ASEAN Energy Policy towards Low Carbon Society

Clean Coal Day International Symposium 2019
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Tokyo, Japan

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One Community for Sustainable Energy

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Introduction

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About the ASEAN Centre for Energy (ACE)

Think Tank

Identifying and surfacing innovative solutions

Energy Data and Knowledge Hub

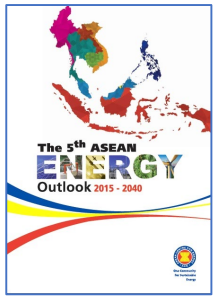
Provide a knowledge depository for AMS

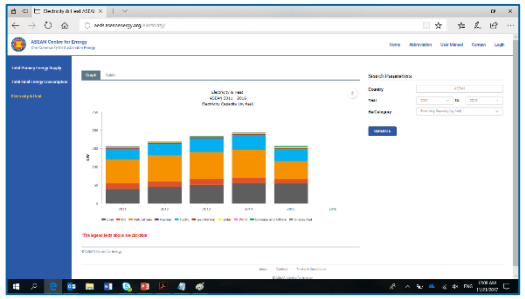
Catalyst

Unify and strengthen ASEAN Energy Cooperation and Integration

- Policies, Legal & Regulatory Frameworks and Technologies
- Policy and Research Analytics
- Energy Database
- APAEC Activities, including with DPs/IOs
- Secretariat

Research, publication, training, capacity building, workshop, policy exchange and recommendations, etc.





ASEAN Energy Landscape

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TOTAL PRIMARY ENERGY SUPPLY (MTOE)

- TPES to grow (2040):
  - BAU – 2.3 X
  - ATS - 2.0 X (14%)
  - APS - 1.8 X (23%)

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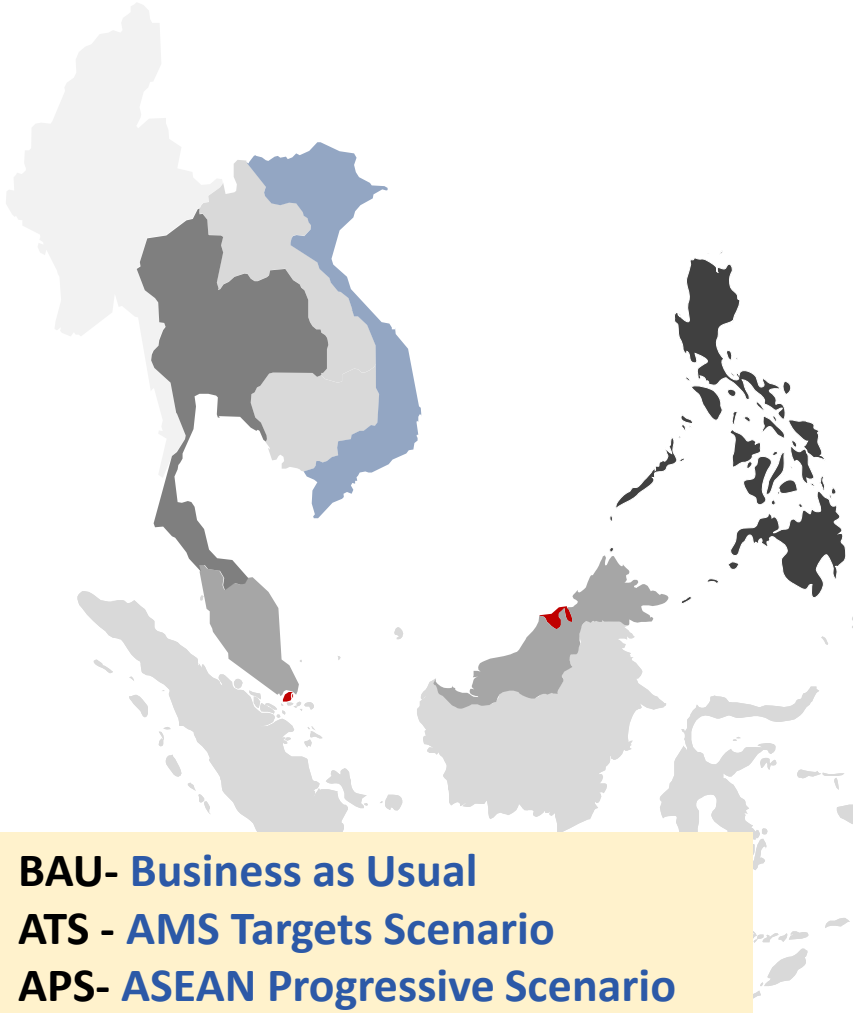

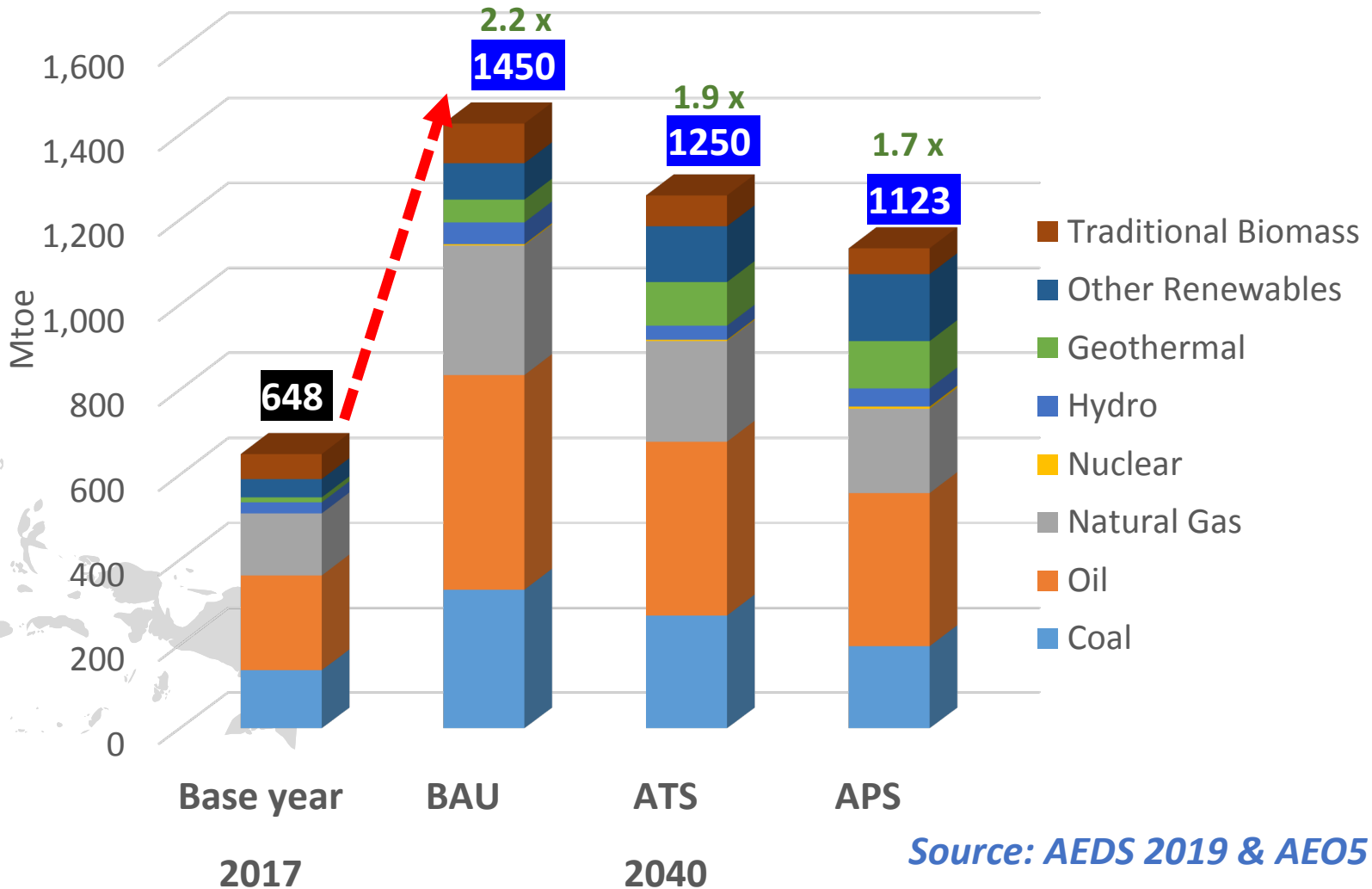

BAU- Business as Usual
ATS - AMS Targets Scenario
APS- ASEAN Progressive Scenario
(target defined the APAEC)

Source: AEDS 2019 & AEO5

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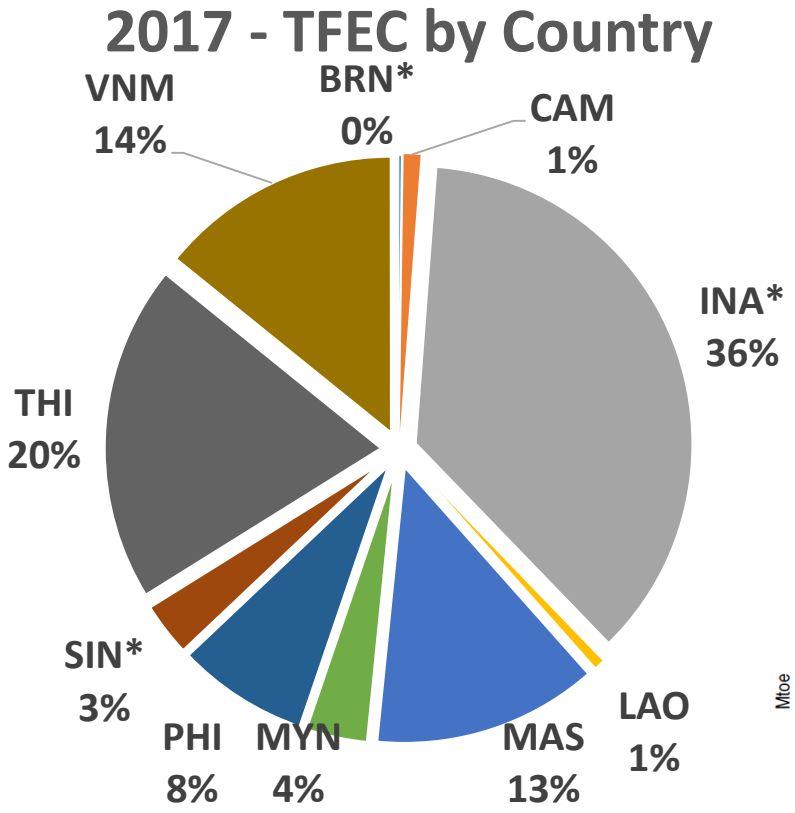
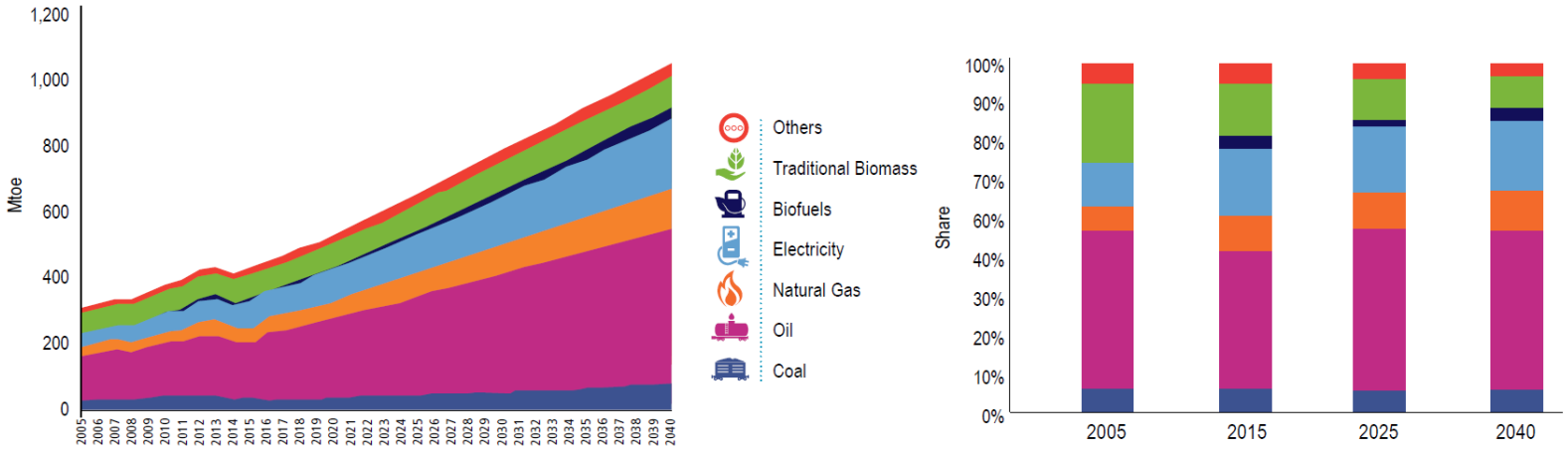
TOTAL FINAL ENERGY CONSUMPTION



- *Oil is still dominant in ASEAN as a contributor to increased demand in transport sector.*
- *Increasing energy demand in industry and commercial sector, as well as massive electrification programme, affects the growth of electricity demand in ASEAN.*



