Photon Energy

July–September 2025

BESS Quarterly Financial Analysis

Breaking down revenue potential in the Czech Republic, Hungary, Poland and Romania

What's inside?

Breakdown of income sources, including DAM and aFRR

Operational strategies to maximise profitability

Comparison of results from the previous quarter

Contents

Executive summary

Battery energy storage systems (BESS) in Central and Eastern Europe delivered steady financial returns in Q3 2025, with Poland and Romania emerging as key performers, particularly for longer-duration systems.

Highlights

Czech Republic

Up to **€14,266** per month for 1 MWh systems

Up to **€18,548** per month for 2 MWh systems

The Czech Republic showed drop in returns across both durations, though revenue remains highly dependent on aFRR Down reservation and aFRR Up reservation. While DAM revenue is more important than before, combining it with ancillary services remains essential for maximising returns.

Poland

Up to **€33,436** per month for 1 MWh systems

Up to **€44,731** per month for 2 MWh systems

Poland remains the most lucrative market overall, with revenue almost two times higher, driven primarily by aFRR Up reservation. Larger systems continue to see outsized gains thanks to added flexibility and Capacity Market participation.

Romania

Up to **€12,856** per month for 1 MWh systems

Up to **€18,510** per month for 2 MWh systems

Romania performs well across both DAM and aFRR services, offering a balanced revenue stream. Value from longer-duration systems has appeared to plateau, with marginal gains primarily from aFRR Down activation and DAM arbitrage.

Hungary

Up to **€8,393** per month for 1 MWh systems

Up to **€12,606** per month for 2 MWh systems

In Hungary, DAM arbitrage provides the greatest income potential. Total revenues improve significantly when optimising across all services. The transition from 1 MWh to 2 MWh systems offers substantial upside, highlighting the importance of storage duration.

Takeaways

- Combining day-ahead market (DAM) arbitrage with automatic frequency restoration reserves (aFRR) continues to be a more profitable strategy than relying solely upon DAM arbitrage, especially in Poland, Romania and the Czech Republic
- Battery duration plays a crucial role in unlocking full market potential

Looking ahead

As market revenues become increasingly tied to aFRR services and duration flexibility, battery sizing and strategic market selection are more important than ever.

Developers and operators looking to maximise ROI must continue to focus on multi-service optimisation and the operational advantages of longer-duration systems.

Get projected revenues for your BESS or hybrid project

Our team can model revenues for all storage and hybrid systems based on location, size and setup.

photonenergy.com/bess

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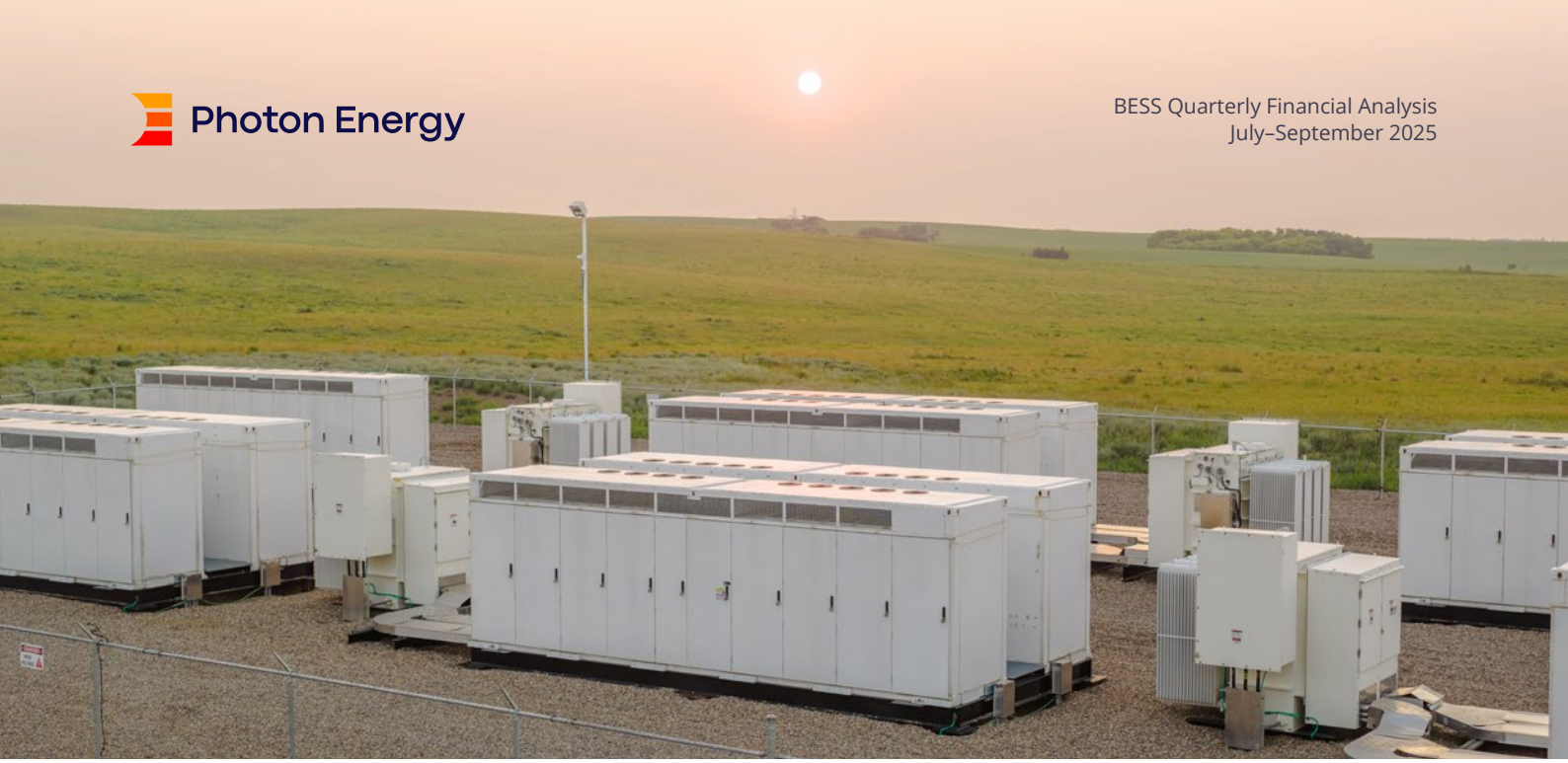


