



# The ASEAN Interconnection Masterplan Study (AIMS) III

THE PROGRESS OF ASEAN INTERCONNECTION MASTER PLAN STUDY III (AIMS III)- as reported to the 38<sup>th</sup> ASEAN Ministers on Energy Meeting (AMEM)

AIMS III Operationalisation Webinar on Updating the ASEAN Power Grid for Increased Renewables  
20 April 2021



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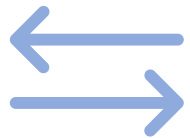
*\*This presentation contains the confidential information on the preliminary results of the AIMS III. It is for the purpose of the report and discussion with AMS only, not for cited or distributed.*

# Directive – updating the regional masterplan on interconnections



## AIMS I (2003)

- Proposed regional electrical power transmission network: ASEAN Power Grid (APG).
- Identified potential saving in new investment and operating costs on interconnection.



## AIMS II (2010)

- Updated APG: changes in economic situation, electricity demand, energy requirement.
- Studied the viability of power purchase (bilateral) and economic exchange (grid to grid) up to 2025.



## AIMS III (2020)

- Updated APG.

## 2020 Key Priority

Joint Ministerial Statement of the 37<sup>th</sup> AMEM  
Bangkok, 4 September 2019:

*“AIMS III will set out the interconnection infrastructure needed to enable expanded power trade as well as integrate higher shares of renewables into the APG.”*



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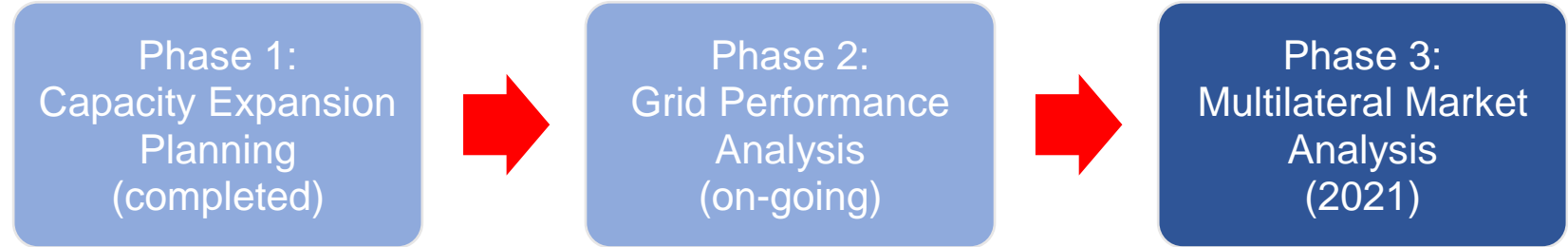
# Concept – study phases and scenarios for regional targets

## Key Principles:

AIMS III provides an updated plan of regional transmission network that links ASEAN power system and maximizes utilisation of regional renewable energy resources:

- Adopted AIMS II concept – *for continuation* – but revised and enhanced, based on the change on economic landscape and electricity supply industry.
- Responded to APAEC targets:
  - Meeting 23% RE share in energy mix by 2025 with vRE development
  - Advancing bilateral and multilateral power trade.
- Time horizon up to 2040.