** 2017 data still need to be verified*

Source: AEDS 2019 and AEO5

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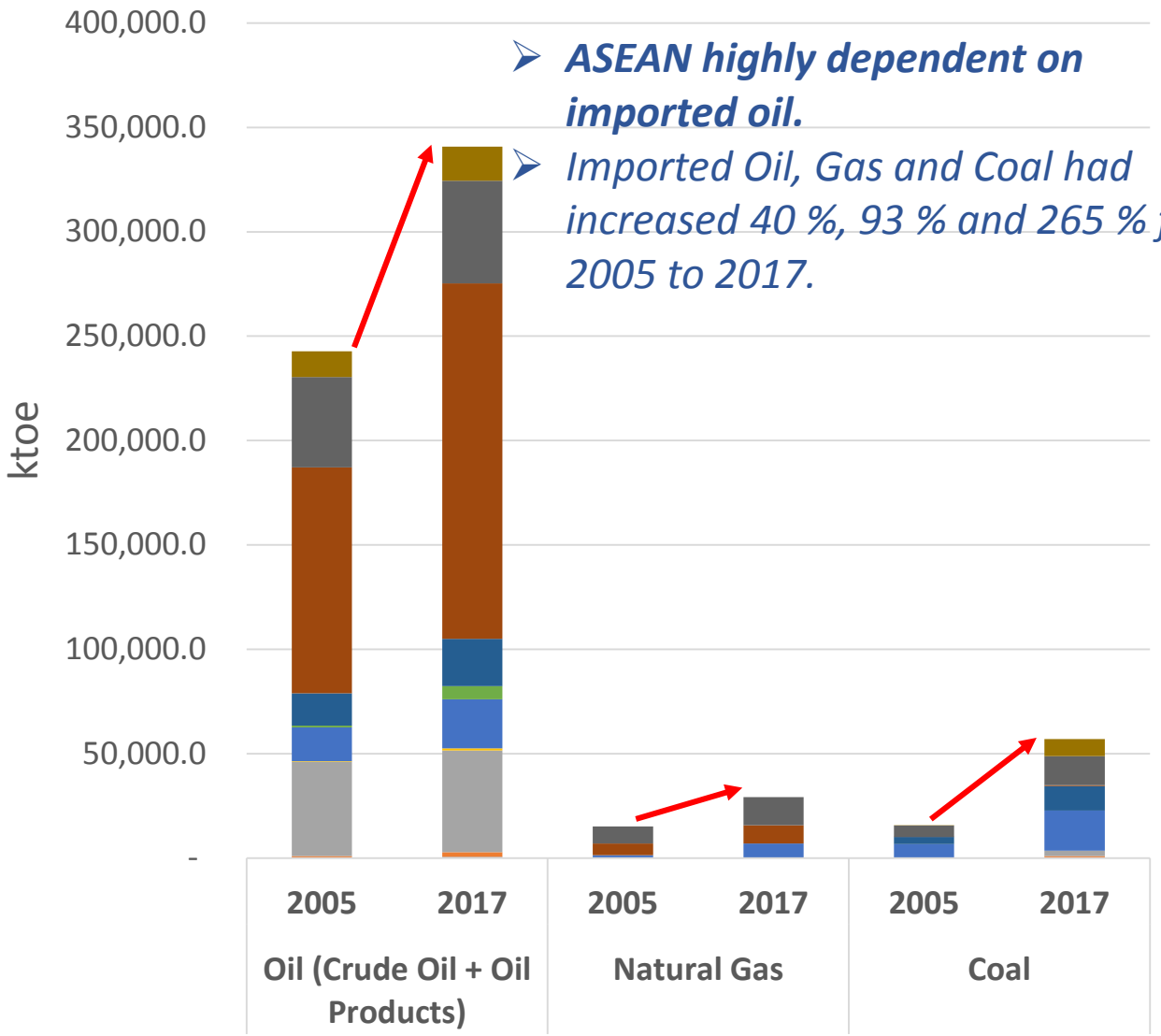
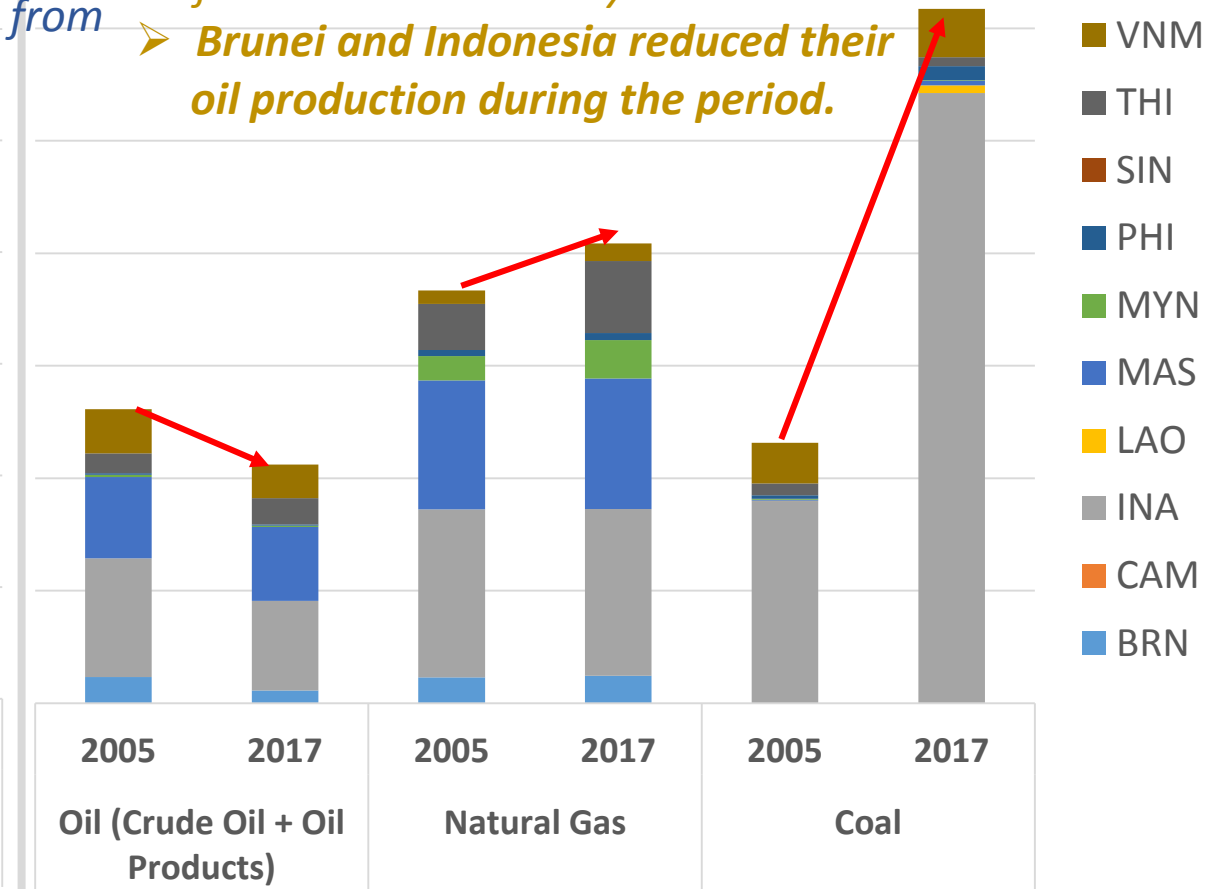
Imported Fossil Fuels

- ***ASEAN highly dependent on imported oil.***
- *Imported Oil, Gas and Coal had increased 40 %, 93 % and 265 % from 2005 to 2017.*



Production of Fossil Fuels

- ***Coal production in Indonesia had tripled over 12 years.***
- *Natural gas production increasing came from Thailand and Myanmar.*
- ***Brunei and Indonesia reduced their oil production during the period.***



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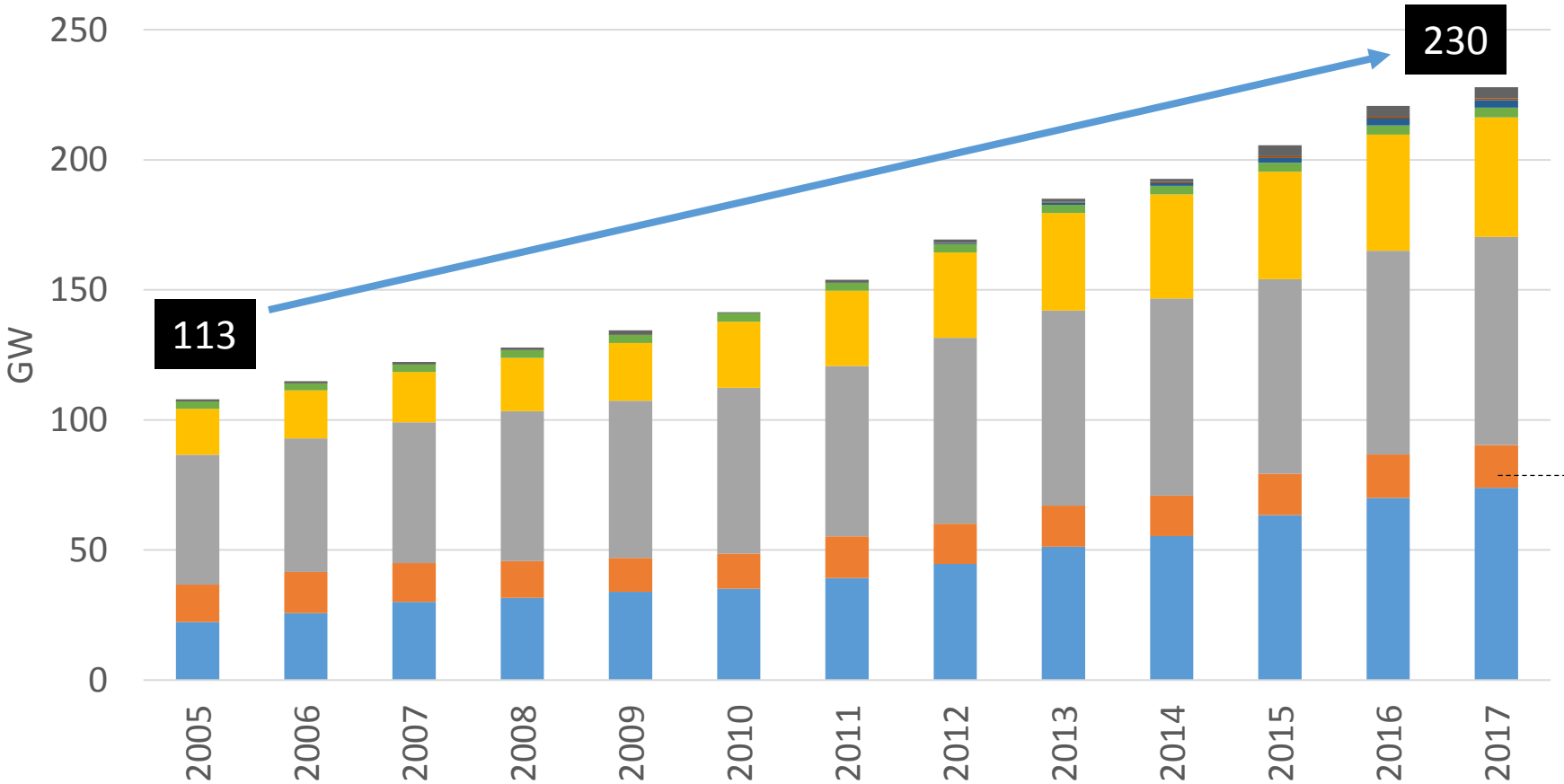
ASEAN Installed Capacities (GW) – Fuel Mix Diversity



	CAGR	
Biomass	13.1%	RE
Wind	26.4%	RE
Solar	77%	RE
Geothermal	2%	RE
Hydro	7%	RE
Gas	3.4%	Fossil Fuel
Oil	1%	Fossil Fuel
Coal	9%	Fossil Fuel

Compound Annual Growth Rate

Renewable Energy has been increasing steadily over the years, growing about **five times** from 2005 to 2017 in **power sector capacities,**
Meanwhile, ***Fossil Fuel*** increase around 1.5 times over the same period.

