



The Status of current Development of ASEAN Interconnection

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General Overview

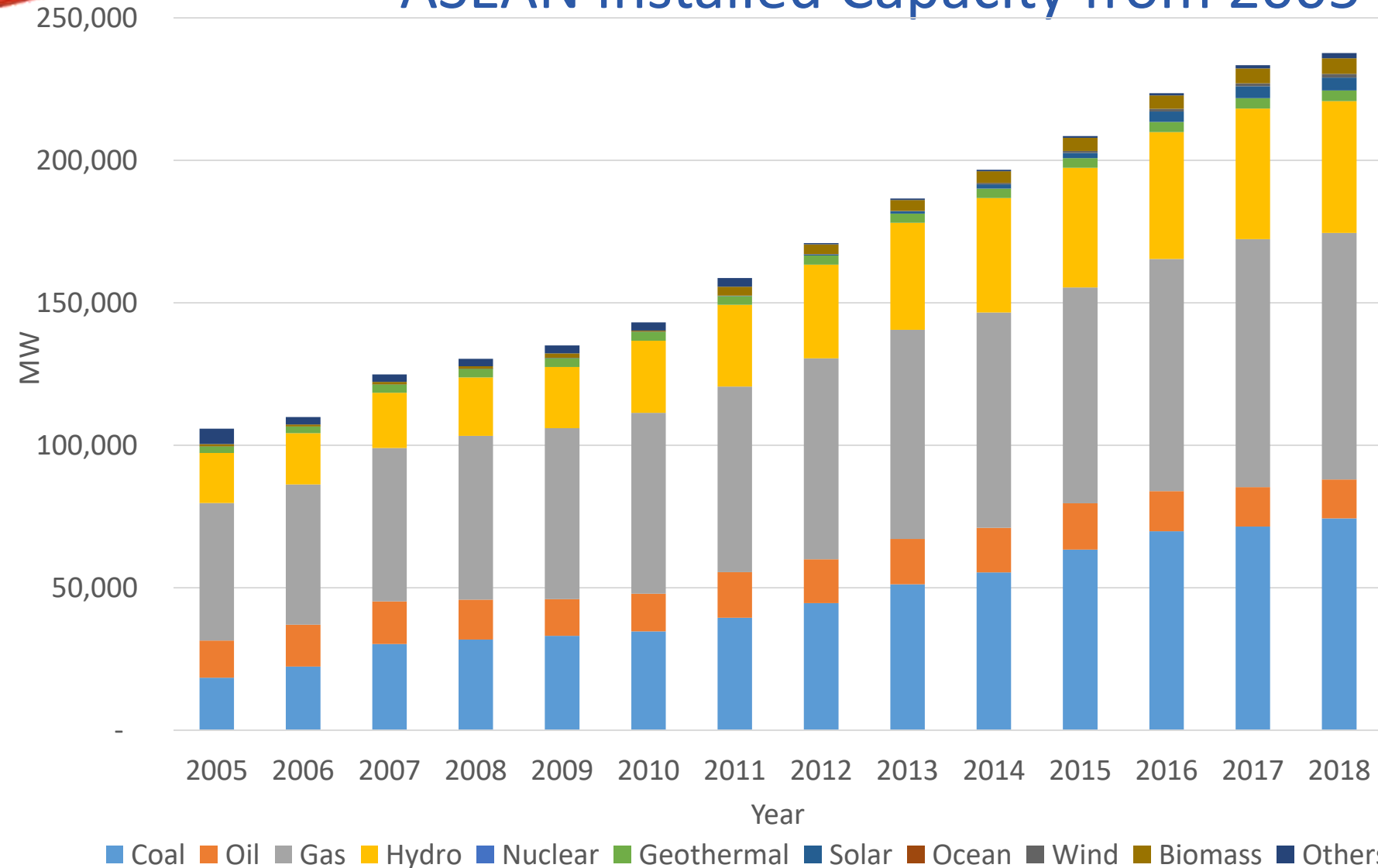
- The Association of Southeast Asian Nations (ASEAN) is one of the regions with the most dynamic economic development and energy demand - energy mix focuses on coal, gas and other fossil energies.
- Over the past 17 years, energy demand in 10 ASEAN Member States (AMS) has grown by 73%.
- ASEAN countries are also actively developing clean energy and has set a regional target of reaching 23% of Renewable Energy (RE) in the primary energy mix by 2025.
- However, AMS vary greatly in terms of the resources endowment and development conditions.
- In recent years, the ASEAN has made substantial progress in renewable development, particularly hydro-based energy. Due to uneven energy distribution and mismatch between power supply and consumption, a key factor for promoting sustainable regional energy development is to strengthen power interconnection and coordinate energy and power resources within the Region.