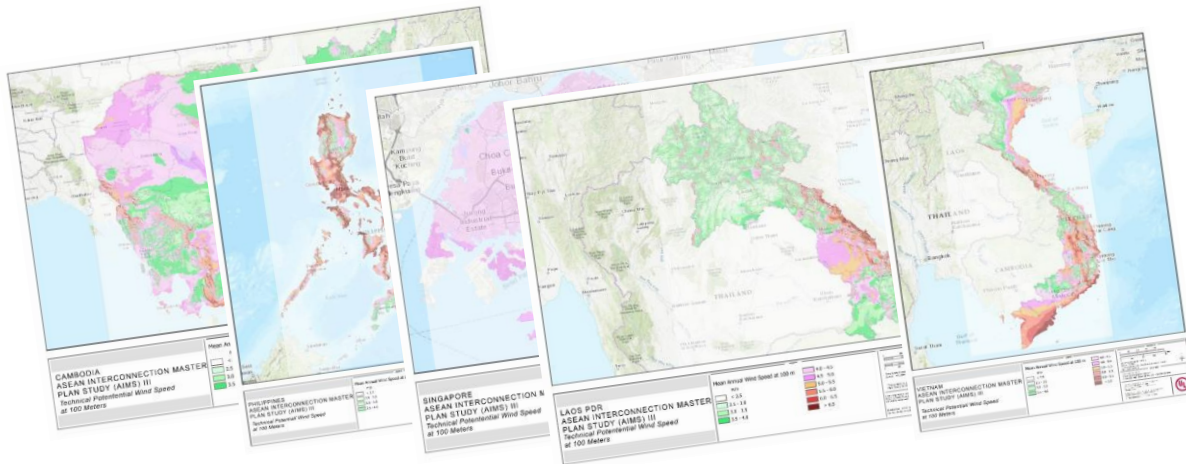
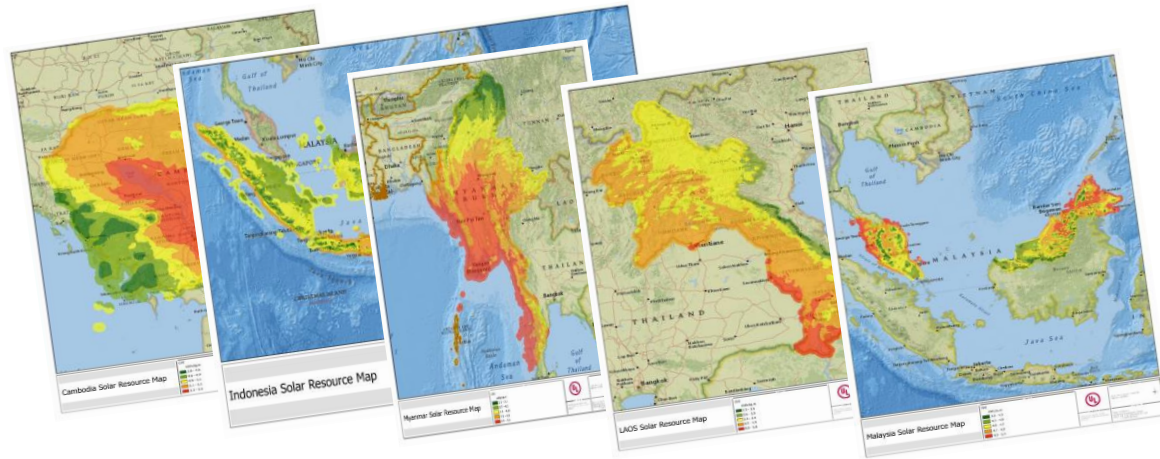
## Study Phases:



## Study Scenarios:

Base Case	Existing PDP is respected, but it is extended beyond PDP period to 2040, without new I/C considered.
Optimum RE	Co-optimization of interconnection capacity and vRE & conventional generation expansion.
APAEC RE Target	ASEAN's RE Target 23% by 2025 is fixed in the plan, the remaining generation and interconnection capacity are optimized.
Higher vRE	Explore the potential of having higher vRE for advancing multilateral power trade.