Installed Capacity Projection by Type of Fuel (GW)

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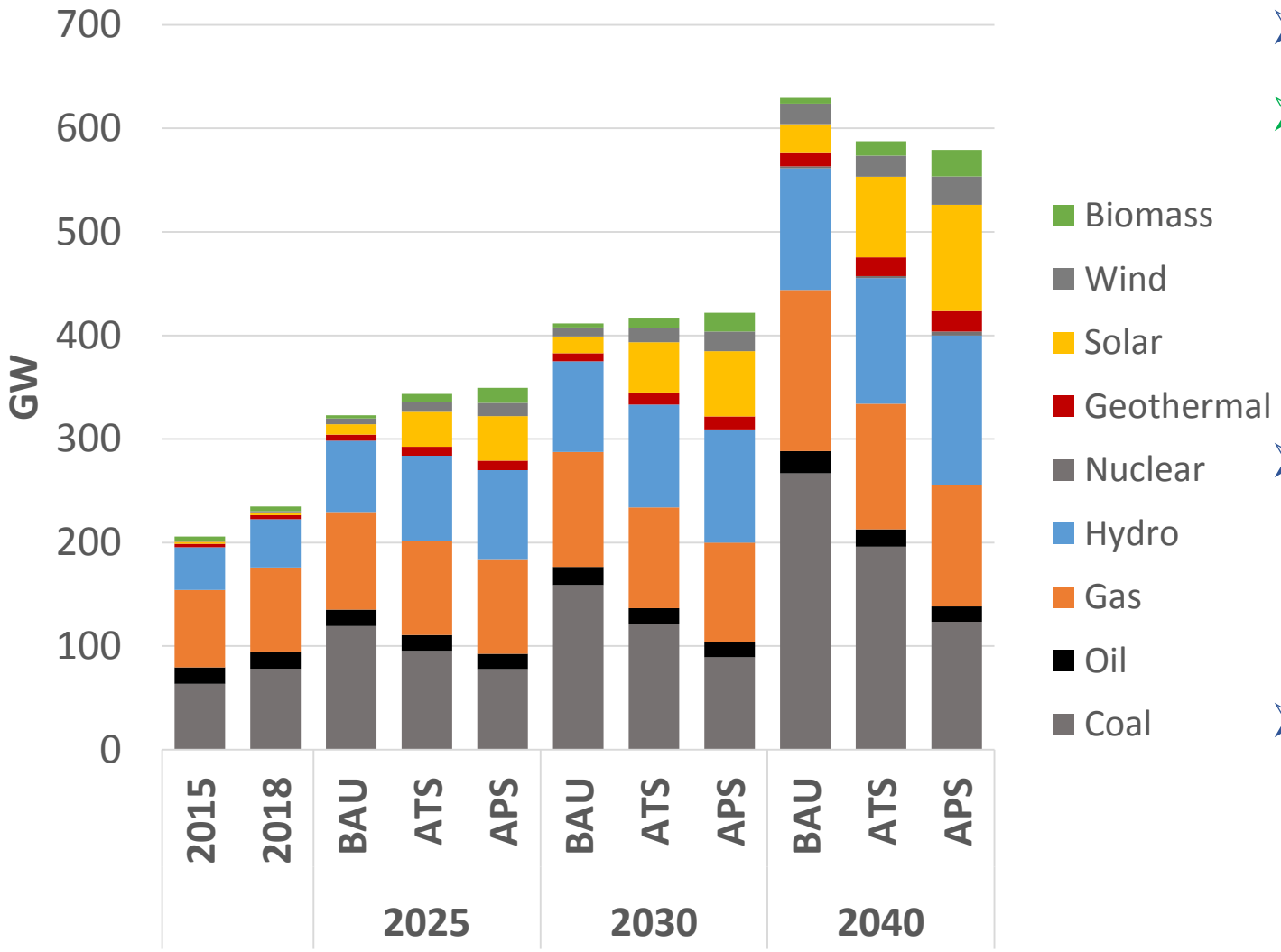

- Electricity Growth 4.6 % over APAEC period;
- **BAU, the fossil fuel** % will reduce from

  74 % in 2018 to
  - ✓ 71 % in 2025 and
  - ✓ 70 % in 2040
- ASEAN Target Scenario **(ATS),** fossil fuel %
  - ✓ 59 % in 2025 and
  - ✓ 57 % in 2040
- Advanced Policy Scenario **(APS)** fossil fuel %
  - ✓ 52 % in 2025 and
  - ✓ 44 % in 2040

ASEAN – Access to electricity(%)

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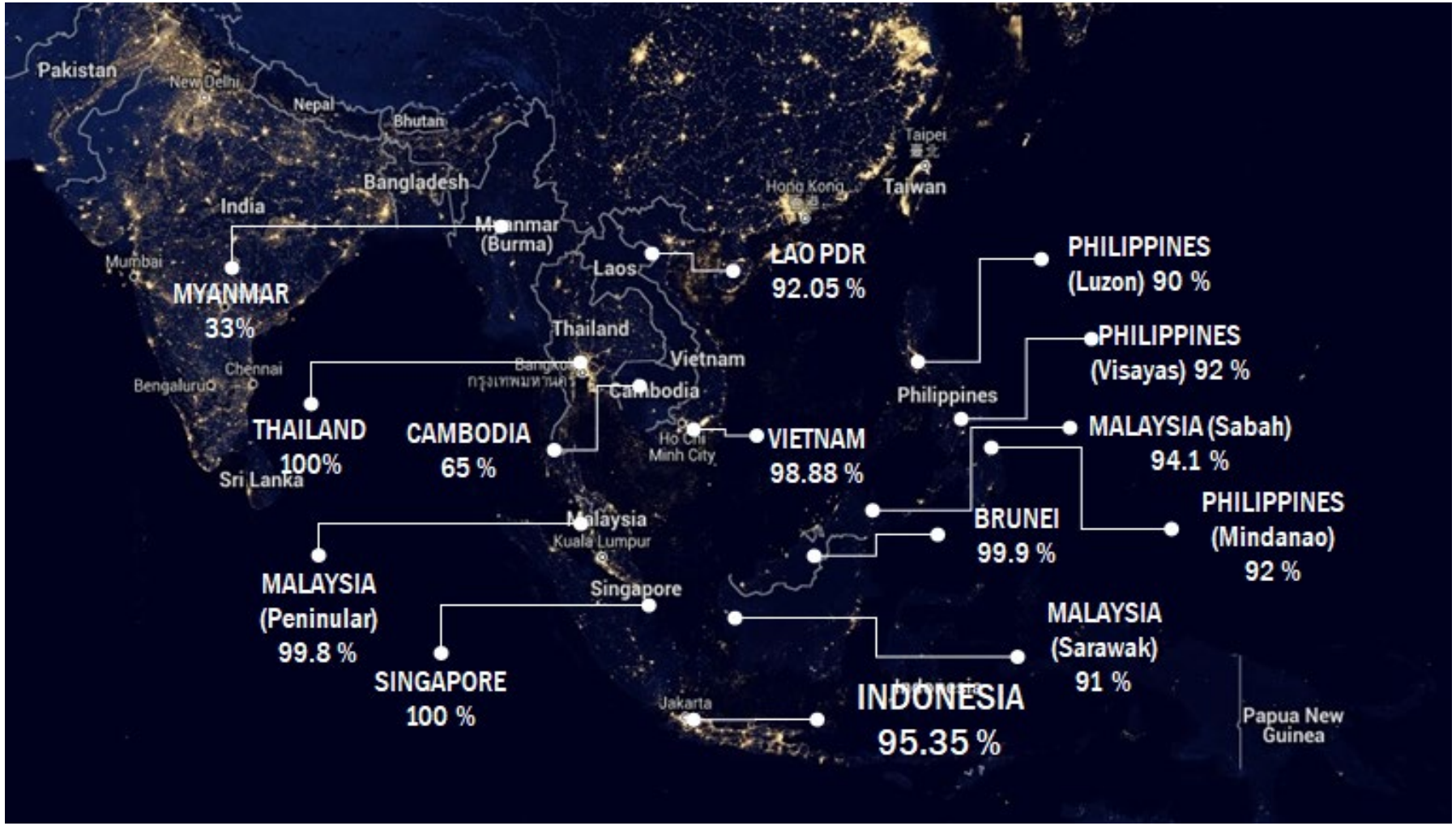
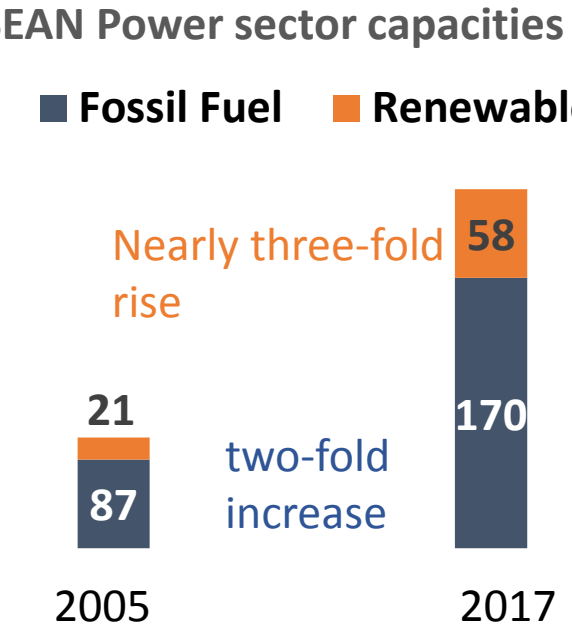


Electricity Consumption

1,502 kWh/cap

(World avg. **3,200**)

ASEAN Power sector capacities (GW)



In 2017, around 60 million people do not have access to electricity

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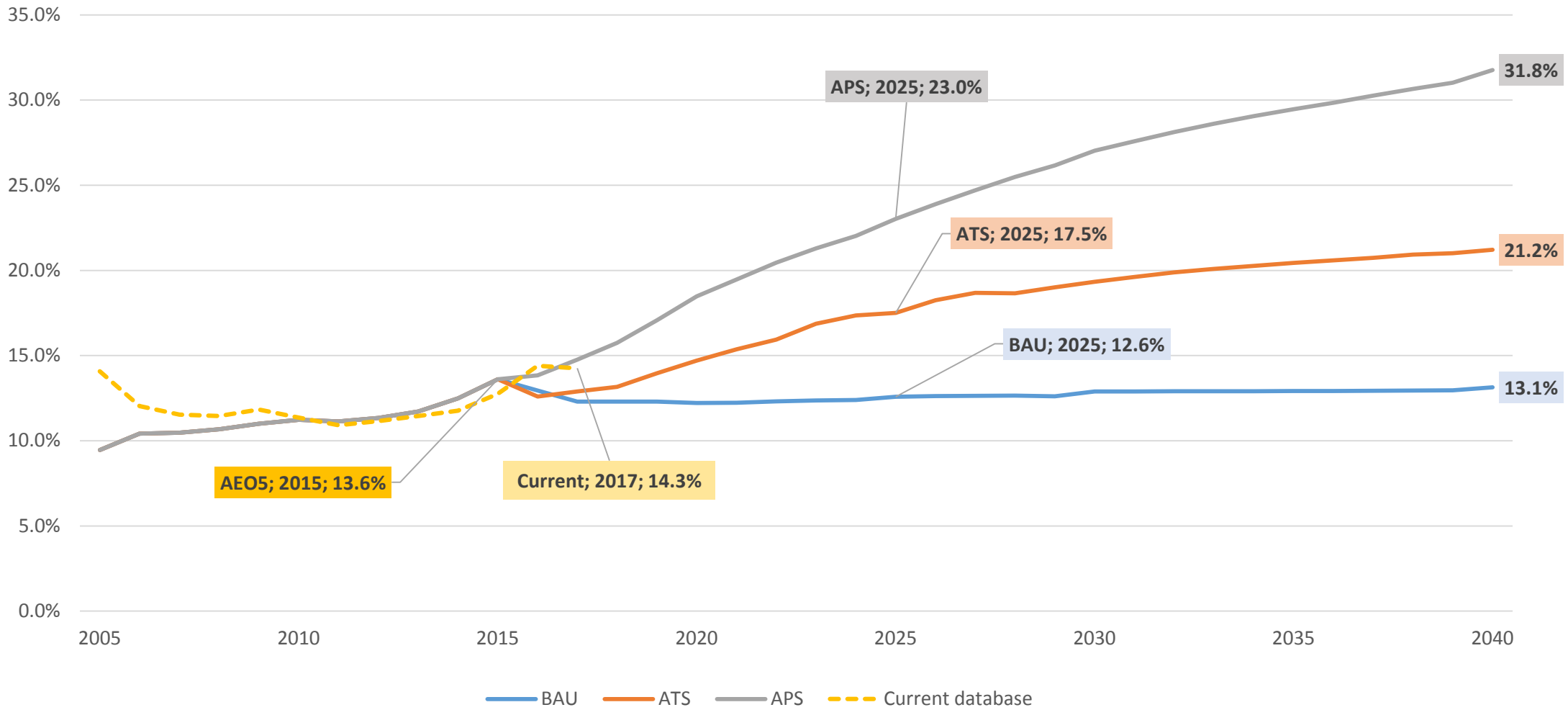
RE Share in TPES



