



ASIA CLEAN ENERGY FORUM 2026

Beyond Transition: Building Secure, Resilient, Inclusive, and Intelligent Energy Systems

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Thematic Track-1 | Session-1.2 : Diversification of Energy Sources | 09 June 2026

Beyond Megawatts

Scaling Bankable Solar+BESS Systems and the Rise of Floating PV Across Asia-Pacific

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AFRY -Introduction

AFRY unlocks the energy and industry transition, strengthening resilience in society by providing **engineering, project management, and advisory services**

ENR Global Ranking under 10 for Hydro, Solar & Wind Services

Net sales, USD

2.8b

Established in

1895

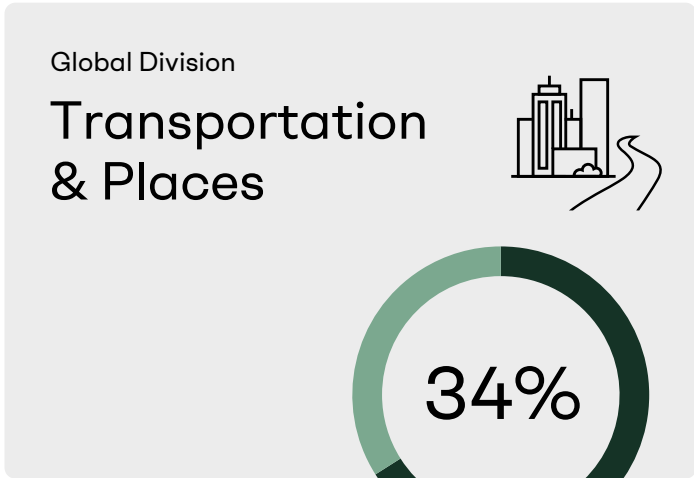
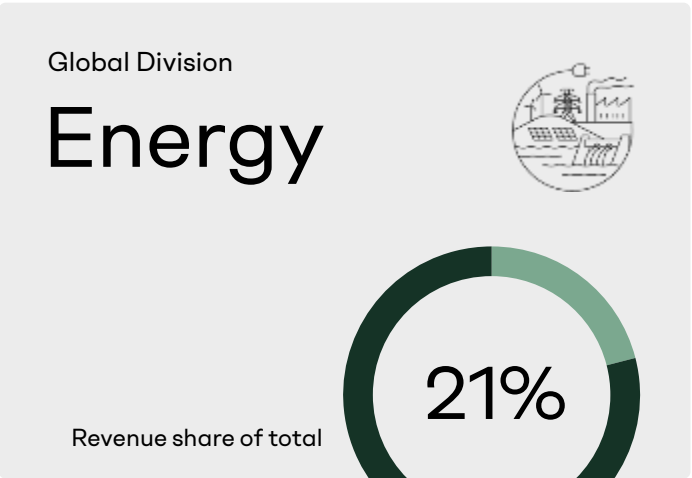
Number of employees

