Improving the regulatory framework and establishing legal certainty are key actions to accelerate energy storage adoption, reducing development risks, and increasing investor confidence

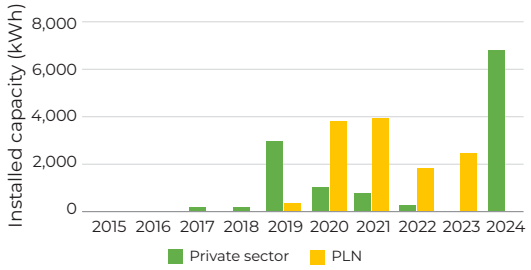
- PLN has increased its installation of medium-scale BESS capacity, particularly following the commissioning of a lithium-ion battery storage system at the Selayar PV system in 2021, which spurred further project development. Previously, the private sector, mostly users of costly diesel generators, led the way in storage installation, implementing medium-scale BESS as early as 2015. PLN has recently integrated at least 2 MW of new BESS capacity annually, with its cumulative capacity now exceeding 12 MW. However, large-scale energy storage is still in the early stages. The Upper Cisokan pilot pumped hydropower storage project, expected to enhance grid stability by 2027, has recently made progress in land acquisition and infrastructure improvements for construction logistics.

- The government's roadmap anticipates a significant increase in energy storage adoption after 2034, as VRE penetration grows and battery prices decline. However, the 29 GWh of storage capacity planned for electricity export projects and utility-led initiatives in the RUPTL could increase installed capacity a thousand-fold over the next decade. Meanwhile, on the consumer side, particularly in the residential sector, BESS installations have yet to yield satisfactory returns under current market regulations. This limits the development of a robust supply chain ecosystem and the growth of domestic expertise in storage technology, which would also help address maintenance challenges for storage assets.

- Although the current technical setup of the power system is not fully favorable to a nationwide energy storage systems (ESS) rollout, there are important deployment opportunities, particularly in improving electrification levels and addressing low reliability and efficiency in small grids. Leveraging these opportunities as a foundation can help expand the role of energy storage in the future grid. IESR's analysis identified key limitations, including the slow pace of VRE capacity growth, the low priority given to energy storage as a peaker asset, and the focus on other grid-enhancing assets with similar functions in current plans.

- Moreover, regulatory frameworks still need improvement to generate demand and establish the economic viability of ESS projects. Currently, planning documents do not fully address the diverse roles and benefits of ESS, and existing regulations have yet to create a strong environment for ESS growth. In addition to improving the regulatory framework and legal certainty, implementing pilot projects to test various ESS technology options and building a storage technology ecosystem, along with a research and development roadmap, should be prioritized in the government's agenda.

Annual capacity addition of medium-scale (>100 kWh) BESS in Indonesia



Source: IESR analysis

Existing characteristics of the power system and their influence on energy storage deployment

Characteristics	Influence on ESS Adoption
Low VRE penetration level and slow growth	Demote
Low electricity load and peak load growth	Demote
High capacity of fast response generators in the pipeline	Demote/ Neutral
Several isolated systems with limited energy sources	Promote
Inferior power system reliability and efficiency in smaller systems	Promote
Low flexibility in current generation mix to accommodate rapid VRE integration	Promote/ Neutral

Source: IESR analysis