Introduction

This quarterly report evaluates the financial performance of standalone 1 MW/1 MWh and 1 MW/2 MWh battery energy storage systems (BESS) in four key Central and Eastern European markets: Czech Republic, Poland, Romania, and Hungary.

We consider two main revenue streams:

- **Day-ahead market (DAM)** arbitrage
- **Automatic frequency restoration reserves (aFRR)** – including reservation and activation (Up and Down)

Methodology

All revenue figures are calculated using an advanced optimisation tool that assumes ideal hourly operation. This allows us to simulate how a battery system could perform in each market under realistic conditions, using real market pricing from July to September 2025.

Assumptions

Roundtrip efficiency:	**94%** (charging and discharging 97% each)
Battery availability:	**96%**
Max cycles/day:	**2**
Operational window:	**0–80% state of charge** (to prevent degradation)
Forecasting noise:	**5%**

This analysis provides storage developers, operators, and investors with a benchmark for potential returns in Q3 2025, and a strategic snapshot of where opportunities are growing.

Monthly average revenues

The tables below compare the average monthly revenues for standalone **1 MW / 1 MWh** and **1 MW / 2 MWh** BESS units across four Central and Eastern European markets. Results are broken down by revenue from **day-ahead market** (DAM) arbitrage alone and revenue from **all-market optimisation** (DAM + aFRR services).

All figures represent simulated earnings under optimal hourly operation between July and September 2025, based on typical system availability, roundtrip efficiency, and operating assumptions, country and market specification.

Monthly average revenue per 1 MW / 1 MWh standalone battery (EUR/MW)

	DAM	DAM + aFRR					
	Total	aFRR				DAM	Total
		aFRR Up		aFRR Down			
		Reservation	Activation*	Reservation	Activation*		
CZ	3,948	5,172	327	4,016	2,328	2,423	14,265
PL	4,124	16,721	600	11,089	1,622	3,405	33,436
RO	4,843	1,422	1,919	1,908	3,767	3,840	12,857
HU	4,704	597	2,463	406	1,612	3,315	8,393

Monthly average revenue per 1 MW / 2 MWh standalone battery (EUR/MW)

	DAM	DAM + aFRR					
	Total	aFRR				DAM	Total
		aFRR Up		aFRR Down			
		Reservation	Activation*	Reservation	Activation*		
CZ	7,092	6,793	263	4,647	1,761	5,084	18,548
PL	7,349	20,730	684	14,944	2,340	6,034	44,732
RO	9,055	1,777	2,691	2,266	4,148	7,628	18,510
HU	8,775	757	2,907	526	1,755	6,662	12,607

**Note: The activation portion of income includes the cost of recharging the battery after aFRR Up activation, and the revenue earned from discharging after aFRR Down activation.*

