CHART OF THE MONTH

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Exploring Energy Storage Trends in Greece: Status Quo and Future Prospects

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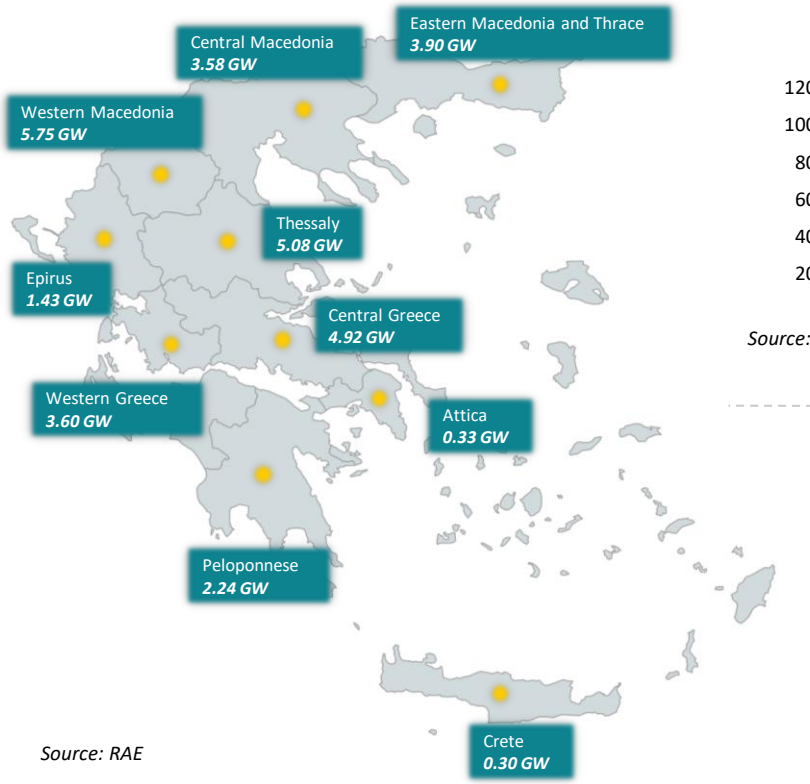
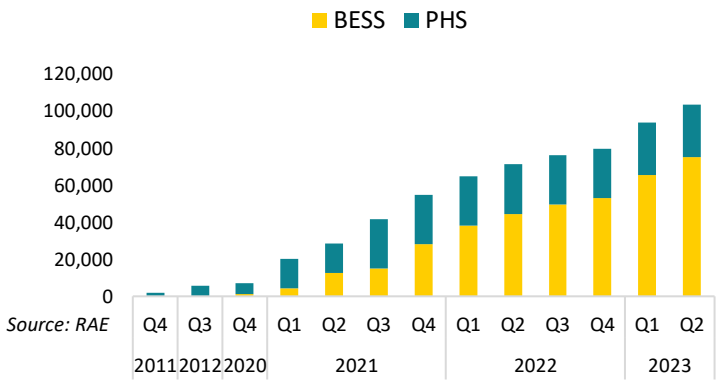
Total Power of Production Licenses (BESS + PHS) by RAE for each region in Greece, as of Jul 2023



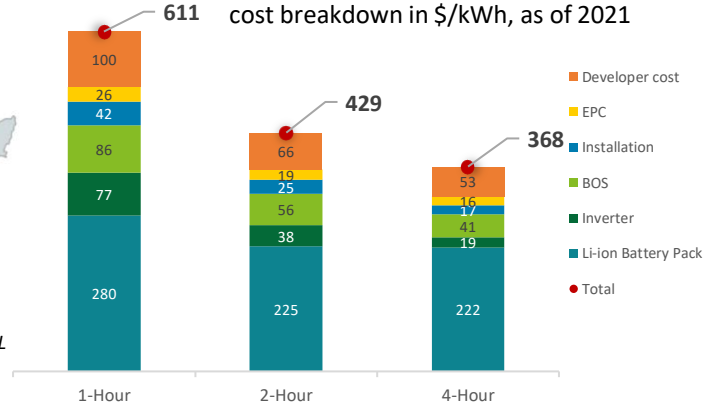
Source: RAE

Cumulative installed capacity (MWh) of production licenses by RAE, as of Jul 2023



