IENE WORKSHOP

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ELECTRICITY STORAGE & GRID MANAGEMENT
for Maximum RES Penetration

Roadmap for the Implementation of Energy Storage Projects in Greece Associated With the RES Targets

HELLENIC ASSOCIATION OF PHOTOVOLTAIC COMPANIES
ΣΥΝΔΕΣΜΟΣ ΕΤΑΙΡΙΩΝ ΦΩΤΟΒΟΛΤΑΪΚΩΝ

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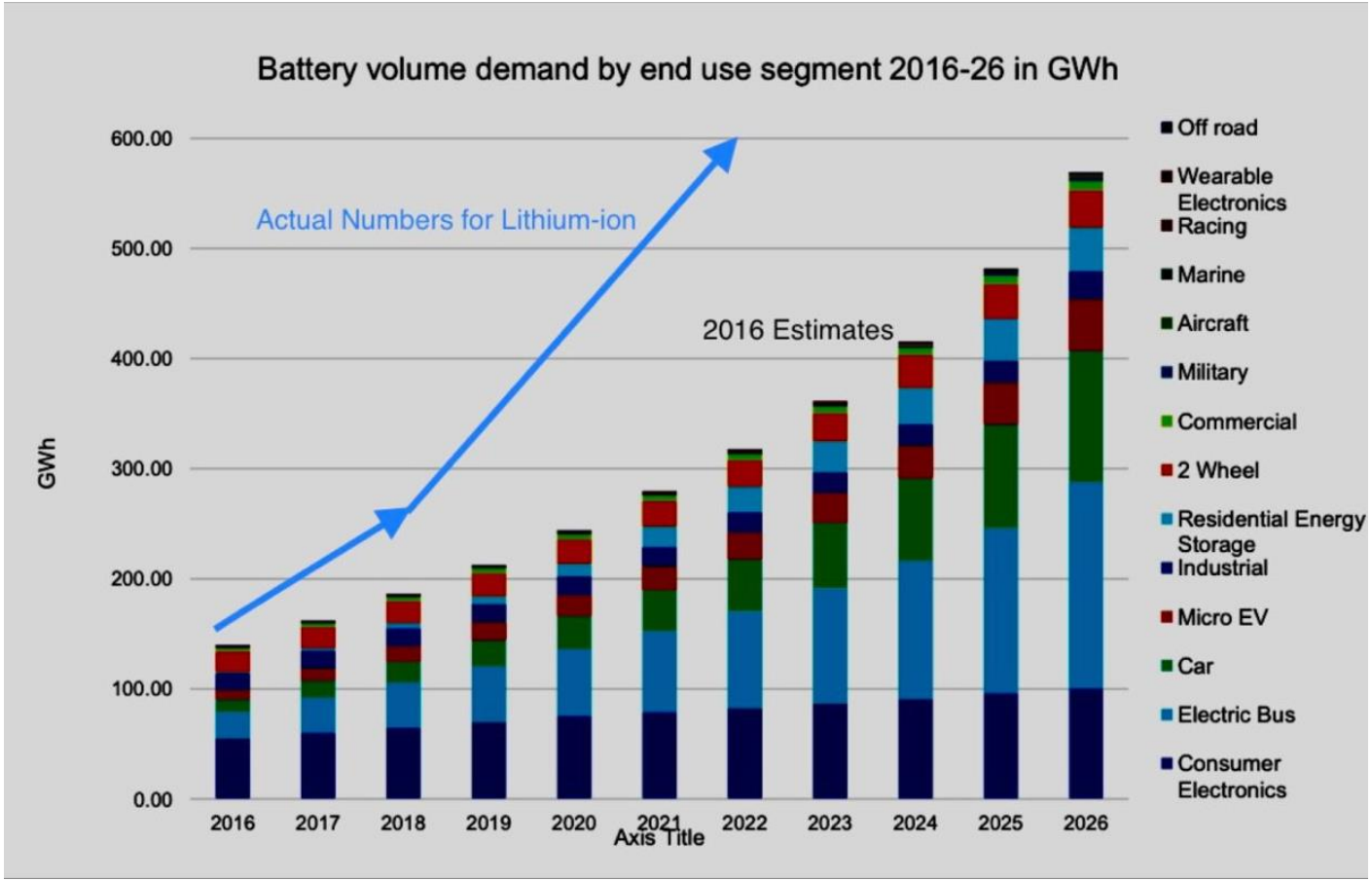
Once again: conservative predictions