# Finding – ASEAN is rich with vRE (solar and wind) potential



## Technical Potentials:

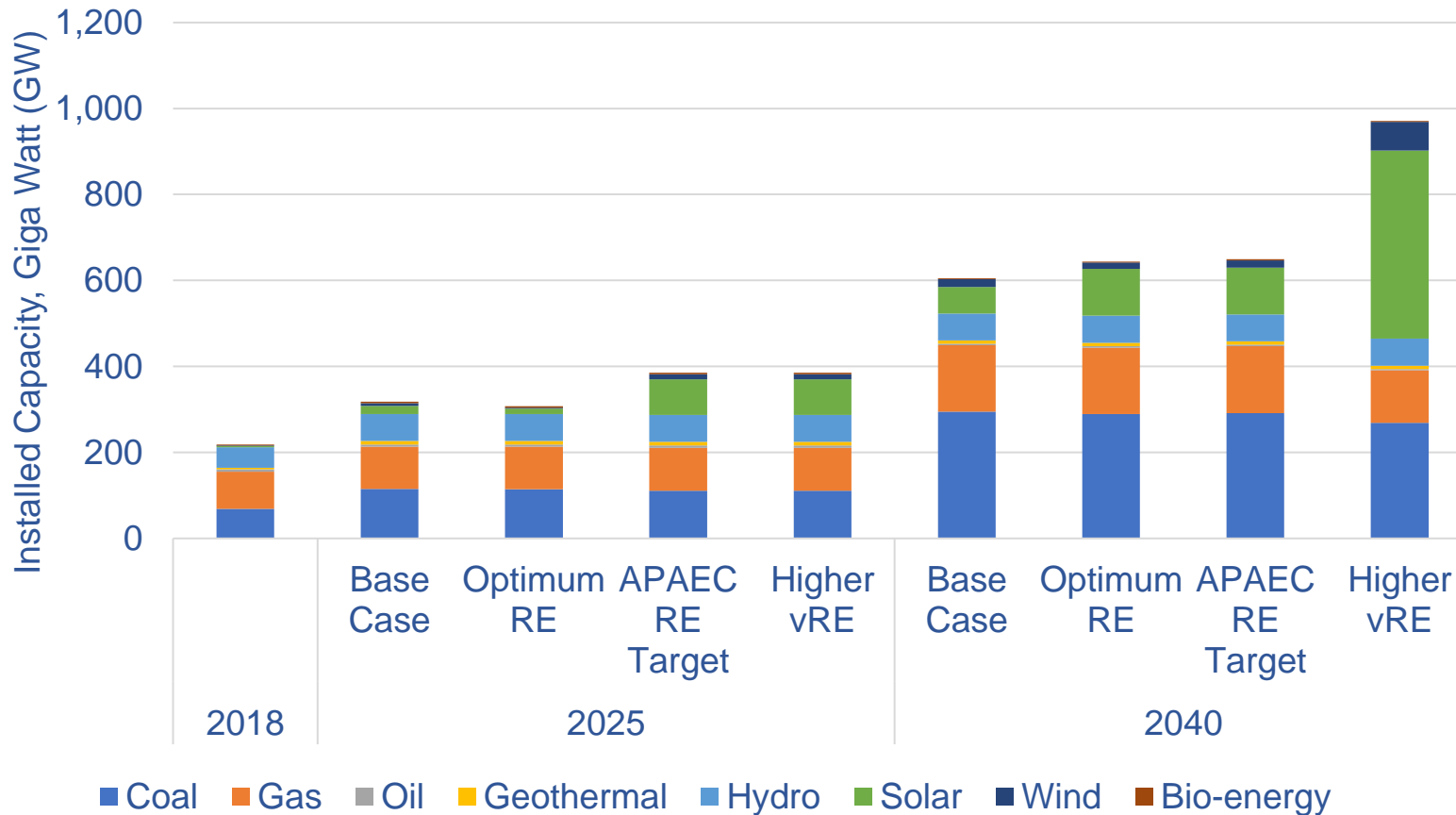
vRE	Gross Capacity (GW)	Gross Annual Generation (TWh/year)	Gross Capacity Factor
▪ Solar	8,119	12,004	12-23%
▪ Wind	342	766	18-30%

Detail site evaluation:  
42 solar sites (124 TWh) and 20 wind sites (27 TWh)

Produced and available to be used for national planning:

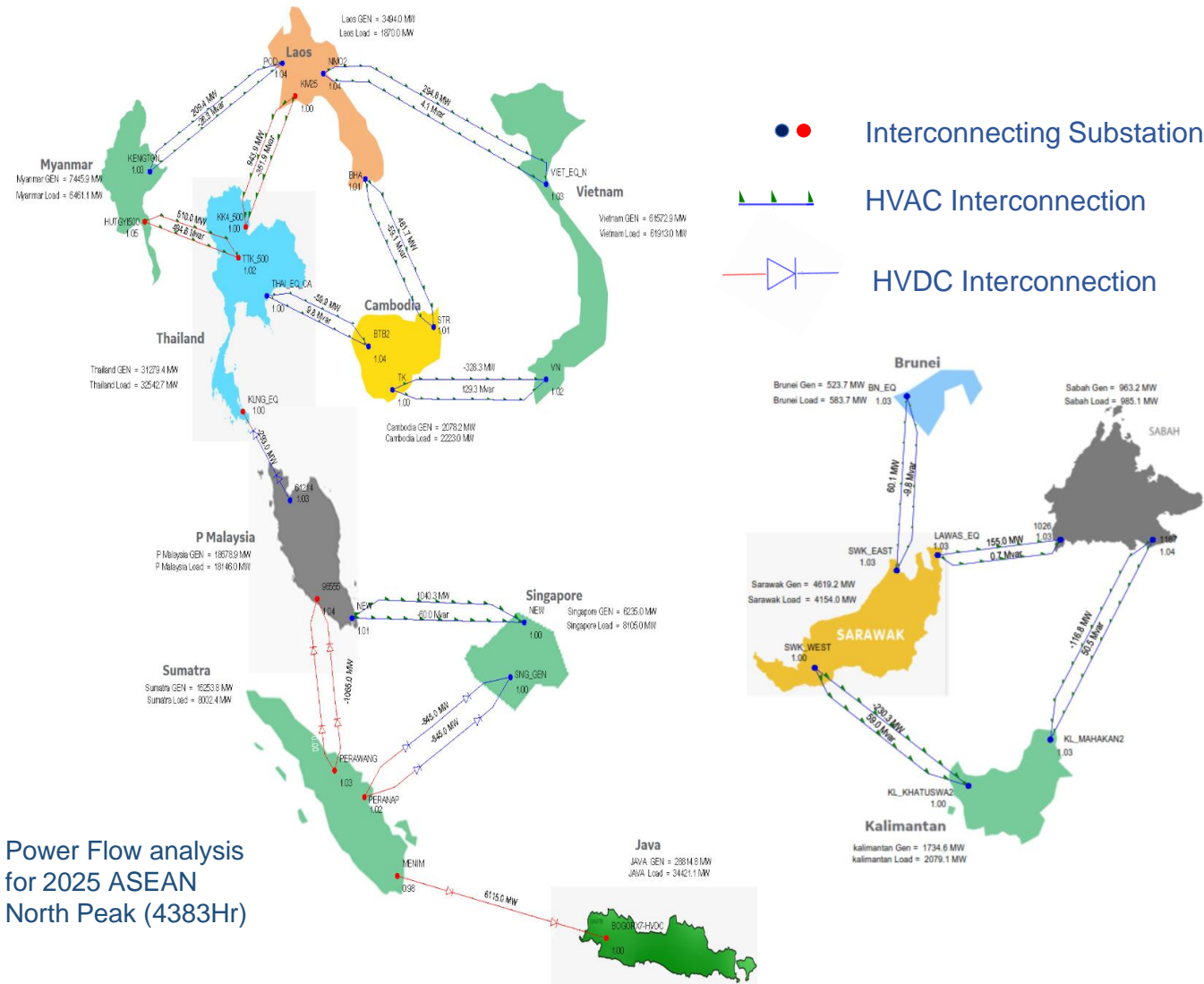
- Complete solar and wind maps for each of AMS.
- Complete monthly generation and diurnal profiles, shows for a particular month how the diurnal profile will be for both high and low generation day.

