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ADB

ASEAN Power Grid and its Economic Impact on Malaysia

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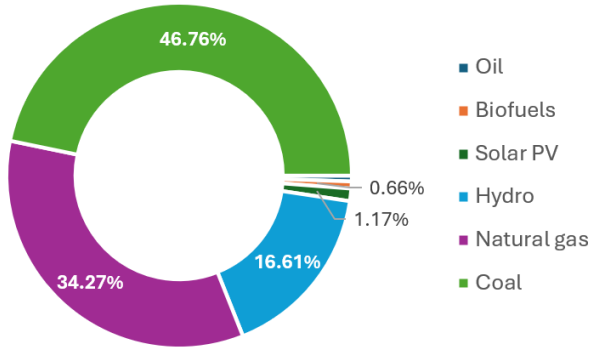
Preliminary Findings

ASEAN Power Grid and Malaysia

- ASEAN Power Grid (APG) consists of **18 power interconnection projects**.
- For Malaysia, APG covers **7 interconnection projects** and one national grid project, i.e. Sarawak and Peninsular Malaysia.
- The existing APG interconnections link Malaysia to Singapore, Thailand, Indonesia, and the Philippines.
- Malaysia has strengthened its role in Southeast Asia's clean energy trade.
  - Current **100MW supply** to Singapore
  - Participation in the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP), and
  - A new **50MW RE** flow between Malaysia and Singapore.

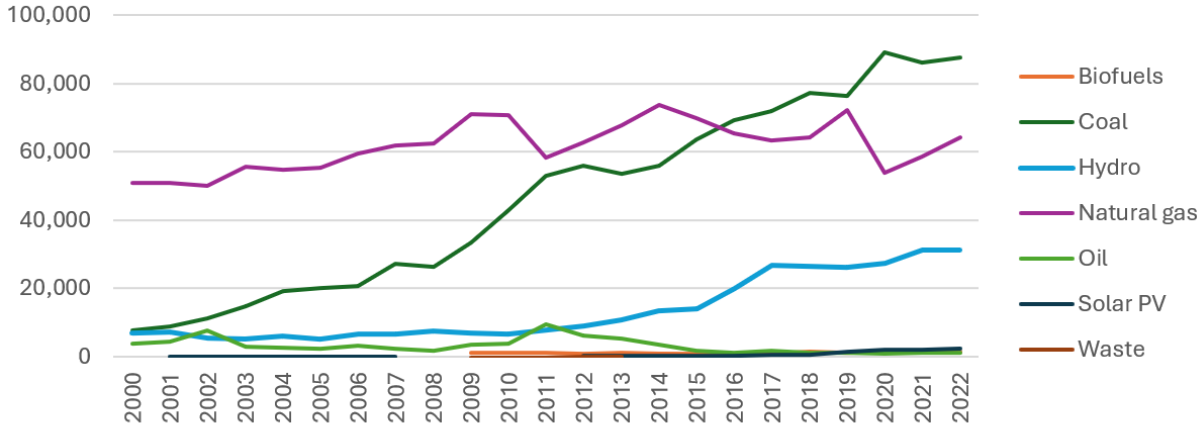
Overview of Malaysia's Power Sector

Figure 1. Malaysia's Power Generation Mix as of 2022, in GWh



Source: IEA (2024). https://www.iea.org/countries/malaysia/electricity

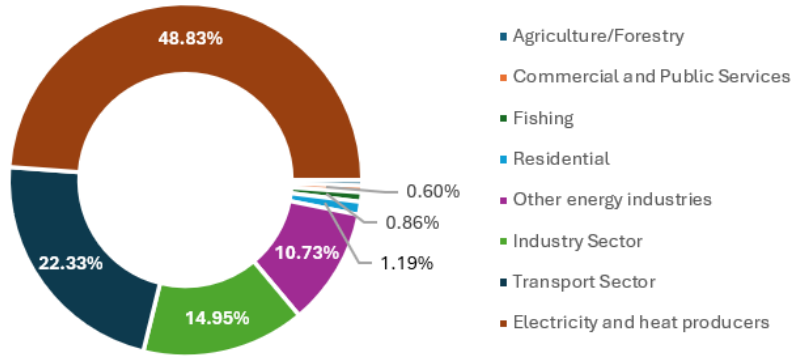
Figure 2. Malaysia's Historical Power Generation Mix 2000-2022, in GWh



