Enscryb

A Nokia Venture

Investment Ready BESS Through Digital Twin Simulation

Project with Smartecon

smartecon

PROJECT OVERVIEW

Customer Profile

Company: Smartecon - Engineering, Procurement, Construction (EPC) provider focused on solar PV and battery energy storage systems (BESS) for utility-scale customers and projects in Estonia, Latvia and Lithuania.

Scope: 10 projects/year, ~10–20+ GWh/yr delivered

Strategic trajectory: Expanding into grid-scale storage and advanced flexibility services in the Baltics.

Project Overview

Market & Asset Inputs

Collect and validate the inputs required for credible modeling: asset data, market data, and operational/contract assumptions.

Guided Simulations

Build single-site BESS (and hybrid) business cases with techno-economic digital-twin to validate sizing, dispatch, value-stacking, and ROI.

Strategies for Customers

Provide scenario results into strategies for Smartecon customer-facing solutions.

MARKET DYNAMICS

Background

The Baltic power system is evolving rapidly: rising variable renewables, tighter Continental Europe Nordic interconnection, asymmetric national resource mixes, and BESS lifecycle realities all shape economics and risk. Understanding these dynamics in high granularity and across borders is essential to size assets correctly, choose market services, and build investor-credible cases.

Market Dynamics

High reliance on variable renewables
Rapid wind & solar growth increases net-load volatility, steep ramp requirements, and the frequency of reserve calls, while elevating risks of curtailment and price cannibalization during high-generation periods.

Interconnected CE - Nordic Flows
Cross-border price formation is driven by regional supply & demand, high-voltage direct current & available transfer capacity constraints, and shifting liquidity across day ahead and intraday markets and reserves. As a result, spreads can invert, value can shift from energy to reserves, and margins can compress when interconnector availability changes.

Varied resource mix across countries
Though a single control area, the three Baltic countries have different primary resources - Latvia has more hydropower, Lithuania has more solar, and Estonia remains more reliant on oil shale and biomass. This varied resource mix, alongside their different investment incentives, adds complexity to a regional analysis.

BESS technology limits and lifecycle costs
Battery storage has a limited lifespan and capacity, and its performance degrades over time. Large-scale projects need to account for this degradation and factor in the cost of maintenance or replacement to accurately assess their long-term economic viability.

CHALLENGES

Market Drivers & Timing

In February 2025, the Baltic states shifted grid stabilization from the Russian/Belarus control area to Continental Europe (CE).

Operating in sync with CE lets the Baltics manage frequency and balancing locally while accessing a broader set of ancillary services - frequency containment reserve (FCR) and frequency restoration reserve (FRR: automatic aFRR, manual mFRR). This shift strengthens reliability and reduces geopolitical risk.

Beyond rising ancillary-service demand, higher European market volatility increases price-arbitrage potential. Cross-border flows also let the Baltics leverage neighboring surplus electricity.

Security-of-supply concerns persist due to limited FCR/FRR capability (e.g., slow-ramping legacy assets) and constrained high-voltage direct current (HVDC) interconnectors.

As a result, interest in grid-scale storage is strong, but prospective FCR/FRR investors still require bankable, long-term business cases validated under CE assumptions.

Challenges

Estimating the benefits of grid storage in the Baltics is difficult given the lack of any history, region's unique market, regulatory, technical, and economic complexities. The energy system is in rapid transition - creating uncertainties that hinder reliable modeling and long-term forecasting.
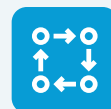
Market and regulatory uncertainties

Evolving market dynamics

Uncertain revenue streams

Speed of market saturation

THE APPROACH

Multi-Stage Market Modeling

We selected a multi-stage approach to mirror real market mechanisms and timelines - rather than "one-shot" modeling.

Each scenario is run as a waterfall of three linked simulations that build on each other's commitments. This yields an integrated value stack - Wholesale Energy (day ahead and intra day) + Frequency Regulation Reserves (capacity & activation) and a transparent trace from commitments to activation.