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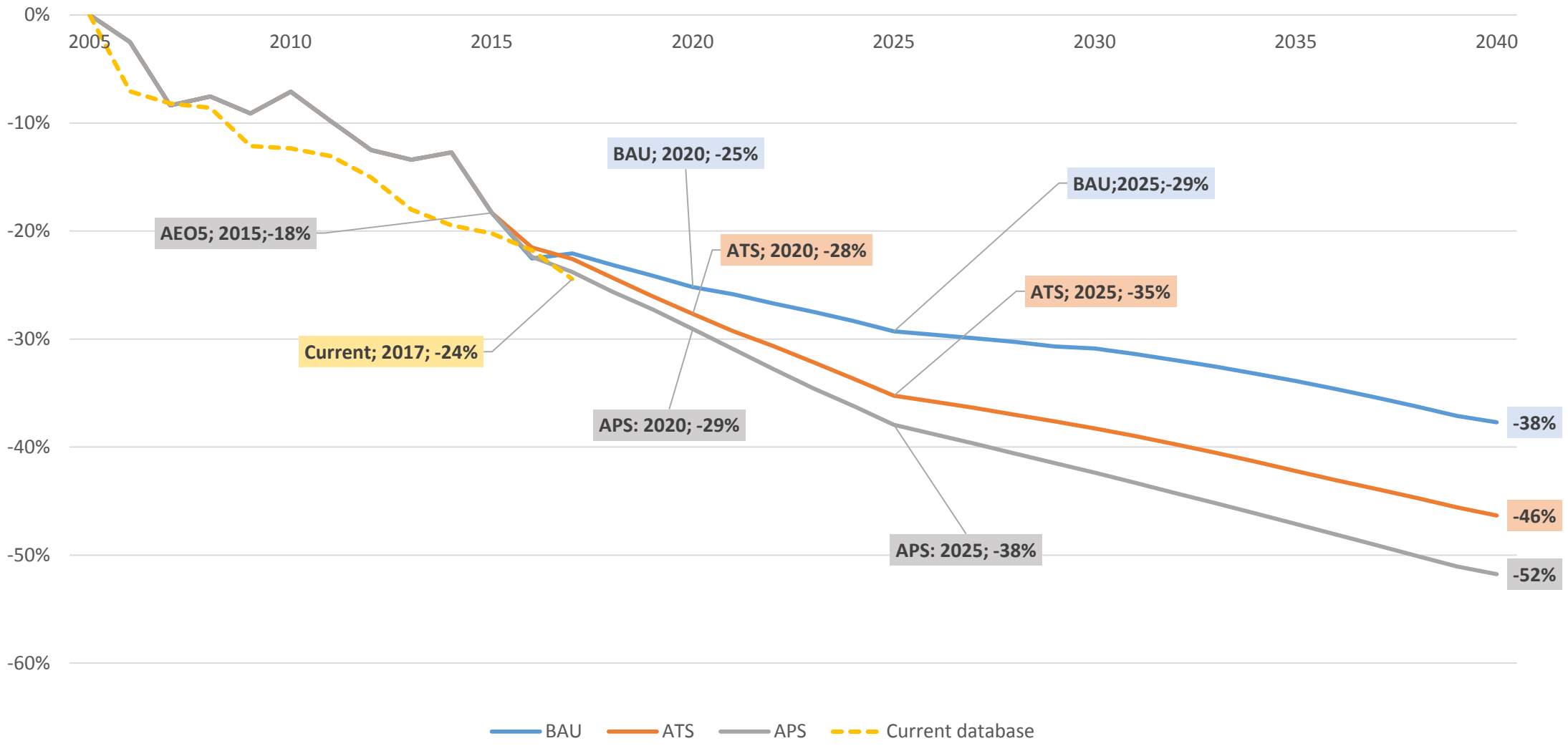
Energy Intensity Reduction (TPES per GDP)



ASEAN Plan of Action for Energy Cooperation (APAEC) 2016 – 2025

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ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025: Phase I 2016 - 2020

"Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All"

- ASEAN Power Grid
- Trans-ASEAN Gas Pipeline
- Clean Coal Technology
- Energy Efficiency and Conservation
- Renewable Energy
- Regional Energy Policy and Planning
- Civilian Nuclear Energy

APAEC 2016-2025 supports Sustainable Development Goals 7

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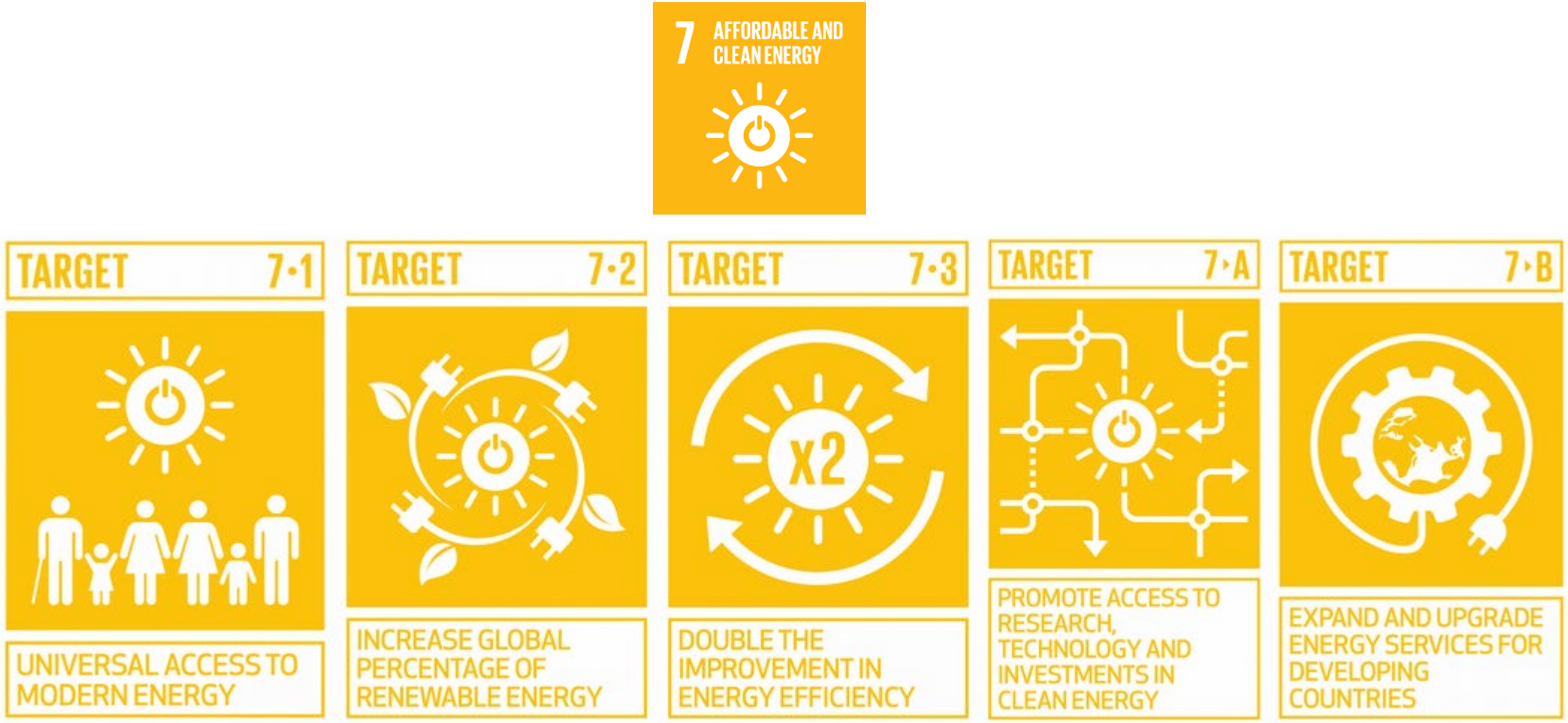

Key Strategies of Seven (7) Programme Areas

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01 ASEAN Power Grid

To initiate **multilateral electricity trade** in at least one sub-region by 2018.

02 Trans-ASEAN Gas Pipeline

To enhance **connectivity** for energy **security** and accessibility via pipelines and regasification terminals.

03 Clean Coal Technology

To enhance the image of coal through **promotion of clean coal technologies** (CCT).

04 Energy Efficiency and Conservation

To **reduce energy intensity** by 20% in 2020 based on 2005 level.

05 Renewable Energy

To **increase the component of RE** to 23% by 2025 in ASEAN energy Mix.

06 Regional Energy Policy and Planning

To better profile the energy sector internatio nally

07 Civilian Nuclear Energy

To build **capabilities in policy, technology and regulatory** aspects of nuclear energy

ASEAN Power Grid

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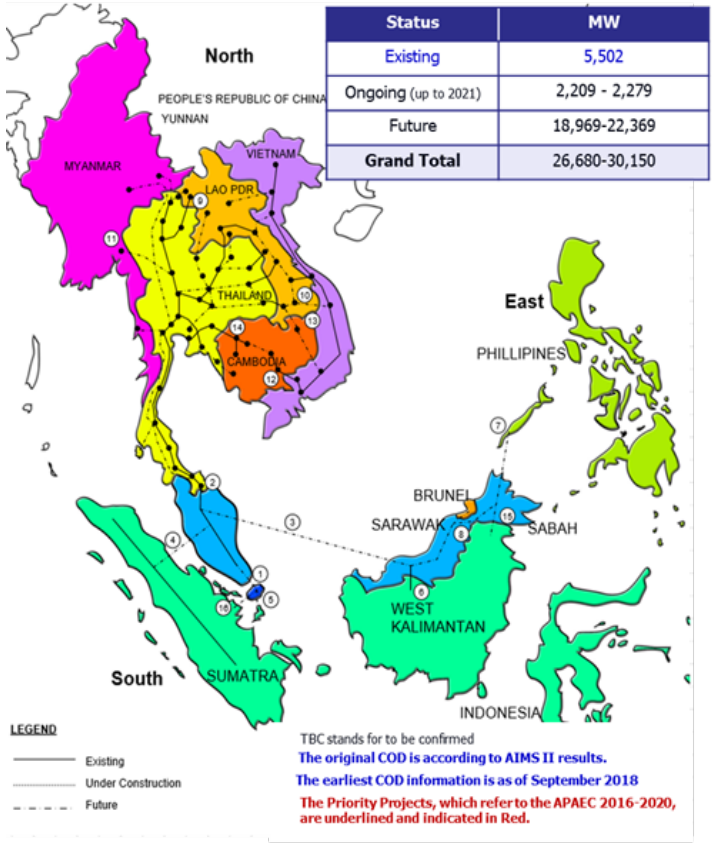
ASEAN Interconnection Projects

(Updated in September 2018)



Status	MW
Existing	5,502
Ongoing (up to 2021)	2,209 - 2,279
Future	18,969-22,369
Grand Total	26,680-30,150

		Earliest COD
1)	**P.Malaysia – Singapore**	
	• Plentong – Woodlands	Existing
	• P.Malaysia – Singapore (2nd link Plentong – Woodlands)	post 2020
2)	**Thailand – P.Malaysia**	
	• Sadao - Chuping	Existing
	• Khlong Ngae – Gurun	Existing
	• Su Ngai Kolok – Rantau Panjang	TBC
	• Khlong Ngae – Gurun (2nd Phase, 300MW)	TBC
3)	**Sarawak – P. Malaysia**	**TBC**
4)	**P.Malaysia – Sumatra**	**TBC**
5)	**Batam – Singapore**	**TBC**
6)	**Sarawak – West Kalimantan**	**Existing**
7)	**Philippines – Sabah**	**TBC**
8)	**Sarawak – Sabah – Brunei**	**2021**
	• Sarawak – Sabah	2021
	• Sarawak – Brunei	TBC
9)	**Thailand – Lao PDR**	
	• Nakhon Phanom - Thakhek - Theun Hinboun	Existing
	• Ubon Ratchathani 2 - Houay Ho	Existing
	• Roi Et 2 – Suvannakhet - Nam Theun 2	Existing
	• Udon Thani 3 - Na Bong - Nam Ngum 2	Existing
	• Nakhon Phanom 2 – Thakhek – Then Hinboun (Exp.)	Existing
	• Mae Moh 3 – Nan2 – Hong Sa (3Units)	Existing
	• Udon Thani 3 – Nabong (converted to 500KV)	2019
	• Ubon Ratchathani 3 – Pakse – Xe Pian Xe Namnoi	2019
	• Khon Kaen 4 – Loei 2 – Xayaburi	2019
	• Thailand – Lao PDR (New)	TBC
10)	**Lao PDR – Vietnam**	**2016 - 2020**
	• Xekaman 3 – Tranhmy	Existing
	• Xekaman 1 – Pleiku 2	Existing
11)	**Thailand – Myanmar**	**TBC**
12)	**Vietnam – Cambodia (New)**	
	• Chau Doc – Takeo – Phnom Penh	Existing
	• Tay Ninh – Stung Treng	TBC
13)	**Lao PDR – Cambodia**	
	• Ban Hat - Kampong Sralao	Existing
	• Ban Hat - Stung Treng	post 2018
14)	**Thailand – Cambodia (New)**	**post 2020**
	• Watthana Nakhon – Aranyaprathet – Banteay Meanchey	Existing
	• Thailand – Cambodia	post 2020
15)	**East Sabah – North Kalimantan**	**TBC**
16)	**Singapore – Sumatra**	**TBC**

TBC stands for to be confirmed

The original COD is according to AIMS II results.

The earliest COD information is as of September 2018

The Priority Projects, which refer to the APAEC 2016-2020, are underlined and indicated in Red.

ASEAN Power Grid

Accelerate the development and completion of the ASEAN Power Grid Projects by 2020.

- Conduct a study and identify areas where indigenous resources can be fully utilised to benefit the region.
- Conduct a study on the ASEAN Primary Energy Resources for Power Generation.

Initiate multilateral electricity trading.