Source: IEA (2024). https://www.iea.org/countries/malaysia/electricity

- More than **80%** of Malaysia's power generation mix is sourced from **fossil fuels**
- Shift from Natural Gas to Coal in recent years
- Power sector accounts for nearly **50% of Malaysia's CO_2 emissions**

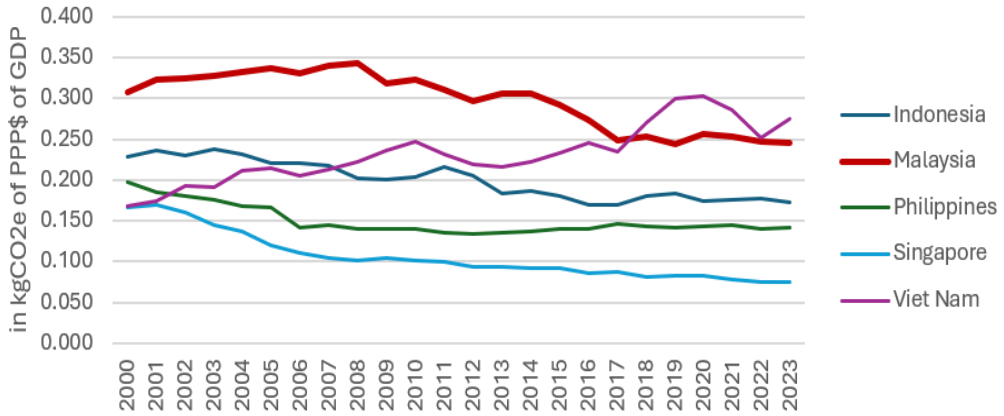
Figure 3. Malaysia's CO_2 Emissions as of 2022, by source



Source: IEA (2024). https://www.iea.org/countries/malaysia/electricity

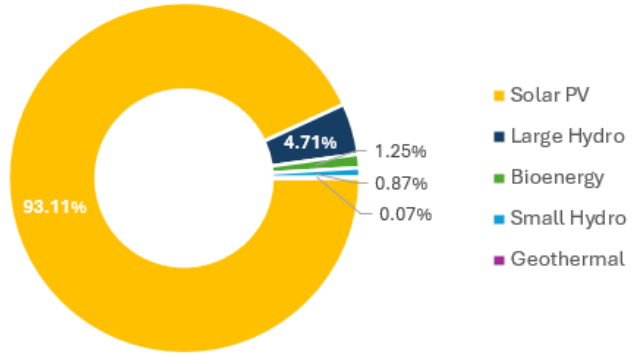
Malaysia's Decarbonization Targets

Figure 4. ASEAN-5 Carbon Intensity of GDP, 2000 to 2023



Source: World Bank WDI (2024). https://data.worldbank.org/indicator/EN.GHG.CO2.RT.GDP.PP.KD?end=2023&locations=MY-SG-ID-VN-PH&start=1990&utm_source=chatgpt.com&view=chart

Figure 5. Renewable Energy Potential in Malaysia



Source: MyRER 2035 Report (2021). https://www.seda.gov.my/reportal/myrer/

- Net-zero goal by 2050
- As of 2023, a **27% reduction** has already been achieved
- From a total of 288.9GW RE potential, more than **90% will be sourced from Solar PV**