18,000

Countries with offices/projects

50/100

FY 2024



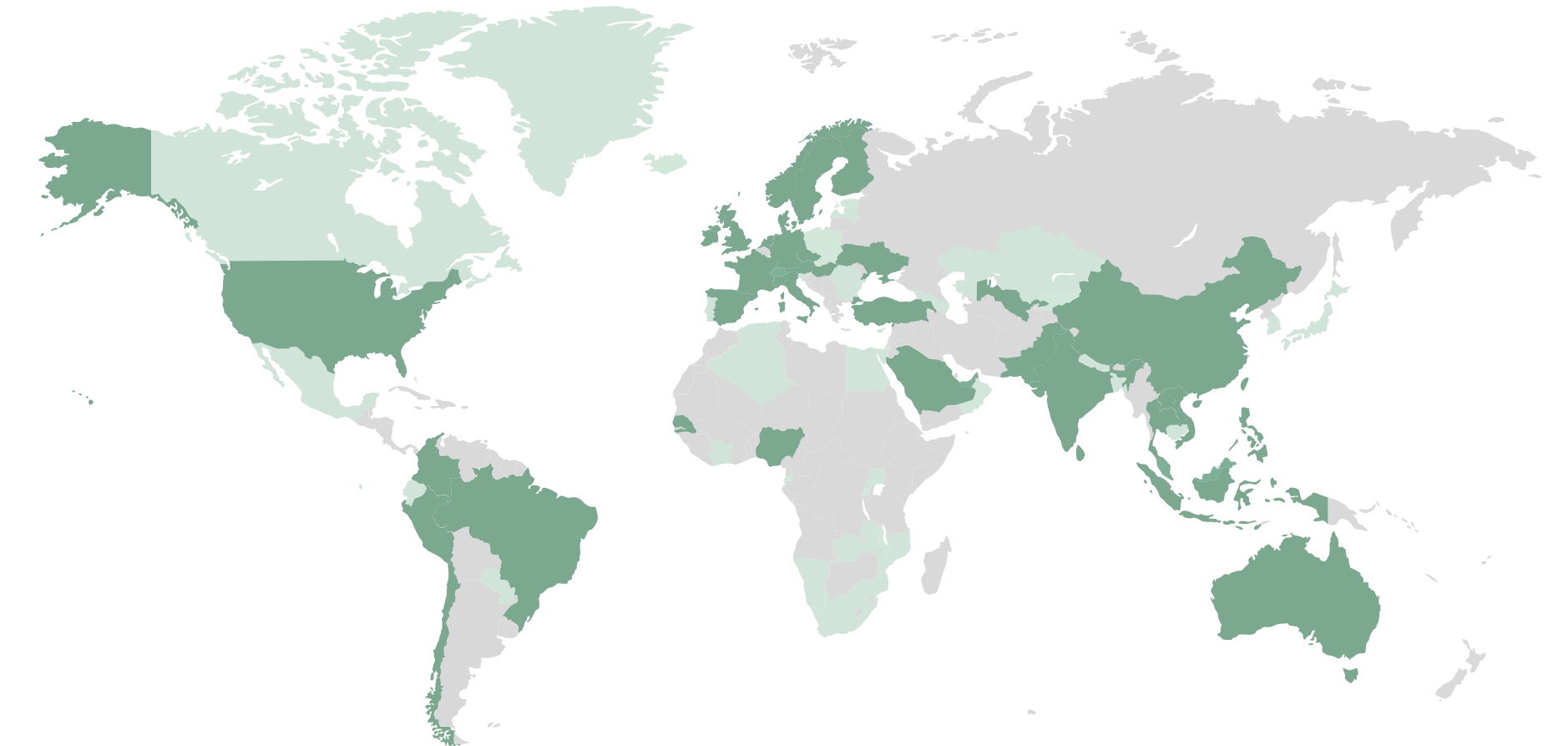
Global Presence in Energy Sector

One regional energy team in Asia Pacific with offices in

- Thailand
- Philippines
- Malaysia
- Indonesia
- Vietnam
- Laos
- Singapore
- India
- China
- Taiwan
- Australia

Total of 500+ Energy professionals across Asia Pacific

More than 200 ongoing power sector assignments in Asia Pacific



■ Office footprint
■ Project footprint

Countries with offices

50

Countries with projects

100

Clean Energy is No Longer Just a Climate Choice

It is a National Security Imperative



70%+

of Asia-Pacific oil
& gas is imported



4.0%

Regional growth slowing
(ADB 2026 Outlook)



400M+

People still lacking
reliable energy access

Geopolitical instability, fossil fuel supply disruptions, and surging BESS cost reductions have converged to make Solar+BESS deployment across Asia-Pacific both urgent and financially viable simultaneously.