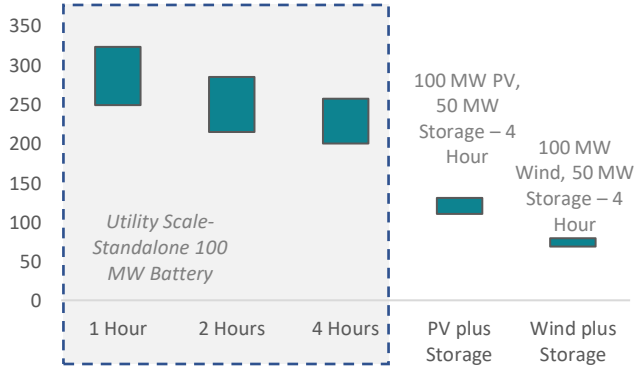
Source: RAE

Utility-scale Li-ion battery (60MW) storage cost breakdown in $/kWh, as of 2021



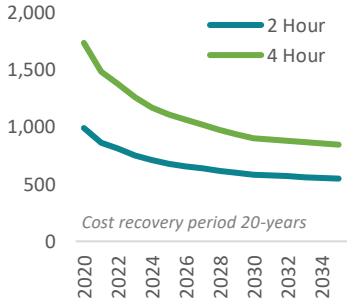
Source: NREL

Levelized Cost of Storage Comparison—Energy ($/MWh)

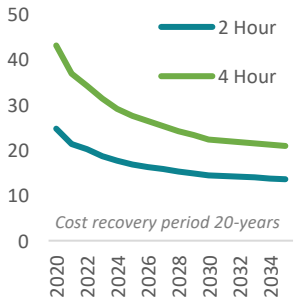


Source: Lazard

Utility Scale Battery CAPEX evolution ($/KW)

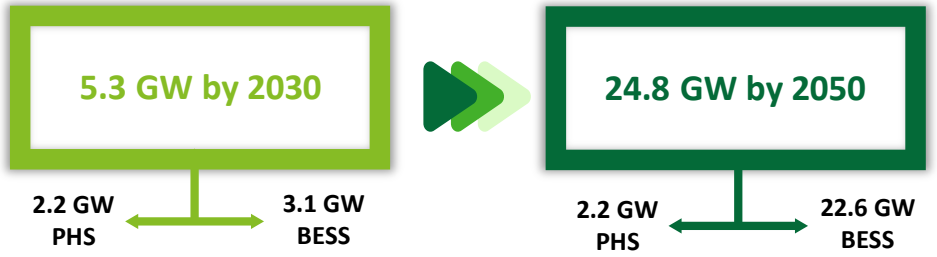


Utility Scale Battery Fixed O&M evolution ($/KW-yr)



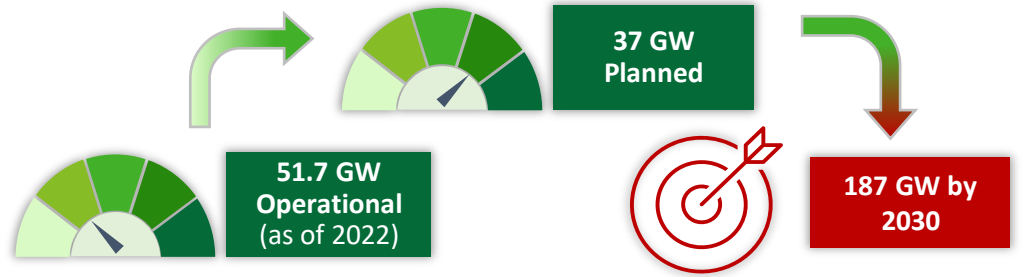
Source: National Renewable Energy Laboratory - NREL