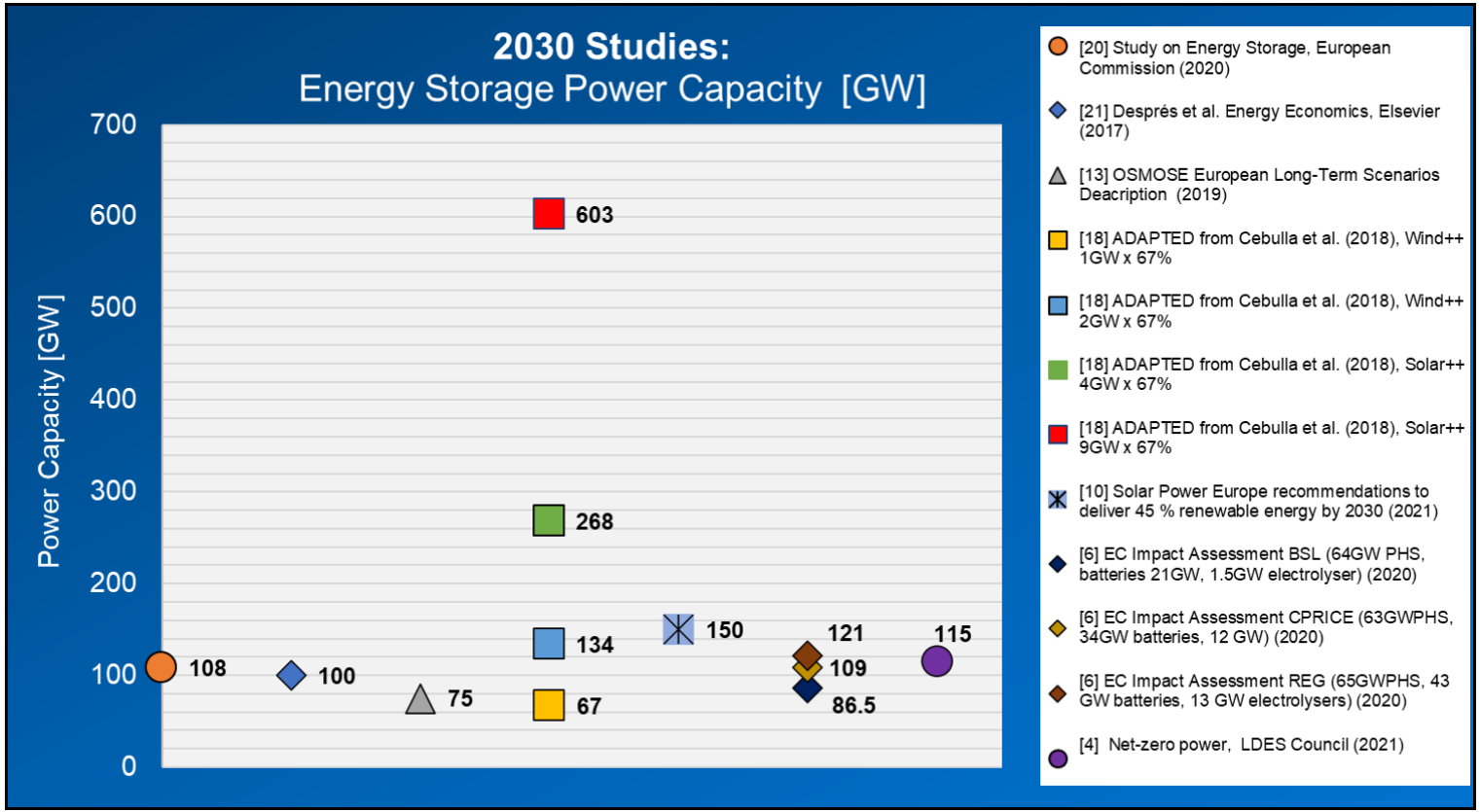


The root of all misinterpretations

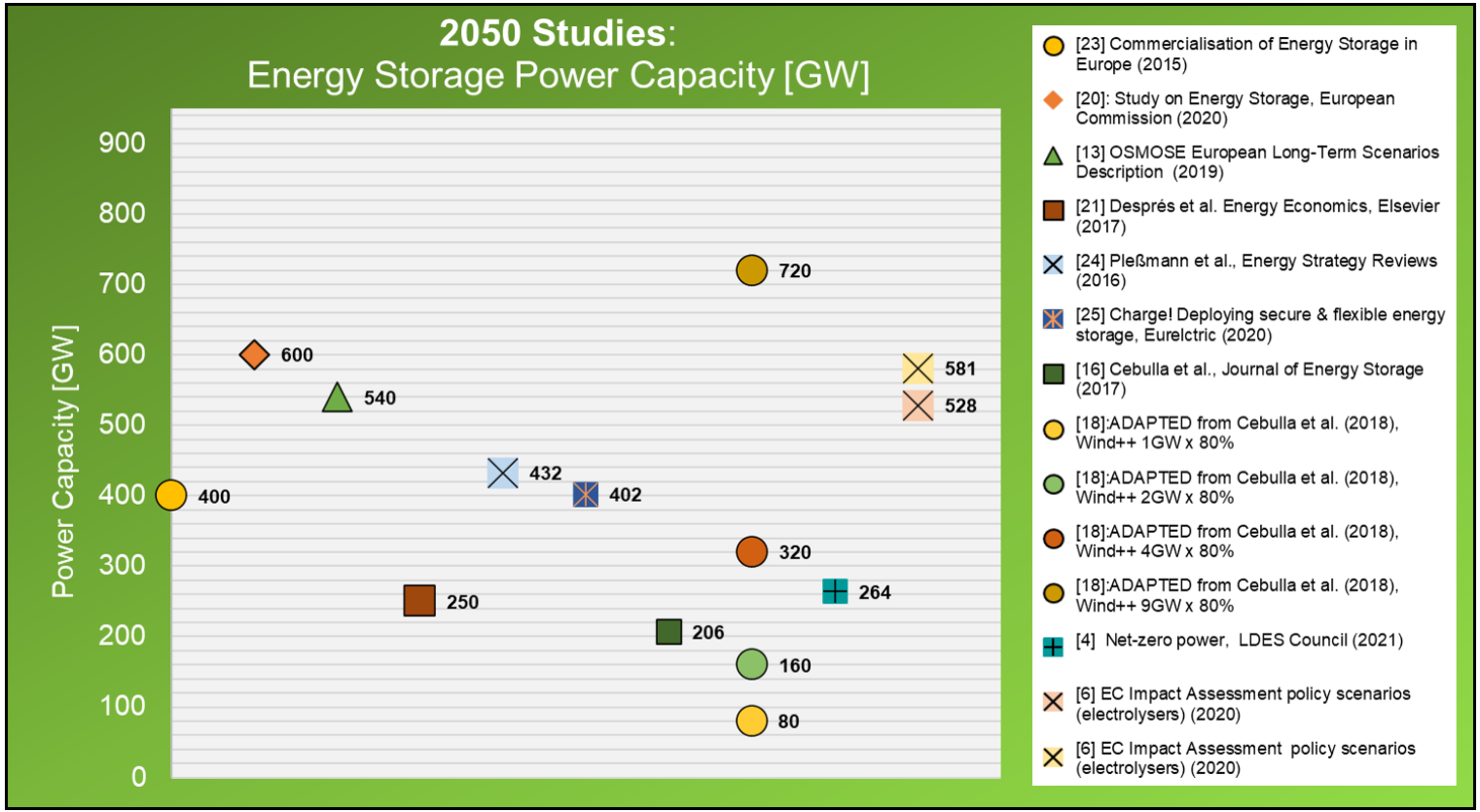
Many studies often **undervalue low emission technologies** and energy shifting resources and **overvalue the use of GHG emitting baseload plants** especially in the 2030-time horizon.

Most EU-wide studies for 2030 do not include the 40% RES target proposed in the REDII revision or the more recent 45% RES stated in REPowerEU today. Furthermore, the 55% GHG reduction target is also not often included in studies, and the role of GHG emitting backup generation in 2030 is significantly overestimated and must be reconsidered at the 2030-time horizon. This means the system will require much greater flexibility and thus **energy storage needs are underestimated**.