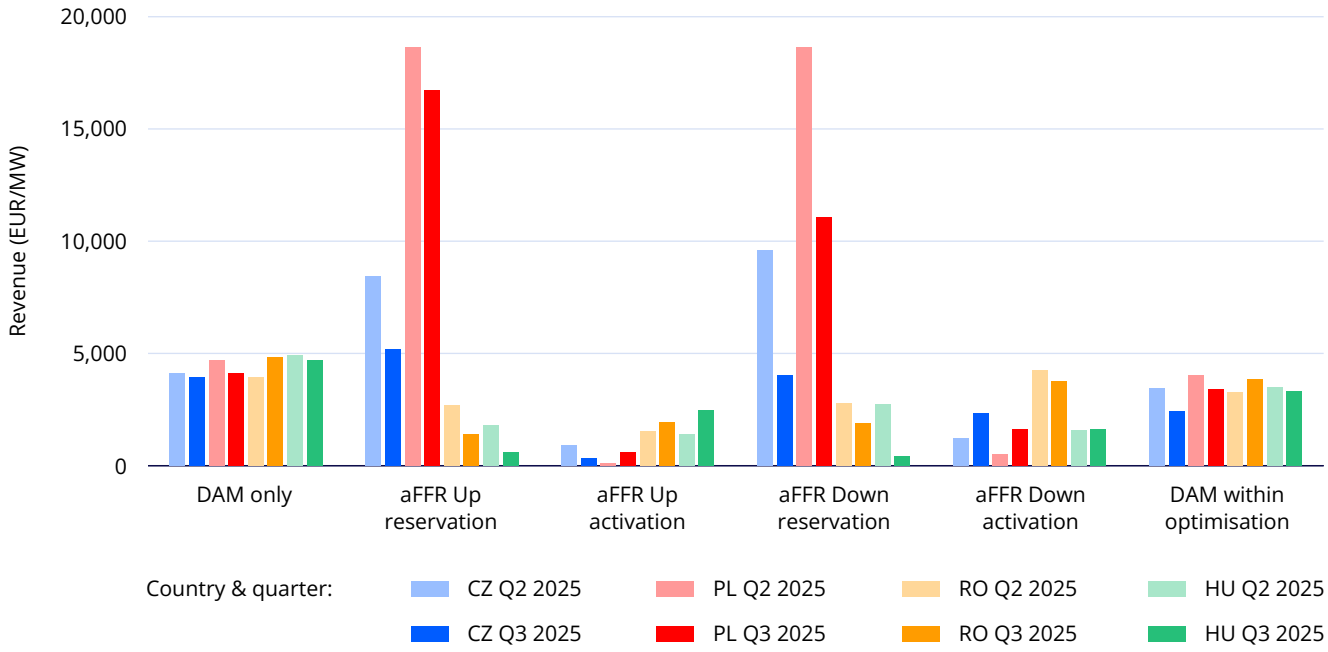
Additional income in Poland

The Polish Capacity Market provides extra revenue that's not reflected in the tables above.
See **Country insights: Poland** for details.