Greece's NECP (under consultation) energy storage targets



Source: NECP

EU at a glance…

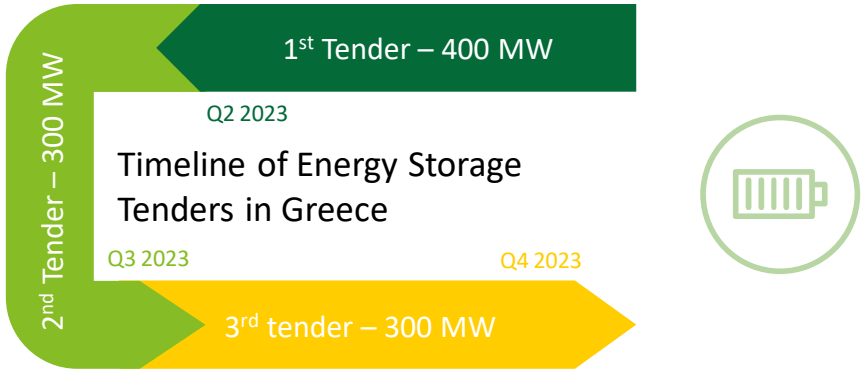


Source: DG-Ener, EASE

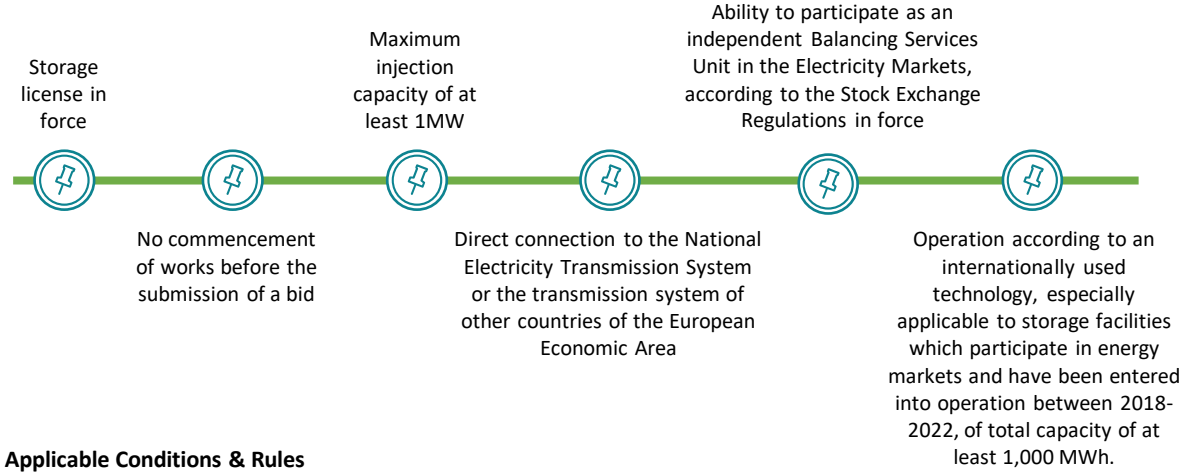
Top 5 EU countries by energy storage power (GW) across the EU for 2022 (left) and 2030 (right)

Source: DG-Ener

Announced Tenders within 2023



Licensing Maturity Requirements and Technical Features of the Stations



Applicable Conditions & Rules

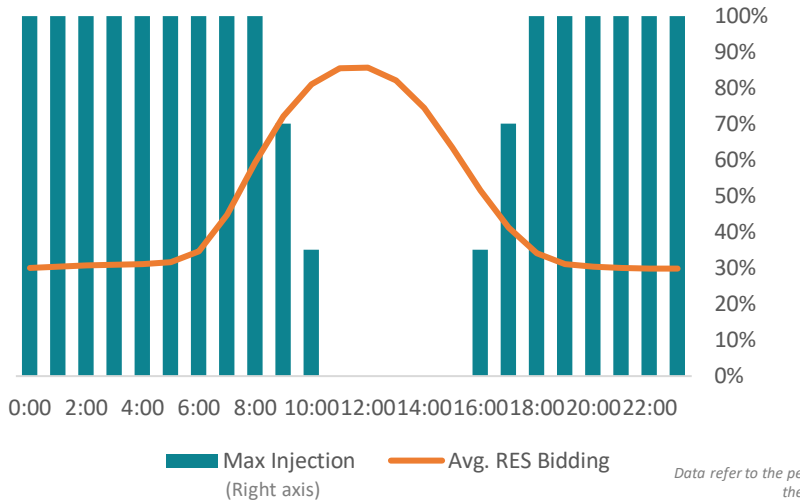
115,000 €/MWh/year	*Max bidding price*
100 MW	*Max capacity of each storage station participating in the auctions*
200,000 €/MW	*Investment aid granted to the selected projects of the 1st and 2nd auction*

Source: RAE, Deloitte Analysis

Those Stations, which are also selected for granting of Operating Aid, shall procure a Good Operation Letter of Guarantee amounting to 200.000€/MW.

