USAID SPP Strategies for Advancing the ASEAN Power Grid

2nd GMS ENERGY TRANSITION TASK FORCE COMMITTEE MEETING

4-5 December 2023, Siem Reap

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Topics

- About the USAID Southeast Asia Smart Power Program
- SPP Strategies for Advancing the ASEAN Power Grid
- JUMPP Update

About the USAID Southeast Asia Smart Power Program

A 5-year program to promote energy trade, support open and transparent energy markets, and accelerate ASEAN's transition to **clean, reliable, and affordable energy**

Targets

Deploy **2 GW** of Advanced Energy Systems

$2 billion of Advanced Energy Financing

5% Increase in Regional Power Trade

Strategy

- Expand power trade
- Accelerate renewable energy deployment
- Support regional and subregional clean energy initiatives
- Support utility modernization
- Optimize natural gas use

Geographic Coverage

A regional program supporting clean energy across ASEAN, especially: **Cambodia, Indonesia, Laos, Philippines, Vietnam,** and **Thailand**

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SPP Strategies for Advancing the ASEAN Power Grid

Near-Term (2023-2026)	Long-Term (2026-2030)
Support adoption of leading practices for Multilateral Power Trade (MPT)	3rd Party Financing for Priority interconnector Feasibility Studies
Increase power exchange across under-utilized interconnectors	Capacity building on sub-sea connector issues and technology
Hybridization strategies to "firm" VRE prior to export	Improved coordination of regional and national power development planning

NEAR TERM STRATEGIES

Support Adoption of Leading Practices for MPT

- Cost-based frameworks for calculating wheeling charges
- Tracking the flow and delivery of Renewable Power Production across multiple utility grids

Role of Wheeling Charges in Power Trade

- Wheeling is required in international power trade to recover costs of using a country's transmission network.
- Without reasonable wheeling cost recovery, countries have little incentive to allow power transit.
- Wheeling charges should be based on economic principles:
  - **Promoting efficiency**: Provide appropriate price and incentives for investment
  - **Recovering costs**: Cost recovery lowers the risk of investment; historic costs vs. forward looking costs can be used.
  - **Ensuring transparency, fairness and predictability**: Confidence in the wheeling charge framework encourages investment, equitable agreements, & new market participants.

Functional Requirement of a Wheeling Charge: Cost Recovery

Capital Costs

- Recovering capital costs for transmission and related assets, reflective of the developer's or owners' cost of capital.
- Recovering a reasonable return on any equity investment

O&M and Refurbishment Costs

- Recovering variable costs including O&M and refurbishment associated with providing the wheeling service
- Inclusive of labor and organizational overhead.
- Typically based on accounting costs

