DECARBONISED ASEAN POWER NETWORKS AND STRATEGIC STORAGE RESILIENCE WITH THE USE OF PUMPED STORAGE HYDROPOWER AS STRATEGIC FIRMING INFRASTRUCTURE

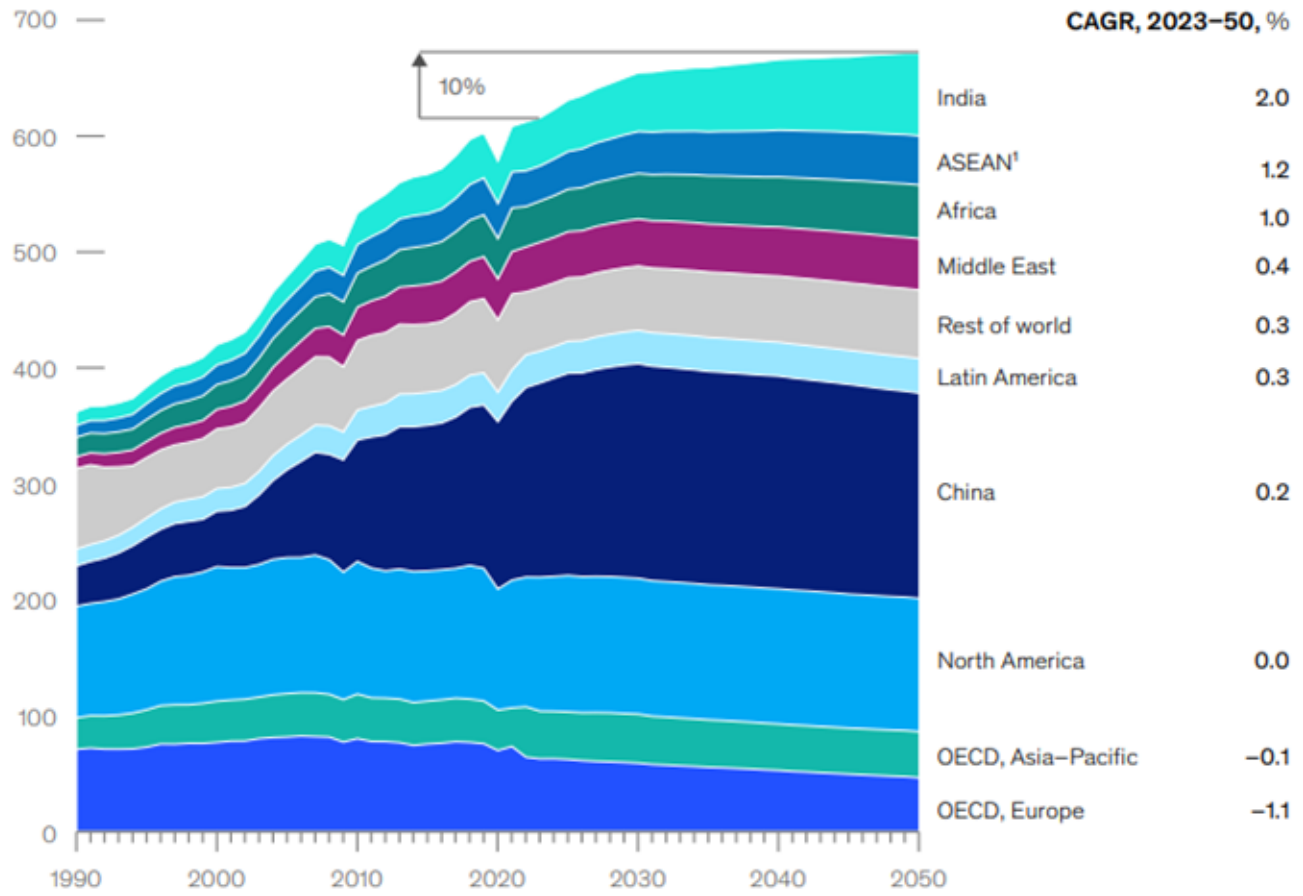
DR. JOSEF M. ULLMER
PRESIDENT DIRECTOR & REGIONAL EXECUTIVE ASIA, OCEANIA
PT ANDRITZ HYDRO

9 JUNE 2026 | 2:00 P.M. – 3.30 P.M. (GMT+8)
MANILA, 9 JUNE 2026

ASEAN'S GREATEST ENERGY RISK IS NOT SCARCITY — IT IS DEPENDENCE

- Geopolitical shocks in 2022 pushed LNG prices to historic highs — with Asian spot LNG nearing US$40/MMBtu and European gas exceeding €300/MWh
- Southeast Asia relies on the Middle East for approximately 60% of oil imports
- Global fossil fuel consumption subsidies reached a record USD 1 trillion in 2022
- ~20 million barrels/day flow through the Strait of Hormuz – 84% of crude goes to Asian markets
- **Strategic priority: reduce exposure by turning indigenous renewable resources into reliable, sustainable and affordable energy**

Energy demand increase by 2050 will likely be greatest in India and ASEAN



[1]Association of Southeast Asian Nations.