Asia-Pacific's Solar+BESS Scale-Up : The Rise of a Natural Partnership

APAC is the world's largest and fastest-growing renewable energy market

~647 GW

Global Solar added in 2025

Another record year

~480 GW

APAC Solar additions in 2025

Incl. China's 378 GW

~275 GWh

Global BESS deployed in 2025

Up 61% YoY

~167 GWh

China BESS share in 2025

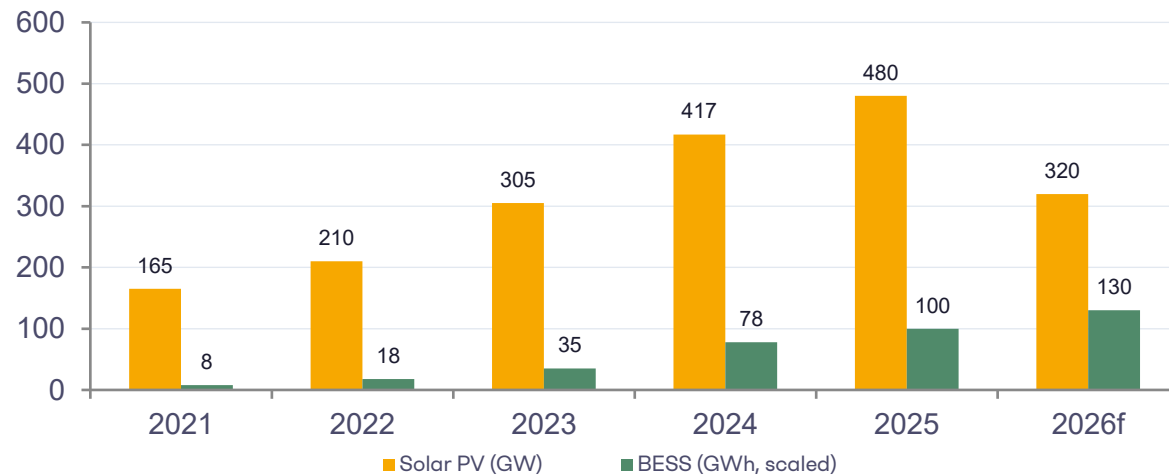
61% of global total

~70 %

APAC projected share of global BESS

By 2026 forecast

APAC Solar PV & BESS — Annual Capacity Additions



↑ 2.9× solar growth in APAC 2021→2025

↑ BESS ~13× scale-up over same period

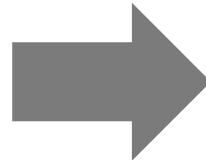
Key BESS Milestones — APAC Region

- 2021** ● China mandates BESS co-location. APAC adds ~165 GW solar.
- 2022** ● BESS adds grow 60% YoY. LFP prices fall below \$140/kWh.
- 2023** ● China adds 23 GW / ~65 GWh BESS. India & Australia write BESS into tender requirements.
- 2024** ● APAC installs 417 GW solar — 70% of global total. LFP below \$100/kWh.
- 2025** ● China adds 378 GW solar + 167 GWh BESS. Global BESS surges 61% YoY.
- 2026f** ● BESS forecast 353 GWh globally — APAC ~70% share.

Ambition and Execution Are Not the Same Thing

What 5GW+ of field advisory experience reveals

✓ FEASIBILITY PROMISES		
	OPTIMISTIC EYAs High solar yields projected based on ideal conditions and historical models.	✓
	STANDARD BESS PERFORMANCE GUARANTEES Bankable warranties on capacity, efficiency and cycle life.	✓
	BENCHMARKED CAPEX & OPEX Costs benchmarked to global markets and similar projects.	✓
	CLEAR GRID INTEGRATION Sufficient grid capacity and smooth interconnection expected.	✓
	CONSERVATIVE DEGRADATION RATES Assumed conservative degradation for PV modules and BESS.	✓



⚠ REALITY IN TROPICAL CLIMATE		
	HIGH YIELD LOSSES High temperatures, soiling, humidity, cloud cover, and component derating reduce actual energy yield.	
	MORE STRINGENT LENDER REQUIREMENTS Lenders require stricter warranties, performance tests, insurance and longer track records.	
	HIGHER O&M COSTS High labor costs, difficult site access, spare parts logistics, corrosion, vegetation management, and extreme weather drive O&M higher.	
	GRID CURTAILMENTS Limited grid infrastructure, congestion and weak off-taker capacity lead to energy curtailments.	
	HIGHER DEGRADATION Higher operating temperatures and humidity accelerate degradation of PV modules and BESS.	

Observation 1: Energy Yield in Tropical Asia

What standard models consistently underestimate



Soiling & Dust

Model Says

1-2%

PVsyst default assumption



Up to 3x higher than model default

Tropical dry-season dust and biological soiling accumulate faster than temperate-climate model defaults assume. Cleaning cycles in SE Asia must be 2-4 times more frequent than other region benchmarks, directly raising O&M costs.



Humidity & Degradation

Model Says

~0.5%/yr

Standard warranty degradation rate (STC)



Up to 1.6x higher than model default

High humidity accelerates encapsulant yellowing, delamination and PID (Potential Induced Degradation). Real-world module loss exceeds PVsyst base assumptions.



Grid Curtailment

Model Says

0-2%

Typical feasibility stage assumption



Up to 10x higher than feasibility assumptions

Fast-growing solar markets face curtailment as grids catch up. Curtailment in Vietnam reached ~500 GWh in 2023 (EVN data) with peak curtailment exceeding 20% in solar-rich provinces. Standard energy yield models rarely capture market-specific grid constraints at feasibility



Temperature & Inverters

Model Says

1-2%

Standard inverter derating assumption



Up to 8x higher during peak hours

Ambient cooling helps modules — but inverter heat management in humid tropical conditions is underestimated. Most inverters are rated at 25°C. In SE Asia, ambient temperatures of 35-45°C trigger thermal derating

Key insight: LTA experience shows real-world P90 yields frequently underperform model P90 in tropical markets — with direct implications for debt service cover ratios.

