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# Indonesia ESS & Rooftop Solar Landscape 2026

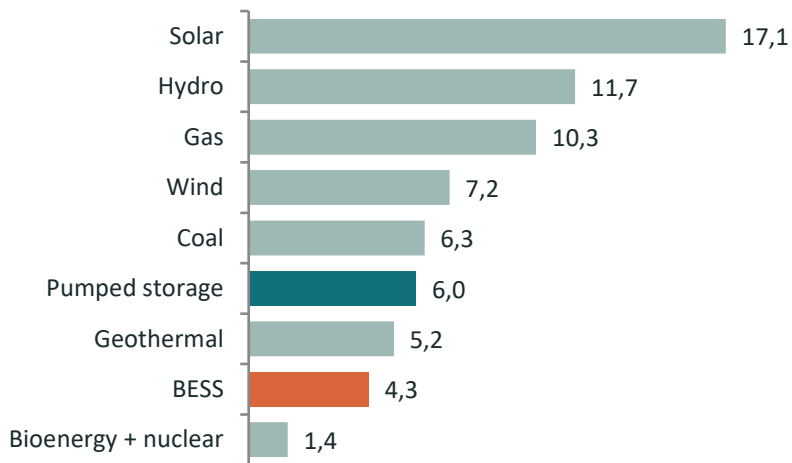
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Data as of September 2026



# ESS in Indonesia: plan vs reality

RUPTL 2025–2034 capacity additions (GW); storage in colour



**Plan:** RUPTL 2025–2034 adds 10.3 GW of storage, 6.0 GW pumped storage and 4.3 GW BESS

**Reality:** only ≈5 MW of BESS reported in operation by June 2026, against a need of up to 6,000 MW

**Boost:** the 100 GW solar programme (Aug 2026) starts with 17 GW backed by battery storage

**Money:** IEA sees ≈US\$560 M a year of BESS investment needed in 2026–2034, about half from private lenders



ESS is now written into national plans. Delivery will hinge on tariffs, load-shifting rules and financing rather than on technology.

# Where ESS is being used



## Grid-scale storage (PLN)

- Standalone BESS provides load smoothing and ancillary services; PLN is tasked with these assets
- PLN plans to extend its GIGA ONE bundled tenders (first used for 1.2 GW of solar) to BESS



## Solar + BESS hybrids

- IKN Nusantara: 50 MW solar + 14.2 MWh BESS (Sembcorp with PLN Nusantara Renewables)
- Hybrids are mostly left to IPPs; MEMR Reg. 19/2025 lets PLN operate hybrid plants



## Diesel replacement, remote grids

- PLN is converting ≈5,200 diesel plants; diesel supplied ≈5.8 GW of grid capacity in 2024
- Remote diesel costs 20–50 US¢/kWh vs ≈14–15 US¢ for solar + battery (IESR)



## Homes, businesses and the EV link

- Home batteries move midday rooftop solar to the evening peak
- CATIB cells serve both EVs and ESS; retired EV packs (70–80%) get a second life as ESS

# Rooftop solar for homes (PLTS atap)

**≈1.3 GW**

rooftop solar installed nationwide,  
April 2026 (PLN, AESI)

**≈1 GW/yr**

estimated rooftop growth; a quick  
contribution to the 100 GW goal (IESR)



## Household rules under Permen ESDM 2/2024

- On-grid applications go through PLN (PLN Mobile app), first come first served
- Capacity follows a PLN quota set every five years, not 100% of connected power
- Surplus exported to PLN is no longer counted on the bill (no net metering)
- Capacity charges are removed; a rooftop-solar complaints centre is provided
- Existing customers stay under the old rules for 10 years (IESR)



Household demand peaks at night but rooftop output peaks at midday. Without export credit, a home battery becomes the missing piece (ESDM, 2024).