McKinsey 2025. Global Energy Perspective 2025

INDIGENOUS RESOURCES ARE ASEAN'S FIRST SECURITY ASSET

- Solar is the region's mass-scale resource
- Hydro and pumped hydro provide balancing and storage
- Geothermal delivers clean firm power
- Offshore wind offers long-term diversification
- **Challenge: Climate change is intensifying heatwaves, floods, sea level rise, and tropical cyclones across Southeast Asia, threatening the reliability, affordability, and resilience of the region's energy systems and infrastructure.**

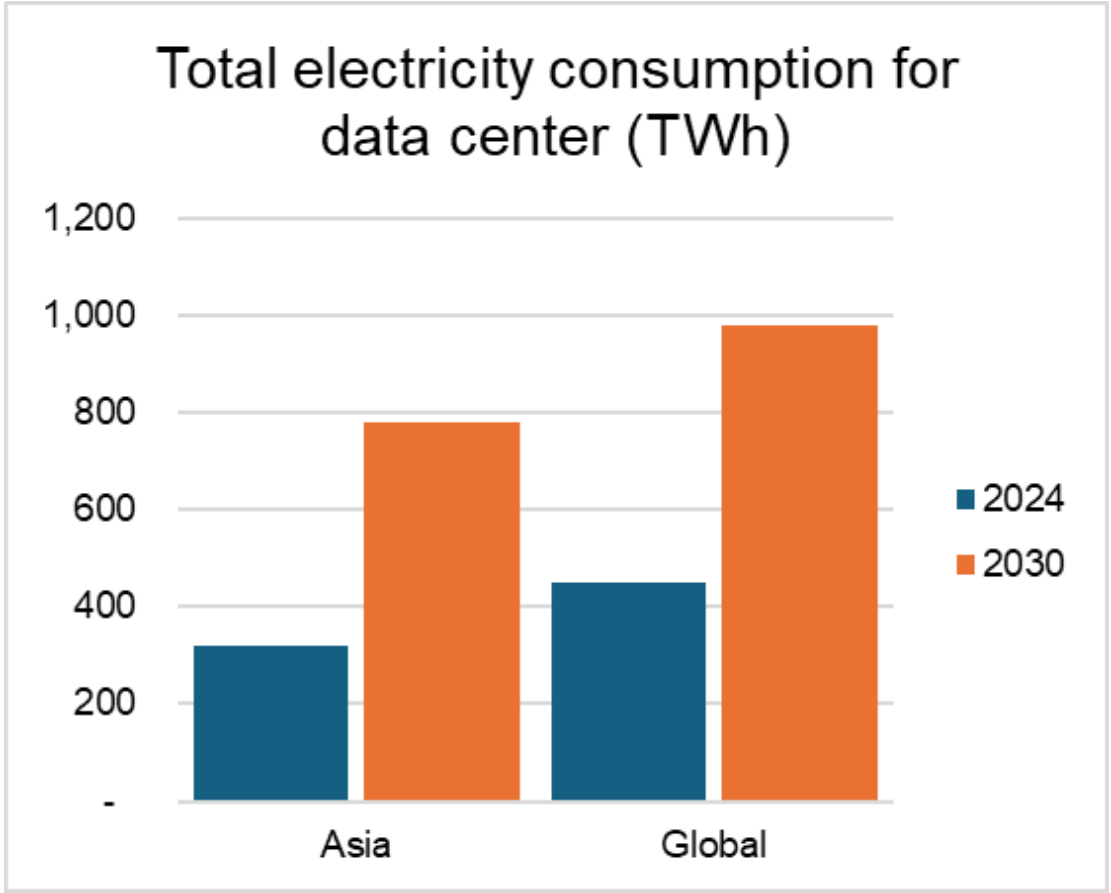
Country	Warming	River flood	Coastal flood	Drought	Tropical cyclone
Brunei Darussalam	0.023	4.9	3.3	1.6	0
Cambodia	0.017	8.7	3.8	3.9	1.8
Indonesia	0.029	8.3	8.1	2.2	1.5
Lao PDR	0.041	8.2	0	2.4	1.4
Malaysia	0.027	6.8	6.4	2.8	0
Myanmar	0.032	8.8	8	0.6	5.8
Philippines	0.026	6.7	8.9	3.3	9.2
Singapore	0.021	0	1.9	0	0
Thailand	0.026	9.8	5.5	5.2	1.6
Viet Nam	0.032	9.9	9.6	3.4	5.9
World average	0.037	4.5	3.5	2.9	1.6

Notes: Low exposure Medium exposure High exposure.