## Scenario Portfolio Over Long-Range Curves

Given the newness of the market, Smartecon did not want to invest in long range price forecasts. Instead, we created scenario pathways informed by analogous EU markets with different maturity levels (e.g., Sweden, Germany) using 15-minute, multi-year histories to bracket a worst ↔ best sensitivity range. For each pathway, we ran scenario versions (A–D) that vary key drivers. This approach replaces a single, brittle forecast with decision-useful ranges.
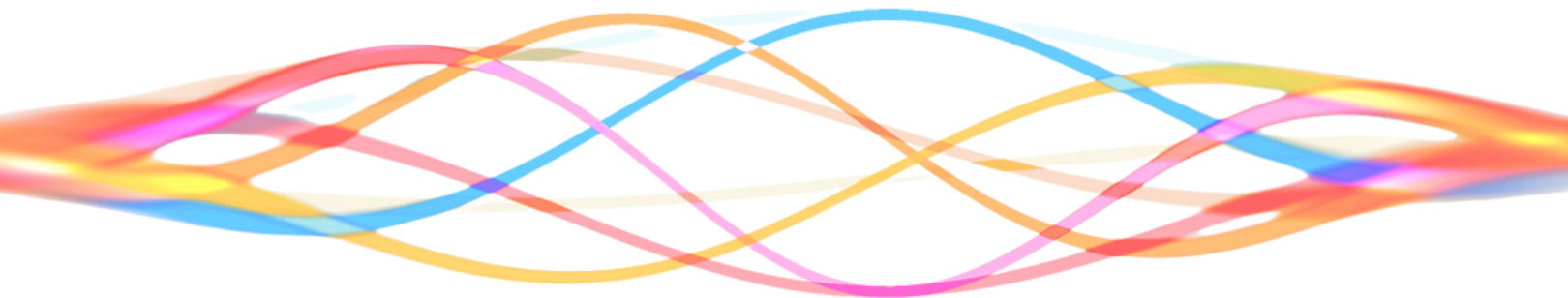
THE APPROACH