ASEAN Power Production and Consumption

Country	Electrification rate	Population (thousands)	GDP per capita (USD)	Power market structure	Peak demand (MW)	Installed capacity (MW)
Brunei Darussalam	99.9%	423	26 493	Single buyer	604*	993
Cambodia	68.6%	15 158	1 226	Single buyer	951	1 698
Indonesia	95.4%	258 705	3 600	Single buyer	33 381	60 793
Lao PDR	92.1%	6 758	2 391	Single buyer	1 056	6 920
Malaysia	99.0%	31 661	9 464	Single buyer	19 884	34 285
Myanmar	33%	52 917	1 297	Single buyer	2 497	5 612
Philippines	90.7%	103 243	3 017	Advanced power pool	5 002	22 735
Singapore	100%	5 607	52 963	Advanced power pool	11 062	13 611
Thailand	100%	67 455	6 304	Single buyer	6 960	43 954
Viet Nam	98.9%	92 695	2 138	Single buyer	29 618	47 025

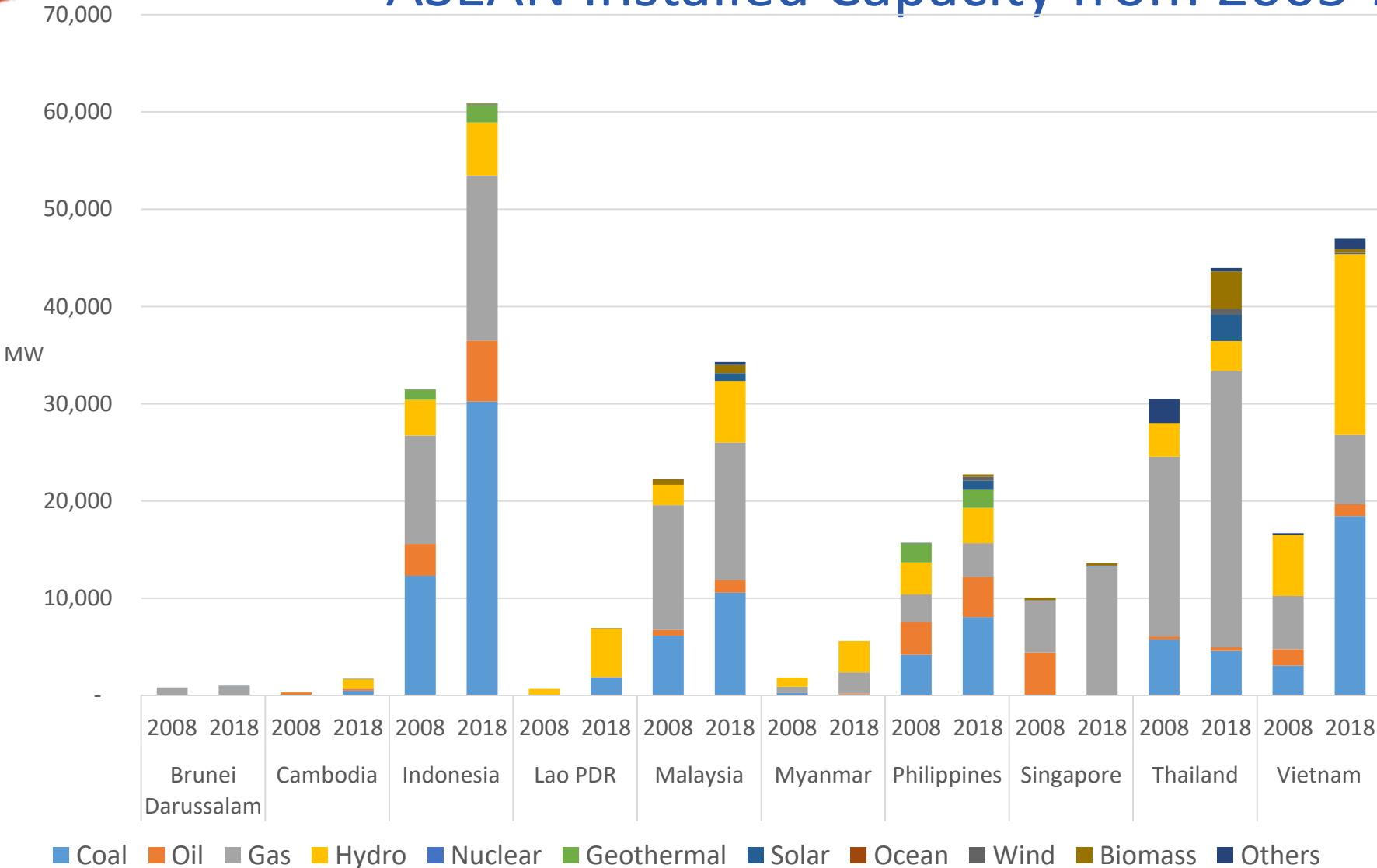
- level of development - electricity access rates range from 33% at the low-end to 100% at the high.
- Most of AMS implement the vertically integrated single buyer model on its power market structure.
- The only exceptions are Philippines and Singapore which have fully restructured power markets through retail model.