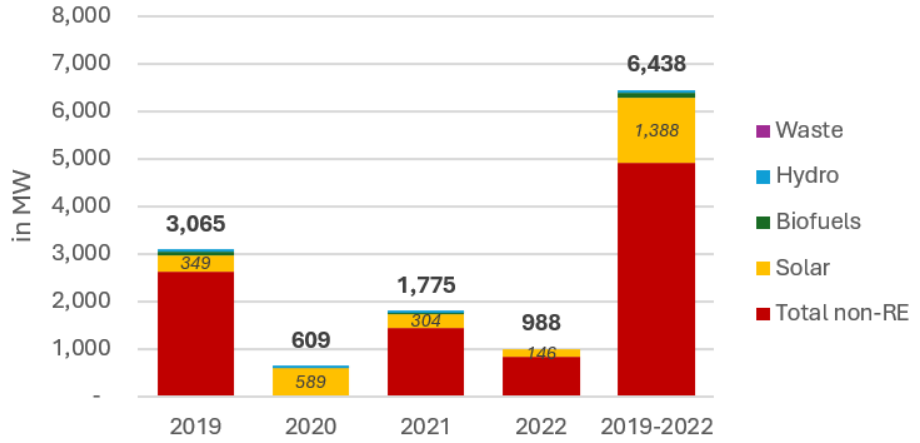
Table 1. Malaysia Clean Energy Commitments and Targets

Policy	Commitments/Targets
NDC	
Unconditional	cut carbon intensity against GDP by 45% by 2030 compared to 2005 levels
Conditional	N/A
Net zero target	2050
Energy Outlook	
Short-term (up to 2035)	31% RE by 2025; 40% by 2035
Long-term (by 2050)	70% by 2050

Sources: Malaysia NDC, MyRER 2035 Report (2021), NETR (2023)

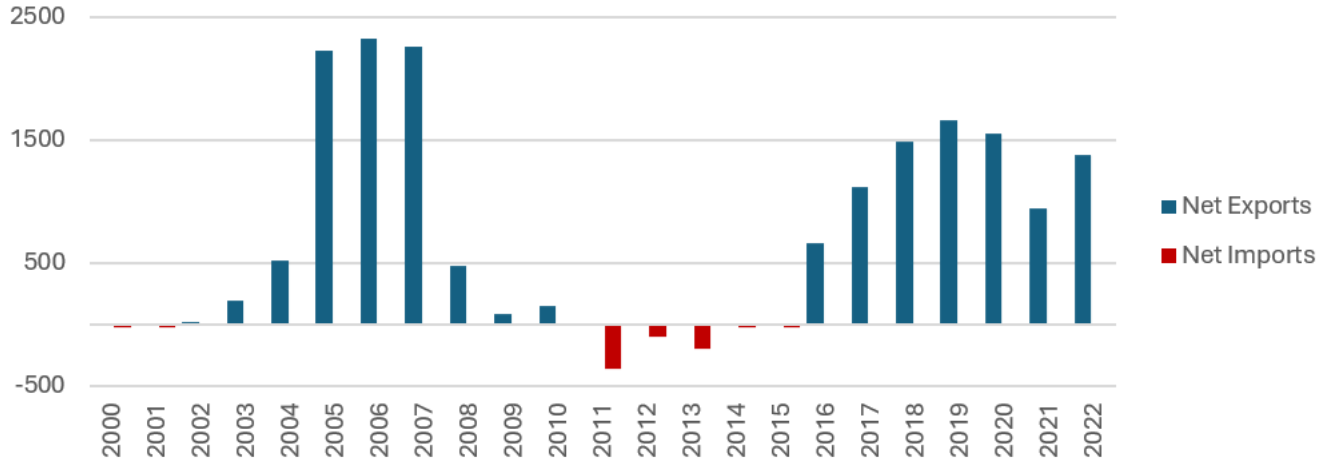
RE Capacity Progress and Power Trade

Figure 6. Installed Capacity Additions in Malaysia 2019-2022, in MW



Source: IRENA (2024) Renewable Energy Statistics 2024.

Figure 7. Net Imports and Exports of Electricity in Malaysia



Source: IEA (2024). https://www.iea.org/countries/malaysia/electricity

Challenge in RE development

- As of 2022, there are only about 9 GW of installed RE capacity
- Despite the large potential of solar, only about 1,388MW capacity additions (2019 to 2022)