Source: IEA 2024. Climate Resilience for Energy Security in Southeast Asia

DATA CENTERS ARE THE NEXT STRESS TEST FOR GRID RESILIENCE

- Data centers are now power-system issues, not just digital-sector issues
- Global data-center electricity: ~415 TWh in 2024, could rise to ~945 TWh by 2030
- Data centers can catalyze grid modernization and clean-energy investment or become systemic risk if approved faster than power, water, grid, and storage can support them
- Data-center demand is increasingly competing for limited grid capacity amid rising electrification and economic growth
- **Data centers without flexible backup are defined points of vulnerability / failure for both the digital and real economy**

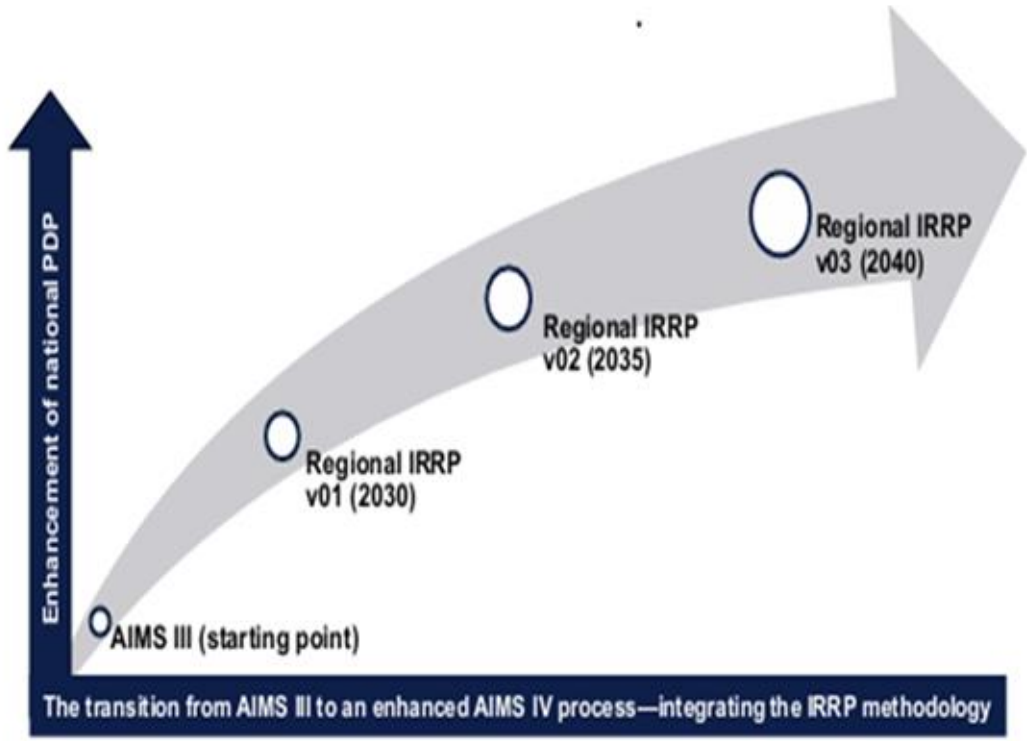


Sources: PwC (2025), Gartner (2025)
Notes: Mainland China, Japan, Australia, India, Singapore, and South Korea account for 84% of Asia Pacific's 2024 data center capacity.

