



From Tollings to Grid Constraints

How to Maximise Value in Today's Market Environment

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Energy Storage Summit, Stuttgart, 04 June 2025

entrixenergy.com



Intro Entrix: we're an optimiser and leading infrastructure investors use our solution to trade their batteries and VPPs

Customer spotlights



Aquila works with us on their **first two storage projects in Germany** (>100MW)



For Encavis, we optimise **batteries together with renewables**

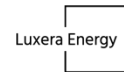


We're the exclusive partner for **Europe's largest residential VPP**



For MEAG, the **asset manager of MunichRe**, we optimise their inaugural storage site in Germany (c. 100MW/230MWh)

Further project references



First project live since
2022

~2 GW
under management

400 MW
going live in 12 projects in 2025

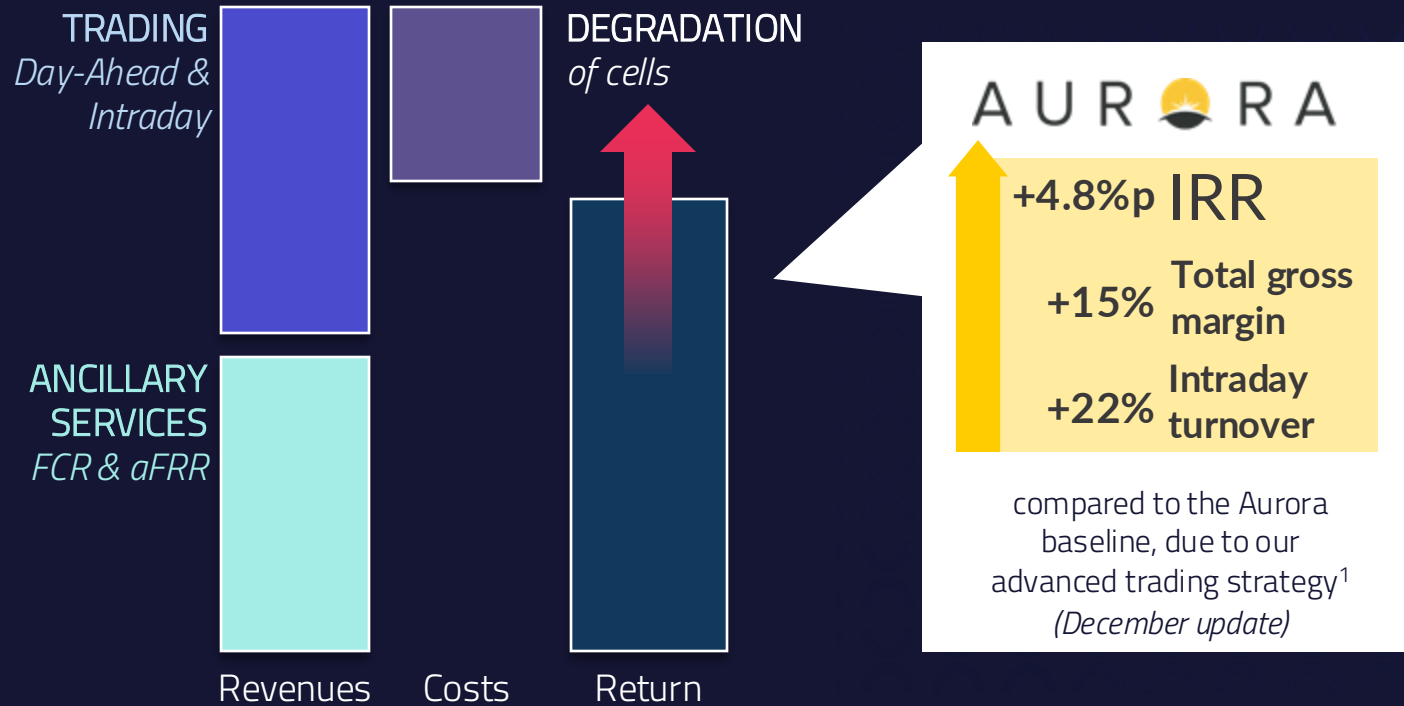
Entrix is active in
5 countries

The German BESS market is scaling
 – let's make sure to capture the full value of flexibility!