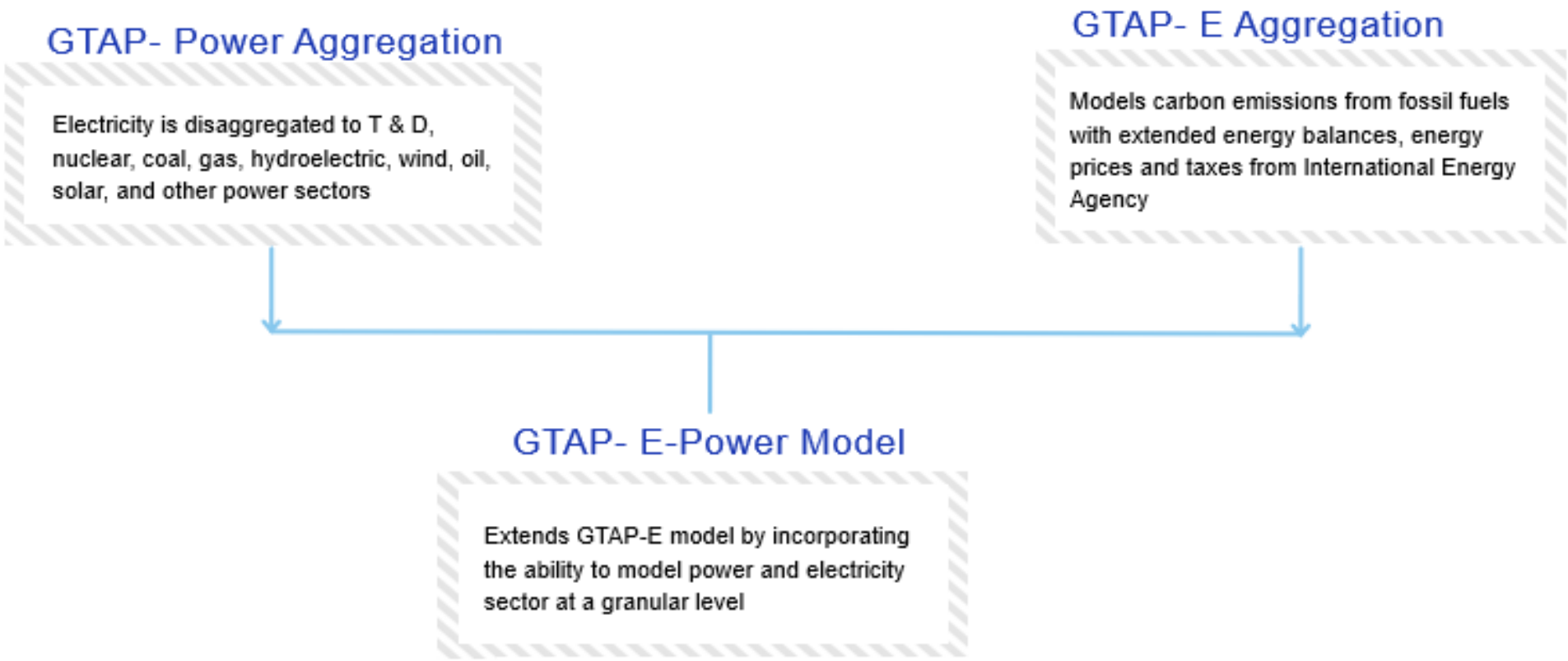
In terms of power trade, Malaysia is a **net exporter** with engagements with Thailand, Indonesia, and Singapore.

APG and Impact on Malaysia

Objective

- First, socio-economic benefits to Malaysia from being part of APG and being part of power trade (and exports) with the neighboring countries.
    - Greater understanding around sectoral and people-centric gains (or not)
    - Greater awareness on community impact
- Second, to identify policy and regulatory challenges for power trade with neighboring countries.
    - Also, provide policy suggestions to mitigate the societal adverse impact.

GTAP E-Power Model Structure and Data



GTAP E-POWER -Models the economic impact of change in emissions and captures the potential for renewable technologies