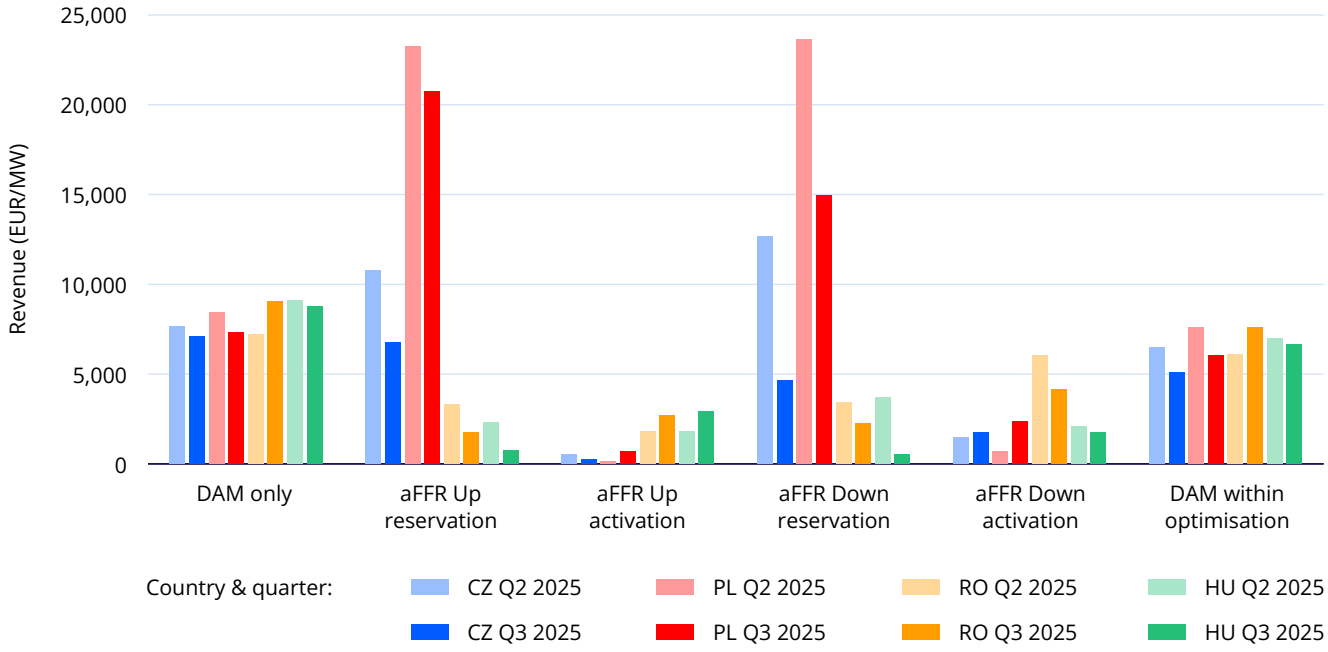
Quarter-on-quarter comparison

The third quarter of 2025 saw a strong rebound in revenue potential for standalone BESS across Central and Eastern Europe. All the reviewed markets reported lower total earnings than in Q2, with the exception of Romania, participating only in DAM, with especially significant gains seen for systems operating with longer durations and full market optimisation.

Monthly average revenue for July–September 2025 1 MW / 1 MWh standalone battery compared to previous quarter



Monthly average revenue for July–September 2025 1 MW / 2 MWh standalone battery compared to previous quarter



Quarter-on-quarter comparison

Key observations

Czech Republic

In the Czech Republic, 1 MWh systems saw a 40% decrease in revenue, going from €23,658 in Q2 to €14,266 in Q3. Larger 2 MWh systems performed even worse, with total monthly revenue decreasing by 41% to €18,548.

This market continues to depend heavily on aFRR Up and Down reservation, and longer-duration systems are clearly better equipped to capture that value.

Poland

Poland maintained its position as the most profitable market overall. Revenue for 1 MWh systems decreased by 20% to €33,436, while 2 MWh systems decreased by 19% to €44,731.

Still, the steady returns reflect consistent demand for aFRR services and ongoing support from the Capacity Market, both of which reward systems with multi-hour flexibility.

Romania

Romania showed a more modest decrease. Revenue declined by 11% for 1 MWh systems to €12,856, and just 11% for 2 MWh systems to €18,511.

While gains were limited, they suggest a stable and balanced market, with incremental improvements rather than sharp swings.

Hungary

In Hungary, revenues fell for both system types: down 24% for 1 MWh batteries (to €8,393) and 26% for 2 MWh systems (to €12,607).

Hungary remains the least lucrative of the four markets in absolute terms.

What this means

The third quarter highlighted the resilience of multi-service strategies and the growing advantage of longer-duration batteries. Key takeaways include:

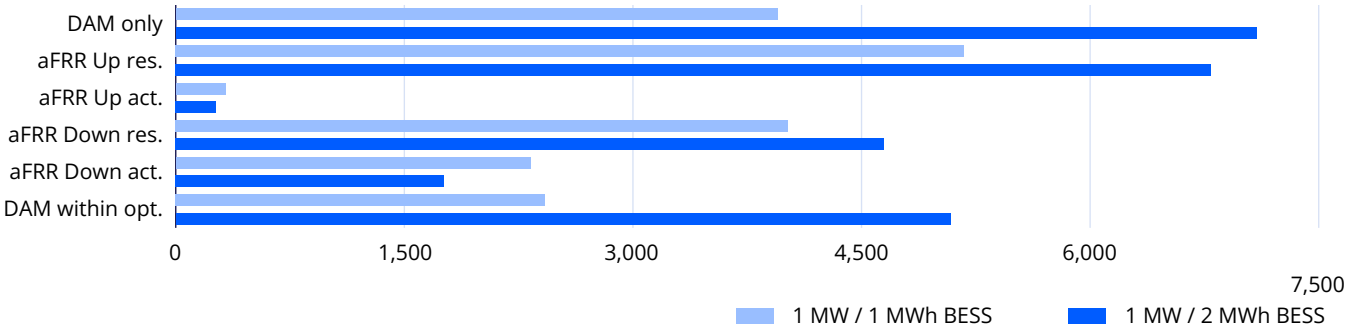
- **The decreasing revenue gap** between 1 MWh and 2 MWh systems across all markets
- **The continued value of aFRR optimisation,** particularly in Poland and the Czech Republic
- **The importance of flexibility** and sustained performance in volatile markets like Hungary

These results underline the strategic advantage of advanced modelling, operational versatility, and market selection in maximising BESS investment returns.

Country insights: Czech Republic

In Q3 2025, 1 MW / 2 MWh BESS units in the Czech Republic earned up to **€18,548 per month,** with nearly all revenue coming from **aFRR services,** particularly **Up and Down reservation.** This marks a significant worsening over Q2 results.

Monthly average revenue (EUR/MW)



Quarterly trend

Compared to Q2, revenue for 1 MWh systems fell by 40%, going from €23,658 to €14,266. For 2 MWh systems, revenue increased by 63%, reaching €31,896. This decrease is the highest in all of the markets analysed in this report. The gains were primarily driven by a strong rebound in aFRR Up and Down reservation prices, which remains the dominant income stream in the Czech market. DAM revenue also dropped slightly quarter-over-quarter but continues to contribute only a minor share of total earnings.

