

# Catalyzing the Future of BESS The Crucial Role of Benchmarking

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# KYOS Energy Analytics

- Headquarters in the Netherlands. A team of 40+ people, 5 different teams.
- International client base across Europe, plus Americas and Japan.
- More than 100 corporate clients.



# KYOS Services



**Software for energy valuation & optimization**



- Our Software & Models have been developed over the past 20 years by an experienced team of markets practitioners (ex-procurement, trading), quantitative analysts and IT developers.

**E/CTRM Software**



- Our E/CTRM software is in use by:
  - Large Industrial consumers of energy
  - Producers of energy
  - Large industrials exposed to a multitude of commodities

**Consultancy**



- We deliver an economical and flexible off-the-shelf SaaS solution, with quick implementation and strong support both during and post-implementation

**Price data**



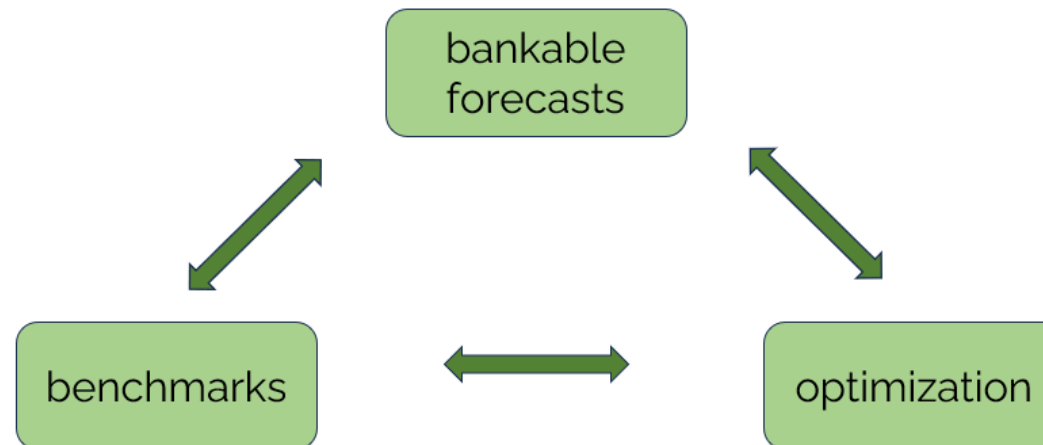
- Continuous feedback from our clients helps us stay ahead.



# Some challenges for BESS asset owners



- What are future BESS revenues?
  - Market/asset specific
- Where are revenues coming from?
  - Changing markets
- Route to Market/Optimizers
  - How to select the best RtM provider?
  - Does the RtM provider perform well?



