BESS
Where Grid Integration Meets Commercial Value

USI–SELA Conference · Panel III — Battery Storage, Flexibility and Energy Infrastructure

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Presenter
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The DSO perspective

Distribution System Operator (DSO)
Safe and efficient operation of the grid

Utility / Investor
BESS as an economic opportunity for the company

Having two perspectives in the same company. We experience the market versus network conflict from the inside.

4’200 MWh	Planned front-of-the-meter storage systems capacity by 2030 (≥135 MWh already in operation)
~1’500 MWh	Behind-the-meter storage systems installed in Switzerland by the end of 2025
7 out of 9	Swiss DSOs where pending BESS connection requests already exceed 10% of coincident grid load

For a DSO, the interesting question is not whether batteries are useful. They are.
The real issue is under what operating conditions they are valuable to the grid.

Where commercial value comes from

Market

Energy arbitrage

Ancillary services

Frequency control, synthetic inertia, voltage support

Grid

Peak shaving, Congestion management

End-users

PV self-consumption, Load shifting

The key to **value** lies in **stacking**: using the same battery for multiple services. But…

Nominal capacity ≠ commercial capacity

A balancing service provider allocates 20%–35% of its capacity to SoC correction: only 65%–80% is available for sale.

(VSE simulation, Swissgrid data 2024–25)

AEM R&D analysis conducted in January 2026 (5 MW / 5 MWh battery, 2022–2025 prices): *the value currently lies in balancing (PRL/SRL) and varies by season. Spot arbitrage is not yet competitive, while peak shaving is heavily dependent on the grid level and the connection point.*

The value is not a characteristic of the battery: it depends on the market, the season and where it is connected.

One battery, two faces

Market signal

- Low / Negative prices → Charge
- High prices → Discharge
- Balancing request → Rapid response
- Aggregator → Portfolio optimization

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Grid signal

- PV surplus → Charge
- Local peak load → Discharge
- Overloaded transformer → Do not increase the flow
- Grid constraint → Actions based on the location

The same battery can erase a peak or create a new one

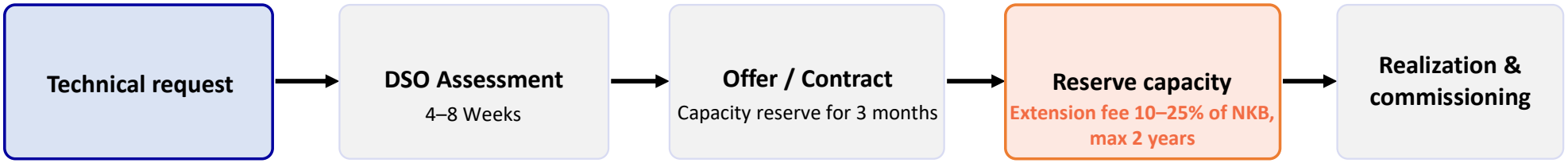
VSE risk: synchronized charging and discharging of **entire fleets**, driven by the same prices or signals from aggregators → new collective peaks.

Market optimum ≠ Grid optimum ⇨ **Main key elements**

Connection procedure	Grid costs	Flexibility mgmt.

Connection: MW/MWh are not enough

Connection capacity is becoming a scarce resource even at distribution level.
The VSE whitepaper, which is currently under consultation, proposes the following recommendation process that filters serious projects from speculative ones:



It starts with the technical request: four things the DSO must know

Power

Maximum input and output (MW), inverter power (MVA)

Energy

Capacity (MWh), charge/recharge management

Behavior

Operating modes, markets and projected SDLs

Control

Remote control, P/Q control, fail-safe behavior

“20 MW / 40 MWh” does not tell me when, how quickly and using which algorithm the battery will switch from +20 to −20 MW.

Who cover the costs for grid reinforcement?

Art. 16 par. 3 StromVV (OAEl) - From 1/1/2025

The rule: If connecting or operating a pure storage facility creates disproportionate extra costs for the grid, these are not part of the network costs. The storage operator must cover an appropriate share of them (principle of causality). (3)

What is still unclear: When does a cost count as "disproportionate"? Should it be assessed case by case, given that the NNMV* prohibits flat-rate charges? And how does this federal rule interact with cantonal law on connection costs? (1)(3)

On the other side: since 2026, pure storage (reine speicher) facilities pay no grid usage fee, and they contribute little to financing of the grid they rely on. (3)

**Netznutzungsmodell für das schweizerische Verteilnetz*

PROPOSED REFERENCE THRESHOLD (VSE)

59 CHF/kW

Grid reinforcement parameter for Distributed Energy Resources (DERs) by analogy with Art. 13e(2) of the StromVV - OAEl (VSE proposal)

Below the threshold → Grid tariffs

Above the threshold → Asset owner (excess)

Should the grid community finance reinforcement created by a merchant BESS?