1 MW / 1 MWh BESS (EUR/MW)

	Q2 2025	Q3 2025	
DAM only	4,126	**3,948**	↘ -4.3%
aFRR Up res.	8,442	**5,172**	↘ -38.7%
aFRR Up act.	930	**327**	↘ -64.9%
aFRR Down res.	9,589	**4,016**	↘ -58.1%
aFRR Down act.	1,237	**2,328**	↗ 88.2%
DAM within opt.	3,459	**2,423**	↘ -30.0%

1 MW / 2 MWh BESS (EUR/MW)

	Q2 2025	Q3 2025	
DAM only	7,657	**7,092**	↘ -7.4%
aFRR Up res.	10,748	**6,793**	↘ -36.8%
aFRR Up act.	523	**263**	↘ -49.7%
aFRR Down res.	12,654	**4,647**	↘ -63.3%
aFRR Down act.	1,466	**1,761**	↗ 20.1%
DAM within opt.	6,507	**5,084**	↘ -21.9%

Strategic implications

- The Czech Republic is not offering such concentrated value through aFRR Up and Down reservation, with larger batteries better positioned to capture income
- 2-hour systems slightly outperform 1-hour systems, emphasising the importance of duration and dispatchability
- Operators should focus on availability, efficiency, and bidding strategy to consistently secure aFRR revenues
- The narrow income profile highlights the need for close monitoring of auction dynamics and price signals

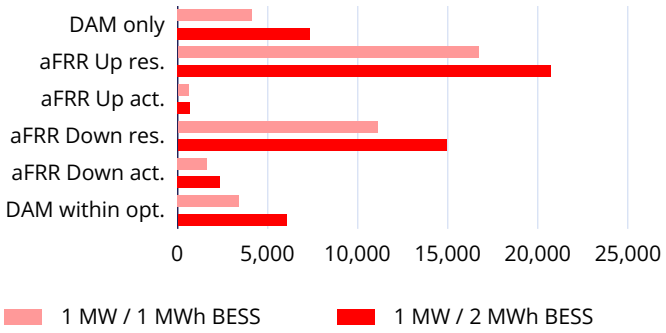
Takeaways

- A strong market for aFRR-focused strategies, particularly for well-optimised 2 MWh systems
- Limited revenue diversification makes this market less suitable for entry-level operators or generic arbitrage models
- Success depends on reliability, foresight, and a deep understanding of the aFRR market
- Best suited for experienced operators who can manage risk and deliver high availability during critical periods

Country insights: Poland

In Q3 2025, 1 MW / 2 MWh BESS units in Poland generated up to **€44,732 per month,** maintaining Poland's status as the most profitable market for long-duration battery systems. Revenue was driven primarily by strong participation in the **aFRR Up and Down reservation** market, supported by stable **DAM** income and added earnings from the **Capacity Market.**

Monthly average revenue (EUR/MW)



The Capacity Market

Poland is the only market in this analysis offering additional income from the Capacity Market, with up to **€997/month** for 1 MWh systems and **€1,995/month** for 2 MWh systems in Q3 2025.

This boosts total returns and reinforces Poland's position as the most lucrative market for battery storage.

Quarterly trend

Compared to Q2, revenues dropped by 20% for 1 MWh systems (from €41,985 to €33,436) and by 19% for 2 MWh systems (from €55,319 to €44,731). These decreases reflect continued strength in aFRR Up reservation and a rising contribution from aFRR Down reservation in Q3 as the main income stream, despite some moderation in price levels. DAM revenues decreased slightly, while the additional support from the Capacity Market provided a reliable cushion against market variability.

1 MW / 1 MWh BESS (EUR/MW)

	Q2 2025	Q3 2025	
DAM only	4,701	**4,124**	↘ -12.3%
aFRR Up res.	18,652	**16,721**	↘ -10.4%
aFRR Up act.	124	**600**	↗ 383.2%
aFRR Down res.	18,659	**11,089**	↘ -40.6%
aFRR Down act.	516	**1,622**	↗ 214.1%
DAM within opt.	4,034	**3,405**	↘ -15.6%

1 MW / 2 MWh BESS (EUR/MW)

	Q2 2025	Q3 2025	
DAM only	8,443	**7,349**	↘ -13.0%
aFRR Up res.	23,224	**20,730**	↘ -10.7%
aFRR Up act.	156	**684**	↗ 339.3%
aFRR Down res.	23,642	**14,944**	↘ -36.8%
aFRR Down act.	695	**2,340**	↗ 236.9%
DAM within opt.	7,603	**6,034**	↘ -20.6%