ASEAN Installed Capacity from 2005-2018



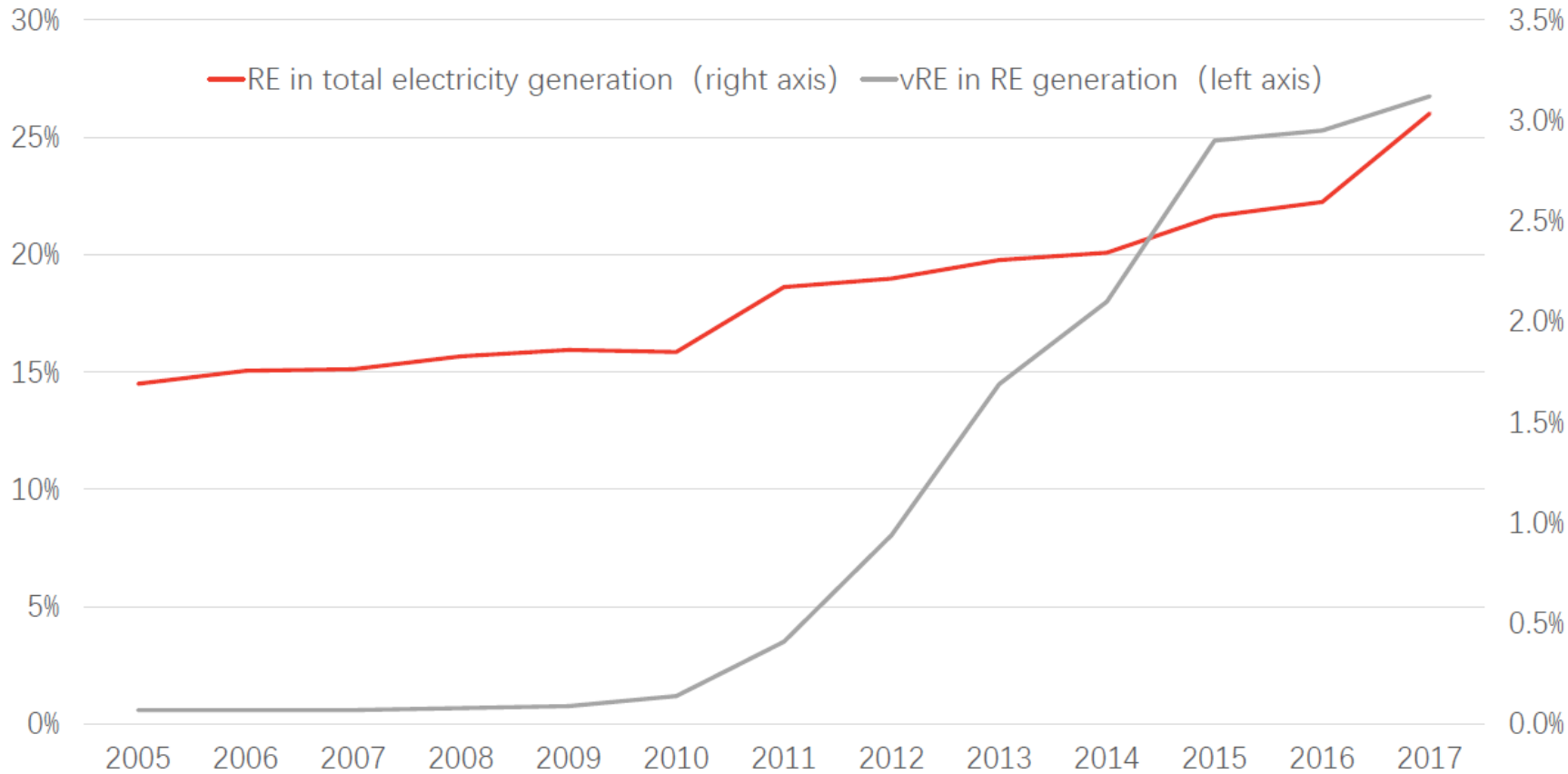
- ASEAN has developed its power installed capacity from 106 GW in 2005, into 237 GW in 2018.
- A dependency of fossil-based fired power plant remains constant along this period.
- However ASEAN's efforts on renewable energy can lower the share of fossil-based installed capacity from 81% to 73%.
- Natural gas is the main sources, about 86.5 GW in 2018.
- coal and hydro-based power plant are the most main sources of specific countries due to its abundance resources.