ASEAN-WIDE INTEGRATED RESOURCE AND RESILIENCE PLANNING (IRRP)

- **Modernize and expand the ASEAN Power Grid beyond today's ~8 GW interconnection capacity to be ready for 350+ GW renewable integration by 2050 through flexibility and energy storage investments, strongly supported by ADB**
- **IRRP v01 (2030)**: Strengthen and standardize national energy planning across ASEAN
- **IRRP v02 (2035)**: Improve regional coordination through shared assumptions, data exchange, and aligned planning
- **IRRP v03 (2040)**: Develop a fully integrated ASEAN-wide IRRP with unified regional planning and collaborative scenarios

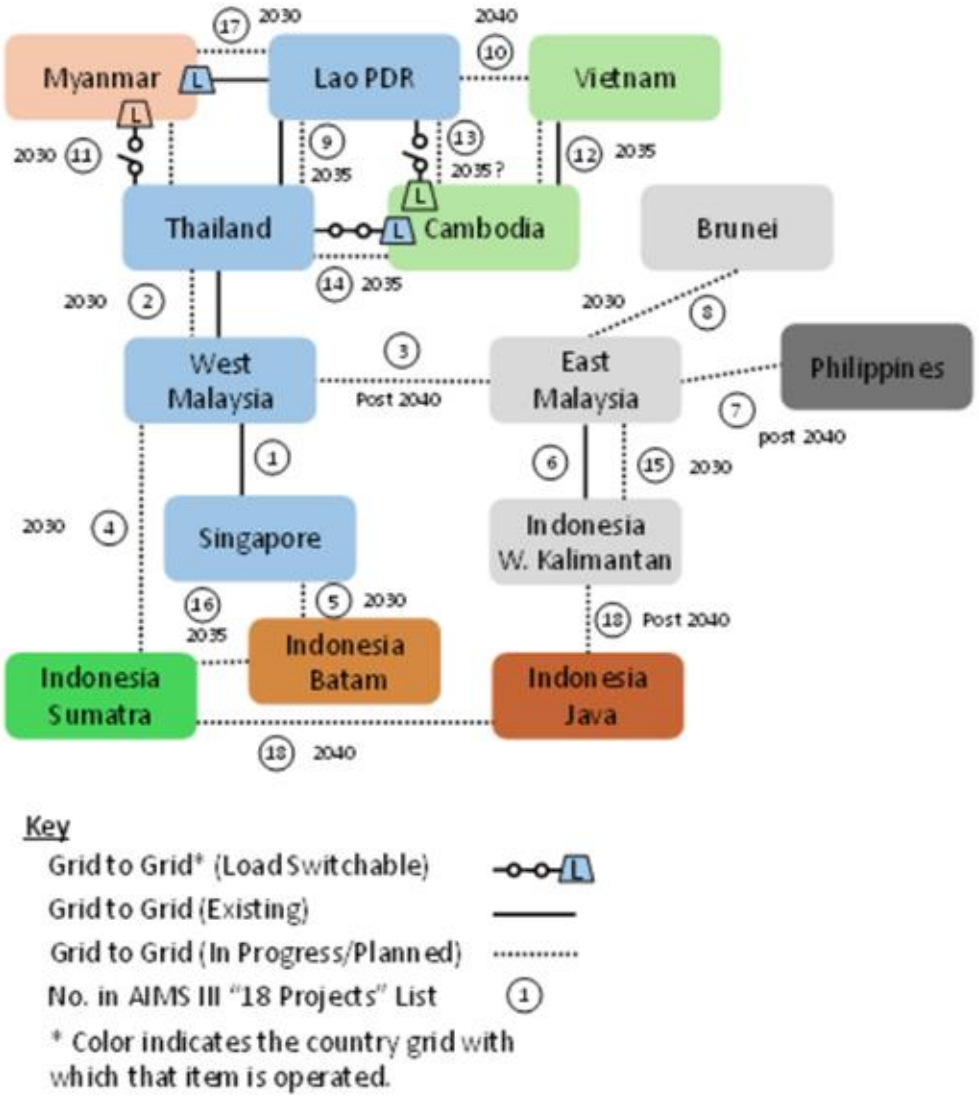
Three-phase ASEAN IRRP implementation



Source: ACE. 2026. AIMS III Phase 3 - Part 2 - ASEAN-wide Integrated Resource and Resilience Planning

ASEAN POWER GRID: FROM AMBITION TO BANKABLE INFRASTRUCTURE

- ASEAN energy demand projected to triple by 2050; 64% of current mix relies on fossil fuels
- Cross-border transmission target: 17.6 GW by 2040
- More than USD 100 billion needed for cross-border transmission by 2045
- APG should be treated as hard energy-security infrastructure, not just a cooperation symbol
- Enables sharing reserves, balancing solar and wind, moving hydro and geothermal power
- **ASEAN Power Grid is a strategic regional initiative to interconnect Southeast Asia's electricity systems in support of reliable, sustainable, and affordable energy through enhanced renewable integration and cross-border power trade.**



Source: ACE. 2026. AIMS III Phase 3_Part 1_Minimum Requirements for Multilateral Power Trade in ASEAN