Network Losses

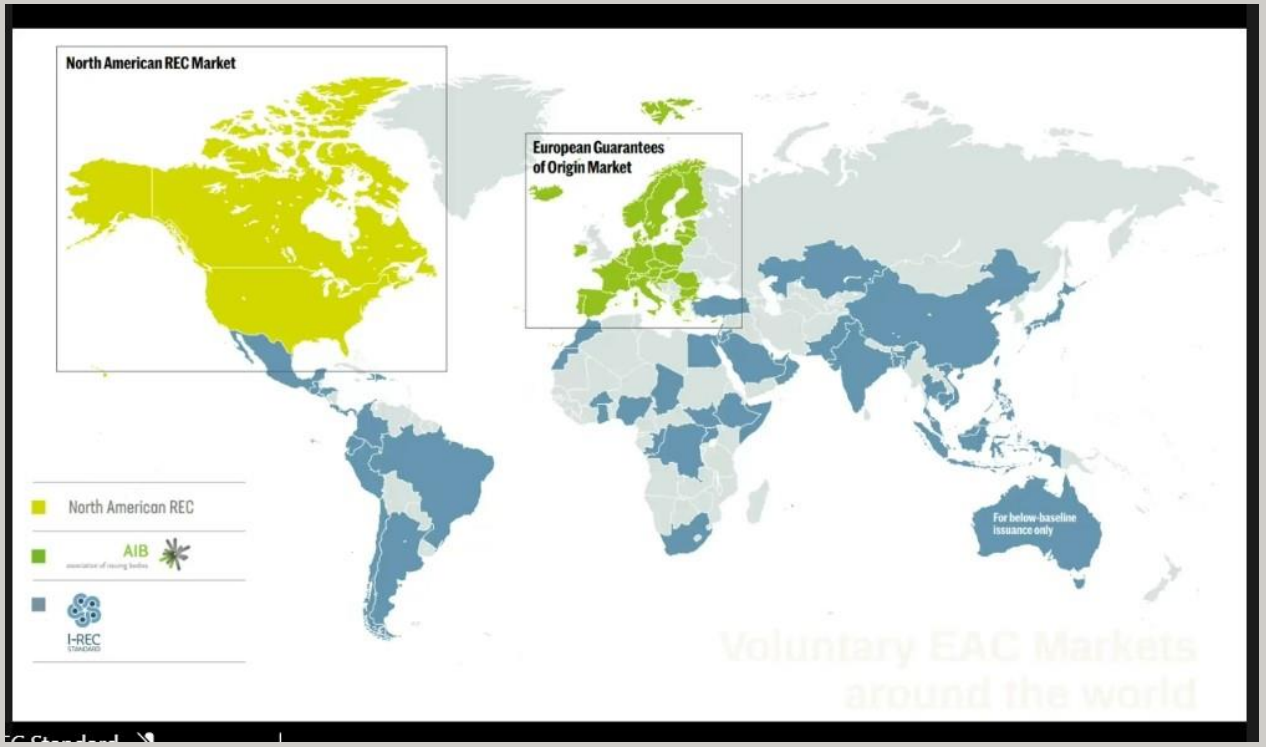
- Incremental losses associated with the impact of wheeling on the network.
- Calculated through a load flow study.

Congestion

- Congestion on the network incurs costs to reroute delivery of power from producer to consumer
- An uplift or redispatch charge reimburses the transmission owner for these extra costs

“Tagging” Delivery of Renewable Energy Across Multiple Transmission Grids

- Utilities and consumers purchasing zero-emissions power need attribution that their consumed electricity comes from RE
- Most of today’s attribution frameworks (e.g., i-RECS) are country-specific –except the EU & US/Canada, which have adapted regional attribution mechanisms
- Many AMS have already adopted single-market RECs frameworks, where attribution is relatively simple
- Multi-lateral power trade of RE requires a regional solution to sourcing RE from one market and consuming it in another



SPP will Support Developing a Regional RECs framework Suitable for ASEAN

- A new regional working group on Renewable Energy Certificates (RECs) is just getting underway
- The working group will address the challenges of "pairing" electricity consumption in one market with RE production in another
- Key issues:
  - Harmonizing Energy Attributes registries to accommodate multi-lateral attribution
  - Creating a tagging system for RE flows over transmission systems
- For further information on this new effort contact: asiasupport@irecstandard.org