## Low-Barrier, Guided Simulations with Enscryb Simulator

Smartecon used the Enscryb Simulator to run battery and hybrid-park scenarios under the modeling approaches listed on the previous page, forecasting revenue streams and net-load costs across the complete value stack: day-ahead (DA), intraday (ID), frequency containment reserve (FCR), frequency restoration reserve (FRR: automatic aFRR, manual mFRR), capacity reserves & activation, and long-term contracts at 15-minute granularity over multi-year horizons. For this complex, market-coupled use case, simulations were guided: Enscryb facilitated modeling choices, highlighted limitations, and ensured the setup reflected market rules and physical constraints.
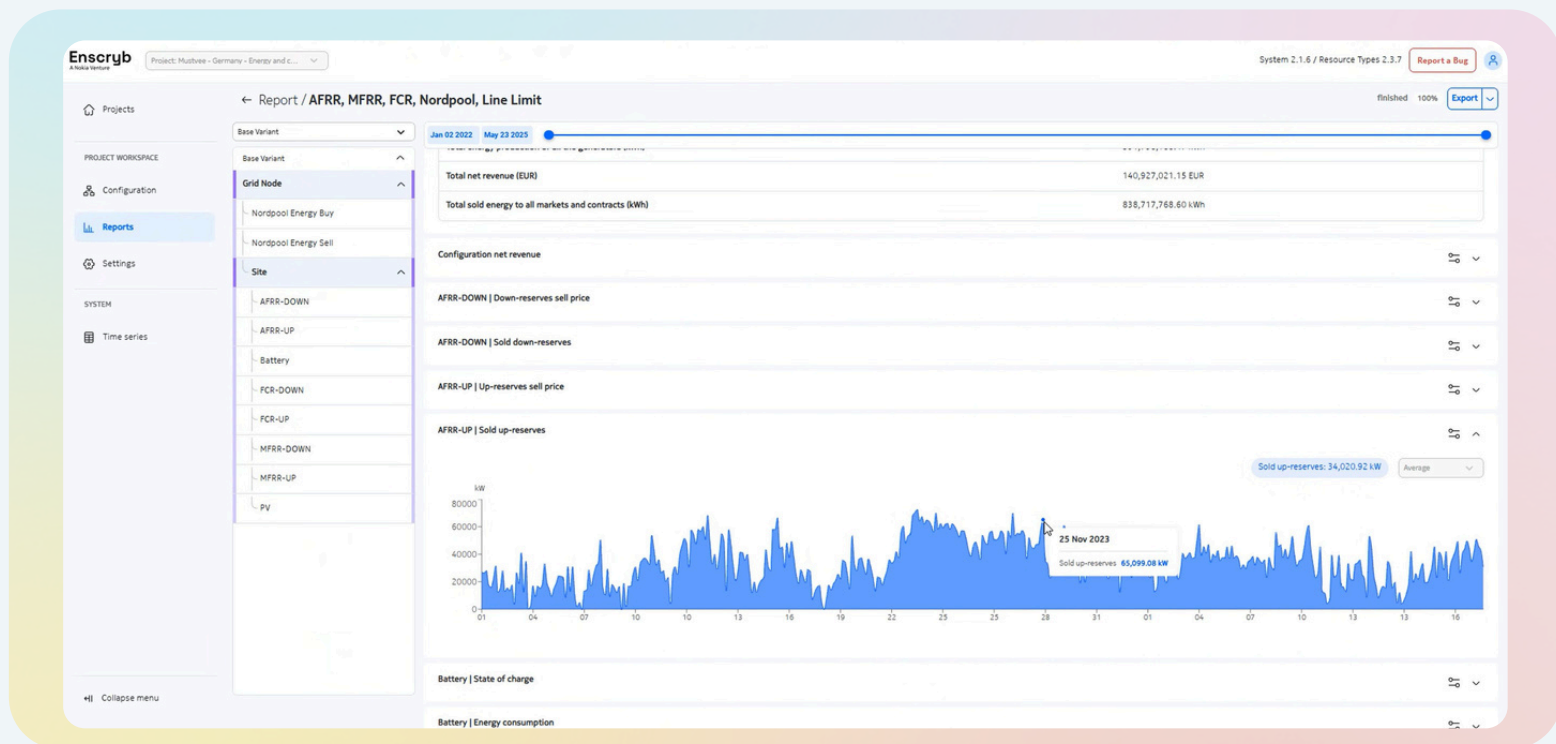
THE SIMULATION

The Three Phased Scenario

- **Step 1 -** Day-Ahead (DA) & Reserve Capacity: Optimize DA energy position and capacity bids (FCR/aFRR/mFRR) under portfolio constraints.

- **Step 2 -** Intraday (ID) Re-optimization: Adjust around Step-1 commitments to capture ID opportunities while honoring SoC/ramp feasibility.