- Lao – Thailand – Malaysia - Singapore Power Integration Project (LTMS - PIP)
- Study to address barriers to interconnections, cross-border trade and investment

Trans-ASEAN Gas Pipeline

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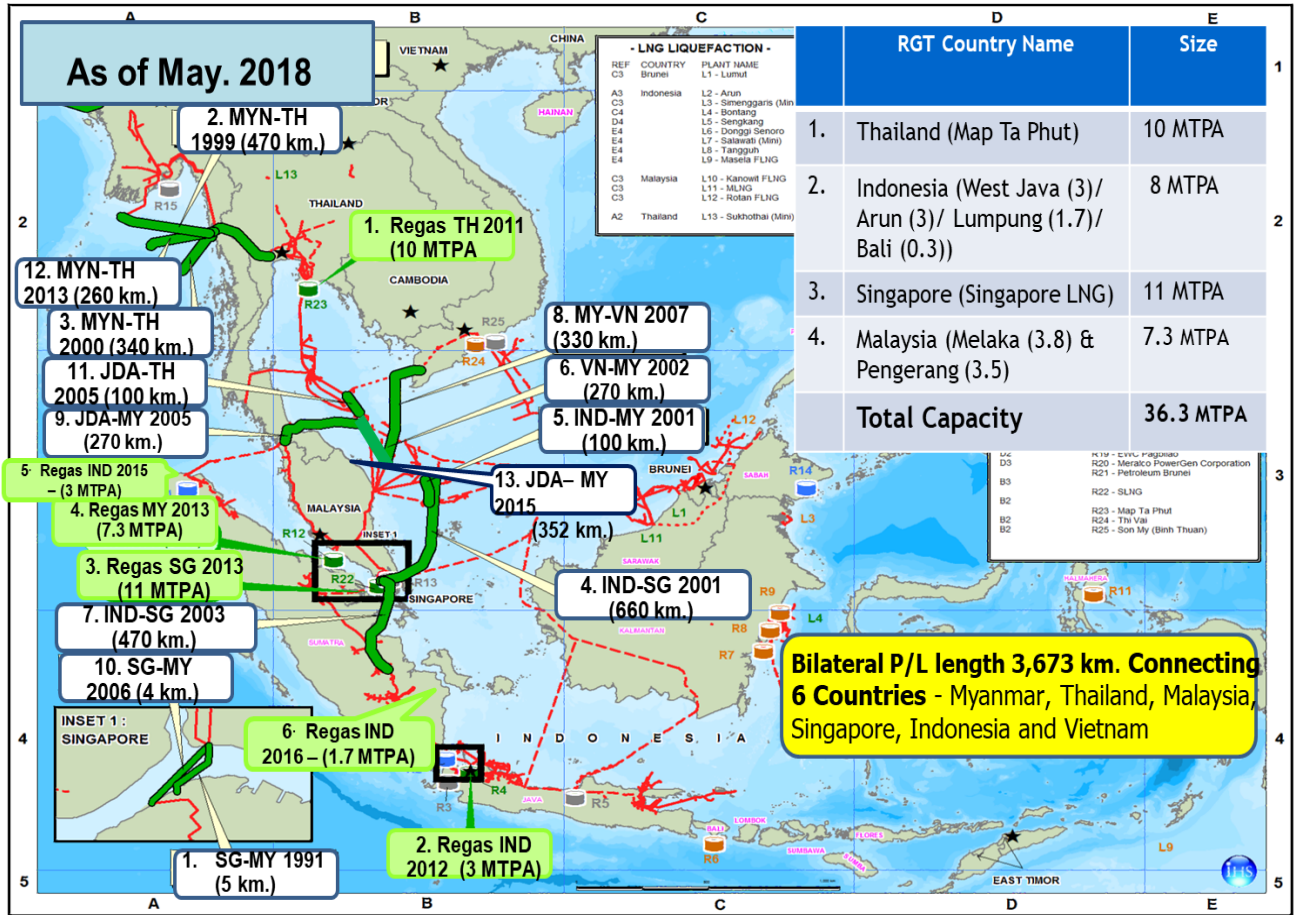

	RGT Country Name	Size
1.	Thailand (Map Ta Phut)	10 MTPA
2.	Indonesia (West Java (3)/ Arun (3)/ Lumpung (1.7)/ Bali (0.3))	8 MTPA
3.	Singapore (Singapore LNG)	11 MTPA
4.	Malaysia (Melaka (3.8) & Pengerang (3.5)	7.3 MTPA
	Total Capacity	**36.3 MTPA**

Trans-ASEAN Gas Pipeline

Enhance gas & LNG connectivity via pipeline and regasification terminals.

- Develop at least one (1) new **LNG regasification terminal** or a cross border gas pipeline by 2020.
- Implement **open access system** by at least one (1) AMS by 2020 and Develop **Technical Database** on ASEAN Gas Infrastructure.

Enhance gas & LNG accessibility via pipeline and regasification terminals.

- Establish a standard clause for **LNG cargo diversion and destination flexibility** for ASEAN LNG Contracts.
- Establish a manual and procedures for the operationalisation of **APSA/CERM**.

Coal and Clean Coal Technology

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CCT Promotion OBS 1

- ASEAN Coal Awards
- Capacity Building Workshops
- Feasibility Study on CCT

Public Awareness on Coal Benefits OBS 2

- Workshop on Coal Image
- Workshop on CSR Best Practice

Intra-ASEAN Coal Trade Promotion and Investment OBS 3

- ASEAN Coal Business Roundtable
- CCT Business & Financing Model
- CCT Demonstration Project

Policy Research OBS 4

- Joint Policy Research on Coal
- Human Capacity Building
- ASEAN CoE
- High Level Policy Discussion

ACDIS OBS 5

- ACDIS Data Submission
- ACDIS Training
- ACDIS Statistical Monitor

To address the environmental issues from coal production and utilisation in ASEAN and to enhance the image of coal through promotion of clean coal technologies (CCT).

Energy Efficiency and Conservation

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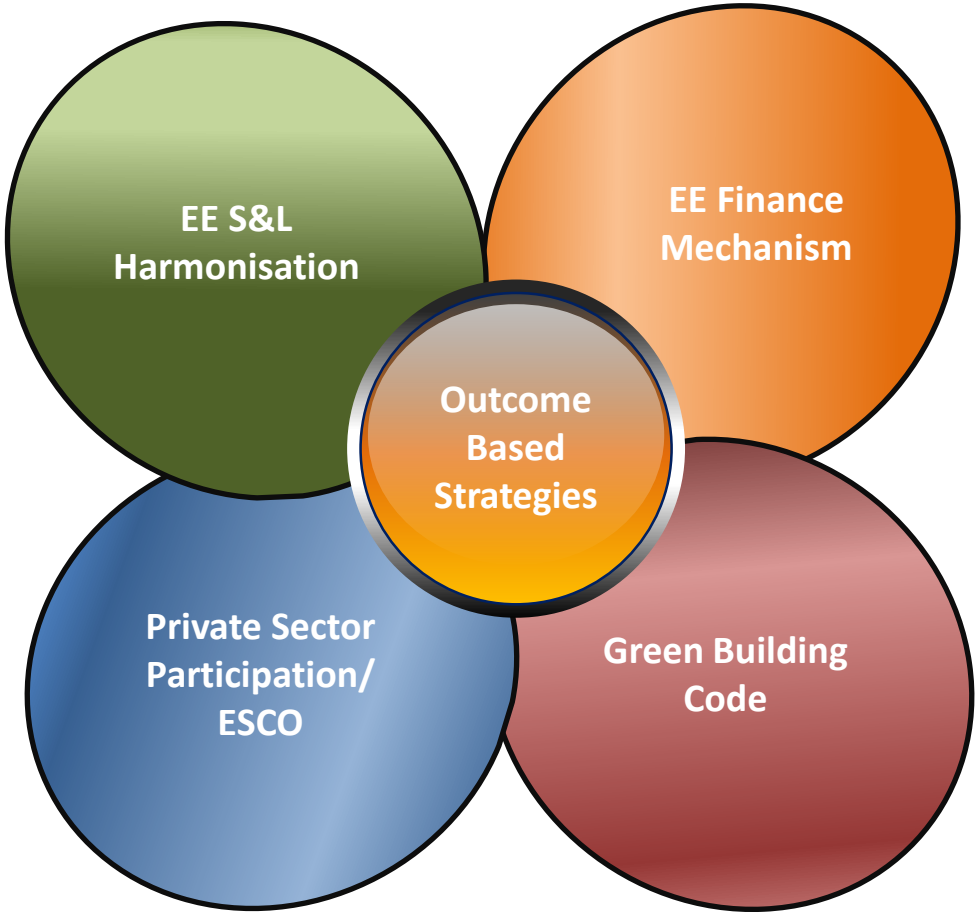
Action Plans

- ❑ Regional policy and roadmap for MEPS
- ❑ National Policy & roadmap for MEPS
- ❑ Awareness raising programme

Action Plans

- ❑ Create more opportunities for private sector
- ❑ Capacity Building
- ❑ ASEAN Energy Awards



Action Plans

- ❑ Establish network of FIs
- ❑ Financing Training
- ❑ Pilot Projects
- ❑ Guidelines on EE financing
- ❑ Implementation of EE financing projects

Action Plans

- ❑ Review of international experience on GBC
- ❑ Guideline of GBC
- ❑ Capacity building

to reduce energy intensity (EI) by 20% in 2020 based on 2005 level.

20

Renewable Energy

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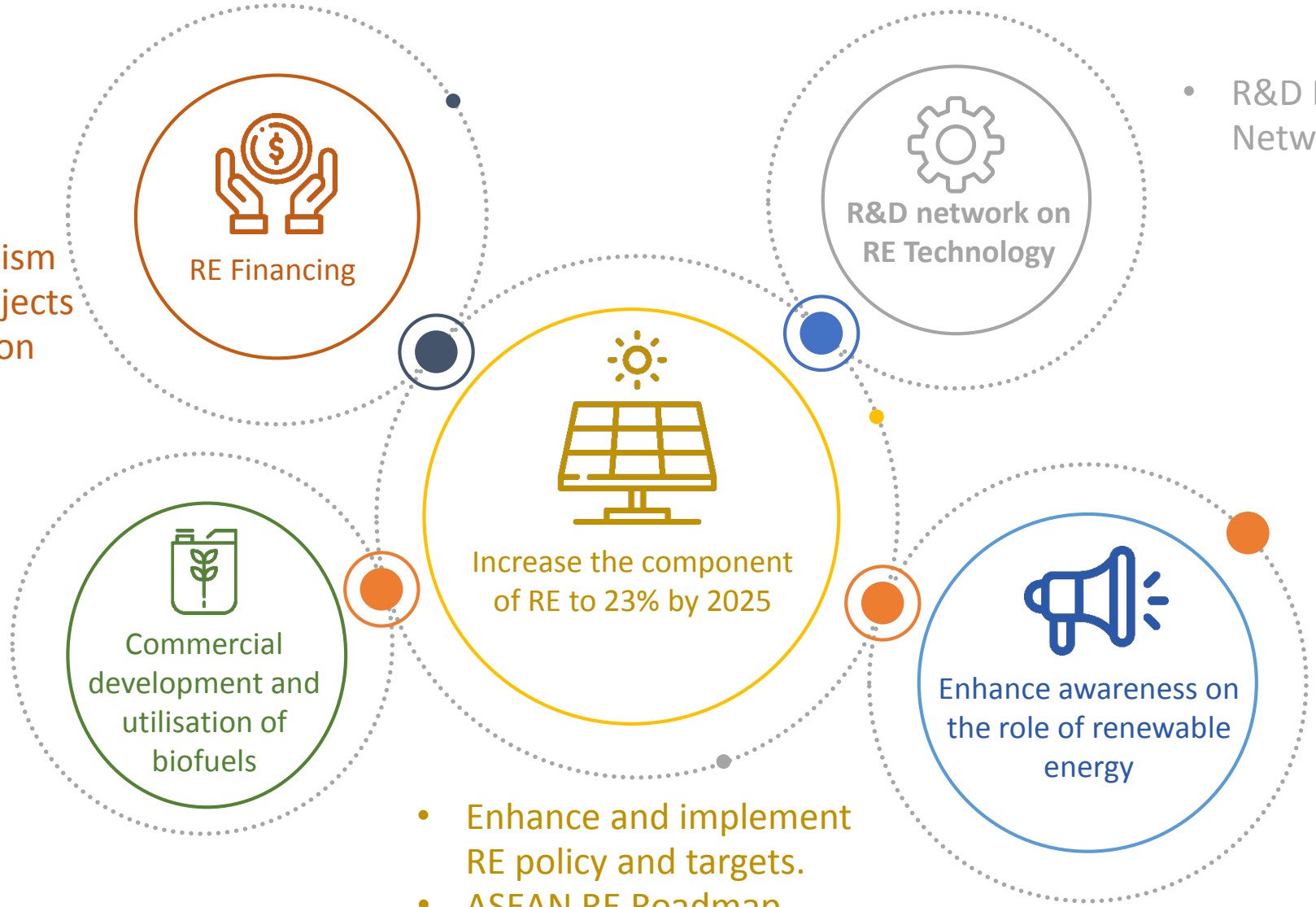
- Develop a RE Financing nodal network
- Guideline of Re support Mechanism for Bankable Projects
- Annual Training on RE Financing



- R&D Nodal Network

- R&D on Biofuels
- Market Studies for Biofuel Commercial

- Develop a nodal network
- RE-Hub
- High Level Policy Dialogue
- Annual Technical Training

- Enhance and implement RE policy and targets.
- ASEAN RE Roadmap

Regional Energy Policy and Planning

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Strengthen collaboration with DPs and IOs.

- AEBF
- Joint Study with IOs
- MoU/Agreement with IOs

- Energy Policy & Planning Workshop
- Data Analysis Training
- Secondment opportunity

Raise the level of data and analysis on ASEAN's energy policy and planning.

Strengthen resilience and emergency preparedness in energy infrastructure/facilities to mitigate the impact of climate change and natural disasters

- Emergency Preparedness Workshop
- vulnerability assessment of energy infrastructure/facilities Training

To better profile ASEAN's energy sector internationally

- ASEAN Energy Cooperation Publication
- ASEAN Energy Outlook
- ASEAN Energy Statistics

Effectively manage the implementation of the APAEC 2016-2025.