# BESS Investments → BESS Valuations

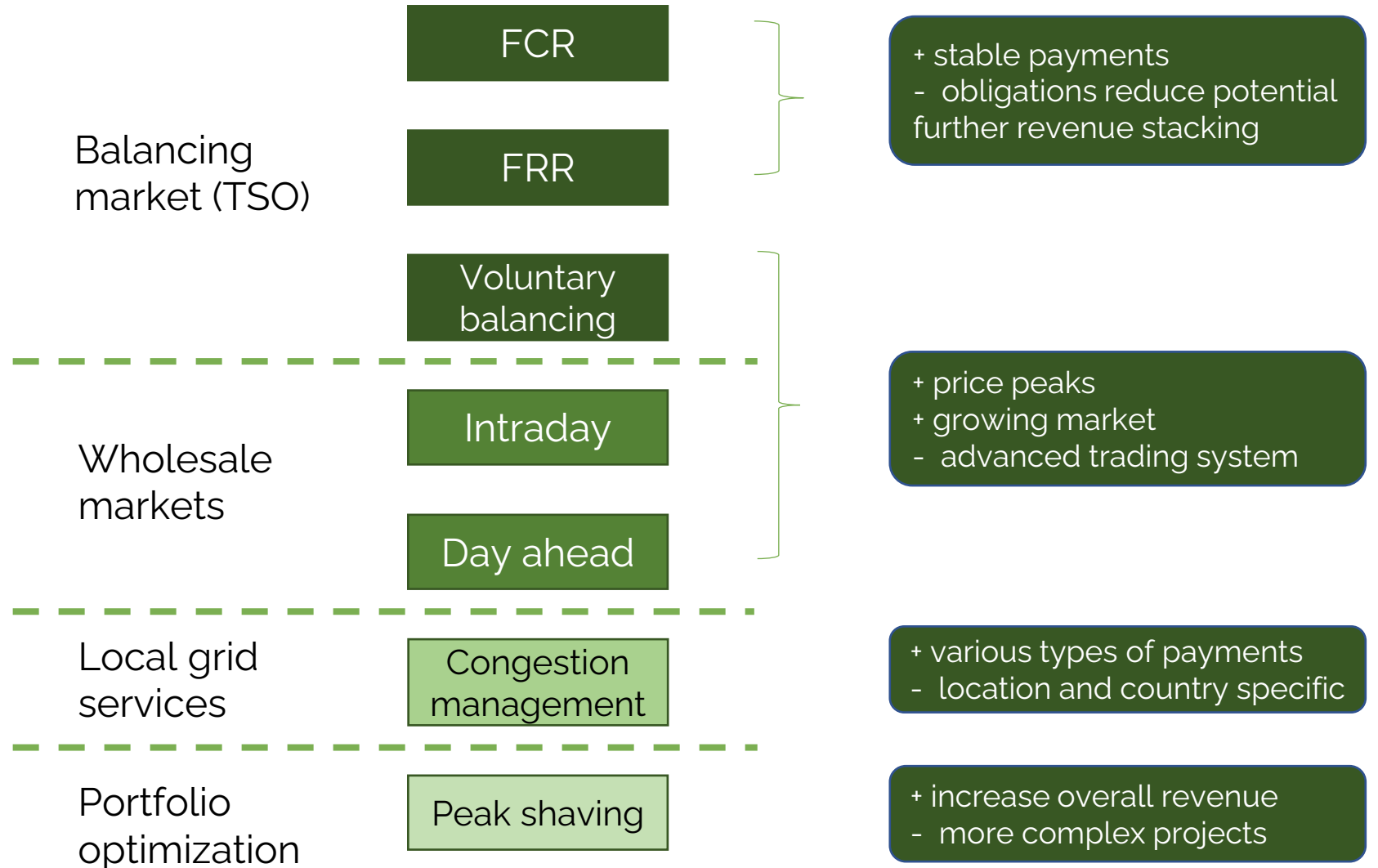


# Energy storage – not as easy as PV or wind



A battery business case has to include a combination of revenue streams

Full value can only be realized with active trading activities



# KYOS BESS valuation approach (KyBattery)

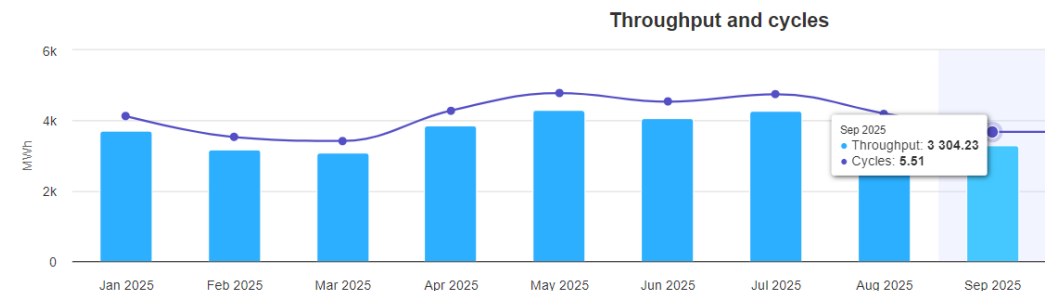
- Calculates future market value, **stacking revenue streams**:
  - Day-ahead, intraday, passive imbalance or a combination
  - Combine with optimizing in FCR or aFRR market
  - Stand-alone or co-located asset

- **Advanced trading strategies**

Battery: VPS - constrained [60]	Capacity: 17.5 MW / 25 MW / 600 MWh	RTE: 70%
Swiss Power [49]	Valuation method: LSMC (100 sim)	Start date: 2025-01-01
Day-ahead (primary)		KySim ID: 145
Job ID: 81567	Created at: 2024-08-29 12:24:19	By: KYOS   Valerio Avenoso

