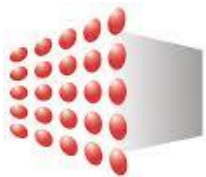


***Scene Setting Presentation:
Socio-Economic Benefits from Enhanced Energy
Connectivity in ASEAN
(Initial Phase)***



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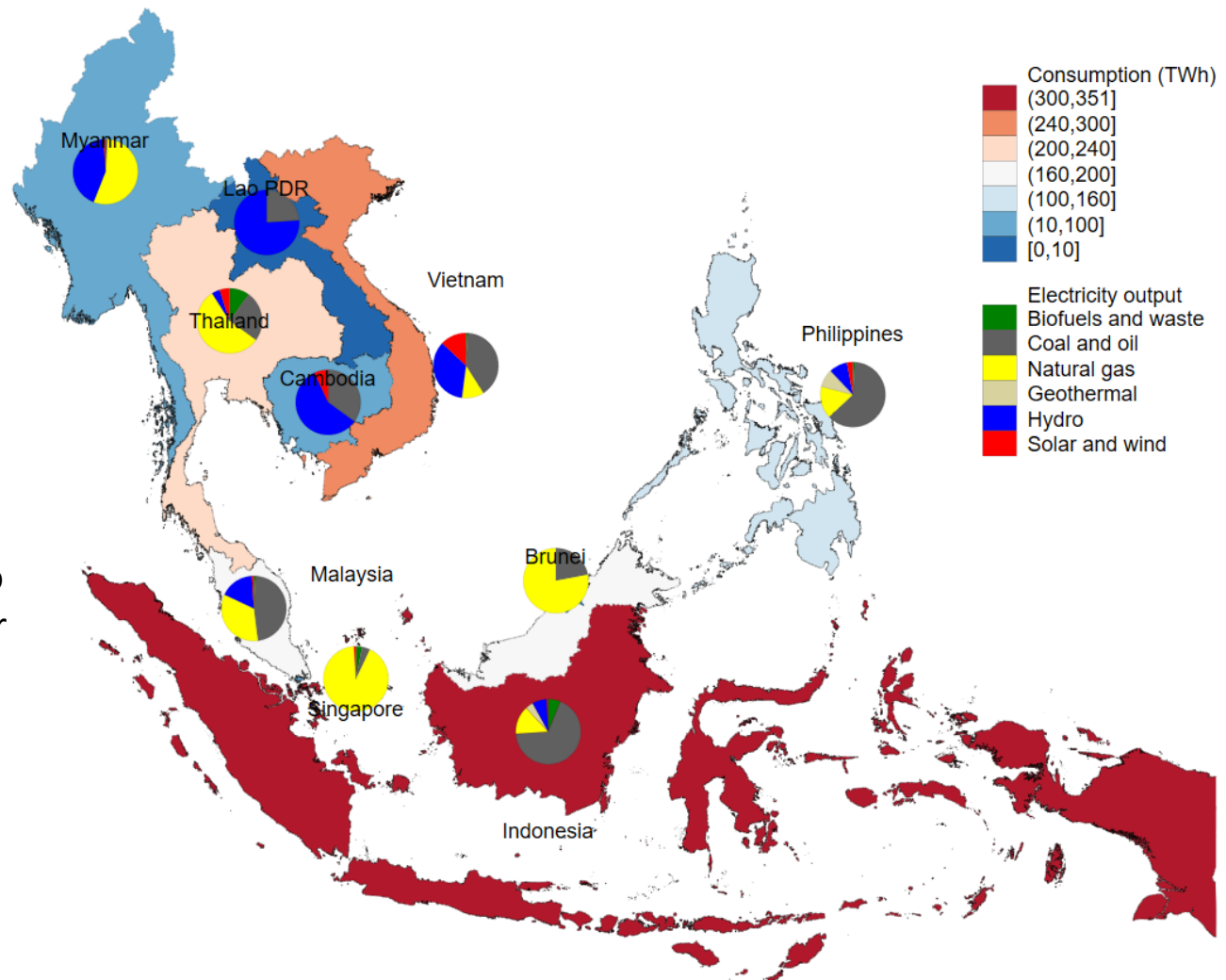
NUS
National University
of Singapore

Decarbonising Asia: Energy Transformation
SIEW Thinktank Roundtables
Singapore, 25 October 2024