Energy Storage installed power capacity requirements across different literature studies for 2030 focused on Europe

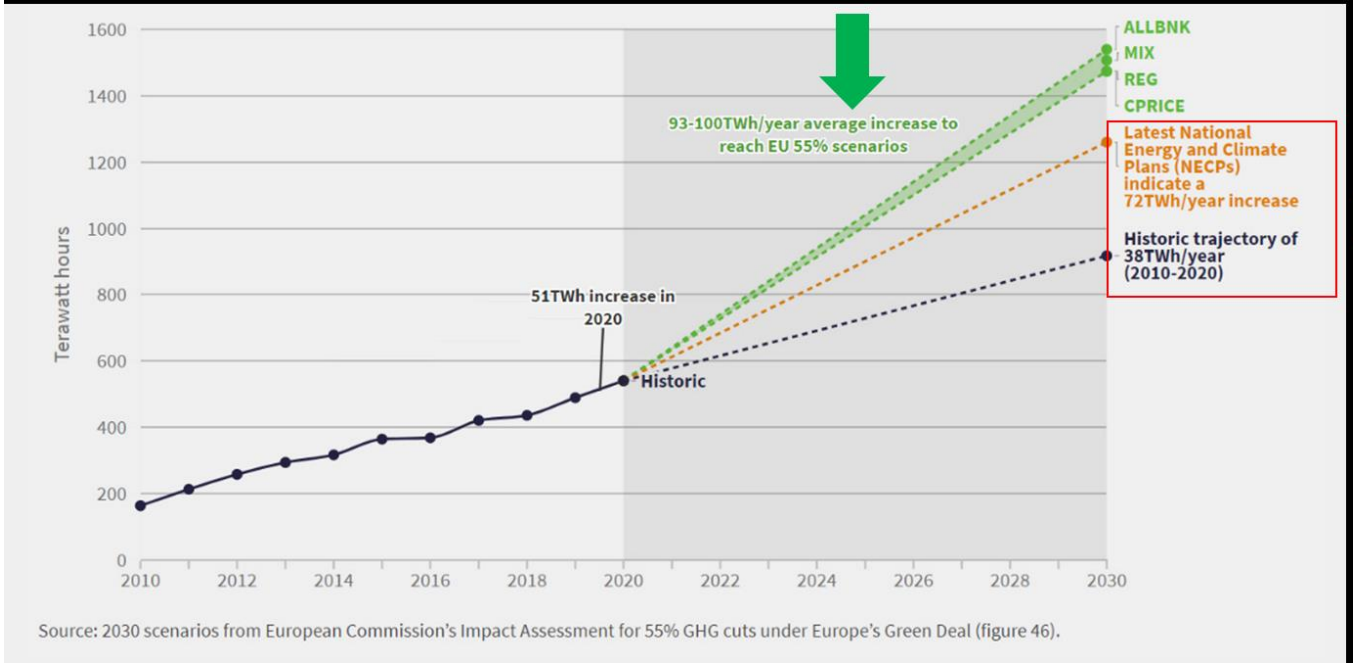


Energy Storage installed power capacity requirements across different literature studies for 2050 focused on Europe