THE PHILIPPINES: BUILDING RESILIENT GRIDS WITH PUMPED HYDRO

- The Philippines' grid faces a flexibility—not capacity—crisis, with inflexible coal baseload and capped WESM price signals limiting investment in batteries and pumped hydro
- GEA-3 signals a major policy pivot toward grid flexibility, with ~95% of awarded capacity allocated to pumped storage hydro
- **Large-scale awards (up to 2 GW per project) demonstrate government preference for utility-scale firming capacity to stabilize future high-renewable grids**
- **GEA-3 positions the Philippines as a potential ASEAN benchmark for using competitive auctions to accelerate pumped storage and system reliability investments**

LIST OF QUALIFIED BIDDERS UNDER GEA-3

No.	RE Developer	Facility Name
Geothermal		
1	Maibarara Geothermal, Inc.	Maibarara Geothermal Power Project - 1
2		Maibarara Geothermal Power Project – 2
3		Maibarara Geothermal Power Project - 3
4	Energy Development Corporation	Mindanao 3 Binary Geothermal Power Plant Expansion Project Phase 3 - Unit 1
5		Bago Binary Geothermal Power Plant - Unit 1
6	Bac-Man Geothermal Inc.	Palayan Binary Power Plant - Unit 1
7	Bac-Man Geothermal Inc.	Tanawon Geothermal Power Plant - Unit 1
Impounding Hydropower		
8	Pan Pacific Renewable Power Phils. Corp.	Gened 1 Hydroelectric Power Project
9		Gened 2 Hydroelectric Power Project
10	Pulangi Hydro Power Corporation	South Pulangi Hydroelectric Power Project
11	United Hydro Power Builders Corporation	Dakgan Hydroelectric Power Project
Pumped-Storage Hydropower		
12	Ahunan Power, Inc.	Pakil Pumped Storage Hydroelectric Power Project
13	First Gen Hydro Power Corporation	Aya Pumped Hydroelectric Power Project
14	Olympia Violago Water and Power, Inc.	Wawa Pumped Storage 1 Hydroelectric Power Project
15	Pan Pacific Renewable Power Phils. Corp.	Maton Pumped Storage Hydroelectric Power Project
16	San Roque Hydropower Inc.	Aklan Pumped-Storage Hydroelectric Power Project
17		San Roque Lower East Pumped-Storage Hydroelectric Power Project
18		San Roque West Pumped-Storage Hydroelectric Power Project
19		San Roque Upper East Pumped-Storage Hydroelectric Power Project
20	COHECO Badeo Corporation	Kibungan Pumped Storage Hydroelectric Power Project
21	Repower Energy Development Corporation	Real II Seawater Pumped Storage Project