# Finding – Providing the possibility to achieve the ASEAN RE Target in 2025



- In 2025, under the Base Case, (all) renewable energies is around 31% of the total installed capacity. But under APAEC RE Target, it can go up to 44%.
- Under the Base Case, AMS are planning to have 19.2 GW solar and 6.5 GW wind installed capacity by 2025. **But to achieve new APAEC VRE capacity target, it should reach 83 GW solar (1% potential) and 12.3 GW wind (4%) – assuming all other types of energy are fixed.**

# Finding – All Proposed Interconnections are Technically Viable\*



- Achieving ASEAN RE Target in 2025 will require 19,918 MW of interconnection capacity.
- Potential commitment to establish the priority projects under APG up to 2025.

**\* Providing cross-border interconnections and strengthening of the grid at national levels are implemented, the ASEAN grid will be capable of evacuating vRE capacity to achieve the ASEAN RE Target.**

# Finding – Economic Factor

## NPV of System Costs 2018-2040 (in Billion USD):

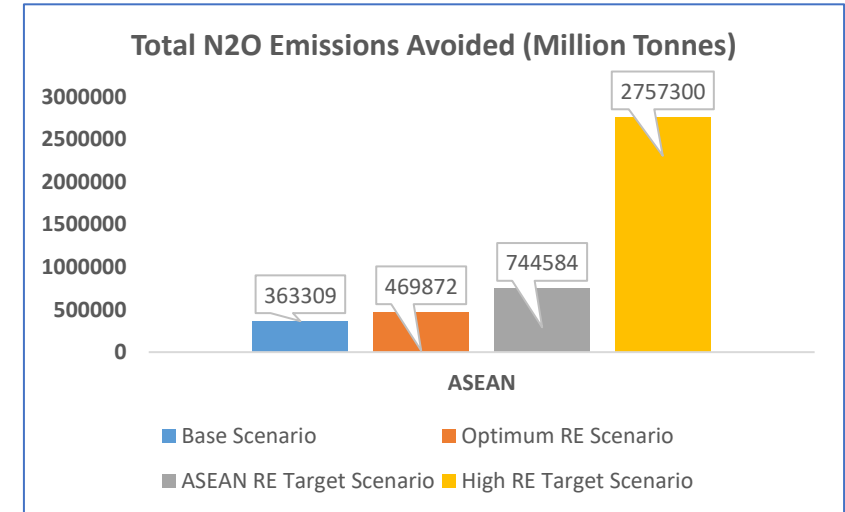
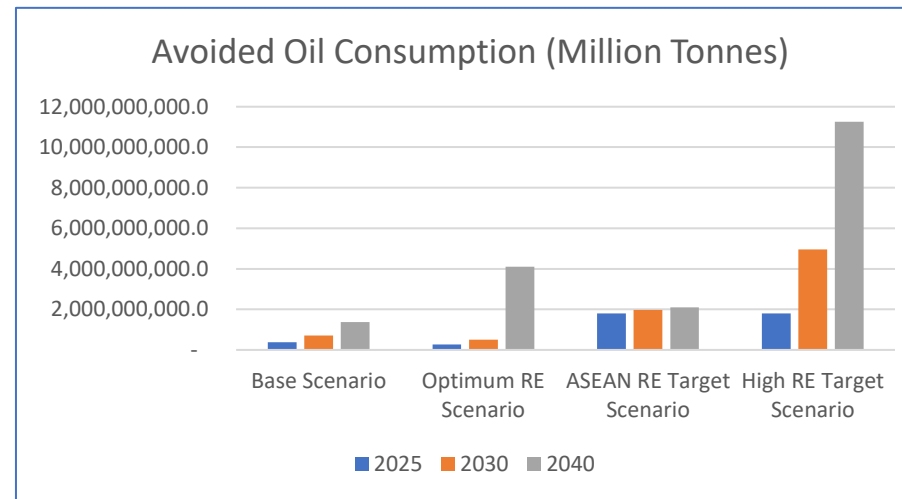
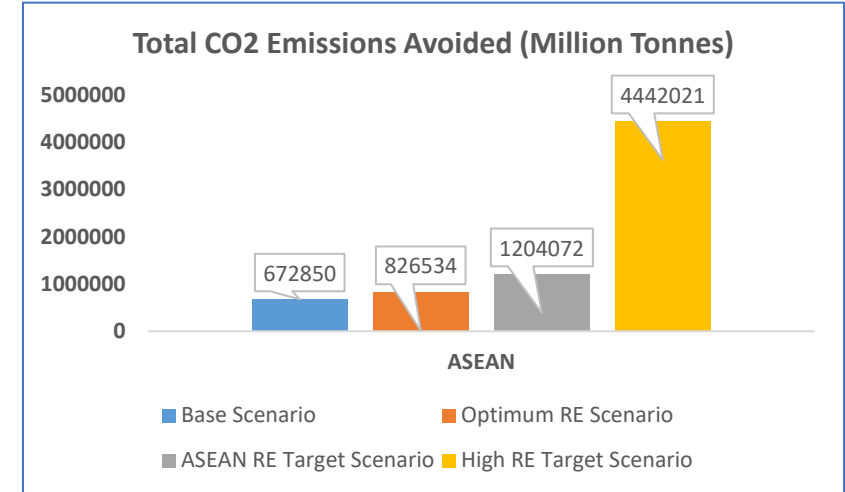
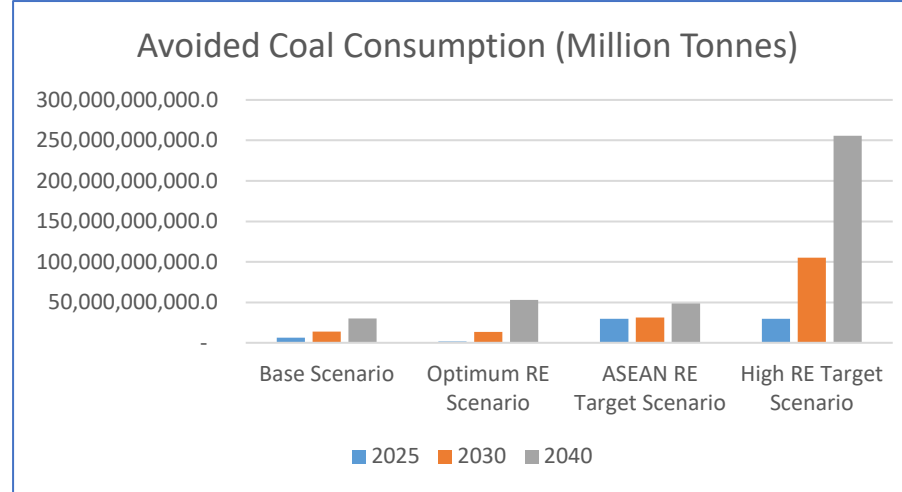
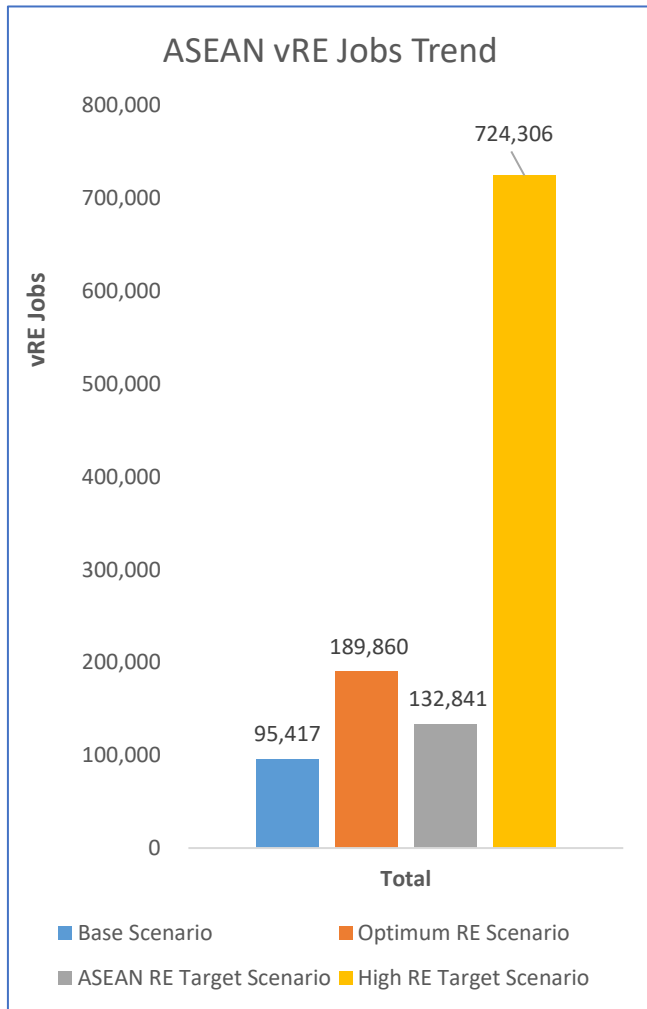
Particulars	Base	Optimum RE	APAEC RE Target	High RE
Thermal Generator Build Cost	89.34	88.18	86.36	69.87
Firm Units Build Cost (except vRE)	77.83	77.83	77.83	77.83
Interconnection Build Cost	0.67	2.41	2.98	16.23
Solar Build cost	10.86	13.92	34.65	58.94
Wind Build cost	5.94	3.41	10.11	24.77
Total Build costs	184.64	185.76	211.93	247.63
VO&M Cost	26.73	25.42	25.72	22.02
Fuel Cost	484.40	479.00	458.68	421.83
FO&M Cost	75.19	74.87	74.61	72.47
Cumulative Production Costs	586.32	579.29	559.02	516.32
Total Cost (Build + Production Costs)	770.97	765.05	770.95	763.95