Wind and Solar Growth required to reach EU's 55% Emissions Target by 2030

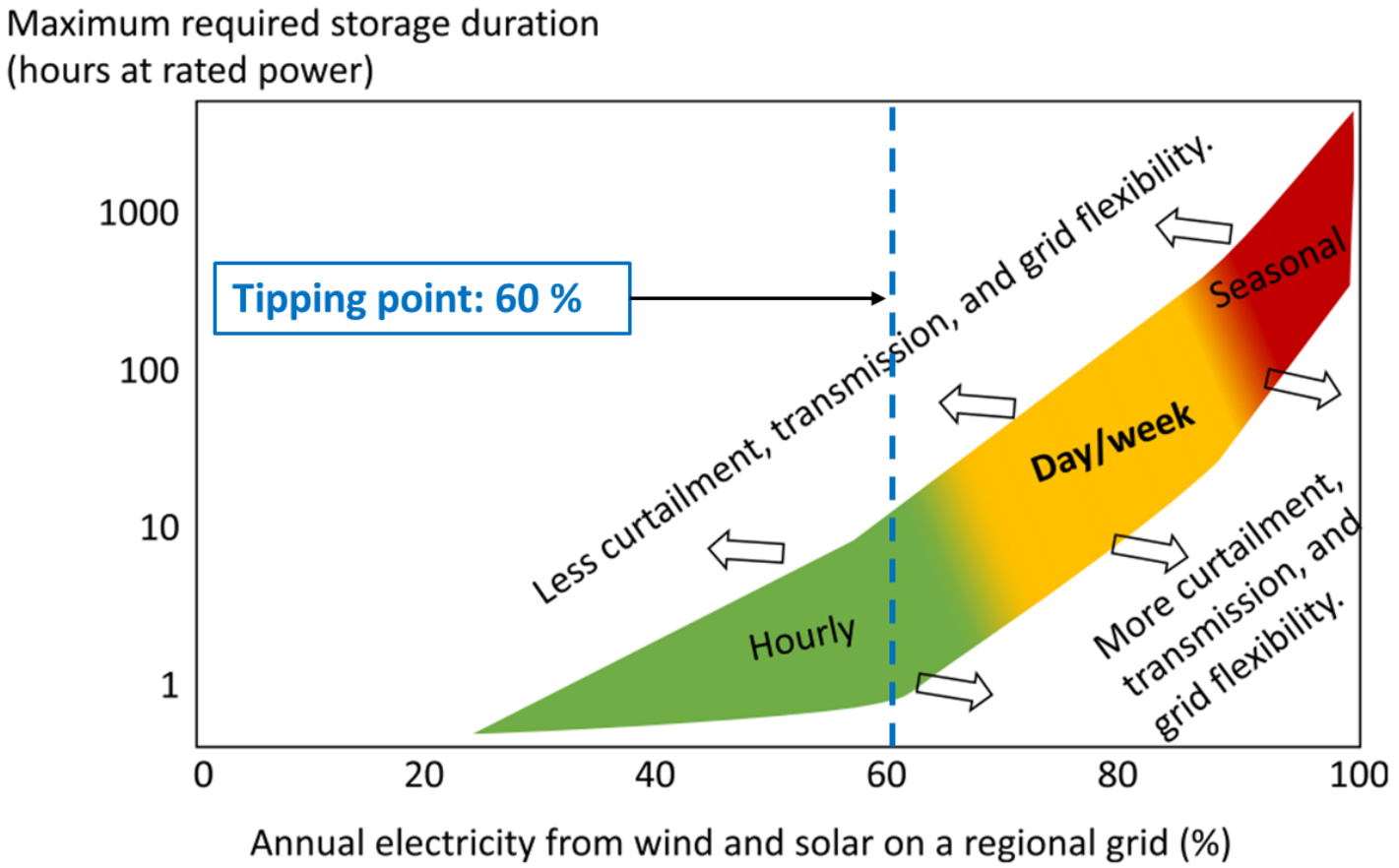
Accelerated wind and solar deployment needed now to achieve 55% GHG reduction target



Source: 2030 scenarios from European Commission's Impact Assessment for 55% GHG cuts under Europe's Green Deal (figure 46).

Do not reach 55% GHG reduction target

Different solutions for different needs



Different solutions for different needs

According to the European Association of Energy Storage, **increasing wind and solar in the electricity mix mainly requires hourly storage (<10 hrs) up to a 60% share of renewable generation in any given EU region. Beyond 60%, there is a sharp increase in the need for more daily and weekly storage**. Seasonal storage becomes more critical beyond 80% variable renewables in the generation mix and will be important especially by 2050. This means by 2030 already the role of energy storage for system flexibility and energy shifting will be critical to integrating high shares of wind and solar.

Solar dominated systems typically require more daily flexibility to cover day/night cycles, whereas wind dominated systems require longer duration storage for days or even weeks of low winds.

Storage minimises RES curtailment

Curtailment occurs when there is overproduction of wind and solar exceeding demand, in which case the excess energy is curtailed and essentially wasted. Alternatively, when there are power system constraints renewable generators must 'dispatch-down', meaning electricity must be curtailed. When low carbon generation is curtailed, polluting generators such as natural gas are often required to ramp up to meet demand.

