



RENEWABLE ELECTRICITY + STORAGE AUCTIONS

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*Innovative solutions in renewable energy
auction designs and their implementation
possibilities in the EnC Contracting
Parties*

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Agenda

- Purpose and main forms of renewable electricity (RES-E) plus storage auctions
- Examples in the EU
 - Germany
 - Hungary
 - Portugal
 - Spain
- Summary and issues to be considered

RES-E + storage auctions – purpose and forms of implementation

Purpose: enable network integration to reach RES-E goals/ increase system flexibility

The main forms of incorporating storage into the auction

- option to participate with and without storage
- special auction/rules for RES-E+storage
- mandating bidders to incorporate storage
- schemes primarily supporting storage, combined with RES-E



Rules related to location

- must be co-located, sharing the grid connection point
- can be installed at any location in the country



Rules related to operation

- limited to storing the electricity from the plant
- can exploit all business opportunities



Innovation auctions



- Combinations of intermittent (wind, PV) and dispatchable (biomass, biogas, storage, etc.) capacity can compete, at least one of which must be wind or solar
- **Main goals:** Increasing the network's capacity to accommodate renewables, decrease the occurrence of negative prices.
- 7 auctions organized, starting in Sept 2020, offered capacity ~2.75 GW, contracted ~ 1.98 GW
 - Bi-annual capacity auctions from 2022, planned quantity until 2028: 5.55 GW, about 10% of offered PV contract capacity**
- Pay as bid, static auction, originally granting fixed premium for 20 years, changed to a (one-sided) sliding premium from 2023.

Storage-related requirements:



- The storage must have power **capacity** of at least 25% of total installed capacity, and 2 MWh/MW storage capacity, (to be verified annually)
- The storage system can only store electricity generated by the **co-located** renewable generation assets and cannot charge from the main grid

Results of the latest auction (2023 Sept)

- 779 MW bid/400 MW auctioned capacity
- 408 MW contracted capacity
- average awarded price: 83.3 EUR/MWh (ceiling: 91.8).

March 2022 auction



- Technology neutral auction, installation of a storage system is a condition for participation.
- Goal** of incorporating storage: to contribute to the operational security of the electricity system.
- Auctioned quantity: 864 GWh generation in two size categories: 5 - 20 MW and 20 MW - 50 MW.
- Pay as bid, static auction providing two-sided CfD for 15 years.
- Ceiling prices: 27 (0.074 EUR)* in the smaller and 25 HUF (0.069 EUR)* per kWh in the larger category

Storage-related requirements



- Battery energy storage with a nominal **capacity** of at least 10% of the power plant, providing at least 1 MWh/MW storage capacity
- Bidders must obtain accreditation for providing (aFRR) services maintained throughout the support period, must be available with 75% of storage capacity.
- The battery **can be placed** anywhere in the territory of Hungary

Results of the auction:

- few valid bids, contracted capacity (only PV) below offered, price reaching ceiling price in the larger size-category.

Size category	Auctioned quantity GWh/year	Contracted quantity GWh/year	Weighted average price	
			Ft/kWh	EUR/MWh*
5-20 MW	144	132	25,73	71.75
20-50 MW	720	303	24,92	69.50

*HUF/EUR - 358.56 in the auction call: https://www.mekh.hu/download/f/60/11000/2022_I_METAR_Kiirasi_dokumentacio_v11.pdf

Portugal

▪ Auction of grid injection capacity, 2020



- Organized for new solar photovoltaic plants with or without an integrated storage system, applying for injection capacity at specific connection points
- **Main goal:** establish efficient application process for scarce grid injection capacity.
- Different remuneration schemes offered, special scheme for RES-E+storage – „fixed flexibility premium” – rewarding flexibility, including
 - fixed capacity-based payment (received or paid)
 - contribution to system stability through a CfD mechanism
 + revenues from the market (electricity & ancillary)
- Support allocated through "ascending clock-type" auction.
- 15-year contracts.