ASEAN Installed Capacity from 2005-2018



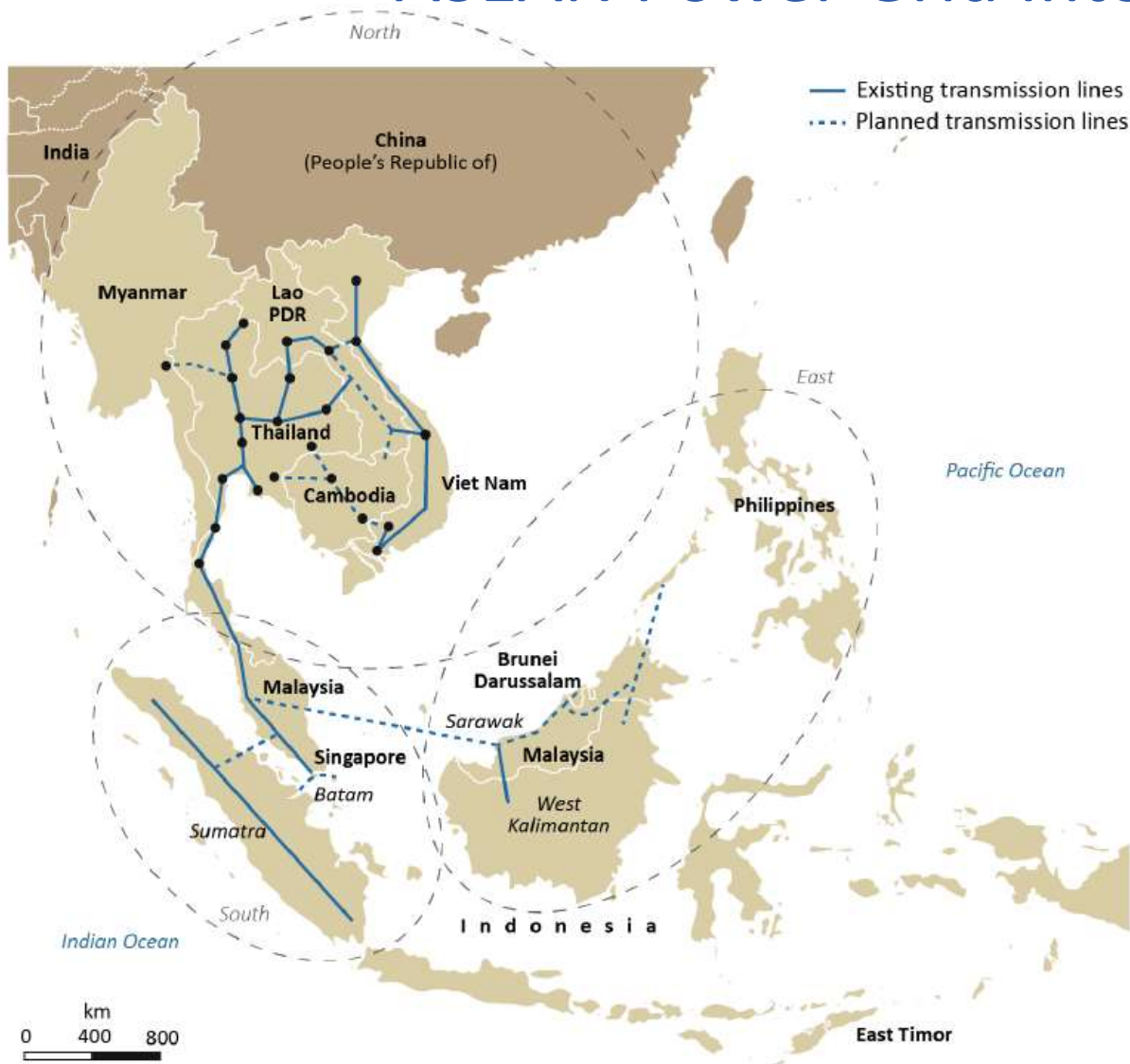
- Indonesia represents the first of ASEAN installed capacity with 60.8 GW (2018).
- Malaysia, Thailand and Vietnam can represent a half of ASEAN with installed capacity of 34.3 GW, 43.9 GW, and 47.0 GW, respectively.
- Combined Singapore and Philippines are about 36 GW, or a sixth of ASEAN total.
- Other AMS, such as Brunei Darussalam, Cambodia, Lao PDR and Myanmar comprised total installation about 15 GW.