Observation 2: BESS Integration — The Lender's View

What multilateral lenders now require — and what developers often underestimates



Performance Guarantees

- Warranted vs actual degradation curves under scrutiny
- Round-trip efficiency assumptions in tropical heat challenged
- Capacity testing protocols now becoming common lender requirement

Real-world gap:

Warranted RTE $\geq 90-92\%$ (DC) $\rightarrow$ actual AC system efficiency 85–88% after inverter & thermal losses

Impact: Lenders now test AC-side deliverability before approving financing — developers who present DC warranties are sent back to renegotiate.



Contractual Risk Gaps

- Interface risk between Solar EPC and BESS supplier contracts
- Warranty hand-off gaps create lender concern at TDD stage
- O&M responsibility boundaries often ambiguous in early contracts

Real-world gap:

EPC-BESS interface risk is one of the top lender's flag in Solar+BESS due diligence, consistently unresolved at contract stage

Impact: Unallocated interface risk between Solar EPC and BESS supplier is the single most common reason Solar+BESS projects are delayed at financial close.



Thermal & Safety Mgmt

- Humid tropical environments accelerate battery degradation
- Thermal management CAPEX systematically underestimated
- Fire safety & access standards increasingly lender-mandated

Real-world gap:

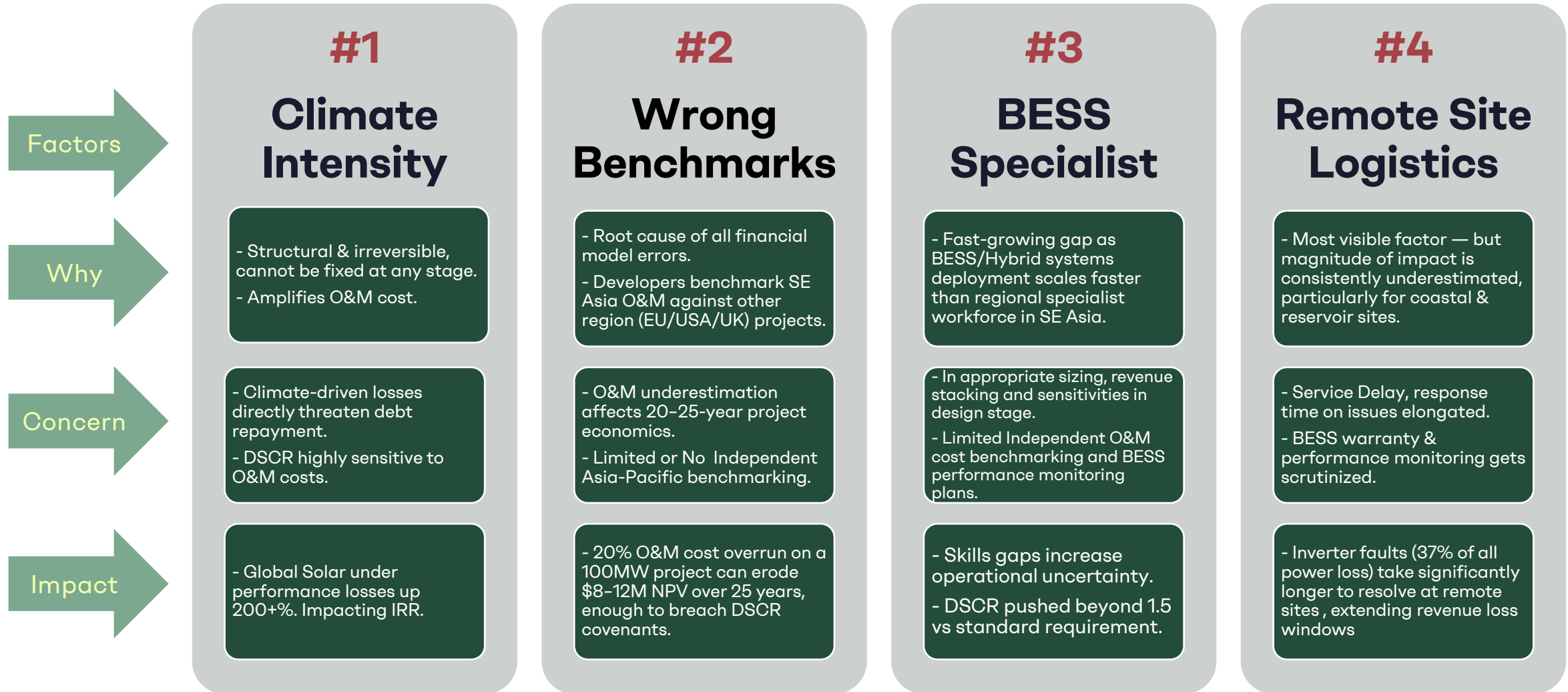
Battery capacity fade accelerates 2–3× above 50°C — SE Asia ambient temperatures routinely push enclosure temps past this threshold