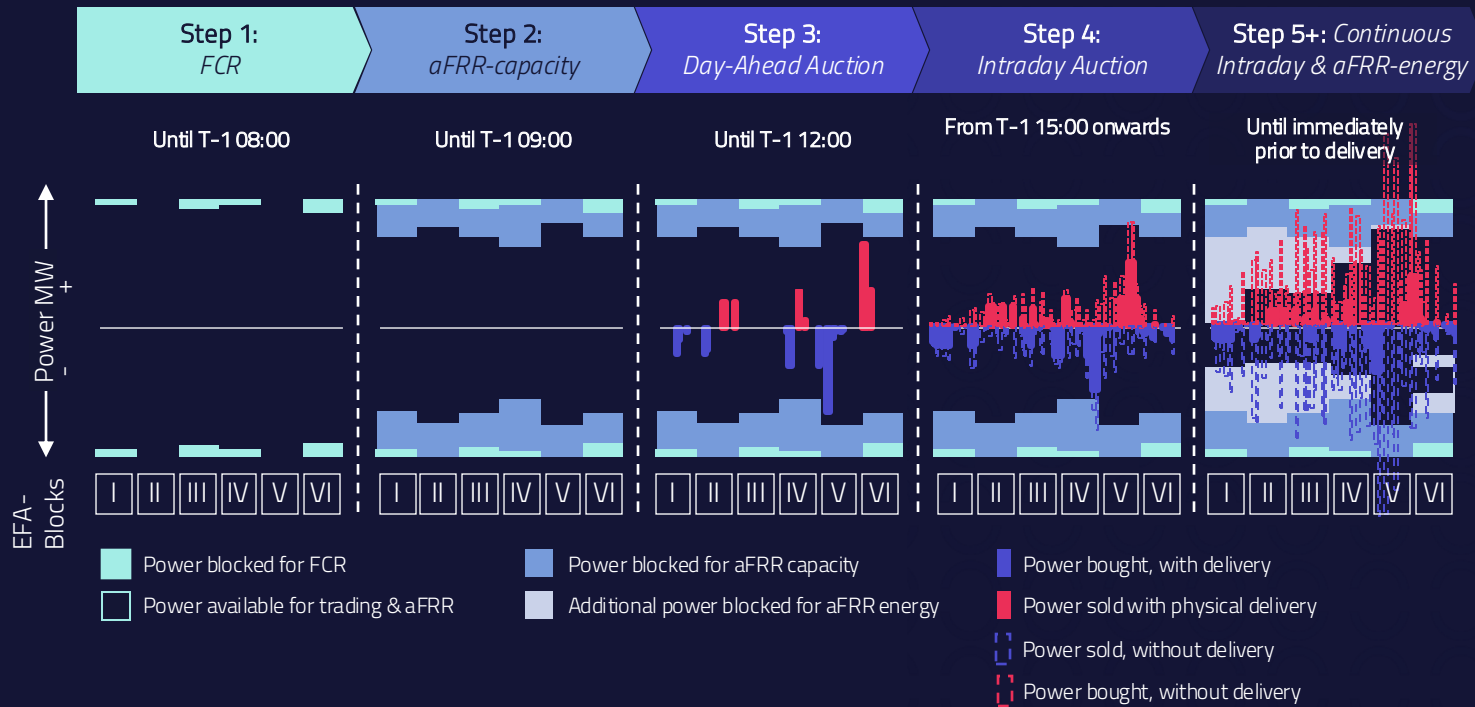
Recap: batteries are a unique asset class that requires specialised optimisation approaches to maximise return

Holistic optimisation of battery storage assets



Importantly, no day is like the other and value is generated until the very last second prior to gate-closure

WHAT ALGOS DO EVERY DAY (EXAMPLE: GERMANY)



AI helps to **distribute flexibility perfectly** across the various revenue streams

Re-optimisation in **real-time** based on the latest market data

95% of trades are virtual: generating revenue without degrading the battery

Value trap 1

Costly and poorly executed revenue hedging

Before contracting revenues, understand your true demand and the "cost iceberg"

Carefully assess your fixed revenue demand

? What's the risk of BESS revenues in your portfolio?

BESS and renewables tend to naturally hedge each other (think: days with negative power prices) – check which further risk mitigation is needed

? Which share of revenues really needs to be fixed?

Contracting is not a binary decision as you can tweak the share of contracted revenues granularly – check what's the optimum for your individual business case and investor profile (debt & equity!)