- Under base case, aiming higher interconnectivity require Interconnection Build Cost and a room for wind and solar investment.
- However, with inter-play between Interconnection Build Cost and wind and solar investment, the Total Costs NPV for the APAEC RE Target are relatively the same with the Base Case (even 20 Million USD cheaper).
- ASEAN RE Target provides the best compromise on costs among all scenarios.

Note :

AIMS III was firstly conducted in 2018. Some of the numbers may not be reflecting the 2021's landscape. The potential taken was made based on consultation with the AMS. Through time, the policy direction might affect the overall result and causing the number is not to reflect the actual condition. However, the policy landscape is still in the same intention, and thus, although the figure is not exact, the number still shows the same narrative

# Finding – Beyond costs, generates jobs and avoids fuels & emissions





- AIMS III provides a comprehensive update of AIMS II, in which the plans of cross-border interconnections in ASEAN are re-optimized in conjunction with the development of vRE to meet ASEAN RE target by 2025, as well as to explore a higher RE target.
- Generation capacity expansion plans, including vRE plans, of individual AMS have been re-optimized simultaneously with the capacity of interconnections among AMS.
- The economic viability of the interconnection projects identified in AIMS II has been reconfirmed by AIMS III, furthermore, they are even expanded for higher vRE utilization and to reach more regions within AMS (e.g. Java is now included in the study).
- AIMS III results and recommendations could be taken into account as part of the implementation of the APAEC 2016-2025 Phase II 2021-2025.
- Further coordination and discussion to advance multilateral power trade in the region, based on the AIMS III recommendations.



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