Policy Scenarios

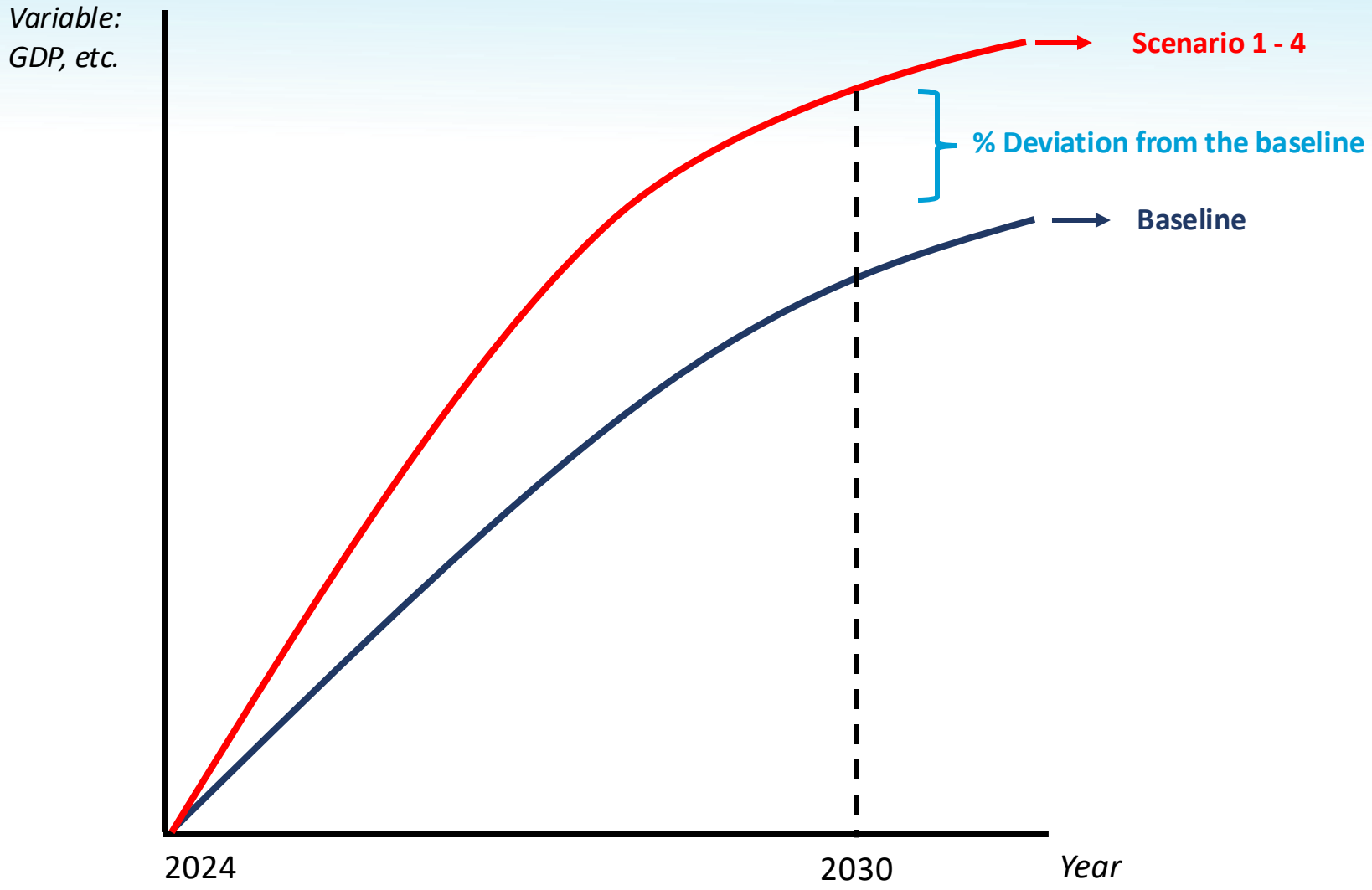
Baseline Scenario: Business as usual (Dynamic Baseline to 2030 so far)

Policy Scenarios: Results are expressed as deviations from the baseline

- **Scenario 1:** Malaysia develops RE for itself - domestic consumption only
- **Scenario 2:** Malaysia participates in APG (Low RE trade: ASEAN Power Grid (APG) with Expanded Transmission Lines (ETLs) across 3 Subregions (SRs) based on APG Map with 31% RE Share (April 2024))
- **Scenario 3:** Malaysia participates in APG (Medium RE trade: APG with ETLs across 3 SRs as above, and incorporate the Optimum RE expansion scenario contained in the AIMS III scenarios with 59% RE share)
- **Scenario 4:** Malaysia participates in APG (High RE trade: APG with ETLs across 3 SRs as above, and endogenous carbon tax to hit conditional NDCs for ASEAN economies with 59% RE Share)