Source: DOE Republic of Philippines, 28 January 2025

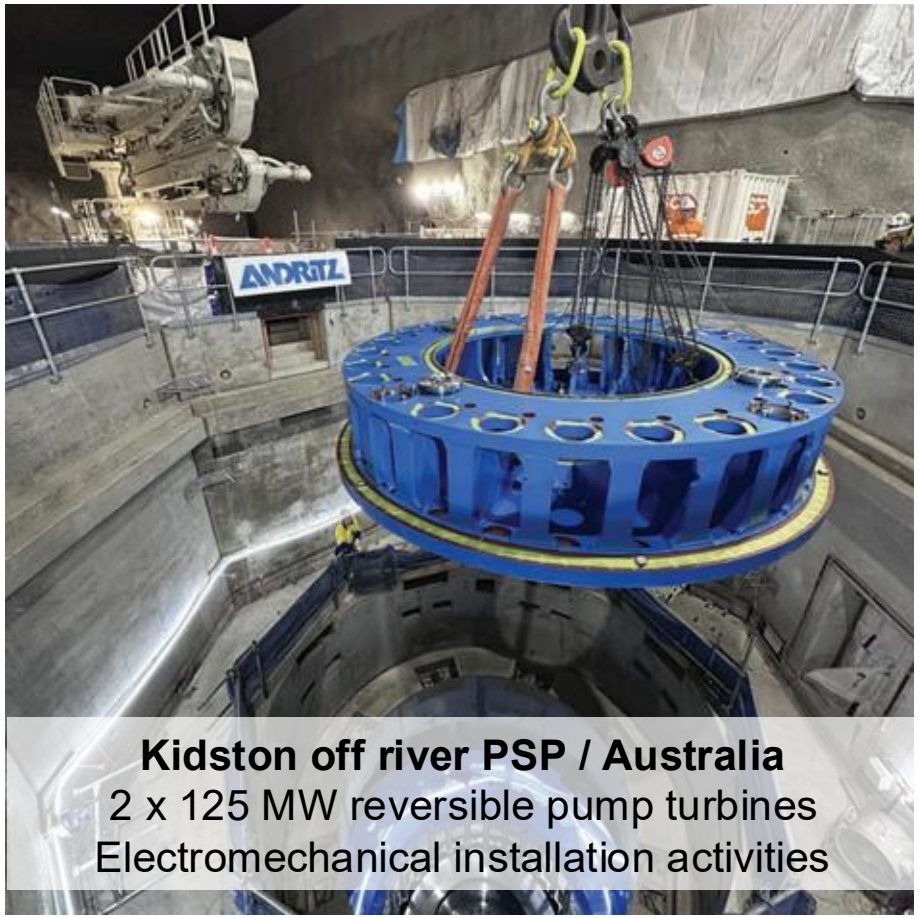
ASEAN GRID FIRMING: PUMPED STORAGE LESSONS FROM INDIA & AUSTRALIA

- **India**:
  - Resource-adequacy framework includes energy storage and flexible resources in planning, while preparing the National Electricity Plan (NEP) 2023
  - Energy Storage Obligation rising from 1% (FY2023–24) to 4% (FY2029–30)
  - **Pinnapuram PSP 1,680 MW**: record-speed 48-months implementation of critical pumped storage hydropower, highlighting the sector's readiness to accelerate 24/7 energy-security and grid-flexibility needs
- **Australia**:
  - Capacity Investment Scheme targets 40 GW by 2030 (26 GW renewable + 14 GW dispatchable)
  - Five-minute settlement and wholesale demand-response mechanism reward fast-response assets

PINNAPURAM PSP, INDIA (240 MW / 120 MW)
6+2 Pump turbines, Motor/Generators, Auxiliary equipment

KEY TAKEAWAYS

- **Indigenous renewable resources, including off-river pumped storage and hybrid renewable systems**, can strengthen ASEAN energy self-reliance amid rising geopolitical, climate, and fuel-supply risks
- **Strategic storage deployment will become increasingly important** as aging thermal baseload assets are phased out and electricity demand grows from industrial expansion, electrification, and data-center development
- **Pumped storage hydropower is emerging as critical firming infrastructure** to maintain grid reliability and resilience while enabling large-scale integration of variable renewable energy (VRE)
- **Accelerated project approvals, regional interconnection and coordinated planning frameworks** — including the ASEAN Power Grid — and adaptable policy mechanisms from Australia and India will be essential to rapidly scale firming capacity, strengthen shared regional energy resilience, and unlock ASEAN's renewable-energy transition



Kidston off river PSP / Australia
2 x 125 MW reversible pump turbines
Electromechanical installation activities

SUPPLEMENTARY MATERIAL

FROM THE HISTORIC PIONEERS OF TECHNOLOGY TO A MODERN MARKET LEADER

2025 Modernization contracts of EGAT's Srinagarind PSP (Thailand)
2025 Rising Promenade Cascade 84 MW First Low-Head projects (Malaysia)
2025 Gandikota 1,800 MW, 3rd successive PSP contracts from Adani since 2023 (India)
2024 Modernization of Malaysia's oldest hydro plant, Chenderoh (Malaysia)
2023 1st variable-speed unit rotor of Fengning II PSP lifted into pit (China; world largest)
2022 Contract signing of 1,470 MW Luang Prabang hydropower plant (Lao PDR)
2021 250 MW Kidston PSP(Australia), E&M Contract 300 MW Nenggiri (Malaysia)
2020 1st 24-hour renewable generation incl. solar, wind and 1,200 MW Pinnapuram PSP (Indi
2019 E&M Contract 250 MW Hatta PSP (Dubai); La Coche 10-pole (France; world largest)
2018 E&M Modernization 3,420 MW Nurek (Tajikistan); E&M contract 1,000 MW Suki Nari (Pakis
2017 Largest commercial Ocean tidal-stream power project connected to the grid (MeyGen, UK)
2016 Contract signing of E&M 670 Nam Theun 1 (Lao PDR)
2014 Largest single-phase generator of Langenprozelten, each pole of 34 tons (Germany; World Record)
2013 Contract signing of E&M 290 MW Xekaman 1 (Lao PDR-Vietnam)
2012 E&M Contract signing of 1,295 MW Xayaburi hydropower plant (Lao PDR)
2011 Contract signing of E&M & H&M 382 MW Ulu Jelai hydropower plant (Malaysia)
2010 Contract signing of E&M, penstock and gates of 1,200 MW Ilisu (Turkey)
2009 Works completion of 1,269 MW Cleuson-Dixence PSP, highest head 1,833 m (Switzerland; World Record)
2008 World largest tidal power plant (Sihwa, South Korea)
2002 First var speed motor-generator outside Japan (Goldisthal, Germany)
1996 COD of 504 MW Cirata hydropower plant stage 2 (becoming the largest hydropower plant in Indonesia)
1986 COD of 504 MW Cirata hydropower plant stage 1 (Indonesia)
1896 First large commercial hydropower plant
1839 First turbine supplied
1805 Foundation of Escher Wyss & Cie, Switzerland