Strategic implications

- 2-hour systems continue to lead in both absolute revenue and resilience to market changes
- The Capacity Market acts as a revenue stabiliser, making Poland a strong long-term investment environment for BESS projects
- Developers should focus on long-duration, flexible systems that can take advantage of multiple value streams (aFRR, DAM, and capacity)
- Maintaining high availability and fine-tuning market responsiveness is key to sustaining competitive positioning

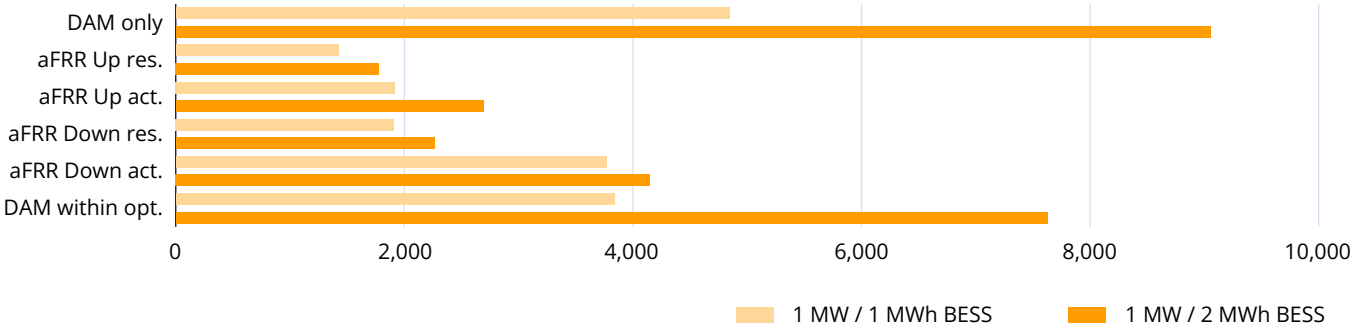
Takeaways

- Despite fluctuations in aFRR prices, Poland remains the top-performing market for battery storage
- The combination of high aFRR returns and Capacity Market participation creates a reliable and scalable revenue model
- Best suited for developers with robust system design and a multi-service optimisation strategy

Country insights: Romania

In Q3 2025, 1 MW / 2 MWh BESS units in Romania earned up to **€18,511 per month,** with revenue coming from a balanced mix of **DAM arbitrage** and **aFRR services,** particularly **Down activation.** While total returns were lower than in Poland or the Czech Republic, Romania remains a strategically valuable market for operators prioritising duration flexibility and diversified income streams.

Monthly average revenue (EUR/MW)



Quarterly trend

Q3 revenues dropped by 11% for 1 MWh systems (from €14,516 to €12,856) and by 11% for 2 MWh systems (from €20,724 to €18,510). While modest, this decrease reflects steady performance across both DAM and aFRR services, with no major shifts in overall market structure. DAM revenues continue to play a central role, complemented by relatively stable aFRR participation, especially in Down activation. The limited growth for 2 MWh systems suggests a possible plateau in incremental gains from longer durations.

1 MW / 1 MWh BESS (EUR/MW)

	Q2 2025	Q3 2025	
DAM only	3,938	**4,843**	↗ 23.0%
aFRR Up res.	2,685	**1,422**	↘ -47.0%
aFRR Up act.	1,528	**1,919**	↗ 25.6%
aFRR Down res.	2,765	**1,908**	↘ -31.0%
aFRR Down act.	4,254	**3,767**	↘ -11.4%
DAM within opt.	3,285	**3,840**	↗ 16.9%

1 MW / 2 MWh BESS (EUR/MW)

	Q2 2025	Q3 2025	
DAM only	7,199	**9,055**	↗ 25.8%
aFRR Up res.	3,338	**1,777**	↘ -46.7%
aFRR Up act.	1,809	**2,691**	↗ 48.7%
aFRR Down res.	3,444	**2,266**	↘ -34.2%
aFRR Down act.	6,027	**4,148**	↘ -31.2%
DAM within opt.	6,106	**7,628**	↗ 24.9%

Strategic implications

- Romania offers a well-balanced revenue profile, drawing from both DAM and ancillary services
- Long-duration batteries are well-positioned to monetise aFRR Down activation and extended DAM opportunities
- While peak earnings are lower than in Poland and slightly lower than in the Czech Republic, risk is reduced due to the lack of reliance on a single income stream
- Operators should prioritise flexibility, availability, and adaptability to shifting service demand