Value Transactions **Cycles** State of charge Distributions

Model run Aggregation  
 Intrinsic  Simulations  Monthly  Yearly



# KYOS BESS valuation approach (KyBattery)



- Value of BESS: optionality
- One price curve/scenario is not enough!
- **Unique: usage of realistic price simulations!**
- Valuation gives:
  - Expected value (intrinsic and extrinsic value)
  - Risk distribution
- Important: transparent methodology to ensure bankability

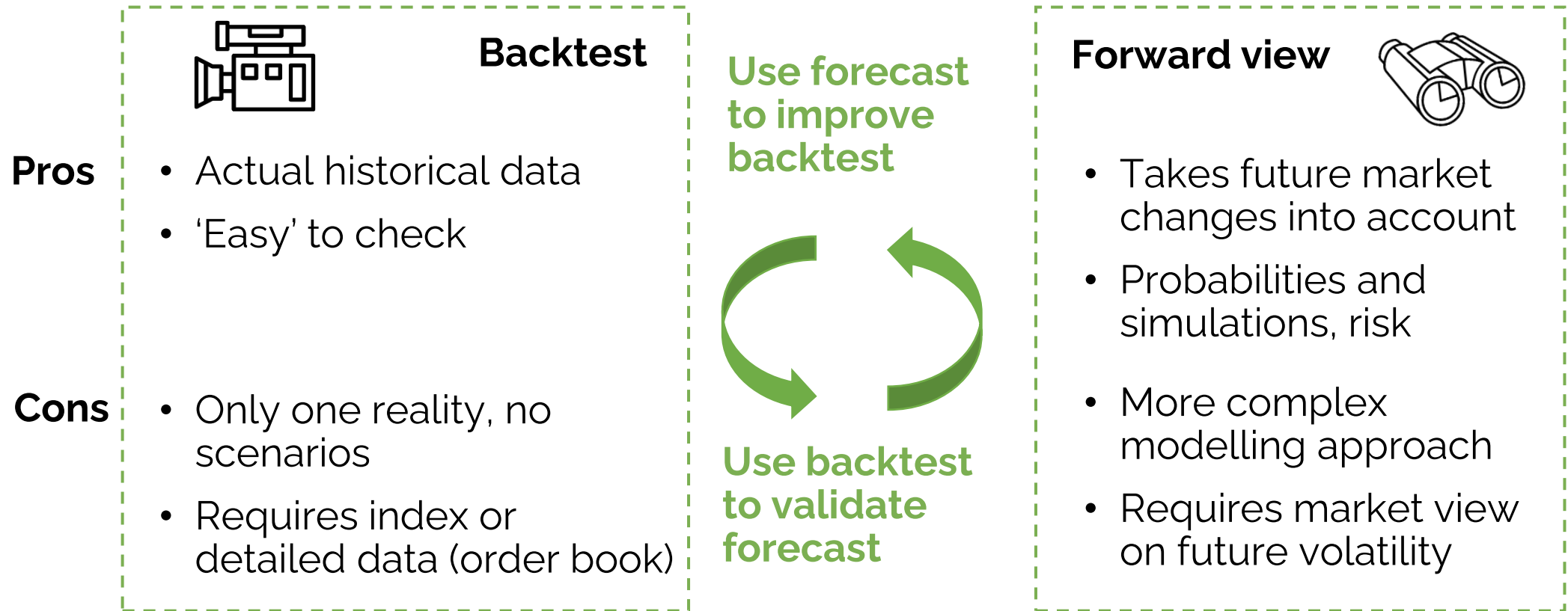




# BESS benchmarks



# How good are BESS valuations?



# But...



## Lack of good independent BESS benchmarks

Available for GB (e.g. Modo) – transparent data

Few markets (e.g. Germany) – available, but provided by optimizers

Most markets – not available

Independent benchmarks ?



