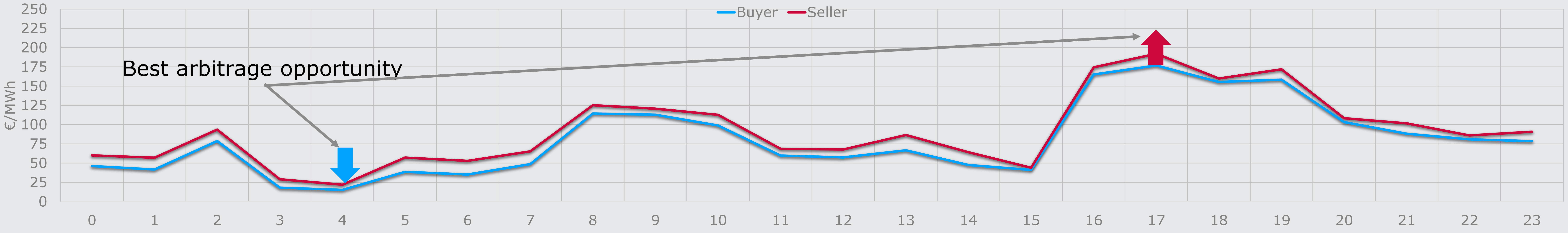
Another complication : Buyer / Seller price depends on orderbook depth



Price for Volume 1 > Price for Volume 2

A simple example : Focus on only intraday trading , Arbitrage

10MW, 10MWh Battery



SoC Plan	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Buy					4MWh 22€																			
Sell																		4MWh 177€						
Energy Output*					-4 MWh													+4 MWh						
New SoC Plan	50%	50%	50%	50%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	50%	50%	50%	50%	50%	50%	50%