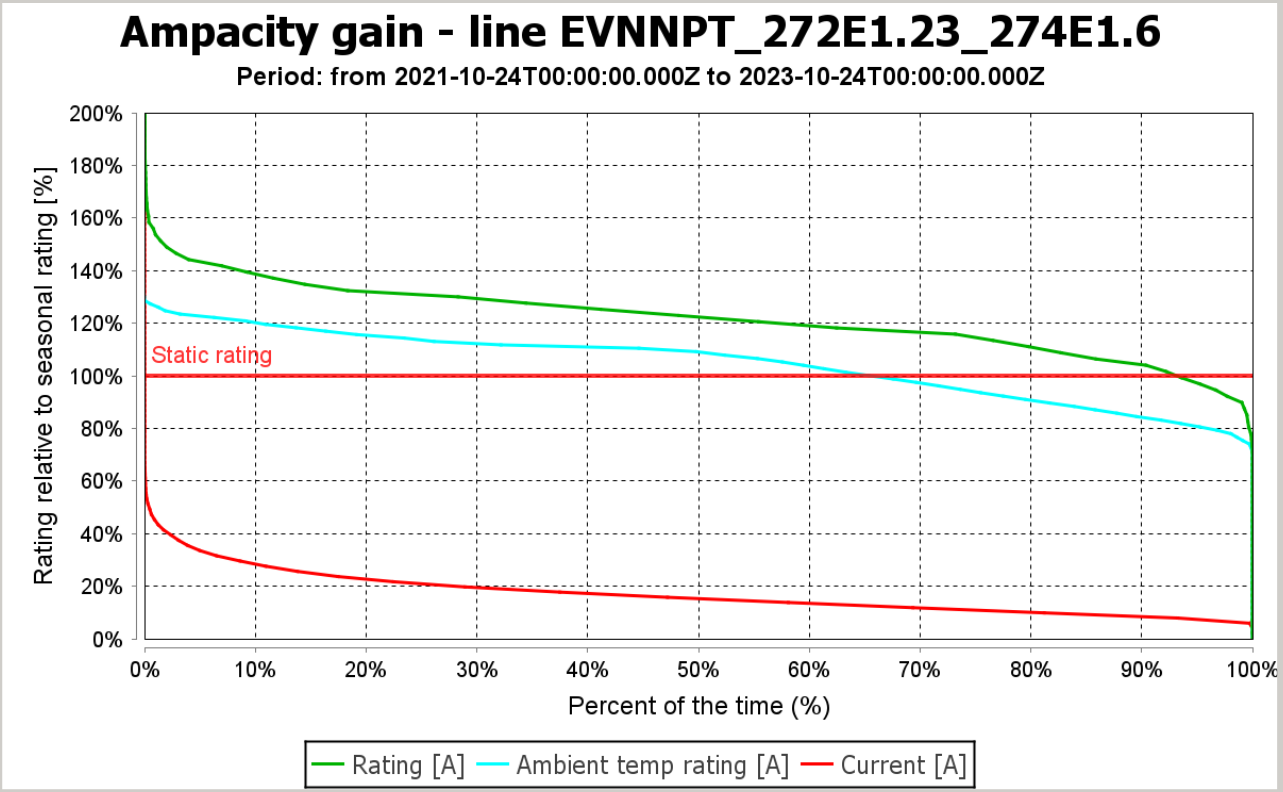
Increasing Power Exchange Across Existing Interconnectors

SPP is supporting EGAT to consider Dynamic Line Rating (DLR) to increase Available Transfer Capacity (ATC)

SPP will conduct a case study of DLR potential on an EGAT transmission line

Potential applications in the GMS:

- Increase power flow on existing lines
- Facilitate supplemental generation (Floating SPV)
- Grid Modernization/Digitalization



Mobilizing 3rd Party Funding of Greenfield Interconnector FS

- SPP supports ACE and HAPUA to move forward the priority interconnectors recommended by AIMS III
- A $2 million grant for FS of two priority Indonesia-Malaysia interconnectors was just approved by USTDA
- Of particular interest is a subsea connection Sumatra – Peninsular Malaysia
- SPP will support ACE and HAPUA to mobilize additional 3rd party financing for additional interconnector projects
- JICA and other donors have expressed interest in supporting this initiative

Hybridization strategies to "firm" VRE exports

- Some bilateral power trading partners are reluctant to accept imports of Variable Renewable Energy (VRE), as variability creates new requirements for voltage and frequency balancing across the synchronized systems
- Hybridization strategies – pairing a VRE resource with a supplemental fast-responding generation resources – is a proven solution to "smoothing" or "firming" VRE
- Existing hydro resources + new battery storage can provide the fast-response "firming" resources needed by VRE-exporting countries
- SPP will support modeling, analysis and piloting of hybridization solutions for ASEAN utilities