# KYOS Battery Index



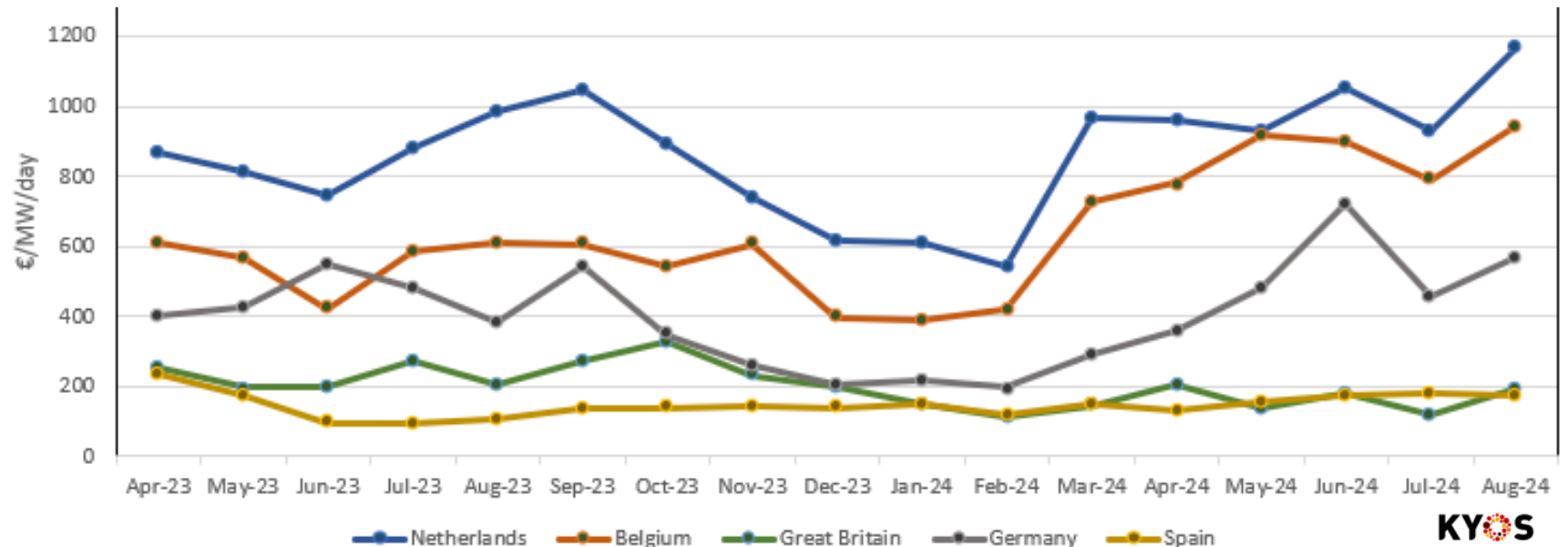
- Assumptions:
  - Mix of intraday trading (100% of capacity) and passive imbalance trading (max 30%)
  - Intraday prices are ID1 (= index of average prices)
  - Intraday prices can be perfectly forecasted
- Main advantages:
  - Can be validated relatively easily
  - Similar approach with ID1 prices can be used for forward valuation

Shows historical revenues for a 2-hour battery.