Margin

155€/MWh x 4MWh = 620€

Discharged Energy

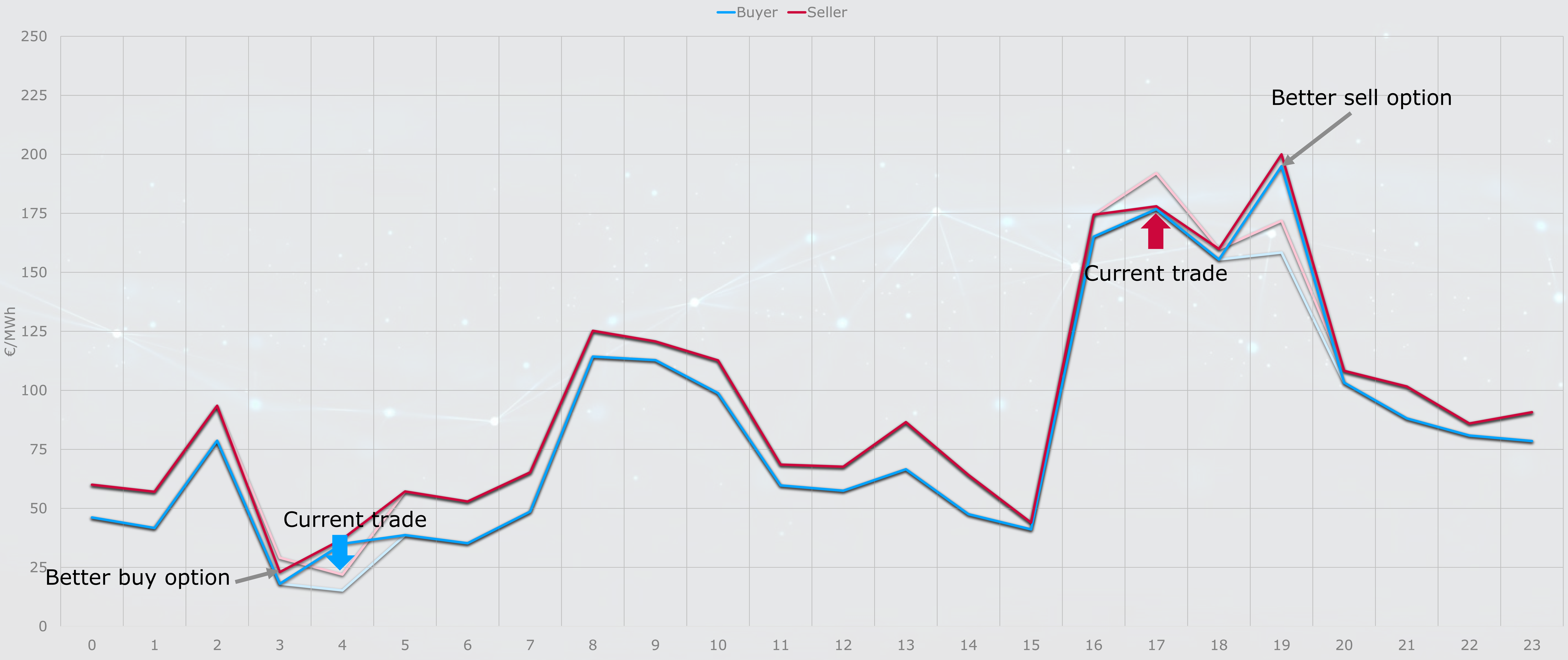
4MWh

Margin per unit of Discharged Energy

155€/MWh

* : Efficiency is considered 100% for sake of simplicity

Fluctuations in market prices can unlock new opportunities



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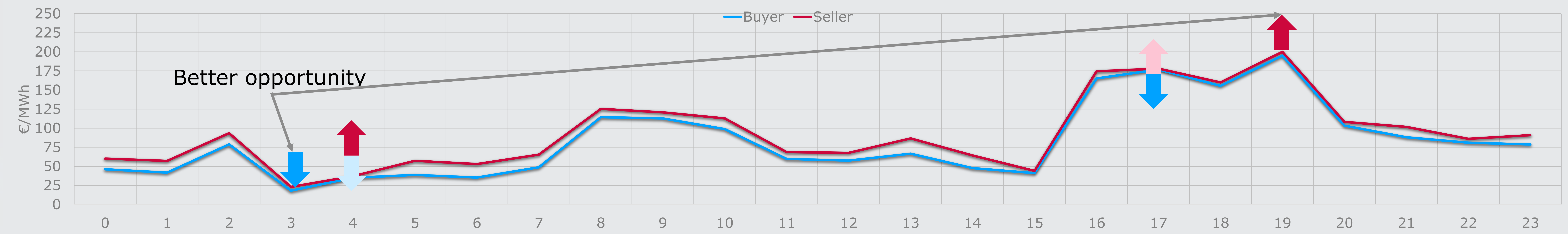
Arbitrage Shift

10MW, 10MWh Battery



SoC Plan	50%	50%	50%	50%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	50%	50%	50%	50%	50%	50%	50%
Buy				**4MWh 23€**	4MWh 22€													**4MWh 178€**						
Sell					**4MWh 35€**													4MWh 177€		**4MWh 195€**				
Energy Output				**-4 MWh**	-4 MWh													+4 MWh		**+4 MWh**				
New SoC Plan	50%	50%	50%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	50%	50%	50%	50%	50%