Impact: Thermal management is underbudgeted at construction stage and creates O&M cost overruns throughout the 25-year operating life.

Experience: LTA roles on BESS projects in Thailand, Philippines, Taiwan, Vietnam — requirements have materially increased since 2022.

Observation 3: O&M — The Most Underestimated Line Item

Ranked by degree of underestimation — based on LTA & Owner's Engineer experience across SE Asia



**And Now
We Take It...**

On Water



Floating Solar PV — Technology & Key Constraints

What this technology is — and what makes it uniquely challenging to build, finance and operate

What Is Floating Solar (adding a BESS)?



Key Technical & Commercial Aspects

TECH. Floating Structure Engineering

Pontoons, anchoring and mooring systems must withstand dynamic loads (wind, waves, fluctuating water levels) requiring specialist marine/civil expertise.

TECH. Corrosion & Material Durability

Continuous water contact, humidity and UV exposure accelerate corrosion of structures, cables and electrical components, demanding suitable-specification materials throughout.

TECH. BESS Siting & Thermal Integration

BESS onshore means long cable runs and grid losses. BESS on water means weight limits and fire safety on floating platforms. demands engineering decisions with direct cost and risk implications..

TECH. O&M Access & Safety on Water

Maintenance and emergency response require water-based logistics, specialist safety protocols and trained personnel.

COMM. Insurability & Asset Bankability

Insurers have limited actuarial data for floating assets in tropical climates. Also limited international standards create a commercial financing discussion before approval, that technical feasibility alone cannot resolve.

FPV+BESS is not ground-mount solar with wet feet — it is a fundamentally different engineering and financing challenge.

Floating Solar (with BESS): Why Asia-Pacific Is the Natural Home

The region has everything needed — land constraints, water bodies, policy will and financing appetite

Land-Scarce Economies with Abundant Water

SEA face land constraints. Reservoirs, irrigation canals and lakes offer GWs of untapped capacity — without using agricultural or urban land.

Yield Advantage Over Ground-Mount

The cooling effect of water on PV Modules yields by 5–10% more. Heat in Tropical climate is challenging; this natural advantage helps.

Policy Momentum Across the Region

Major Asian economies have all included FPV in national renewable energy plans. Regulatory frameworks moving in the right direction.

Multilateral Financing Already Flowing

International Multilateral Financial Organisations have all financed FPV projects across Asia-Pacific. De-risking infrastructure exists.

The Scale of What's Possible

5GW+

Global FPV installed capacity — APAC leads with ~70% share

100GW+

Technically suitable water bodies in SE Asia for FPV development

10+

FPV projects directly assessed by AFRY across SEA in last 2 years

\$1B+

Multilateral Banks' FPV financing committed across Asia-Pacific

BESS Growth across the region is already enormous

What Must Happen for FPV+BESS to Actually Scale

Three conditions — from an Advisory role perspective.

#1 Build the Technical Standards First

- No bankable international standards for FPV+BESS currently exist
- Not all Ground-mount standards cannot be applied to floating systems
- Structural, electrical, safety and O&M standards must be developed before GW-scale deployment

For Industry and Standard Bodies

#2 Evolve the Financing Frameworks

- FPV+BESS needs its own TDD checklist, not an adapted solar checklist
- Insurance markets need more actuarial data from operating projects to adjust the price risk
- Multilateral banks, have a critical de-risking role through co-financing and guarantees

For Lenders & Multilateral Banks

#3 Apply Ground Lessons Honestly

- Humidity and corrosion data from ground-mount directly predicts higher risk for floating systems
- O&M models must be built from region-specific data and not from other region benchmarks
- BESS integration lessons from land apply on water, with compounded complexity

For Developers & Project Teams

Asia-Pacific has the Water Bodies.

Positive Policy Intention, and the Financing Appetite.

**What it needs now is the technical and regulatory rigor to
match the ambition**

On the Ground — and on the Water.

Making Future