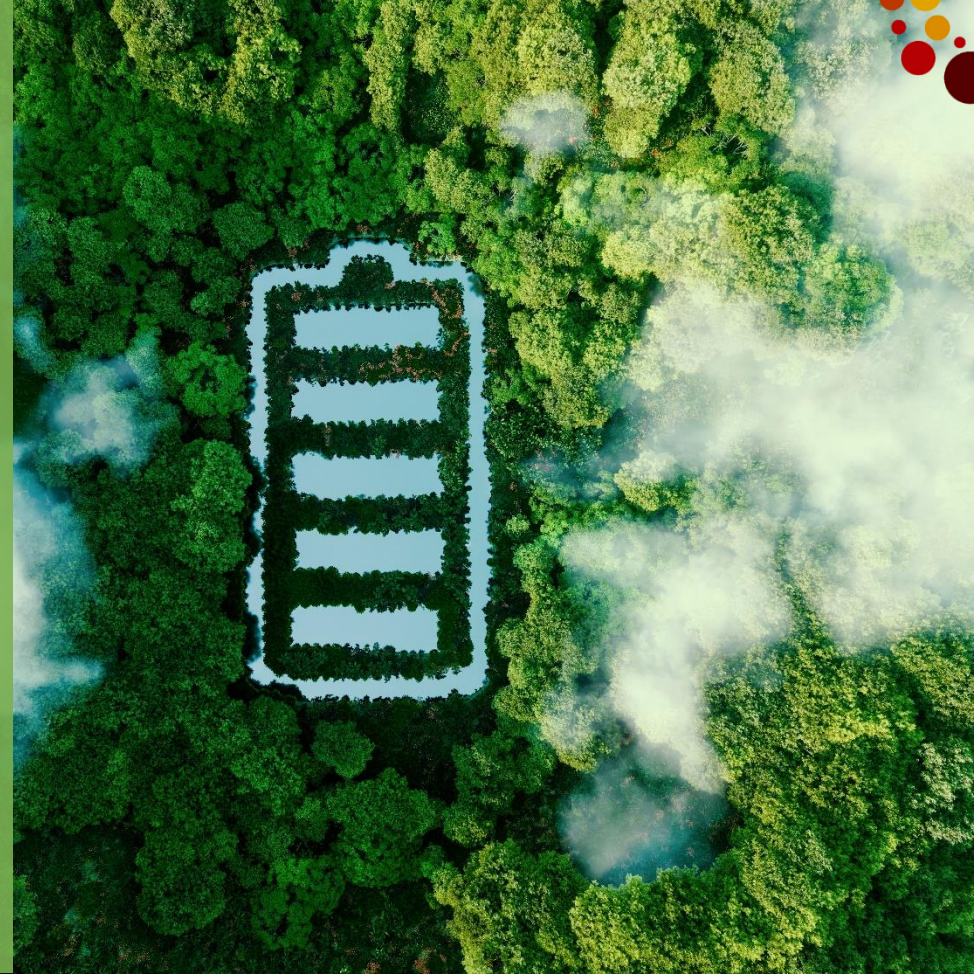
Calculated with **KyBattery software**

See also:

<https://power.kyos.com>



# BESS optimization



# Theory is nice, but...



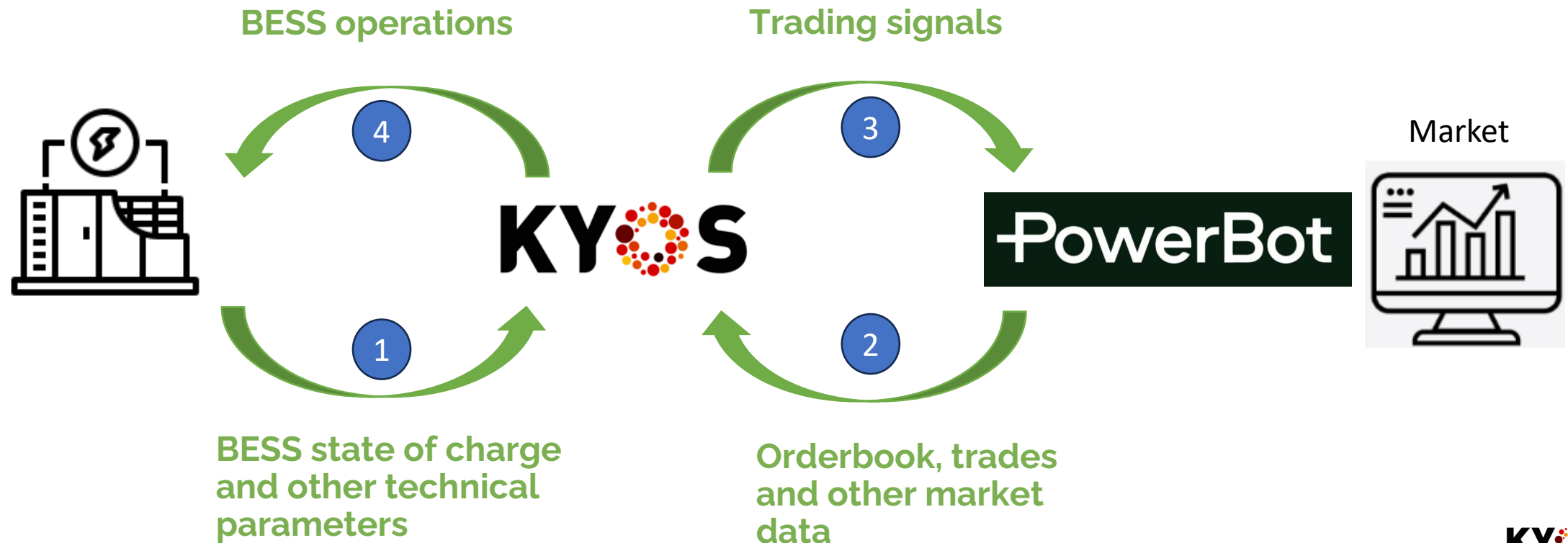
Every valuation model has its simplifications and assumptions  
Every benchmark has its simplifications and limitations

As always, reality is different!