Margin
735.49

Discharged Energy
4MWh

Margin per unit of Discharged Energy
184€/MWh

Same discharge, higher margin

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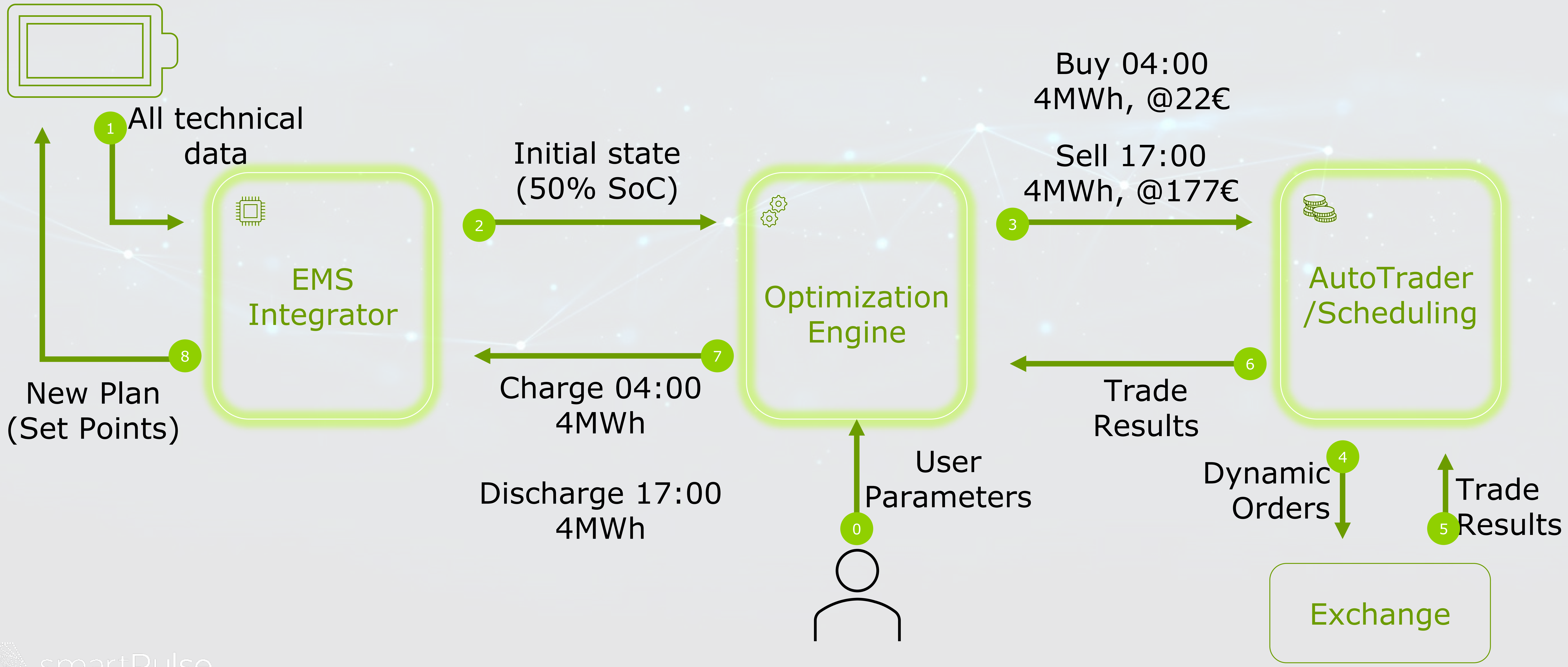
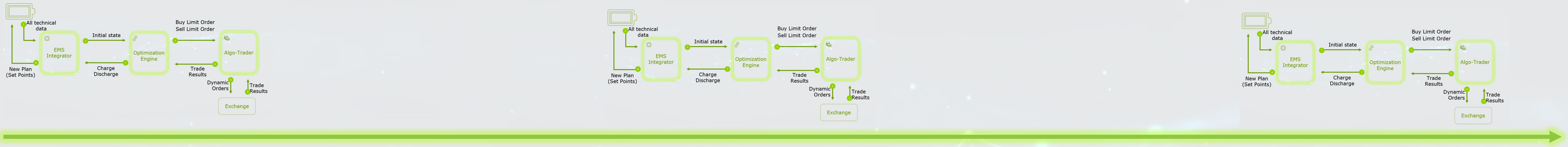
In the background : Optimization Cycle

The operation requires the EMS integrator, optimization engine, and algo-trader to function in perfect synchronization. This collaborative process is what we call an **optimization cycle**.

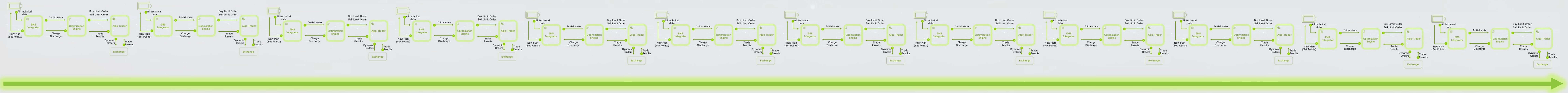


The optimization cycle needs to run at regular intervals

However, **longer intervals may lead to missed opportunities**

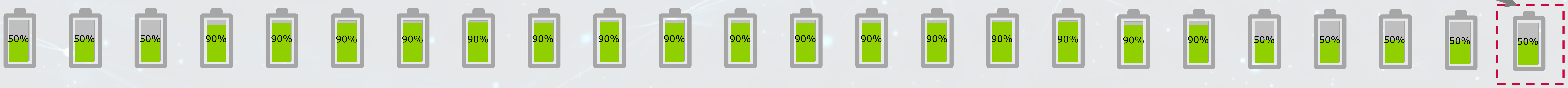


Therefore, **seamless integration** between components is essential for optimal performance.