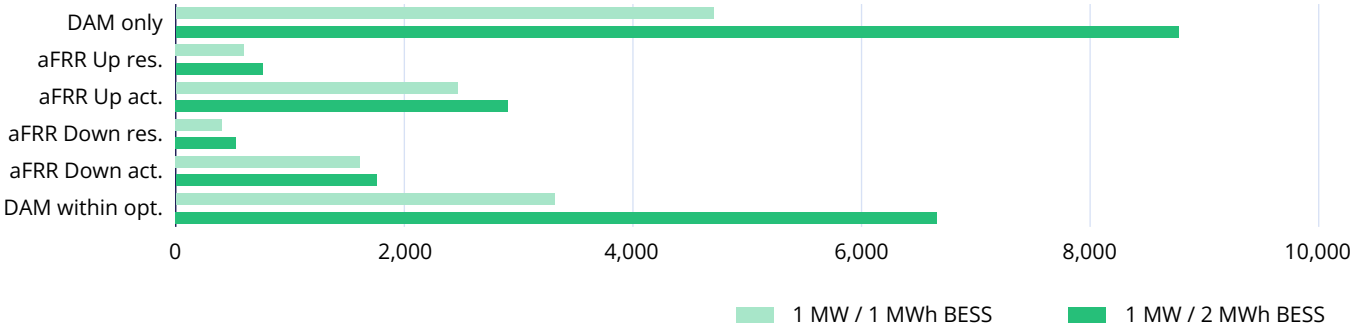
Takeaways

- Romania continues to be a stable and predictable market, particularly attractive for investors seeking steady income and lower volatility
- 2 MWh systems continue to earn more in total
- Best suited for developers and operators with a long-term outlook and a preference for moderate, multi-channel revenue models

Country insights: Hungary

In Q3 2025, 1 MW / 2 MWh BESS units in Hungary generated up to **€12,606 per month,** marking a strong worsening over the previous quarter. Revenue was drawn from a balanced mix of **DAM arbitrage** and **aFRR** services, suggesting that Hungary's market is becoming increasingly favourable to flexible, duration-optimised storage strategies.

Monthly average revenue (EUR/MW)



Quarterly trend

Revenues fell by 26% for 2 MWh systems (from €16,916 to €112,607) and by 24% for 1 MWh systems (from €11,023 to €8,393) compared to Q2. While these increases were smaller in absolute terms than in other countries, they do not highlight a positive trajectory for the Hungarian market, especially given its previously higher baseline. This was supported by modest decreases across all key revenue streams, including DAM participation, aFRR Up reservation and activation.

1 MW / 1 MWh BESS (EUR/MW)

	Q2 2025	Q3 2025	
DAM only	4,928	**4,704**	↘ -4.5%
aFRR Up res.	1,802	**597**	↘ -66.9%
aFRR Up act.	1,406	**2,463**	↗ 75.2%
aFRR Down res.	2,724	**406**	↘ -85.1%
aFRR Down act.	1,593	**1,612**	↗ 1.2%
DAM within opt.	3,498	**3,315**	↘ -5.2%

1 MW / 2 MWh BESS (EUR/MW)

	Q2 2025	Q3 2025	
DAM only	9,080	**8,775**	↘ -3.4%
aFRR Up res.	2,313	**757**	↘ -67.3%
aFRR Up act.	1,815	**2,907**	↗ 60.1%
aFRR Down res.	3,696	**526**	↘ -85.8%
aFRR Down act.	2,103	**1,755**	↘ -16.5%
DAM within opt.	6,989	**6,662**	↘ -4.7%

Strategic implications

- Hungary's balanced income structure makes it suitable for both short- and long-duration systems
- The DAM arbitrage is becoming single dominant revenue stream with almost half of total revenues coming from this service
- Operators should treat Hungary as a complementary market, ideal for portfolio diversification and multi-service optimisation

Takeaways

- Hungary demonstrated consistent quarter-on-quarter decrease in Q3
- The returns remain modest
- This market may be best suited for experienced developers looking to expand regional portfolios and explore underutilised revenue streams

Price report

This section presents pricing data from Q3 2025 across day-ahead and ancillary service markets. These prices form the basis for the revenue modelling presented earlier and help explain changes in financial performance across Central and Eastern Europe.

All prices are reported in **EUR/MWh (or EUR/MW in case of reservation) as monthly averages** and include:

- Day-ahead market (DAM) prices
- aFRR reservation (Up and Down)
- aFRR activation (Up and Down)

Assumptions

The following assumptions apply to price calculations only and reflect the mechanisms and values used in each country.

aFRR ancillary services pricing [1]

Country	Reservation	Activation
CZ	Pay as bid	Marginal price
PL	Marginal price	Marginal price
RO [2]	Marginal price	Marginal price
HU	Pay as bid	Pay as bid

Poland Capacity Market assumptions

Parameter	Value [3]
Correction factor for batteries	95%
Capacity market service	Max 4 hours in row
Capacity market testing	4x per year
Capacity market hours	7–22
Latest available price	210.00 PLN/MW/year

Network tariffs [4]

Country	EUR/MWh
CZ	38
PL	47
RO	21
HU	28

[1] 80% successful auctions for reservation and 50% for activations.

[2] In Romania, ancillary service offers must be symmetrical. Participants must participate in both directions, Up and Down.

[3] These values are valid for 2025. The price reflects the average price from additional auction. System stress events (SSE) not counted, in 2025: 0 hours of SSE in Poland.