ASEAN Growth of Renewables



- Hydro power generation still accounts for the largest part of RE generation.
- However, vRE is rapidly increasing (in particular from 2010 to 2015, from 0.14% to 2.90% of total RE generation).
- Since 2016, the growth of vRE generation began to slow down.

ASEAN Power Grid Interconnection Overview

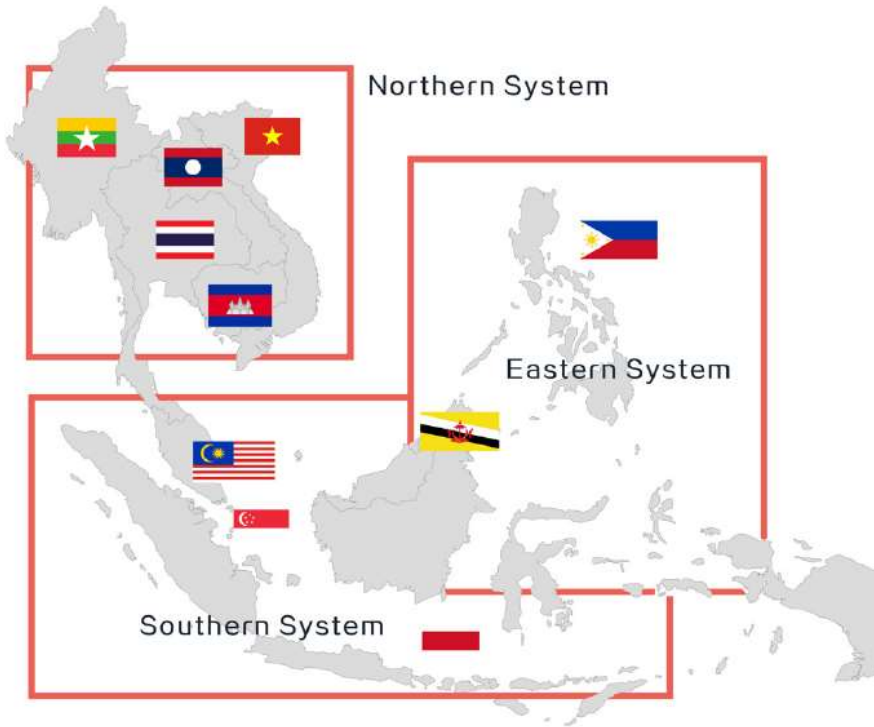


- The ASEAN member states (AMS) have had a long-standing goal of integrating their power systems.
- The overarching aim is to develop the ASEAN Power Grid (APG). The APG is composed of a series of cross-border alternating current (AC) and direct current (DC) interconnectors.
- Power trade across the APG lines that currently exist is primarily bilateral, and organised under a wide range of different trading arrangements.
- Among ASEAN countries, cross-border integration already occurs among many countries on a bilateral basis. Nearly all of the existing ASEAN cross-border integration efforts fit into the first two categories: unidirectional power trades and bidirectional power trades.