Some of key elements in decision making: What's the Value of Energy Left at End of the Horizon?

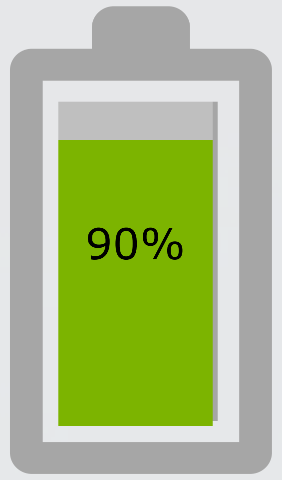
How to decide whether to fully charge, fully discharge, or end at the initial level?



the energy remaining in the battery has a value,
potential for future use

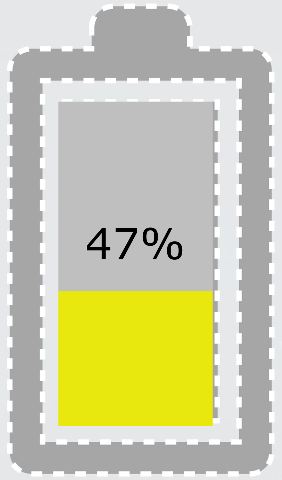
Some of key elements in decision making: Efficiency Gaps: the Theory and Reality

Inputs



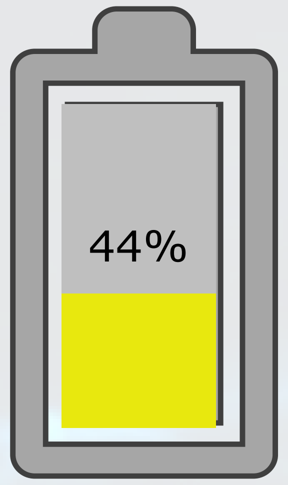
Max : 9MWh
Min : 1MWh
SoC : 9MWh
SoC : 90%
Efficiency : 92%

Optimization Output



Output : 4MWh
Target SoC : 9 – (4 / 0.92) = **4.65MWh**

Real EMS Data



Output : 4MWh
SoC : 4.45MWh
Actual Efficiency : 88%

Problem:

Difference between theoretical efficiency (92%) and actual efficiency (88%) creates a SoC imbalance for subsequent optimization cycles

Solution:

- Real-time tracking of actual battery efficiency
- Updating optimization models with the realized efficiency values.

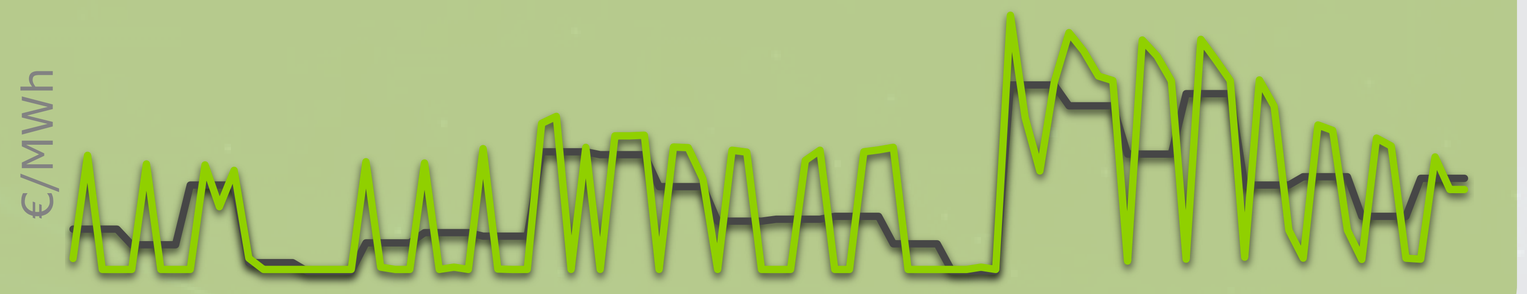
Trader Inputs: Control of Optimization Decisions