- **Step 3 -** Balancing Activation (aFRR/mFRR): Add activation behavior and economics consistent with reserved capacity; quantify incremental revenue and operational impacts.
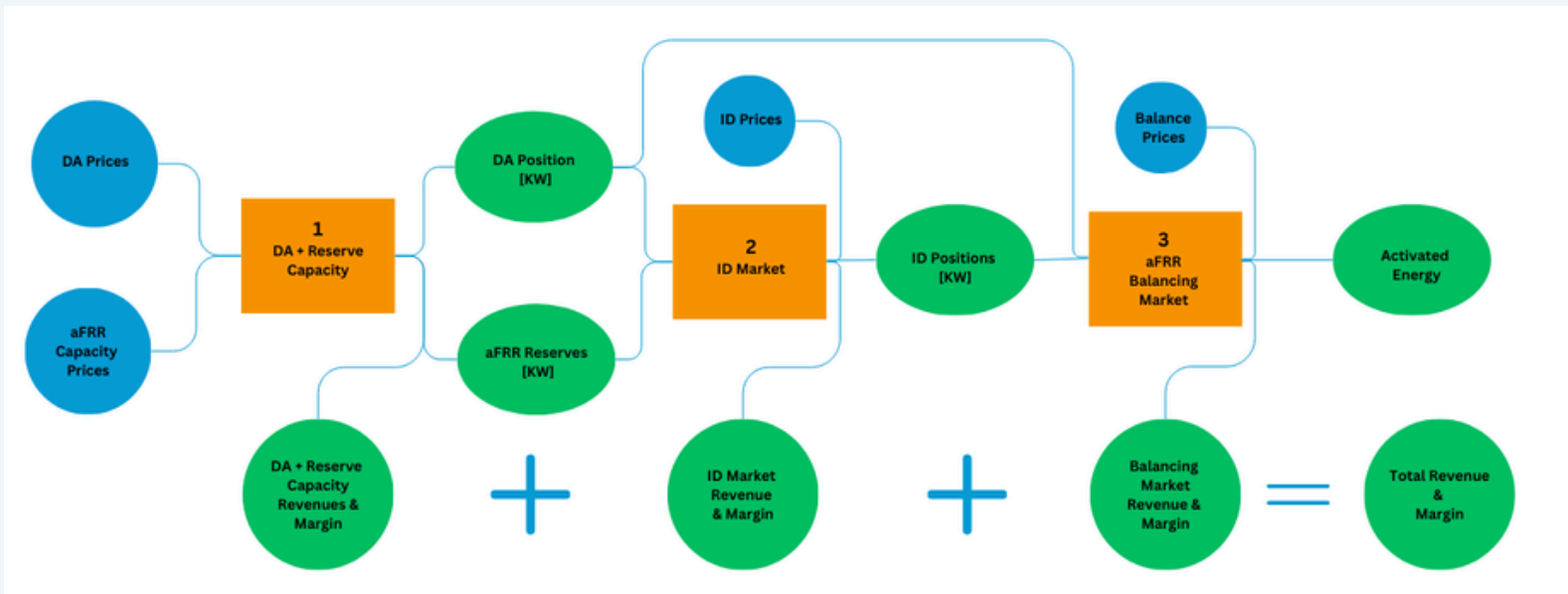
RESULTS

Key Outcomes

- **Transparent, drill-down data:** Multi-year, 15-minute simulations produced auditable CSV exports and summary KPIs - stack revenues, net-load costs, state of charge (SoC)/cycles - enabling expert review of consistency and assumptions.

- **Event-level insight:** Teams could zoom in/out to see which events (price spikes, liquidity changes, interconnector limits) drove outcomes and how operational adjustments (SoC windows, reserve split, ID hedges) shifted the value stack.

- **Rapid iteration:** Scenario re-runs (e.g., ±15% liquidity, line-limit changes, unit availability) required minimal effort, supporting fast comparisons across A–D variants.

Customer Feedback

"Working with Enscryb helped us understand how BESS can participate in the new Baltic market design and gave our clients more confidence in their investment decisions."

Real-time simulations of energy systems – from grid to meter

Accurate Revenue forecasting for storage and hybrid systems

- **The simulations demonstrated** where BESS investments are best positioned under current Baltic conditions. However, given today's unsaturated markets, a prolonged program was not necessary to confirm near-term viability. BESS projects are likely to achieve positive investment outcomes at present penetration levels. As the region matures and begins to resemble more saturated European markets, this scenario-based modeling will become increasingly valuable for optimizing dispatch policies, sizing, and portfolio strategy. We also note that energy-crisis dynamics and the Ukraine war created price outliers in historical data.

ENSCRYB

Enscryb Solutions

Enscryb helps BESS developers and operators move from uncertainty to action. We **Simulate techno-economic scenarios** to build bankable cases, **Validate sizing and dispatch** policies with transparent KPIs, **Execute** aligned deployment plans across markets and IT/OT, and **Orchestrate portfolios** as price signals and grid conditions evolve. The result is faster decisions, resilient revenues, and a repeatable path to scale.

Unlocking the Power of Flexibility Together!

Are you ready to scale? Contact us to schedule a demo today .

Contact:

Sales Rep info

Enscryb.Energy

https://www.linkedin.com/company/enscryb/