- Monitor and Evaluate APAEC Progress
- MTR
- APAEC Phase II

Civilian Nuclear Energy

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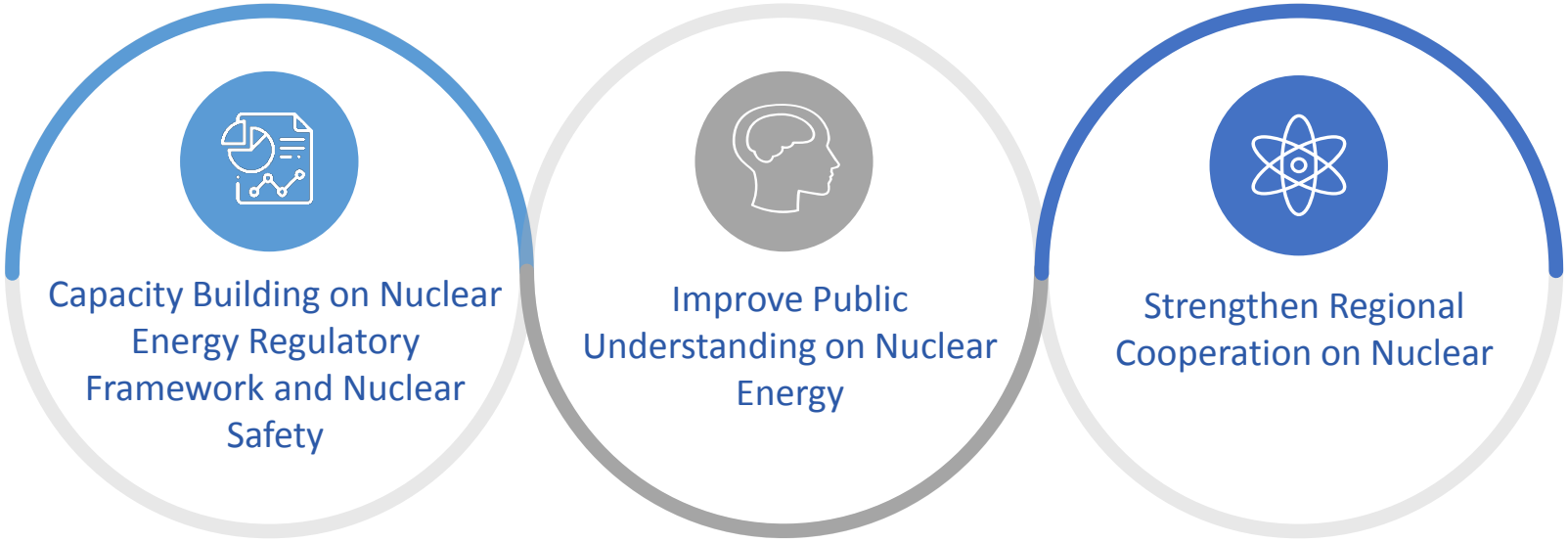

- Regional nuclear safety framework, public acceptance and emergency response activity
- international nuclear institutions study visits
- Technical study on nuclear safety and enhance capacity on emergency planning exercises

- Public education to raise awareness on Nuclear Energy as Alternative Energy Options.
- Regional public communication strategies

- study on the potential regional nuclear energy arrangements.
- portal of nuclear communities and database on nuclear

Key Directions for Coal and Clean Coal Technologies towards Low Carbon Society

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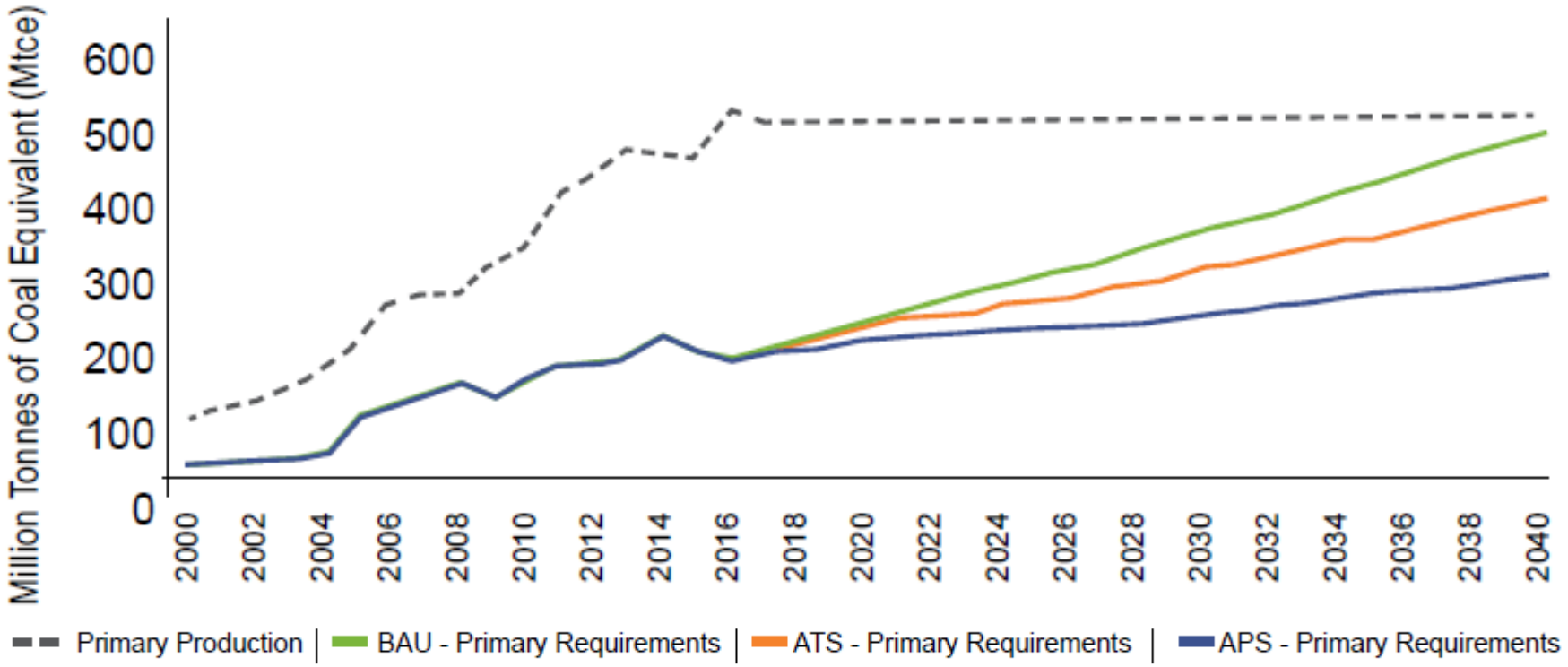
Growing Role of Coal in ASEAN
Coal – Production vs. Requirements

ASEAN will have a surplus of coal until 2040.



Source: AEO5

CFPP Installed Capacity in GW by Country

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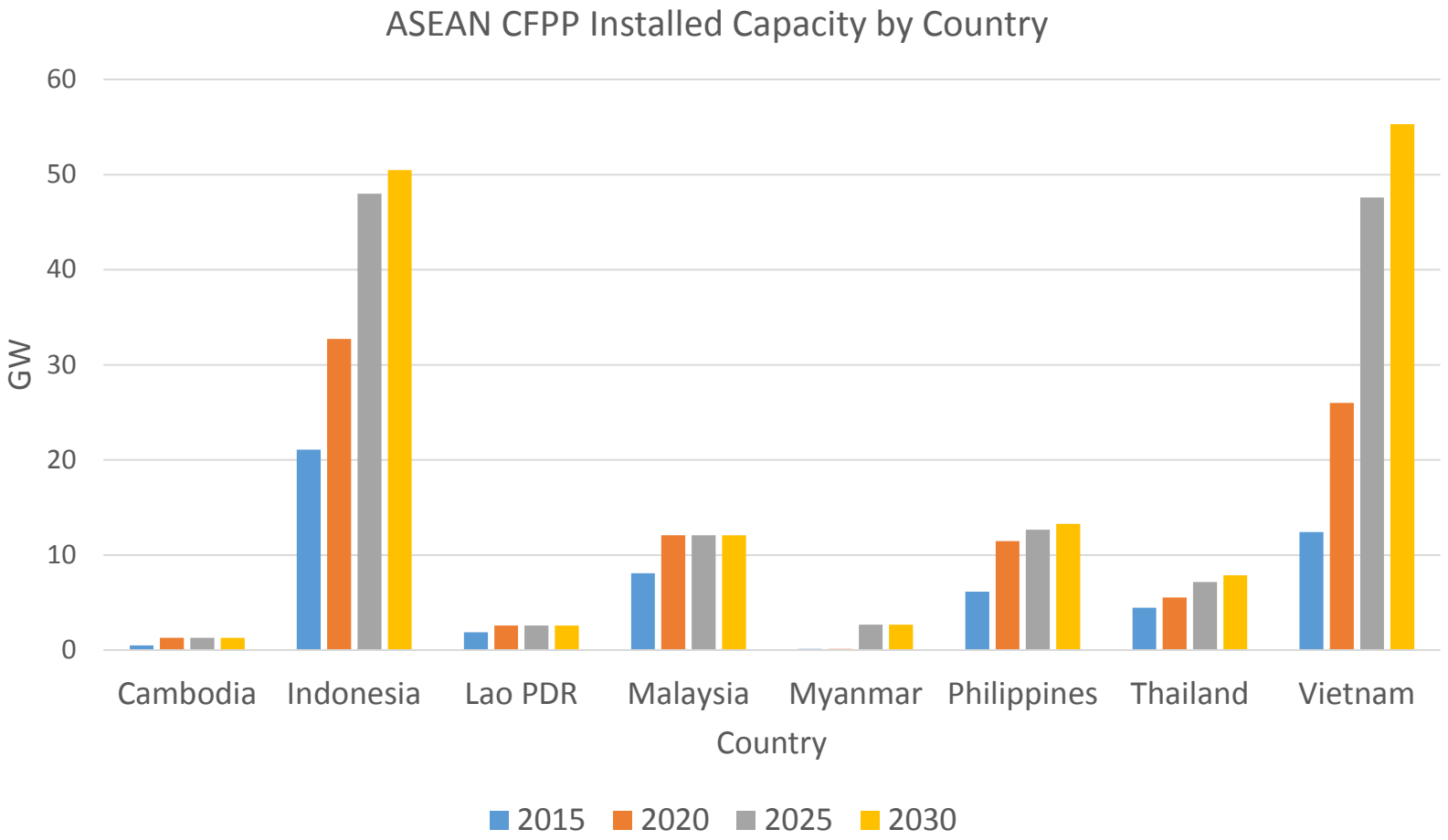

- ASEAN will double their CFPP installed capacity by 2025.
- Major contributors to capacity additions are expected from Indonesia and Vietnam.
- Notable contributions are also expected from Malaysia, Philippines, and Thailand.

Sources: 16th AFOC Council Meeting Country Reports & AEO5

ASEAN move towards utilisation of Clean Coal Technology

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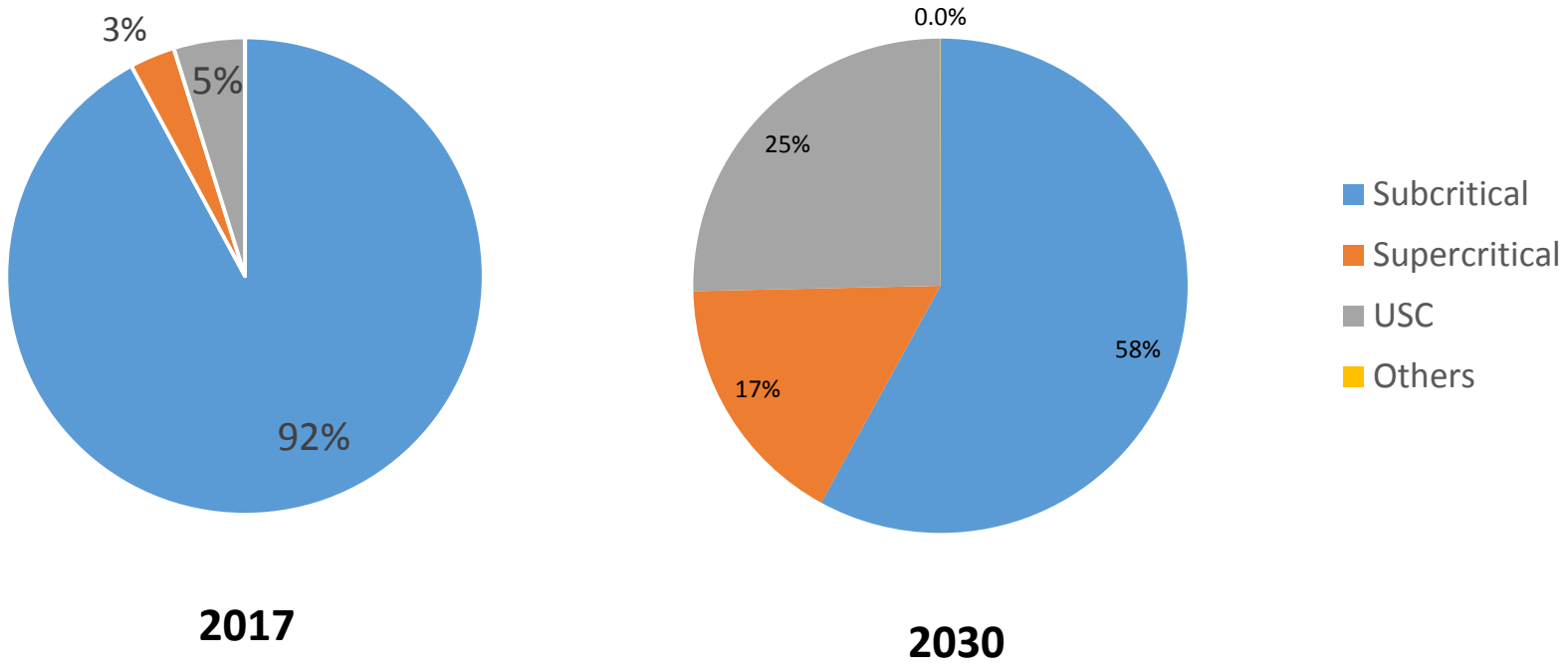