Be mindful of the fixed revenue "cost iceberg"

Explicit costs

Swapping merchant returns with fixed returns

Implicit costs

Lack of performance in daily optimisation

"Contractual costs" (e.g., penalties for unavailabilities)

Young & dynamic market environment paired with under-estimation of BESS-inherent "option value"



If you need contracted revenues on your project, make sure you select players according to their strengths

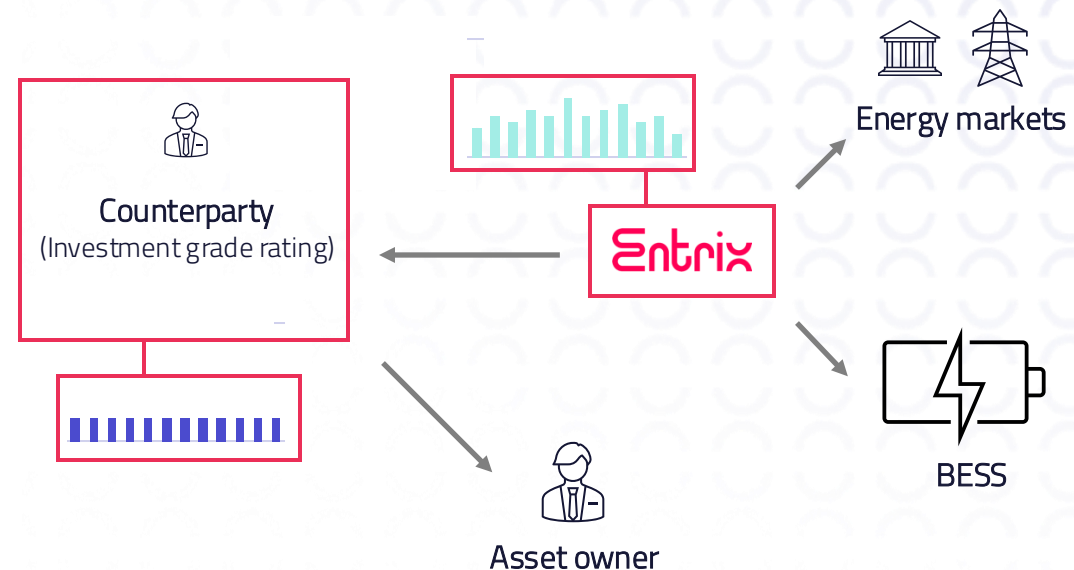
“Strength-based” revenue contracting

Offering contracted revenues requires two distinct competencies:

- 1) Being able to price flexibility **long-term** and having the balance sheet to back this up
- 2) Being able to capture the maximum value of BESS in the **day-to-day**

Our suggestion: work with a combination of (i) counterparty backing revenues and (ii) flex optimizer – ideally in a purely financial setup

→ Both players act according to their strengths & financial setups allow for great flexibility



Value trap 2
Signing up for revenue-eroding grid constraint setups

Grid constraints are the new normal – however, there is no “normal” setup yet



Number of non-firm grid connections is increasing

Grid operators cannot assess impact of BESS on their grids yet and are trying to minimise adverse effects through restricted grid permits



Broad range of constraints is emerging

Constraints vary widely in nature, including their scope, timing, notification procedures, and technical interfaces



As a result, BESS revenue can drop substantially

If not addressed proactively, these constraints can significantly affect large parts of the revenue stack

Exemplary grid constraints

- Restriction of allowed feed-in
- Restriction of allowed charging
- Adjustment of ramp-rates
- Prevention of ancillary services
- “Lead time” restrictions (i.e., communication of constraint and/or dispatch schedule)



To minimise the impact on revenues, dynamic constraints with an automated interface are highly preferred over static constraints

Understand the grid operator's pain point

"Drastic" constraints are often easy to implement but come with high collateral damage. Understand what the grid operator really wants to protect themselves against (e.g., load, generation, predictability, n-1). Try to find out how BESS might be able to help grid operator

In principle, protect the full revenue stack

Maintain ability to use flexibility in all ancillary services, charging from grid, & discharging into the grid – and then agree to exceptions

Prefer dynamic & event-based constraints over static constraints

Avoid constraints like "no feed-in between 8am and 4pm" but instead opt for "no feed in during peak PV generation" – you want to know the constraint approx. 2 days in advance

Leverage technology (of your optimiser)

We implement grid constraints in our solution, e.g., through direct communication channels with grid operators. This can be complex but likely protects a lot of value and possibly is the requirement for a project becoming viable at all

Potential benefits of "getting it right"

Financially

Significantly reduced costs of grid connection

Limited BESS revenue reduction (e.g., ca. 10% for avoiding PV congestion)

Systemically

Increased local value of BESS → increase in BESS acceptance by grid operators & more efficient and effective energy transition

We're here to capture the full value of flexibility together with you!

Get in touch



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