[4] This fee is applied whenever a battery is charged from the grid, for the purpose of DAM arbitrage and when recovering from activation Up.

Price report

Market price summary: Q3 2025

This table provides detailed pricing information (in EUR) for different countries and different energy market mechanisms. The table captures a range of statistics for each country, including the **mean**, **minimum**, **maximum**, and **standard deviation**.

Country	Market type	Mean	Min	Max	Std dev
Czech Republic	DAM	86.9	-61.2	465.7	48.0
	aFRR Down reservation	8.2	0.1	77.6	13.3
	aFRR Up reservation	11.9	1.3	81.7	10.5
	aFRR Down activation	33.9	-3,669.0	1,051.7	144.5
	aFRR Up activation	85.6	-2,016.8	2,430.5	106.4
Poland	DAM	102.7	-86.4	445.8	51.4
	aFRR Down reservation	24.8	8.4	158.0	27.7
	aFRR Up reservation	35.9	8.4	321.9	37.1
	aFRR Down activation	59.0	-1,962.5	548.4	109.7
	aFRR Up activation	101.2	-236.5	1,542.9	61.8
Romania	DAM	92.9	-60.6	425.8	57.0
	aFRR Down reservation	7.8	0.2	65.6	10.4
	aFRR Up reservation	6.2	2.7	12.0	1.9
	aFRR Down activation	-25.3	-1,244.8	107.1	172.6
	aFRR Up activation	143.9	0.0	1,307.3	172.0
Hungary	DAM	95.1	-60.6	462.1	56.1
	aFRR Down reservation	0.9	0.0	22.3	1.7
	aFRR Up reservation	1.6	0.0	43.4	3.6
	aFRR Down activation	-5.9	-744.6	78.2	39.1
	aFRR Up activation	116.7	-7,329.1	17,754.0	624.0

Note: The positive Down activation prices represent a situation when the client is paying for charging the battery during activation, the negative Down activation prices represent a situation when client gets paid for charging the battery during activation.

Price report

Market insights

Day-ahead market (DAM)

- DAM prices rose significantly in all analysed countries, with the lowest increase in Romania
- Volatility decreased in all countries, with the most significant decrease in Poland
- Hungary and Romania are the most volatile DAM markets

aFRR reservation

- aFRR Down reservation prices decreased significantly in all analysed countries; the most significant effect can be observed in the Czech Republic and Hungary
- aFRR Up reservation prices decreased in all countries. Hungary and Romania were most affected by this trend
- Poland is the most stable market, posting gains in both Up and Down reservation pricing

aFRR activation

- aFRR activation Down price volatility increased in all analysed countries except for Romania, and aFRR activation Up price volatility decreased in countries apart from Hungary
- Romania and Hungary posted negative average aFRR Down activation prices, with Romania's becoming less negative than in the previous quarter
- The highest average aFRR Up activation prices were observed in Romania: above €140/MWh on average

Takeaways

- Czech Republic significantly decreased in price signal for aFRR services
- In Poland we can see a slightly weaker effect on both Up and Down reservation prices
- Romania's decreases in all aFRR activation and reservation prices, limiting income potential and reinforcing the importance of flexible, long-duration systems to manage volatility
- Hungary improved only in DAM prices. The aFRR Up activation and reservation price levels are even more modest than the previous quarter, and volatile elsewhere

Conclusion and outlook

In Q3 2025, all four markets saw negative revenue trends compared to the previous quarter, but battery energy storage in Central and Eastern Europe continues to offer strong revenue potential, especially for longer-duration systems optimised across multiple services, with Poland leading in absolute revenue values.

While aFRR reservation income dipped slightly in some areas, full-market participation, combining DAM arbitrage and ancillary services, consistently delivered financial upsides.

The most successful systems in this quarter were:

- **Well-sized.** 2 MWh batteries consistently outperformed 1 MWh systems in total earnings, thanks to their extended discharge duration and increased service eligibility
- **Strategically operated.** Flexibility to participate in both DAM and aFRR was key to maximising returns across all countries
- **Market-aware.** Revenue performance closely mirrored changes in local price trends and market conditions, reinforcing the importance of continuous monitoring and adaptation

Czech Republic continued to reward systems focused on aFRR Down and Up reservation, though its market remains narrower in scope and prices are decreasing compared to previous quarter.

Poland remains driven by high aFRR reservation prices. Capacity Market income provides an additional revenue stream, further boosting long-term potential.

Romania offered a relatively balanced revenue mix, highlighting the importance of flexible, long-term strategies.

Hungary showed modest momentum, with improved aFRR Up activation pricing supporting gradual revenue growth.

Ready to explore the profitability of a BESS or hybrid project?

Whether you're planning a new system or assessing returns in a specific location, our team can model revenues for BESS and hybrid setups including PV, wind, biogas and self-consumption.

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