# Going beyond: real-time battery optimizer

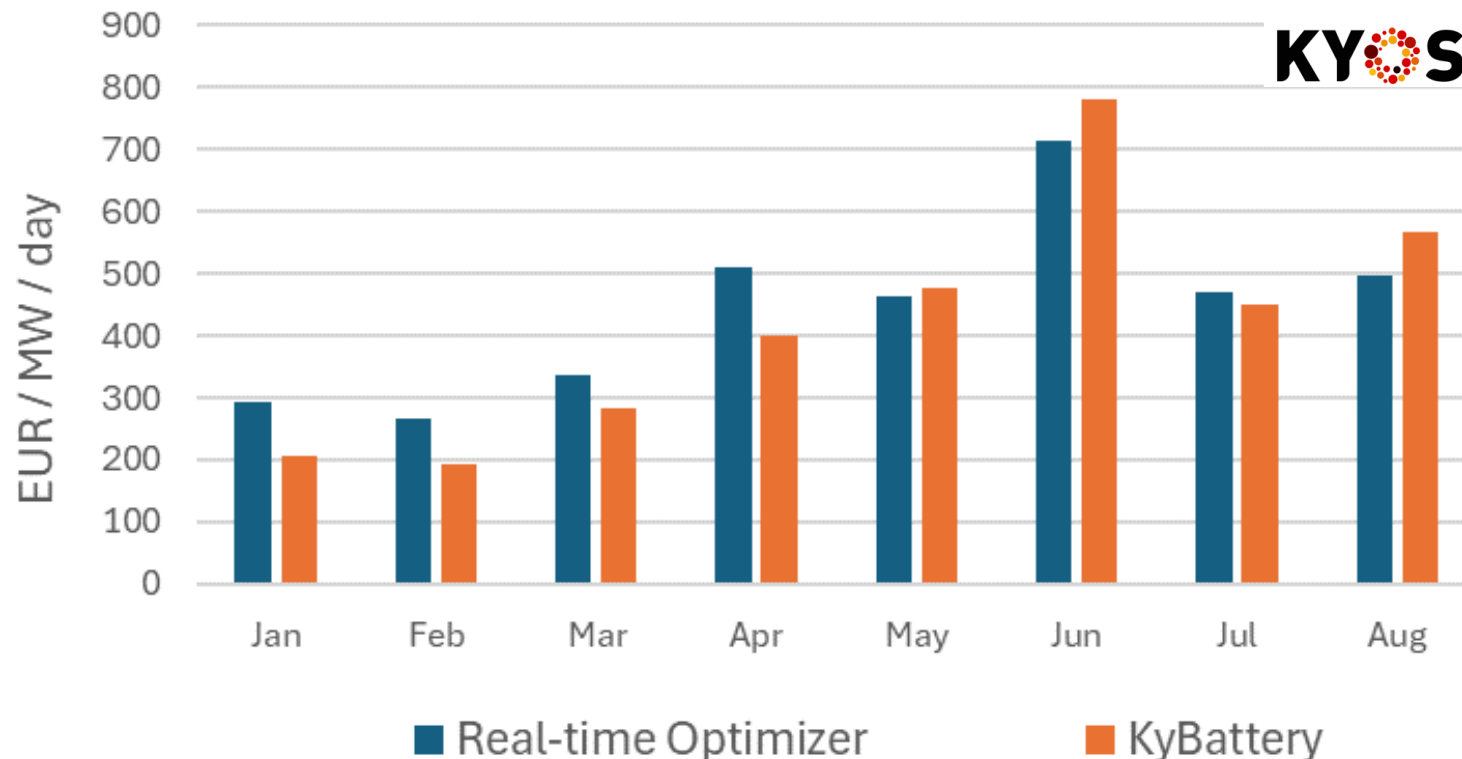
- Assess real trading performance: orderbook instead of ID1 index
- KYOS developed **real-time battery optimization software**
- Can be run **real-time**, in **shadow-trading** or in **backtest** mode