1. **Cycle cost** can be determined for each contract to have tune aggressiveness for charge and discharge
2. Or **minimum sell and maximum buy prices** for each contract can be determined to have a “do not sell if” approach
3. Or **buy and sell price forecasts** can be entered for each contract to have a “do not sell until” approach

What We've Discussed Is Just an Example— Real-World Scenarios Are Far More Complex

Complex Intraday Products

15-minute, 30-minute, and hourly contracts require cross-product trading to maximize profits.

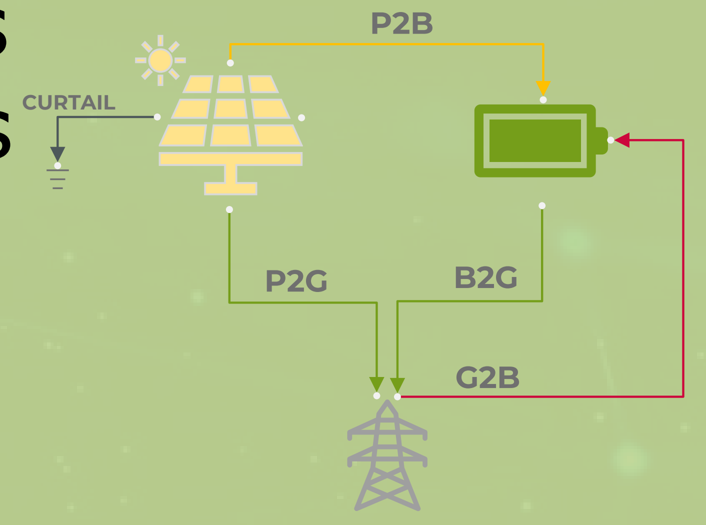


Multimarket Optimization

- DAM,IDA,Ancillary Services and IDC
- Continuously updating bids while **considering opportunity costs**
- Evaluating potential opportunity costs for better decision-making

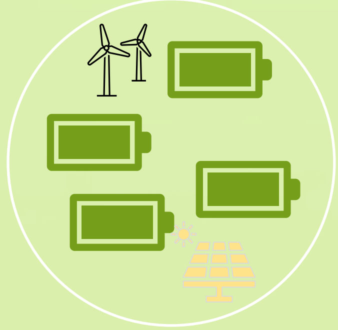
Co-Located Batteries

- Power plant forecasts
- Imbalance risks
- Grid constraints



Portfolio Optimization

Portfolio-Based Optimization for Multiple Assets Under One Trading Unit



Degradation Cost

- Battery lifespan varies with DoD levels
- Cycles are based on DoD levels specific to each market's characteristics
- Cost adjustments in optimization.

Trader Insight

- Traders' insights often surpass AI in specific scenarios
- Allowing traders to input expectations into the optimization model

Key Components for Effective Real-Time Battery Optimization

- An **optimization algorithm** that considers battery status, trader insights, live market data, and TSO instructions to make real-time decisions.
- A software system that transmits optimization results to the battery, retrieves real-time battery data, and integrates with **various EMS providers**.
- A **TSO integration module** that collects all ancillary service data, feeds it into the optimization process, and submits resulting bids to the TSO.
- A **scheduling system** that regularly updates the battery or co-located asset's schedule with the TSO.
- A **dynamic intraday trading system** that continuously monitors live market data, feeds it into the optimization process, and places orders in response to optimization results.

A Unified Platform for Real-Time Battery Management

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Real-Time Battery Management Platform

Integrated all components into a single platform

From optimization to trading, TSO interactions to EMS integration, everything is **streamlined in one place**.

No need to deal with **multiple software solutions**

smartPulse handles the entire operation with **full market and system integration.**

Focus on finance, operations, and trading while we provide the **complete technological infrastructure** for your success

Thank You

ÖNDER AKAR

CEO at smartPulse Technology | Super platform for short-term power trading

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