LONG TERM STRATEGIES

Subsea Interconnector Capacity-Building Workshop

Objectives:	• Build awareness of technology and issues associated with subsea power transmission lines • Build capacity of ASEAN energy entities to evaluate subsea project proposals and develop appropriate subsea connector policies • Provide updates on planned and ongoing subsea connector feasibility studies
Potential Workshop Delivery Partners:	• USAID SE Asia Smart Power Program • ASEAN Center for Energy • USTDA • US DOE Net Zero World Program • HAPUA APG Working Group
Details	• Two-day workshop May 2024 in Jakarta • 50-80 persons from Energy Ministries, Regulatory Agencies and Utilities
Experts to be Mobilized:	• UNCLOS Law of the Sea expert • Environmental & Social Impact Assessment in the Subsea Context • EU subsea connector project experience • Subsea risk assessment • Subsea project FS experts • Subsea power cabling, HVDC, supply chain & operations experts

Coordination of Regional & National Power Development Planning

- Regional Interconnector Master Planning under the AIMS III framework the responsibility of ACE, APGC, HAPUA
- National Power Development Planning the responsibility of Ministries and HAPUA utilities
- Identification of power trading – and regional power market - opportunities could be improved through:
  - Sharing of grid models and forecasting/production costing software (such as PLEXOS)
  - Bilateral workshops to identify additional power trading or market development opportunities
- USAID SPP and USAID LES are ready to support workshops between power trading partners to identify additional power trading and other opportunities, such as hybridization

JUMPP UPDATE

JUMPP

USAID Smart Power Program JUMPP Delivery Through FY24

- SPP will continue supporting Lao PDR's MEM and EdL, as part of JUMPP's bilateral technical cooperation
- SPP will implement activities in support of RE auctions by Mekong utilities, delivered through its Competitive Procurement Center
- SPP will continue supporting Interconnector Project Feasibility Studies, in cooperation with ASEAN Center for Energy (ACE) and Mekong utilities
- SPP will support updating the AIMS III Interconnector Master Plan, in cooperation with ACE and Mekong utilities
- SPP will implement Utility Strengthening Partnerships, including:
  - EV deployment and grid impact management
  - Rooftop solar management
  - Identifying opportunities for enhanced bilateral and multilateral power trade

Thank you!

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SPP Activities in Support of the ASEAN Power Grid
2. Dynamic Line Rating – Capacity Building/Case Study

- SPP is supporting EGAT to consider Dynamic Line Rating as a tool for real-time adjustments of power flow
- SPP will conduct a case study of DLR potential on an EGAT transmission line

Potential applications in the GMS:

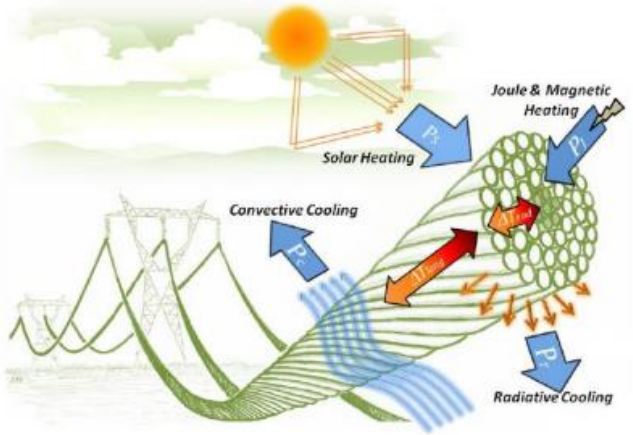
- Increase the power flow on existing lines
- Facilitate supplemental generation (Floating SPV)
- Grid modernization/Digitalization of grid

Background

Heat stored in conductor = Heat gain – Heat loss

$$c_p m \frac{dT}{dt} = P_{joul} + P_{sol} + P_{mag} - P_{con} - P_{rad}$$

oule heating | Solar heating | Magnetic heating | Convective cooling | radiative cooling



System mechanical and electrical factors
- Line current
- Sag/tension
- Insulation

Environmental factors
- Wind speed
- Wind direction
- Solar radiation
- Ambient temperature

Ampacity