- We analyze the differences between each of scenarios 1-4 from scenario 0 that is the baseline
- Each one of this will be done for two years – 2030 and 2040 – and for the RE sector and the greater macroeconomy

Interpreting our Dynamic Model Results



Summary of Preliminary Results (% Deviation from 2030 Baseline)

Metric	Scenario 2 (Low APG Trade)	Scenario 4 (High APG Trade)
RE Sector Growth		
Jobs	⇑ 112%	⇑ 201%
Production	⇑ 121%	⇑ 212%
Investment	⇑ 127%	⇑ 220%
Tax Revenue	⇑ 101%	⇑ 191%
Macro Impact		
GDP	⇑ 4.0%	⇑ 9.0%
Jobs (Economy-wide)	⇑ 3.1%	⇑ 6.1%
Manufacturing Output	⇑ 5.2%	⇑ 9.7%
Services Output	⇑ 4.5%	⇑ 9.5%
Overall Investment	⇑ 5.4%	⇑ 9.9%

Preliminary Conclusions

- **Greater the integr**ation with the grid, **higher are the economic gains for Malaysia**, even at a macro level, but mostly driven by the huge gains in RE sector, translating into the boost of both manufacturing and services sector.

- The main channels for these positive effects are – **greater productivity** in the economy, **lower power prices** and **higher competitiveness** of all sectors benefitting from the greater and cheaper availability of power.

Further refinements of the findings

- Extension to 2040
- Deeper analysis of results, tabulation, graphs etc.

- Further revisions to methods:
  - Granular details – who are the losers? E.g. Why export when local industries need it?
  - Can losing sectors/people be compensated by tax revenue recycling?
  - What about energy price volatility (like Finland, etc.)?
  - People-centric analytics: Household Income Implications: For example, differences in gains by agriculture (farm wages), manufacturing and services,
  - Inequalities: unskilled-skilled labor differences
  - Capture increase in RE capacity in other countries as well.

- Other comments and suggestions (to make the findings useful for policy makers)

Challenges

- Domestic grid is important to promote cross-border electricity trade.
  - Challenge may exist for greater investment in upgrading transmission grids, particularly to accommodate the **integration of greater RE** overtime
  - Malaysia- domestic grid is **60 years old**; hydropower resources are in Borneo (not connected to peninsular Malaysia)
- Countries can have **limited export links** to their neighbours [Laos 20 vs Malaysia 2]
- Subsea cable cross-border transmission has different sets of challenges (vs. land link) with different kinds of stakeholders and required approvals.
- Challenges may exist in terms of power systems that are diverse in their standards, specifications, and protocols for electricity transmission and distribution.

Challenges (derived from the LTMS-PIP Case study)

Category	Challenge	Opportunity
Technical Challenges	Wheeling Charge Methodology	Inconsistent fees. Recommend standardized method with principles of fairness, cost recovery, and transparency.
	Grid Infrastructure Limitations	Outdated infrastructure. Requires new investments.
	Regional Grid Code	Lack of unified code. Needed for renewable integration and reliability.
Political Challenges	Resource Nationalism	Sovereignty prioritized. Need regional framing.
	Continuity of Energy Trade Policies	Frequent shifts deter investment. Stable, long-term agreements needed.
Institutional & Capacity Challenges	Dedicated APG Regulatory Institution	No central body like Nord Pool. Causes fragmentation. Establish APG authority.
	Divergence in Electricity Market Structures	Varied market setups. Harmonization and liberalization required.
	Human Resource Capacity	Gaps in skills. Need training in RE integration, pricing, grid code.

Source: ISEAS (2023). Accelerating the ASEAN Power Grid 2.0: Lessons from the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP).

Thank you

ADB plans to raise knowledge capacity on APG (partnering with key stakeholders):

- Country studies, covering Indonesia, Thailand and others.
- Thematic studies on energy security, community impact (case-studies), lessons learnt from other regional power markets (such as Nord Pool in Europe and India-Bangladesh)
- Webinars, workshops and policy dialogues