# Real-time optimizer performance

- Is the P&L of the real-time battery optimizer (intraday orderbook, shadow trading) in line with the KyBattery backtest (ID1, 'known prices')?
- Example results on the German intraday market

Realized Earnings - KYOS battery models





# Example of challenge for BESS owner



BESS owners use Route-to-Market/optimizer

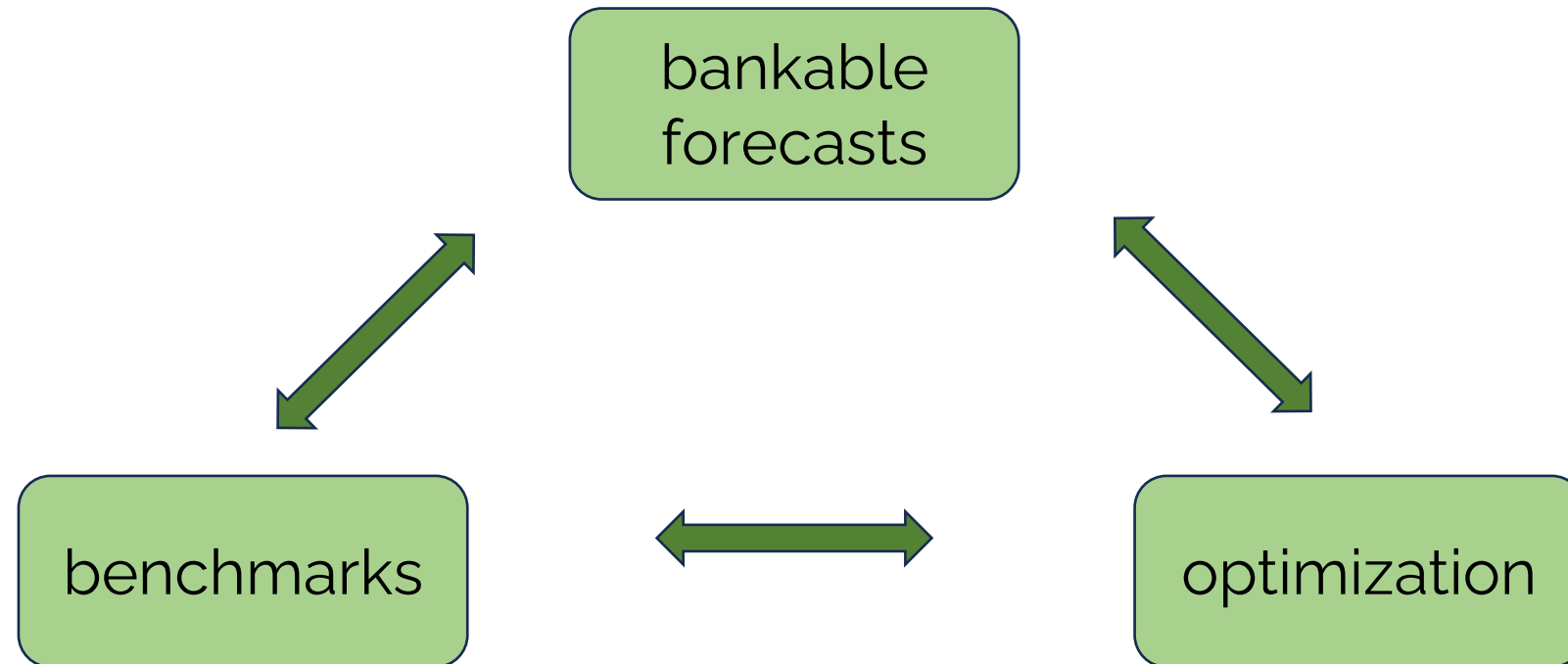
- Different models possible:
  - Fixed price/toll
  - Index/formula
  - Full merchant/open book
- Challenges:
  - How to select the best RtM provider?
  - Does the RtM provider perform well?
- Solutions:
  - Upfront (forward) assessment of revenue models
  - During operation: continuous benchmark of performance.



# Summary



BESS growth requires three, linked, key elements



# KYOS Energy Analytics: quarterly publications



## Free publications



See: <https://www.kyos.com/knowledge-center/>



# Contact us



We look forward to supporting you with the right data, tools and advice!



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