ASEAN Power Sector at a Glance

ASEAN's Electricity Generation Mix in 2022

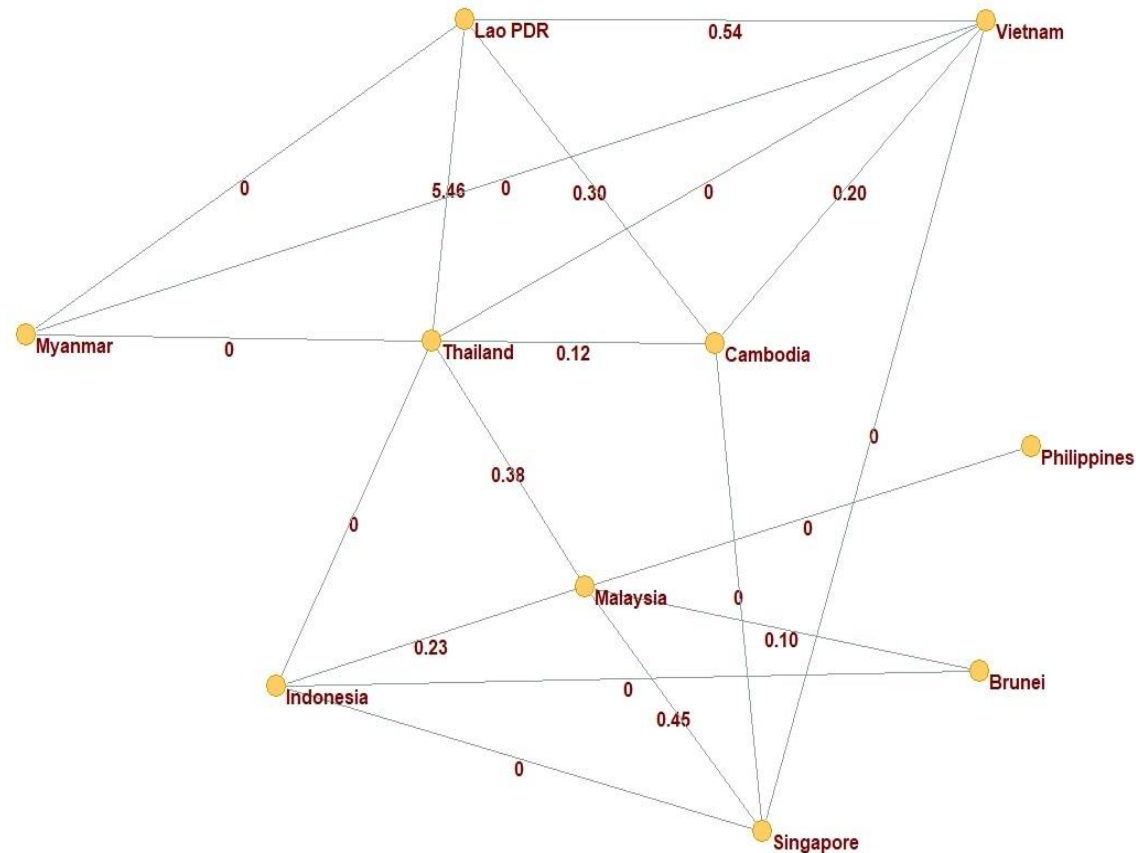
- Fossil fuel share in ASEAN's power generation mix remained at 72.3% in 2022
- Heterogeneity in electricity consumption, renewable resource potentials, and emissions targets (NDCs)
- What are the viable **net-zero pathways** for ASEAN's power sector?
 - Meet future power demand
 - Meet NDCs and beyond
 - Economically and technologically feasible



ASEAN Power Sector at a Glance

- ASEAN has a long-standing development goal of cross-border transmission through the ASEAN Power Grid (APG)
- Existing and ongoing cross-border transmission capacity: 7.78 GW
- Future development of the APG will connect all ten ASEAN countries into an integrated power grid network
- What are the **socio-economic benefits** arising from enhanced cross-border transmission?

Network Structure of the ASEAN Power Grid



Notes:

(1) Value of edge: transmission capacity (GW).

(2) Zero means no transmission capacity in 2018.

(3) Transmission lines are not drawn to scale.