- Indonesia, Malaysia, Thailand, and Vietnam are planning to build their new CFPP with CCT (Supercritical & USC)
- There is around 27% of the planned capacity have not yet decided the technology choices

Sources: 16th AFOC Council Meeting Country Reports & Country's PDP

Indonesia is the first developer of Supercritical, while Malaysia is the first developer of USC

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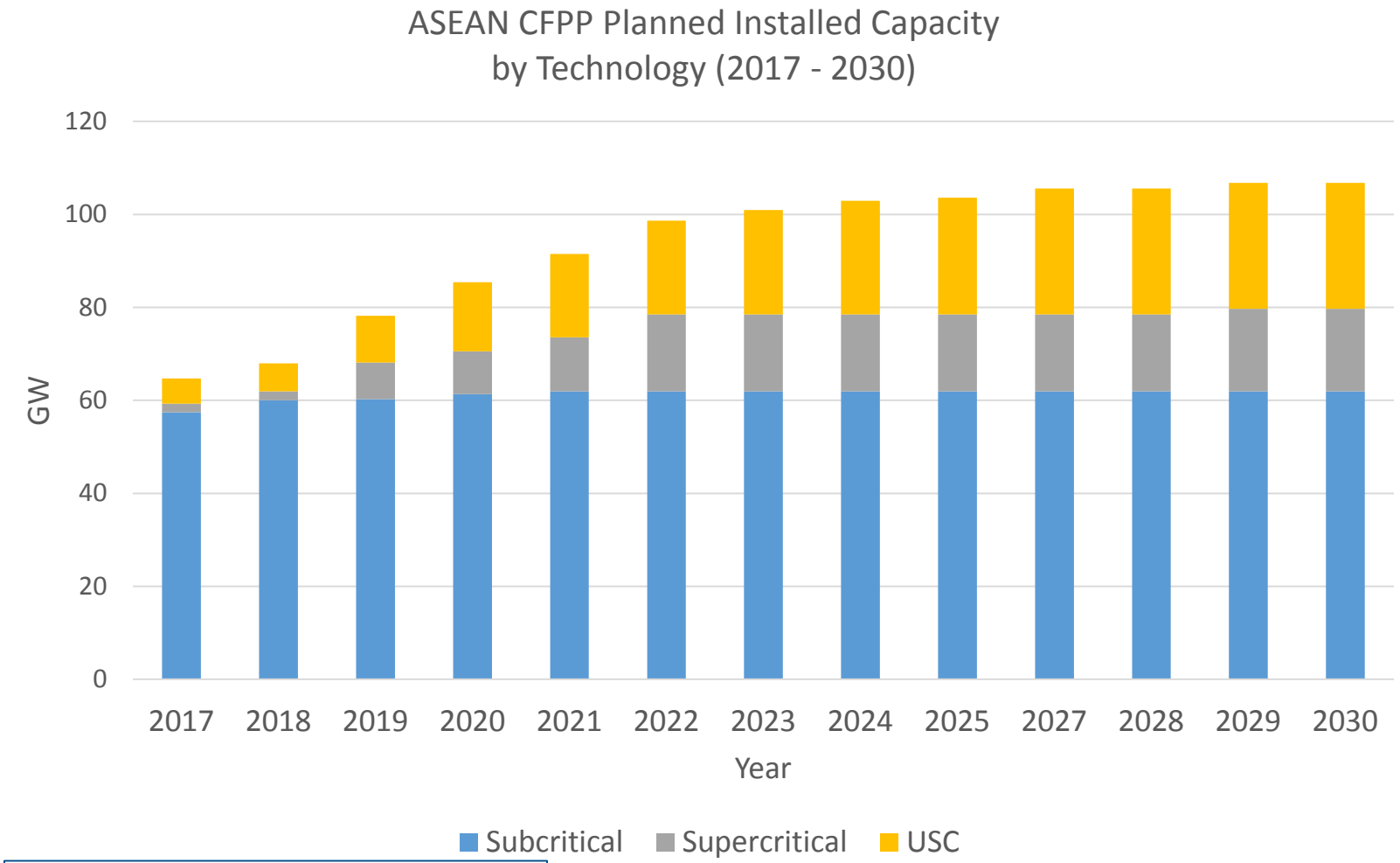

- From 2018 to 2030, there will be additional 15 GW of Supercritical and 21 GW of USC CFPP
- In 2018, Indonesia has installed 3,409 MW Supercritical CFPP and will have the first 2,000 MW USC CFPP in 2020
- Malaysia already has 3,100 MW USC CFPP and will add 2,000 MW in 2019.

Sources: 16th AFOC Council Meeting Country Reports & Country's PDP

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Key Initiatives on CCT

ASEAN Coal Awards

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Objectives

- To promote cleaner and economical utilisation of coal
- To improve the general perception/image of coal
- To disseminate best practices in the coal sector
- To increase public awareness on Clean Coal Technology (CCT)

Background & Updates

- Biennial event jointly by ACE and AFOC.
- BOJ evaluates and selects winners
- In 2015, 21 entries, 18 winners
- In 2017, 21 entries, 17 winners
- In 2019, 24 entries, 18 winners
- The next awards is in 2021

Awards Categories

1. Coal Mining
2. CCT Utilisation
3. Coal Distribution
4. CSR
5. Special Submission

Capacity Building & High Level Policy Dialogues

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AFOC CCT Workshop 2018

Recommended to establish ASEAN Emission Standard

Recommended to develop regional strategies on public acceptance for coal-fired power plants

Recommended to the AMS to influence policymakers on the importance of tax policy stability through high-level policy dialogues.

Workshop on Enhanced Coal Image and CSR Best Practices

Recommended to set up and develop emission standard for CFPP.

Recommended to develop prepare the CCS Road Map for ASEAN.

Collaboration between ACE-JCOAL

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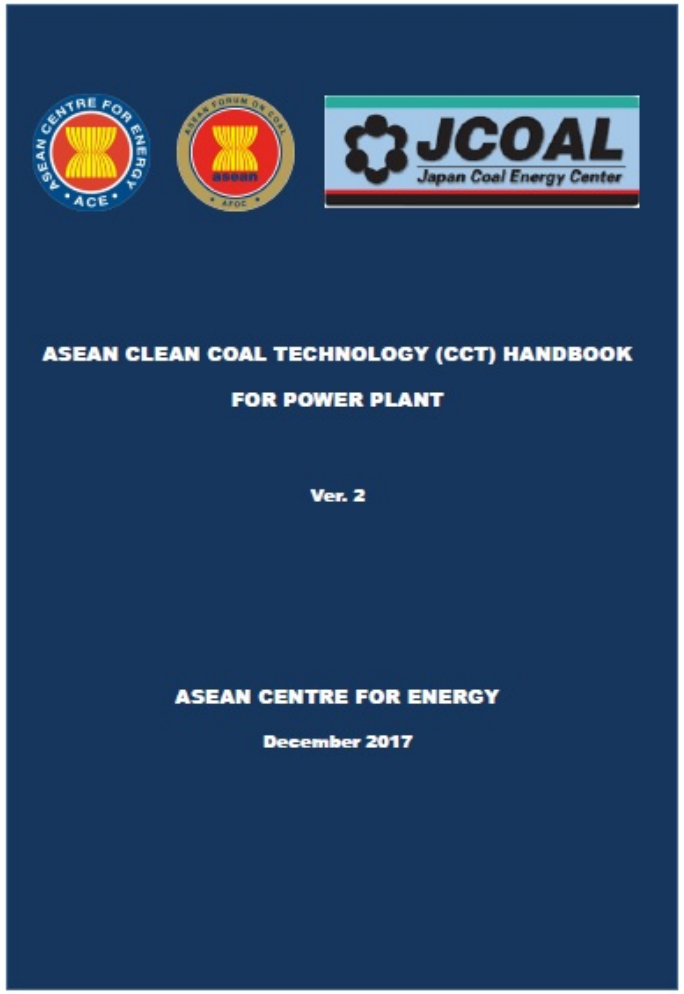

ASEAN Clean Coal Technology Handbook for Power Plants, Ver 2.

- Joint Study between ACE – JCOAL in cooperation with AFOC
- Provide a deeper insight and updated information on the status and plans on opportunities for the deployment of CCT.
- Best practices and trends in CCT application and development in Japan

Collaboration between ACE-WCA

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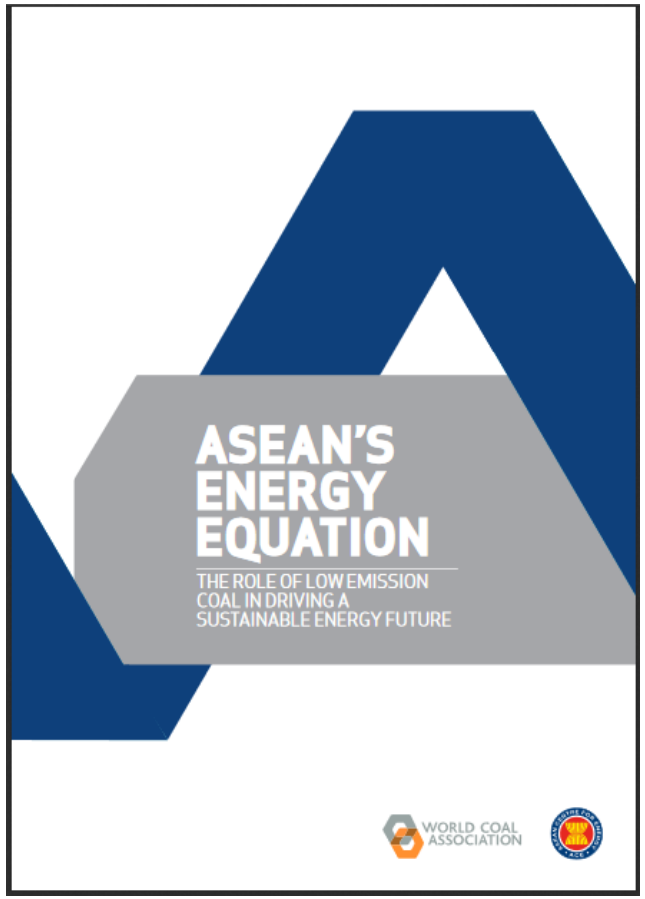

ASEAN's Energy Equation: the role of low emission coal in driving a sustainable energy future (ACE -WCA)

Provides comprehensive analysis for the energy security and sustainable development opportunities from CCT

Insights from the report provided framework for the "Call to Action" :

- ASEAN Should reaffirm the regional strategies for CCT
- ASEAN should support the transition away from the least efficient technology in favour of HELE coal.
- AMS call on international community to provide support for the deployment of CCT

ASEAN Coal Centre of Excellence

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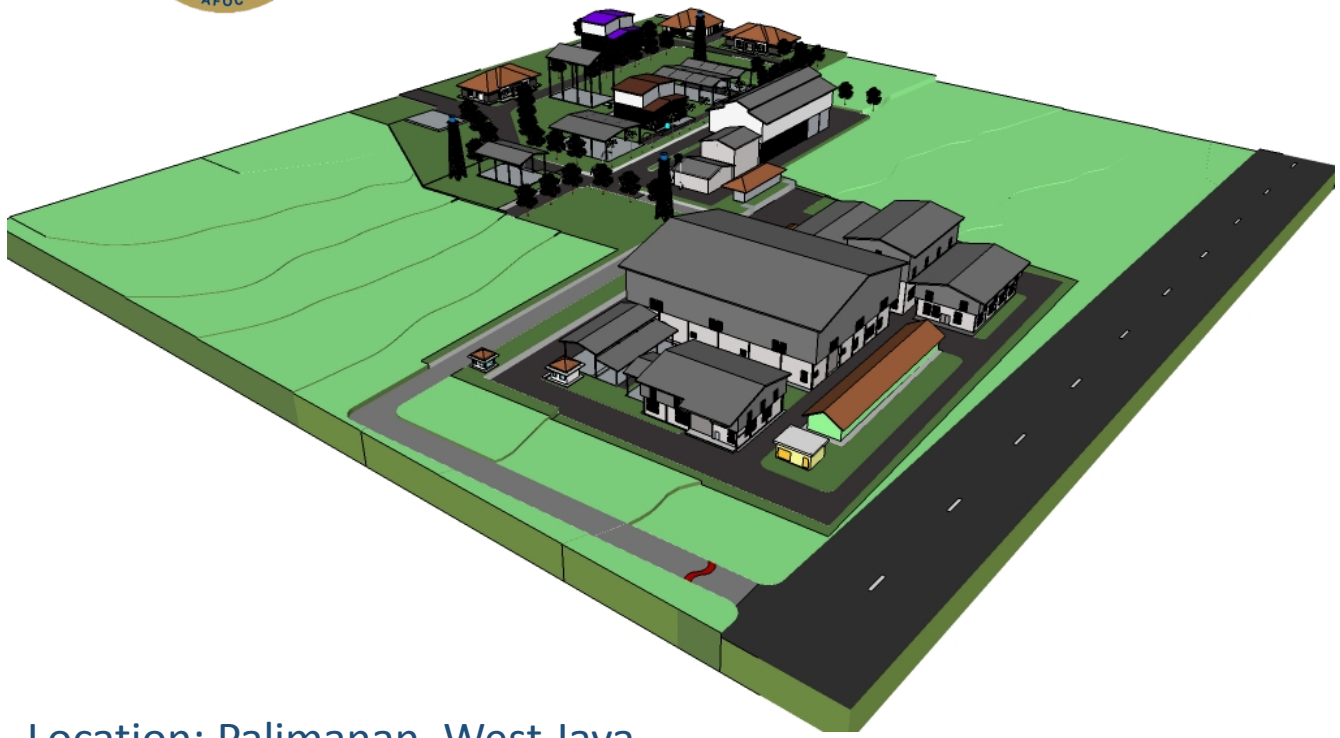

Location: Palimanan, West Java, Indonesia

- Centre for support the R&D, technology transfer, pilot project, and capacity building for Clean Coal Utilisation Technologies in ASEAN
- To be equipped with the pilot plants and laboratories of coal utilization technologies.