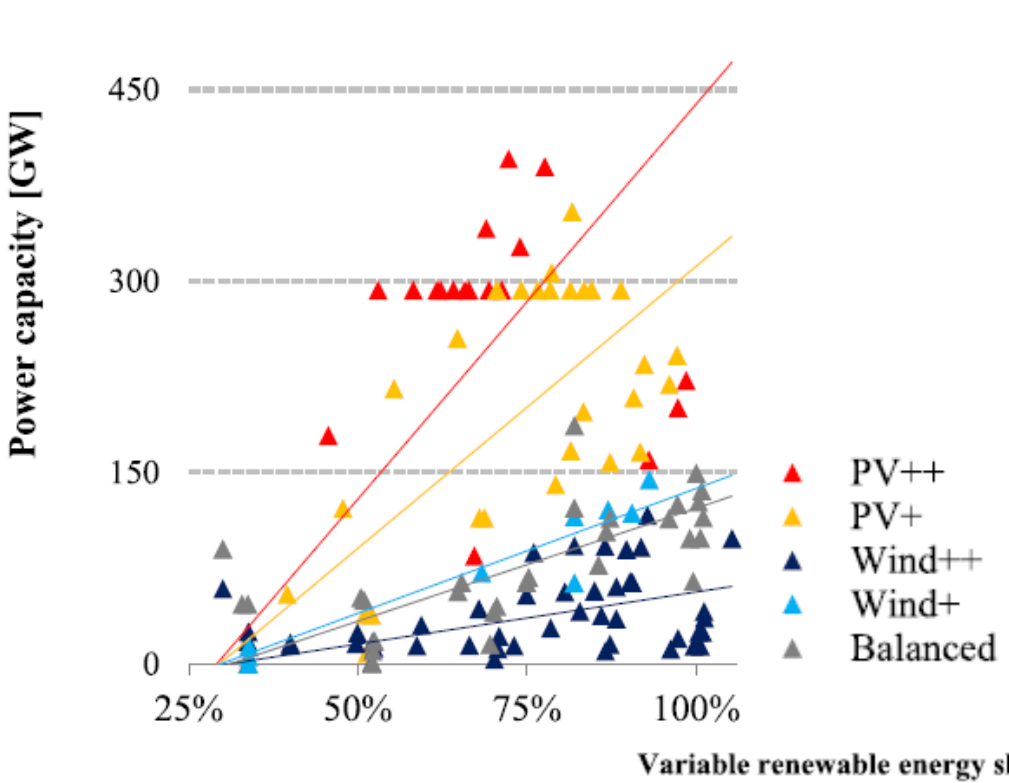
Energy storage would be able to absorb the excess wind and solar energy that would otherwise have to be wasted. **Storage can therefore minimise curtailment by shifting and storing excess renewable generation and using it to cover energy shortfalls traditionally covered by fossil fuel gas generators**.

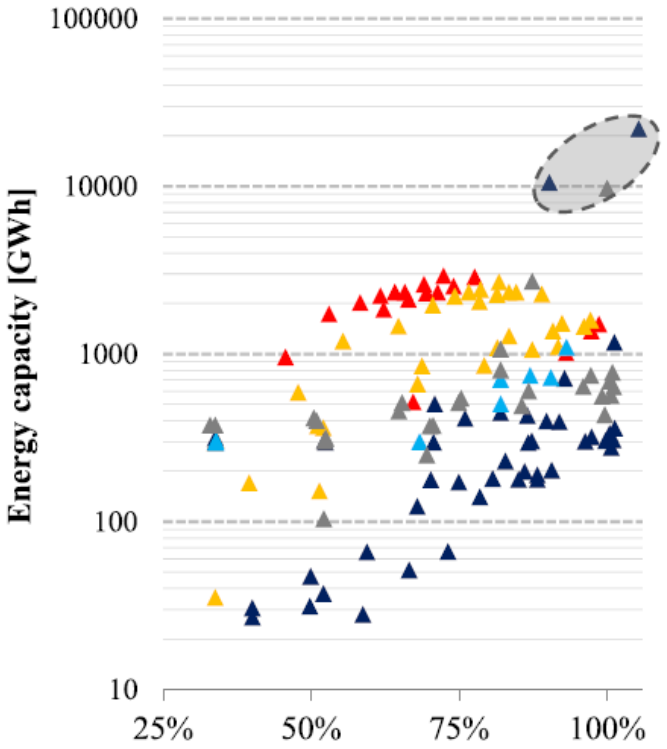
How much energy storage is needed in EU?

Higher amounts of **solar** generation typically require more daily energy shifting flexibility from batteries (**at EU level, 4-9GW/%vRE**), whereas **wind** dominated systems need longer term energy shifting to account for days or weeks of low winds (**at EU level, 1-2GW/%vRE**). These results will also depend on the storage durations, longer durations would mean lower installed capacity and vice versa.

The European Association of Energy Storage estimates **energy storage power capacity requirements at EU level will be approximately 200 GW by 2030** (focusing on energy shifting technologies and including existing storage capacity of approximately 60 GW in Europe, mainly PHS). **By 2050, it is estimated that at least 600 GW of energy storage will be needed** in the European energy system.

How much energy storage is needed in EU?





PV++ indicates power mixes that are dominated by PV
Wind++ shows scenarios which are strongly wind-dominated

Source: Cebulla F., et al, 2018

How much energy storage is needed in Greece?

Greece covers ~2% of electricity generation in the EU. Assuming that the share of vRE is 65%-69% by 2030 (PV+ dominated, i.e., 0.08-0.12 GW/%vRE), **the energy storage power capacity requirements in Greece by 2030 are 5.2-8.3 GW**.


Fossil fuels
Energy Storage
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