# Home solar: fire and accident risks

## Where residential solar fires start



### DC connectors and cabling

Loose, badly crimped or cross-mated MC4 connectors heat up and arc



### DC isolators

DC isolators were linked to 18 of 50+ UK PV fires reviewed (BRE)



### Inverters

Overheating and DC arc faults; 7 of the same incidents



### Installation workmanship

Over 36% of those fires were caused by installation faults

As of September 2026, official, centralized statistics specifically summarizing the number of fire incidents or accidents involving rooftop solar panels (PLTS Atap) in Indonesian residential areas are not yet available or have not been published by relevant agencies (such as the Ministry of Energy and Mineral Resources, PLN, or the fire department).

### Several fatal fire incidents have occurred at communal-scale solar power plants serving residential facilities:

September 2026 (Ngada, NTT): A solar power installation serving 115 households and public facilities in Heawe Village was destroyed by fire.

August 2021 (Nunukan, North Kalimantan): The solar power plant (PLTS) battery building in Seimanggaris was completely destroyed by fire, resulting in total losses of IDR 3.2 billion.



Beyond fire: DC arcs reach  $\approx 6,000$  K and can burn through a cable in seconds; rooftop strings stay live in daylight even if house power is off; falls and shock threaten installers.

# ESS fire risk: thermal runaway



## What goes wrong

- A cell overheats, its separator fails and an internal short starts self-heating
- Heat spreads to neighbouring cells and releases flammable, toxic gas
- Triggers: overcharge, damage, heat, or faults in the power electronics



## What the data show

- Grid BESS failure rate per installed capacity fell  $\approx 97\text{--}99\%$  from 2018 to 2025 (EPRI)
- 72% of failures happen in the first two years of operation
- Only  $\approx 11\%$  trace to cell defects; most come from controls and integration
- Moss Landing (USA), Jan 2025: fire at a 1,200 MWh facility



## Indonesian context

- NMC thermal-runaway risk was flagged on slide 10; LFP, dominant in local EVs, is generally more stable
- Faulty panel-battery-inverter integration can cause overheating and fire
- Industry told BSN (Nov 2024) that SNI coverage for BESS is still lacking

# Safety checklist: homes and regulators



## Households and installers

- Use a licensed, certified installer; avoid unbranded cables and connectors
- Choose certified modules and inverters (IEC 61730) and batteries (IEC 62619, UL 9540)
- Ask for DC arc-fault protection, rapid shutdown, grounding and surge protection
- Site batteries in a ventilated, protected spot away from exits and bedrooms
- Inspect regularly (thermal imaging, connector torque) and label the system for firefighters



## Regulators and industry

- Harmonise SNI, PUIL and ESDM rules on rooftop PV fire safety
- Make DC arc-fault protection mandatory; standardise connectors and torque
- Strengthen installer certification and installation audits
- Complete SNI schemes for stationary BESS, e.g. SNI IEC 62619
- Start incident reporting and firefighter training, modelled on EPRI and UK PV-FIN

# Industry Players & Production Capacity



## Solar Panel Manufacturing:

Indonesia relies heavily on imported Tier-1 panels (mainly from China). Local production is growing but faces challenges meeting large-scale utility demands and TKDN rules.



## ESS Production:

Indonesia Battery Corporation (IBC) and private joint ventures are rapidly expanding BESS (Battery Energy Storage Systems) using LFP and second-life NMC cells.



## Key Solar Developers:

The Commercial & Industrial (C&I) rooftop solar market is driven by local developers like SUN Energy, Xurya, and Agra Surya Energy.

# Technology Trends & Global Competition



## **Chinese Technological Dominance:**

The Indonesian market is heavily penetrated by global brands (e.g., Huawei, Sungrow) for inverters and BESS due to cost competitiveness and advanced integration.



## **Smart Integration:**

Rapid adoption of smart hybrid inverters and AI-driven Energy Management Systems (EMS) for peak shaving and grid stabilization in C&I sectors.



## **Supply Chain Vulnerability:**

High dependency on global supply chains for critical solar components (wafers, cells) prompts government pushes for an integrated upstream-to-downstream domestic solar industry.