Dr. Josef M Ullmer has been seasoned Energy Professional in the Electricity Field active in Asia and Oceania for the last four decades

He has devoted his career developing and delivering projects that improve grid stability and ensure reliable electricity supply – from thermal and gas power systems to modern renewable solutions – before finding his long-term passion in hydropower development across the Middle East, Asia, Australia, New Zealand and Oceania.

Josef, as an Electrical Engineer, has extensive experience in the business development, design, manufacturing, installation and operation and maintenance of Hydro Power projects

His work focuses on renewable and sustainable electric energy, with particular emphasis on integrating intermittent solar and wind generation through hydropower and pumped storage, as well as deploying hydropower for green hydrogen production to achieve net-zero emissions efficiently and at scale

ANDRITZ

ENGINEERED SUCCESS

DR. JOSEF M. ULLMER
PRESIDENT DIRECTOR &
REGIONAL EXECUTIVE ASIA, OCEANIA
PT ANDRITZ HYDRO

ANDRITZ HYDROPOWER IN ASEAN

Vietnam 2,590 MW
Operation MW 2,260
In execution MW 330

Myanmar 19.6 MW
Operation MW 19.6
In execution -

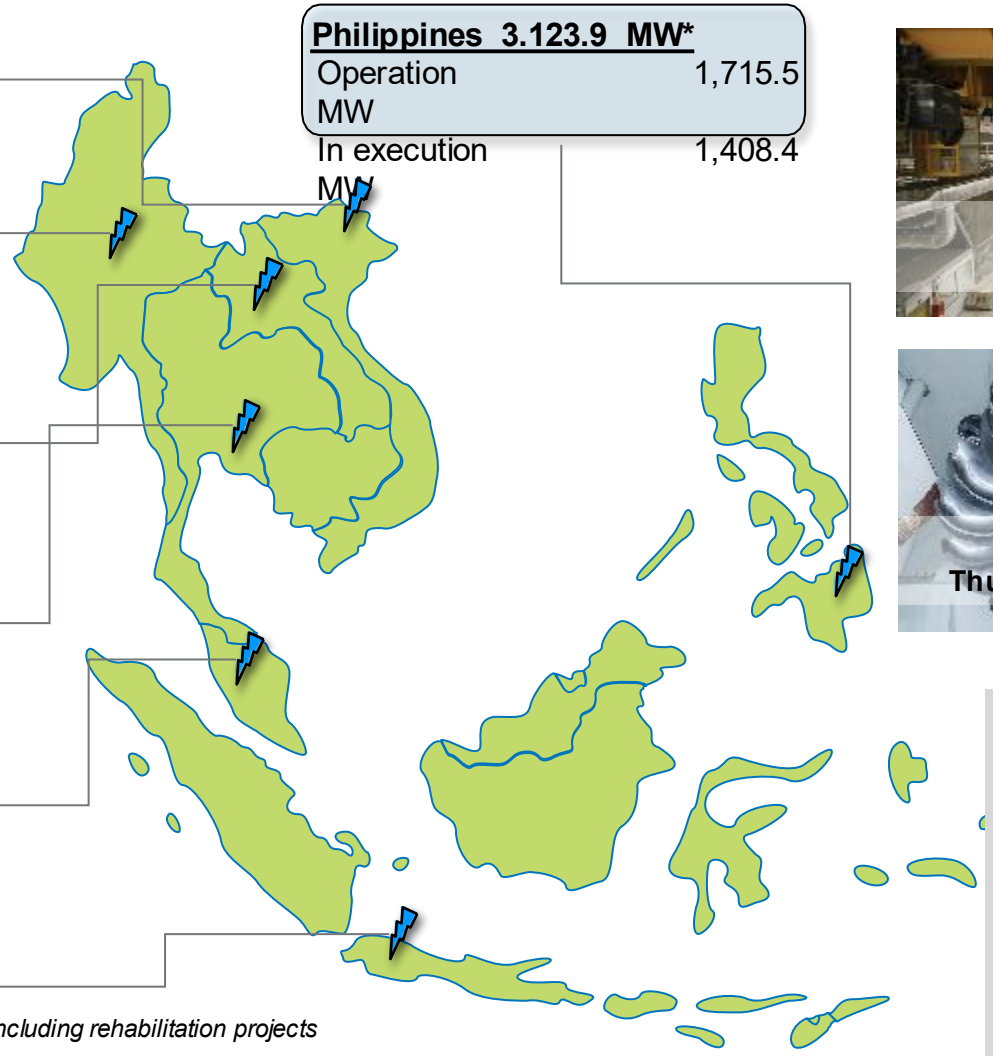
Laos 6.039.8 MW
Operation 3,259.1 MW
In execution MW 2,781