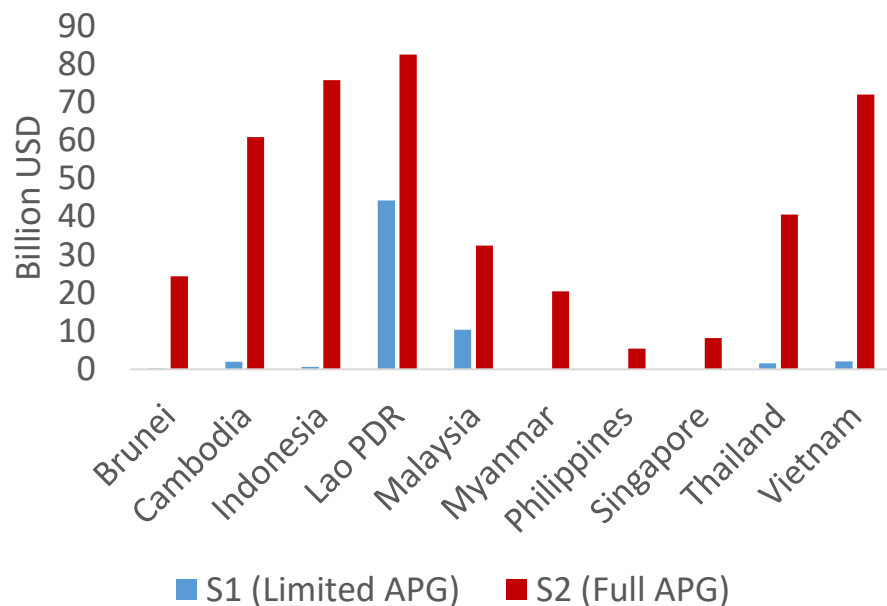
Scenario design

- Critical questions
 - What are the viable net-zero pathways for ASEAN's power sector that can meet its future electricity demand through 2050?
 - What's the role of cross-border transmission in unlocking potential socio-economic benefits in such pathways?
- Two scenarios
 - S1 (Limited APG): cross-border transmission capacity remains unchanged at 7.78 GW for future years
 - S2 (Full APG): Expansion in cross-border transmission is allowed in the planned transmission lines
- Analytical tools
 - ESI's in-house Power Capacity Expansion model with hourly resolution
 - A framework of Energy Security Index comprising 12 indicators from economic, energy supply chain and environmental dimensions

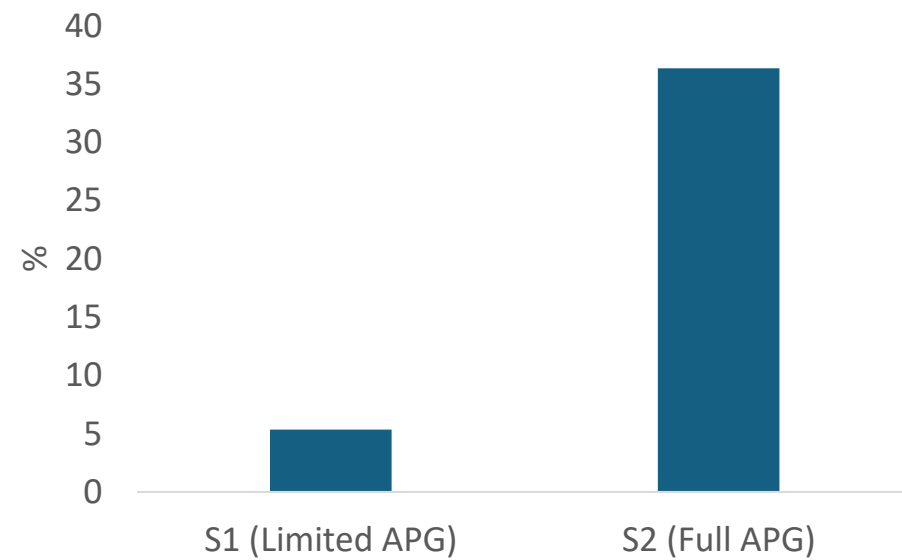
Enhanced cross-border transmission can generate significant revenues through electricity trade

- More ASEAN countries can benefit from larger export revenues through enhanced cross-border transmission
- Cumulative export revenue can reach 36.4% of total investment in low-carbon generation

Cumulative export revenue
2018 - 2050



Cumulative export revenue of ASEAN
Relative to total low-carbon investment



Notes: export price is based on the hourly marginal cost of exporter. In the model, electricity flows from a place with low marginal costs to the place with high marginal costs.