Selected Stations' owners shall submit a request for activation to IPTO by 30.09.2025.

Maximum allowed injection capacity & Typical RES Bidding profile in the Day-Ahead-Market

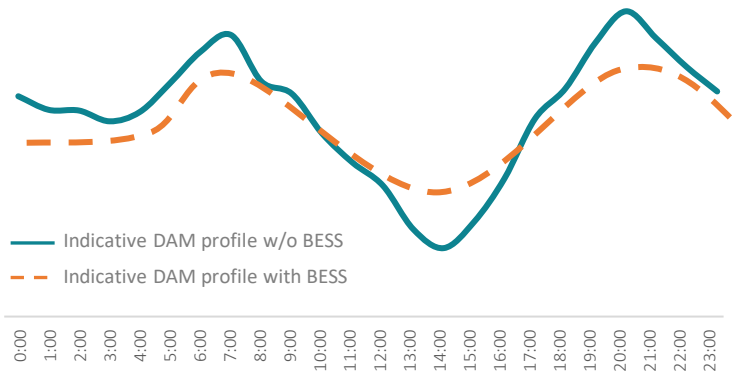


Data refer to the period effective from the start of the Day-Ahead-Market until the end of August 2023 (i.e. 11/2020-8/2023)

According to the indent a. of par.13 of the Article 10 of the L.4951/2022, the maximum injection capacity of storage stations is limited, during specific hours within each allocation day, which compared to their maximum injection capacity per their Storage License.

During the hours of high-RES production, batteries are prohibited or allowed to some extent, to inject power in the system. In those hours it would be typical for the batteries to charge with renewable energy and as the RES production declines, the batteries will inject power back into the system.

Indicative profile of daily DAM price during high-RES penetration and expected profile of daily DAM when batteries will come online



With the higher penetration of RES, especially during mid-day, DAM price is dropping significantly, reaching as low as zero, introducing problems of financial viability of the RES project. The penetration of BESS, is expected to smoothen the high fluctuation of DAM price during the day.

Source: EnEx, Deloitte Analysis

Based on the **production licenses** that have been issued **by RAE**, energy storage systems (both PHS and BESS) are distributed (in terms of GW installed power) **across the regions of Greece**.

Thessaly is leading the way with a power of **5.08 GW**. **Attica and Crete** are the two regions with the lowest power, with **0.33 GW** and **0.30 GW**, respectively.

It is also evident that the **focus** is placed heavily on **BESS systems**, as **for 2022 and 2023 so far** there have been **virtually no new licenses for PHS systems**.

This emphasis on battery systems is further supported by **Greece's NECP** (*under consultation*), where the energy storage targets for **2030** and **2050** see, on one hand, a significant **increase for the battery systems** (from ***3.1 GW*** to ***22.6 GW***), while on the other hand the **pump hydro systems remain the same** (***2.2 GW***) between the two milestone years.

The **EU**, as of **2023**, has **operational** almost **52 GW** of energy storage systems, with the **vast majority (~85%)** coming from **PHS.**

Additionally, there is **planned power** of around **37 GW** until **2050**, meaning that these are facilities that have been announced, authorized, are under construction or in a bidding process. The breakdown of the planned power capacity is as follows: **30 GW** will come from **PHS** systems, while **6 GW** from **BESS** systems.

The **increased demand of energy storage** in the following years will lead to **reduced LCOE towards 2050.**

In 2022, **ancillary services** are the primary application of **grid-scale projects**. But the **energy transition** will unlock new storage applications – and **a shift to energy trading.**

Global investments in **raw material supply and processing** should **alleviate cost** pressure by 2025.

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