Cleaner Coal Utilisation Roadmap

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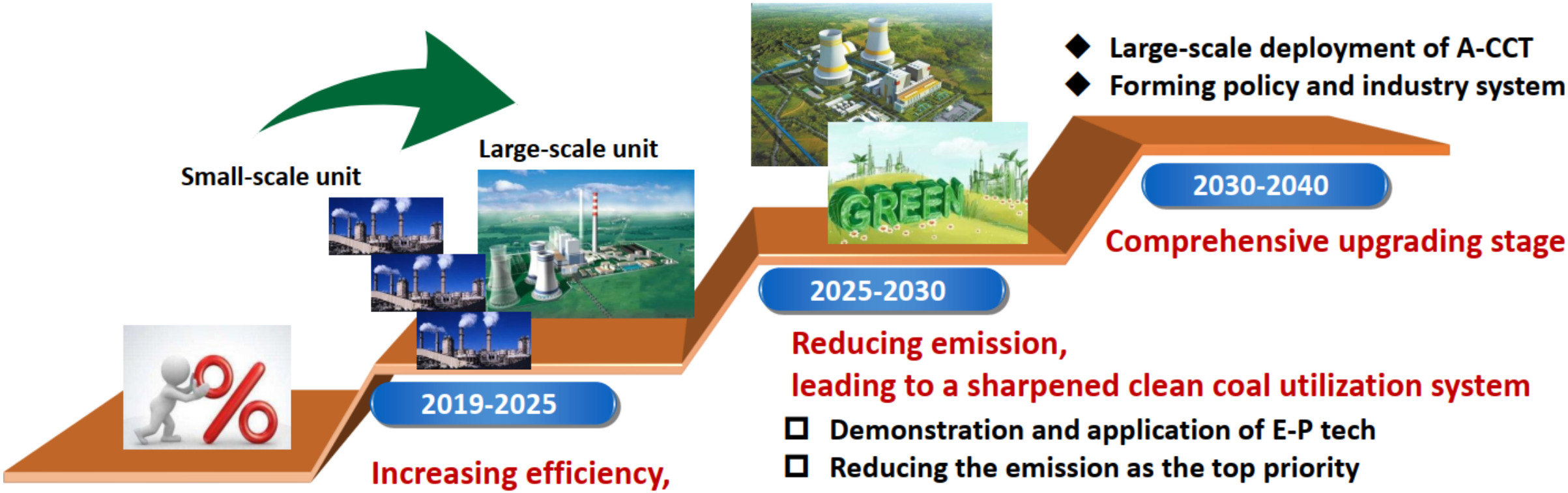


Challenge for the future

Increasing efficiency, resulting emission reduction

- ✓ Increasing efficiency as the primary task
- ✓ Deployment of HELE tech in newly-built plants
- ✓ Promoting the retrofit of plants to improve efficiency

Reducing emission, leading to a sharpened clean coal utilization system

- ☐ Demonstration and application of E-P tech
- ☐ Reducing the emission as the top priority

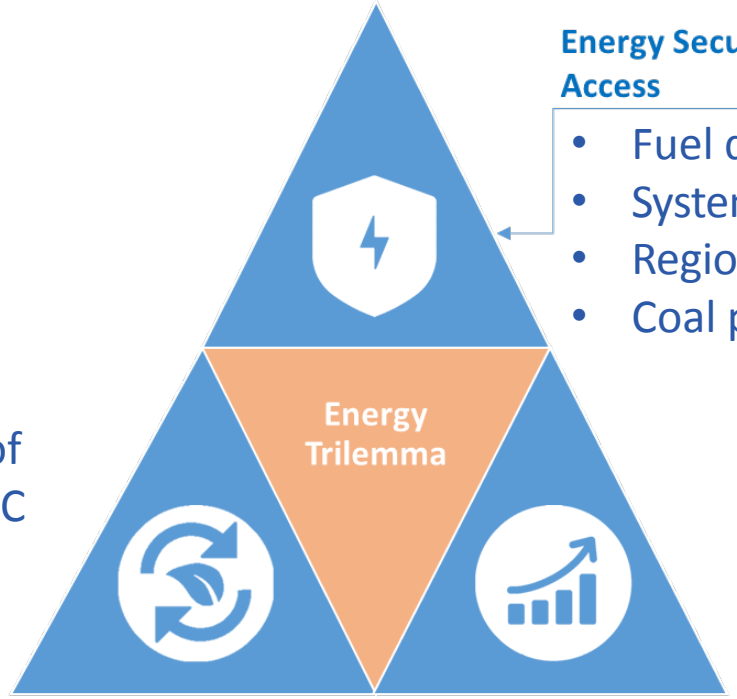
Comprehensive upgrading stage

- ◆ Large-scale deployment of A-CCT
- ◆ Forming policy and industry system

Source: Study on Cleaner Coal Utilisation Roadmap in AMS, 2019

ASEAN's Future Strategic Directions for Coal

One Community for Sustainable Energy



Energy Security & Access

- Fuel diversification policy
- System ability to cope with rising electricity demand
- Regional coal trade policy
- Coal prices

- Regional policy for deployment of CCT (technology shift to USC, LRC upgrading, CCS, fuel blending, Coal Gasification)

Environmental Sustainability

Economic Development and Growth

- Accessibility and affordability of energy supply
- Coal as one of solutions to rural electrification
- Multilateral electricity trading and integration

37th ASEAN Ministers Meeting (AMEM)

The Ministers **acknowledged the outlook of rising power generation from coal in the region until 2040**, and noted the efforts by the ASEAN Forum on Coal (AFOC) to promote clean coal technologies (CCT) and intra-ASEAN coal trade; work towards establishing an ASEAN Coal Centre of Excellence; continue updating the ASEAN Coal Database and Information System; and share and build technical capacity for the deployment of CCTs, including carbon capture storage and utilization technologies.

The Ministers also noted the completion of the joint study on a **Cleaner Coal Utilisation Roadmap** in ASEAN by ACE and China Energy Technology and Economics Research Institute (CETERI), which serves as a useful reference to further accelerate the deployment of CCT in the ASEAN region and could assist ASEAN Member States to develop their national roadmaps.

16th AMEM+3

One Community for Sustainable Energy

The Ministers recognised coal as one of the important resources, especially for power generation in the region and noted the need to adopt cleaner coal technology, secure financial support, and promote policies for clean coal technologies (CCT) including high-efficiency coal-fired power generation.

The Ministers **welcomed the new initiative of Japan on Carbon Recycling Technology** and welcomed the results of the joint study by ACE and China Energy Technology and Economics Research Institute (CETERI) on Clean Coal Utilisation Roadmap in ASEAN Member States which serves as a useful reference to further accelerate the deployment of CCT in ASEAN region.

13th EAS Ministers Meeting

One Community for Sustainable Energy

Initiative to promote carbon recycling. The Ministers discussed the importance of increasing global investments on innovation in order to reduce emissions and provide reliable and affordable energy. They welcomed the proposed Japan-led initiative to promote investments in carbon recycling or carbon capture and utilisation (CCU). The Ministers looked forward to cooperation on research, development and deployment of carbon recycling technologies and reiterated the call to mobilise financing to take advantage of the broad range of energy resources and cleaner energy technologies to achieve resilient economic growth, energy security, energy supply diversity and sustainable ecosystems.

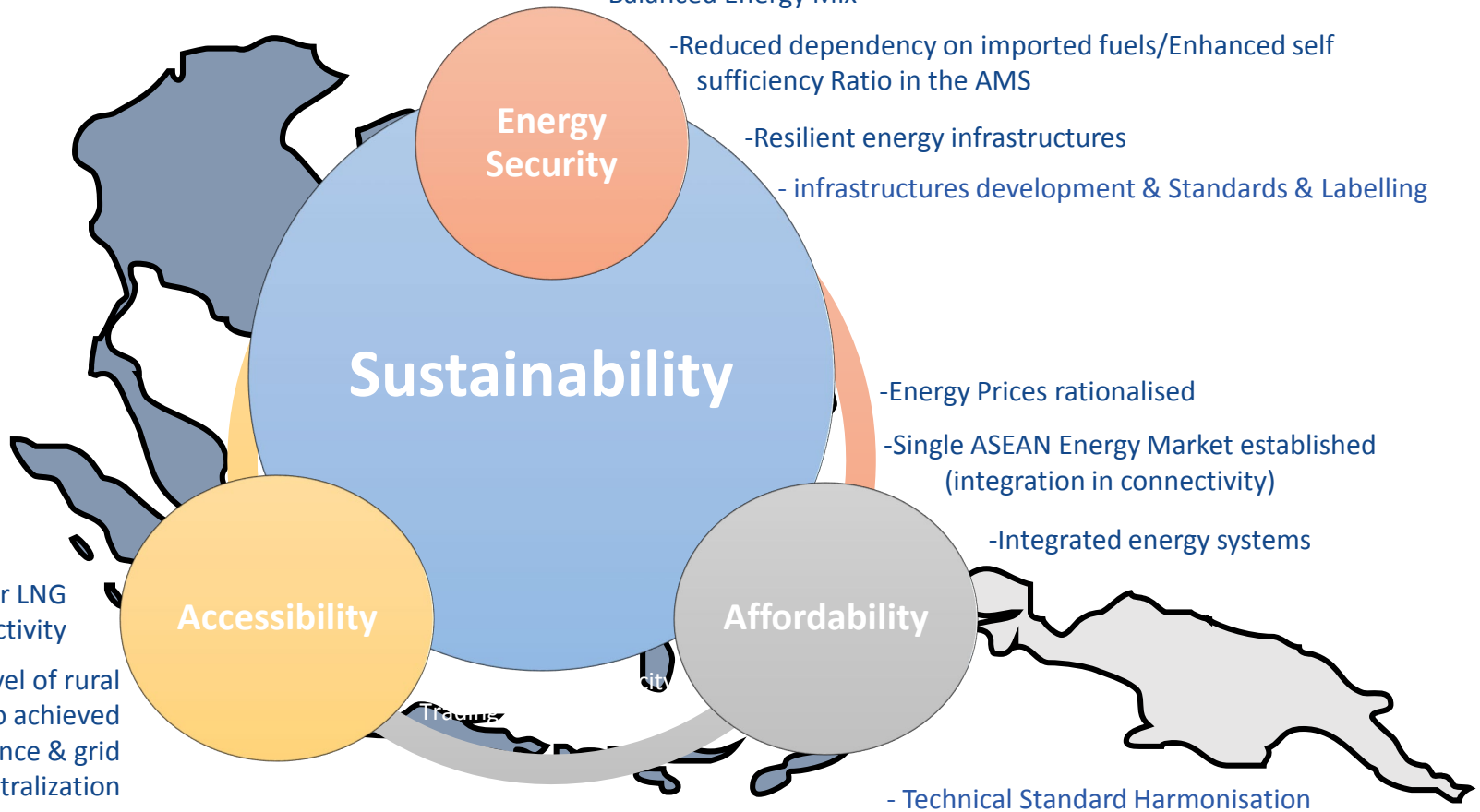
The Ministers **recognised the need to deepen collaborative actions, including mobilising finance from wide variety of sources and conduct of capacity building**, to increase clean coal technology deployment and natural gas utilization to support energy security and diversity of supply as the region transitions through partnership and innovation to a lower carbon future.

Achieving ASEAN Economic Community Goals

One Community for Sustainable Energy

Guiding Theme:

i. increasing **trade and investment**
ii. integrating **micro, small and medium enterprises(MSMEs)** in the **Digital Economy**
iii. developing an **innovation-driven economy**.



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