BESS related requirements



- the storage system must have a power capacity of at least 20% of the awarded capacity, and must be capable of operating continuously for at least one hour
- projects are free to sell their energy in the market as they see fit, as well as receive revenues from providing ancillary services with the storage system*



Results of the auction:

- Out of the 13 winners, 8 were RES-E+storage, 670 MW allocated
- Due to the strong competition, bidders offered negative fix compensation
- Comparing projects is difficult due to special methodology of evaluation
 - ‚price’ estimated to fall between 12 and 30 EUR/MWh.*

Spain

RES-E auctions



- **Goal:** increase accommodation capacity of grid

Auction scheme (REER) (first in 01/2021, latest 11/2022)

- techn. neutrality provides opportunity for dispatchable technologies, including RES-E+storage*
- pay-as-bid auctions, CfD provided for a 12 years, special remuneration formula with 25% market exposure**

PERTE tender for BESS+RES-E, 2023:

- CAPEX support, hybrid installations with new or existing RES-E facilities (PERTE: strategic projects for the economic recovery and transition)
- The projects that were awarded based on four criteria: (economic viability (35%), technical features (25%), project viability (10%) externalities (30%))

BESS related requirements



- REER auction: requiring 2 MWh of storage to be installed for each MW of wind or solar
- PERTE auction: min. 1 MW of power (40-100% of RES-E plant capacity) and 2 hours of storage capacity






- REER auction: co-located with RES-E plant, charging from grid not allowed, only storage of generated electricity
- PERTE auction – co-location required, sharing connection point

Auction results

- REER Auctions: no winning RES-E + BESS projects
- PERTE tender: oversubscribed, 34/58 projects awarded, wind&PV with storage, grants cover 40-65% of the project cost

**Energy storage potential in Spain's upcoming renewables auction as country targets 2.5GW by 2030 - Energy-Storage.News, **<http://aures2project.eu/wp-content/uploads/2021/06/papeles-de-energia-paper-3.pdf>, RES+storage Anuncio 40803 del BOE núm. 311 de 2022, 2022, Spain awards contracts to 1.9GWh energy storage in first PERTE tender - Energy-Storage.News, 2023, Spain launching grants for 600MW of energy storage (energy-storage.news), <https://elperiodicodelaenergia.com/endesa-naturgy-iberdrola-acciona-q-energy-enerfin-los-ganadores-de-las-ayudas-para-desarrollar-baterias-en-espana/>*

Summary

	Germany	Hungary	Portugal	Spain
Form of incorporating storage 	special auction for innovative solutions	same scheme, mandating bidders to incorporate storage	same scheme, special rules for RES-E plus storage	option to participate in normal auctions & special storage capacity tenders
Rule for location 	must be co-located with RES-E installation	can be located anywhere in the system of HU	integrated with the RES-E plant (co-located)	integrated with the RES-E plant (co-located)
Restrictions related to operation 	participation on ancillary services markets not allowed	certain storage capacity must be available for system services	no restrictions	can store only the electricity from the co-located RES-E plant

- The form of incorporating storage is usually aligned with the main goals of support
- Including storage in the normal auctions requires special remuneration rules - might be more complex
- Ensuring fair competition in electricity and ancillary markets might justify restrictions on operation, however, it can result in higher prices (while other storages operating in the market might have also received support)

Issues to be considered in EnC countries

Development of ancillary services markets?

- In lack of well-functioning markets, auction might provide incentive to invest in storage/system services.
- In well-developed markets, allowing storage systems to participate in various markets might decrease required support.

https://www.youtube.com/watch?v=tV_w3GsTSmk

Do other sources of flexibility/dispatchability exist in the country?

- Other sources (dispatchable RES, RES-E curtailment, cross-border trade, other kind of storage, demand response, etc.) shall also be considered – their procurement requires a whole system planning perspective
- Installing storage shall not be mandated for all variable RES-E plants.

State of the grid/local bottlenecks to RES-E?

- Local bottlenecks in grid might require co-located storage to enhance RES-E grid connections and save on grid enforcement.
- RES-E + storage and standalone storage auctions are aligned accordingly (also considering whole system planning) - several countries support or plan to support both (e. g. Spain, Hungary, Greece).

Thank you for your attention!

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