# Regulators and State-Owned Enterprises (BUMN)



## Regulators (ESDM & PLN):

Ministry of Energy and Mineral Resources (ESDM) controls quotas and grid connection rules (Permen ESDM 2/2024). PLN dictates grid-scale ESS procurement and limits solar integration to protect base-load assets.



## BUMN (State-Owned Enterprises):

PLN Nusantara Power and PLN Indonesia Power lead large-scale solar and BESS projects.



## IBC's Role:

Indonesia Battery Corporation (IBC) coordinates the downstream ecosystem, expanding beyond EVs into stationary energy storage solutions.



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# Demand Absorption and ESS Usage



## Usage Segments:

Primarily utilized for grid stabilization, peak shaving in C&I (Commercial & Industrial) sectors, and off-grid solutions in remote islands (replacing diesel).



## Absorption Challenges:

High upfront costs and the removal of net metering for rooftop solar limit residential absorption.



## Industrial Demand:

Mining smelters and industrial estates show high potential for BESS absorption to meet their ESG targets and manage renewable intermittency.

# Economic and Environmental Impact



## **Economic Impact:**

Reduces dependency on expensive diesel for remote grids, saving operational costs (BPP) for PLN and subsidizing state expenditures.



## **Environmental Impact:**

Accelerates the phase-out of fossil fuels and directly cuts greenhouse gas emissions by enabling higher renewable energy penetration.



## **End-of-Life Risks:**

Unmanaged solar panel and battery waste pose long-term environmental hazards without proper recycling frameworks.

# Global Competition and Local Ecosystem



## Chinese Dominance:

Global leaders like CATL, BYD, and Huawei dominate the Indonesian market with integrated Solar-plus-Storage solutions.



## Local Assemblers:

Companies like PT Len Industri strive to increase local content (TKDN) but struggle against the scale and pricing of imported Tier-1 modules.



## Global Partnerships:

Foreign Direct Investment (FDI) remains crucial. Western and Middle-Eastern developers (e.g., Masdar) partner with local firms to secure large government contracts.



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# Data Snapshot: Demand Absorption



## ESS (BESS) Absorption:

Only ≈5 MW reported in operation by June 2026, severely lagging behind the grid stability requirement of up to 6,000 MW.



## Rooftop Solar (PLTS Atap):

Reached 1.3 GW nationwide by April 2026, with an estimated steady growth of 1 GW/year for residential and C&I sectors.



## Hybrid Projects:

IKN Nusantara stands as a benchmark, successfully absorbing a hybrid installation of 50 MW solar integrated with 14.2 MWh of BESS.

# Data Snapshot: Industry Players



## **Local Assembler Capacity:**

Domestic solar manufacturers (e.g., PT Len) average under 500 MW/year, struggling to compete on price with global Tier-1 gigafactories.



## **C&I Developer Portfolios:**

Local giants are scaling rapidly; SUN Energy targets >500 MWp in its portfolio, while Xurya has completed over 100 industrial rooftop projects.



## **ESS Production Scale:**

The CATIB consortium (IBC & CBL) phase 1 (6.9 GWh, starting mid-2026) is explicitly designed to supply the stationary BESS market alongside EVs.

# Regulatory Landscape: ESS and Rooftop Solar



## Revoked Rules:

Previous net-metering schemes (e.g., Permen ESDM 26/2021) that allowed 100% export credits for rooftop solar are no longer active, fundamentally shifting the ROI model for residential users.



## Current Framework:

Permen ESDM 2/2024 governs rooftop solar (no export compensation, strict quota system, zero capacity charge). For ESS, MEMR Reg. 19/2025 and RUPTL 2025-2034 dictate grid-scale hybrid operations and storage targets.



## Future Legislation:

The anticipated New and Renewable Energy Bill (RUU EBET) aims to provide a broader framework for corporate renewable procurement. Mandatory SNI standards for BESS and Extended Producer Responsibility (EPR) for battery recycling are also being drafted.



# Thank You

**Questions & Answers**

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