Flexibility rather than oversizing the network

NOVA Principle: Optimisation → Reinforcement → Expansion
Economic efficiency takes precedence over expansion.

The DSO's toolbox when the grid cannot always handle full power (VSE whitepaper):

1 Grid expansion
Standard approach expensive and slow

2 Permanent contractual limit
With compensation, on injection and/or withdrawal

3 Temporary limit
Until the reinforcement work is completed

4 Guaranteed flexibility & Curtailment
As presented inside Art. 19c StromVV (OAEI)

Yesterday: fixed grid connection capacity

Tomorrow: limits that adapt to actual grid conditions

Conflicting commands?
The safe operation of the local grid is a priority (VSE 8.1.6 (1))

How to bring investors and DSOs together

The starting point (Art. 17c StromVG) is that flexibility belongs to the asset owner. The DSO must enter into a contract with them on non-discriminatory terms and pay the service, except in the case of a narrow-guaranteed use reserved for grid security.

Convergence areas

1. **Information** → Transparency on grid status and available connection capacity
2. **Market signal** → Dynamic and other tariff schemes, grid-fee exemption for pure storage
3. **Contractual flexibility** → The DSO buys peak shaving, congestion relief and investment deferral
4. **Guaranteed use / Direct control** → Grid security only, within legal limits (Art. 19c StromVV)

EXAMPLE
Small flexibility, big savings

3%→30%

Renouncing just 3% of annual PV feed-in saves grid users ~30% of distribution grid expansion costs.

That 3% is exactly where the law drew the guaranteed-use line. Beyond it, flexibility is contracted and paid: that's the investor's business case.
(BFE Verteilnetzstudie 2022; BKW 2023)

"The winning BESS business models will be those that monetise flexibility without externalising grid constraints."

Key takeaways

1. **BESS are not necessarily grid-friendly**
   They only become so with the grid connection, operational strategy and constraints.

2. **Connection capacity is becoming a scarce resource**
   We need credible plans, clear rules, measures to prevent speculation, and clarity on who will pay for the reinforcements.

3. **The future is coordinated flexibility, not just larger grids.**
   Market and grid convergence is essential: Swissgrid's national TDC platform is already on the agenda. (7)

BESS can provide flexibility to the power system, but the distribution grid remains the physical reality within which that flexibility is exercised.

Thank you for your attention

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Resources

1. *VSE Whitepaper Grossspeicher (under consultation)*
2. *VSE Handbuch Speicher HBSP-CH 2025*
3. *Swiss Electricity Act framework (Mantelerlass): StromVG Art. 14a, 17c · StromVV Art. 13e, 16 para. 3, 19c · NNMV-CH (2026)*
4. *Batteriemonitor Swissolar 2026": https://www.swissolar.ch/de/markt-und-politik/markt-schweiz/batteriebericht*
5. *Flatt M., Widmer A. (2026), Der Anschluss von Grossbatteriespeichern stellt Schweizer Verteilnetzbetreiber vor Herausforderungen, EVU Partners AG, 16 giugno 2026 — evupartners.ch*
6. *Fuchs A., Evrenosoglu C.Y. (2026), Was bringen Batteriespeicher für das Verteilnetz?, Bulletin Electrosuisse*
7. *FEN, ETH Zürich (2022), TSO-DSO Flexibility: towards integrated grid control and coordination in Switzerland*
8. *AEM R&D internal analysis (Value staking for BESS, gen. 2026)*
9. *BFE / UFE (2022), BFE-Verteilnetzstudie — Auswirkungen einer starken Elektrifizierung und eines massiven Ausbaus der Stromproduktion aus erneuerbaren Energien auf die Schweizer Verteilnetze, Consentec GmbH & Polynomics im Auftrag des Bundesamts für Energie, Bericht vom 10. November 2022.*
10. BKW (2023), *Auswirkungen der Energiewende auf die Schweizer Verteilnetze*, Netzstudie/Broschüre.