Thailand 2,441 MW*
Operation MW 1,841
In execution MW 600

Malaysia 2,139 MW
Operation MW 1,715
In execution MW 424

Indonesia 2,559 MW
Operation MW 2,559
In execution MW 90

Philippines 3.123.9 MW*
Operation MW 1,715.5
In execution MW 1,408.4



*Including rehabilitation projects

Selected project references

DR. JOSEF M. ULLMER
President Director & Regional Executive Asia, Oceania

PT ANDRITZ HYDRO
Jl. Talang No. 3 10320 Jakarta／INDONESIA

Tel. : +62 21 3906929

Mob. : +62 816 870047

e-mail : Josef.Ullmer@andritz.com

REFERENCES AND CITATIONS

- [1] IEA, Southeast Asia Energy Outlook 2024, Paris, 2024. https://www.iea.org/reports/southeast-asia-energy-outlook-2024
- [2] IEA, Fossil Fuels Consumption Subsidies 2022, Paris, 2023. https://www.iea.org/reports/fossil-fuels-consumption-subsidies-2022
- [3] U.S. EIA, “Amid Regional Conflict, the Strait of Hormuz Remains Critical Oil Chokepoint,” June 2025. https://www.eia.gov/todayinenergy/detail.php?id=65504
- [4] IRENA & ACE, Renewable Energy Outlook for ASEAN: Towards a Regional Energy Transition, 2nd Edition, 2022. https://www.irena.org/publications/2022/Sep/Renewable-Energy-Outlook-for-ASEAN-2nd-Edition
- [5] IEA, Energy and AI, Paris, 2025. https://www.iea.org/reports/energy-and-ai
- [6] ADB, Asian Development Outlook April 2026, Special Topic: AI Readiness and Economic Impacts in Asia and the Pacific. https://www.adb.org/publications/asian-development-outlook-april-2026
- [7] ICSC, “Rethinking Baseload: Why the Philippines Needs a Flexible Power Grid,” Briefing Note, March 2026. https://icsc.ngo/portfolio-items/rethinking-baseload-why-the-philippines-needs-a-flexible-power-grid/
- [8] OECD, Renewable Energy Regulatory Diagnostic Toolkit (adapted for ASEAN context).
- [9] ACE, 8th ASEAN Energy Outlook (AEO8), September 2024. https://aseanenergy.org/publications/the-8th-asean-energy-outlook/
- [10] ADB, ASEAN Power Grid Financing Initiative, 2024. https://www.adb.org/where-we-work/southeast-asia/asean-power-grid
- [11] Eco-Business, “ASEAN Power Grid Needs at Least US$100 Billion to Build Transmission Lines: ADB,” 2024. https://www.eco-business.com/news/asean-power-grid-needs-at-least-us100-billion-to-build-transmission-lines-adb/
- [12] H. Lee, “Unlocking the ASEAN Power Grid (APG) Potential,” ADB/ACEF Presentation, June 2024. https://asiacleanenergyforum.adb.org
- [13] India Ministry of Power, “Renewable Purchase Obligation (RPO) and Energy Storage Obligation Trajectory till 2029–30,” Order dated 22 July 2022.https://powermin.gov.in
- [14] India MNRE, Energy Storage Systems (ESS) Overview. https://mnre.gov.in/en/energy-storage-systemsess-overview/
- [15] Australian Government DCCEEW, Capacity Investment Scheme, updated May 2026. https://www.dcceew.gov.au/energy/renewable/capacity-investment-scheme
- [16] ADB & World Bank Group, ASEAN Power Grid Financing Initiative with ASEAN Secretariat and ACE, 2024. https://asean.org
- Dec 2022：Natural gas and LNG related information | JOGMEC JOURNAL 独立行政法人エネルギー・金属鉱物資源機構［JOGMEC］

LEGAL DISCLAIMER