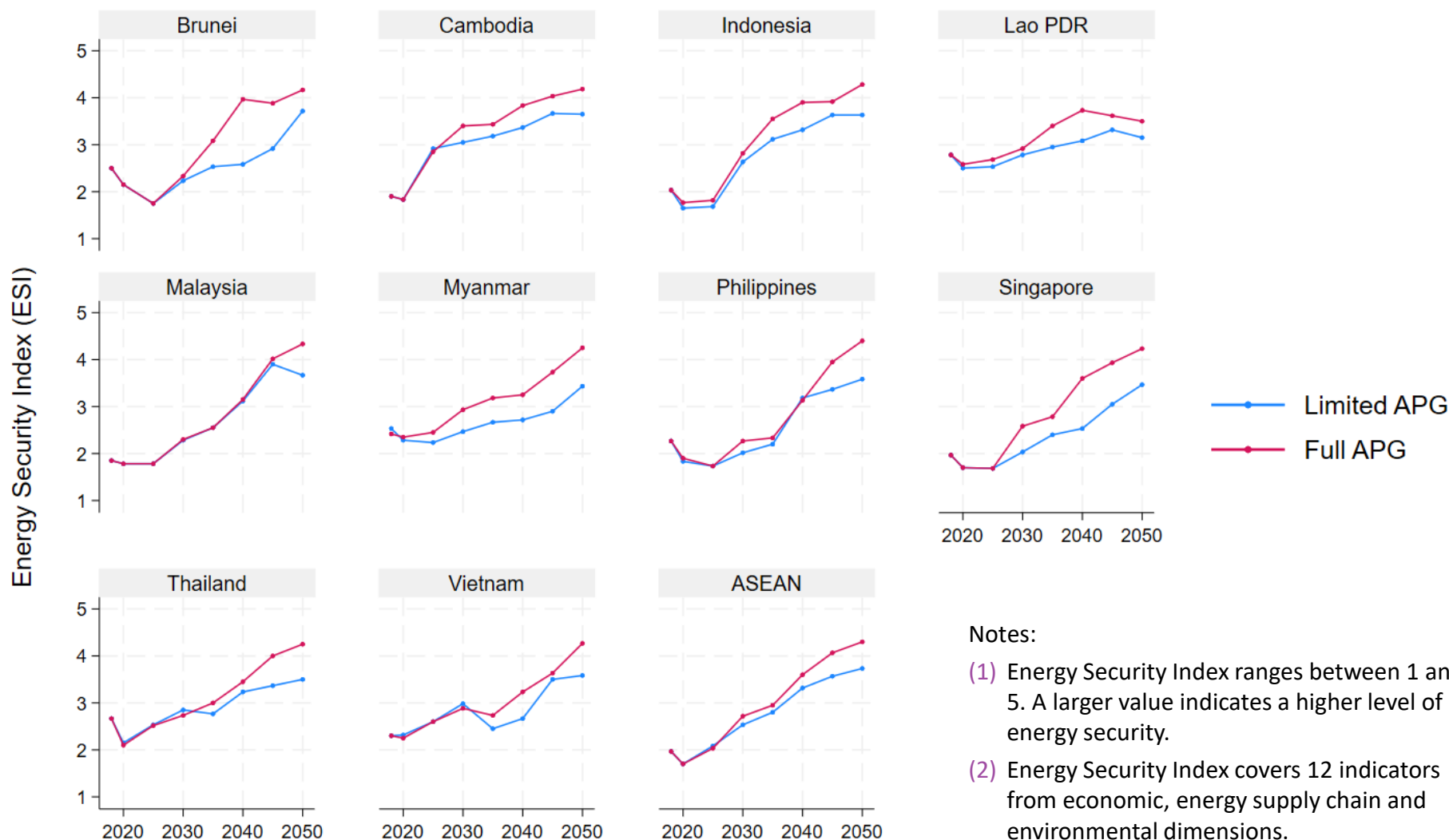
Enhanced cross-border transmission can bring cost-savings in ASEAN's energy system

- For importers, less domestic generation and storage capacity are needed
- For exporters, export revenue can offset domestic energy system costs

Net energy system cost (billions USD) Cumulative statistics for 2018 – 2050			
Country	S1 (Limited APG)	S2 (Full APG)	S2 minus S1 (%, relative to 2018 GDP)
Brunei	9.5	9.0	-0.5 (-3.4%)
Cambodia	50.3	45.2	-5.1 (-20.8%)
Indonesia	682.0	666.7	-15.3 (-1.5%)
Lao PDR	-0.8	-20.1	-19.4 (-106.7%)
Malaysia	408.0	398.9	-9.1 (-2.5%)
Myanmar	63.5	53.1	-10.4 (-15.3%)
Philippines	358.2	357.0	-1.1 (-0.3%)
Singapore	210.5	163.1	-47.3 (-12.6%)
Thailand	613.5	601.7	-11.7 (-2.3%)
Vietnam	658.0	647.4	-10.7 (-3.4%)

Notes: (1) Net energy system considers import cost and export revenue. (2) Transmission cost and transmission loss are borne by importers. (2) A negative value of net energy system cost indicates that export revenue exceeds all other cost components.

Enhanced cross-border transmission can improve energy security in ASEAN



Concluding remarks

- Enhanced cross-border transmission can play an important role in achieving net-zero emissions in ASEAN's power sector
 - Electricity imports can account for up to 28% of ASEAN's 2050 generation mix
- Enhanced cross-border transmission can boost electricity trade and generate export revenue in ASEAN
 - Cumulative export revenue can reach up to 36.4% of total low-carbon investment
- Significant cost-savings can arise from enhanced cross-border transmission
 - Both exporters and importers can reduce their cumulative net energy system costs
- Better energy security performance arises from enhanced cross-border transmission

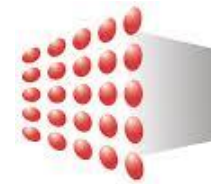
Thank you!

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Acknowledgements:

*We would like to thank all team members: Su Bin, Angel Mah,
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