This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Source: Establishing Multilateral Power Trade in ASEAN, International Energy Agency (IEA), Aug 2019

ASEAN Power Grid Interconnection Projects



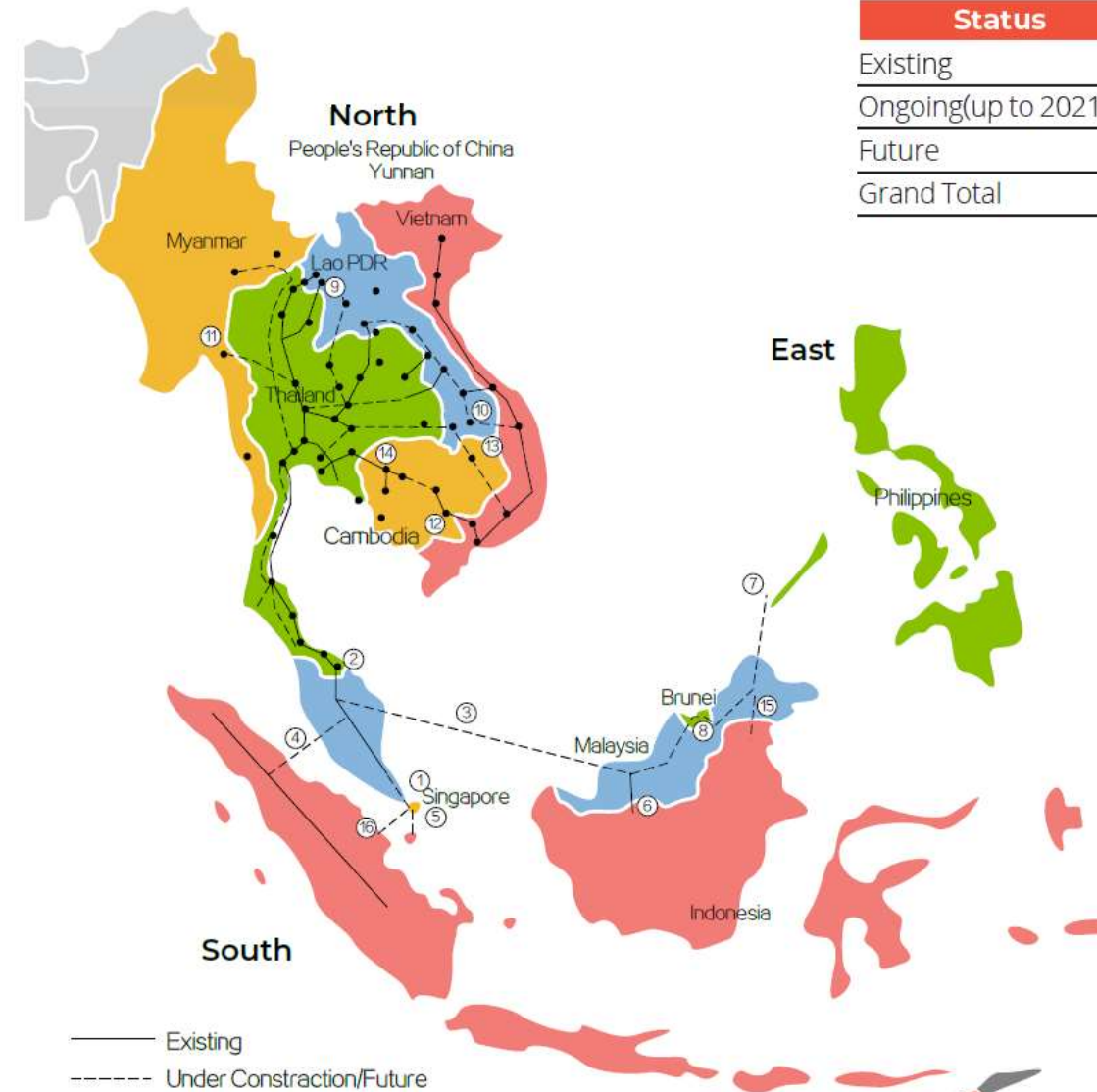
NO.	System/ Project	No. of Interconnection links			
		Exist	Ongoing (up to 2021)	Future	Total
Northern System		11	4	15	30
9	Thailand - Lao PDR	6	3	5	14
10	Lao PDR - Vietnam	2		2	4
11	Thailand - Myanmar			4	4
12	Vietnam - Cambodia	1		1	2
13	Lao PDR - Cambodia	1	1		2
14	Thailand - Cambodia	1		3	4
Southern System		1		4	5
1	P.Malaysia - Singapore	1		1	2
4	P.Malaysia - Sumatra			1	1
5	Batam - Singapore			1	1
16	Singapore - Sumatra			1	1
Eastern System		1	1	3	5
6	Sarawak - W.Kalimantan	1			1
7	Philippines - Sabah			1	1
8	Sarawak - Sabah- Brunei		1	1	2
15	E. Sabah - E. Kalimantan			1	1
Northern-Southern System		2		2	4
2	Thailand - P.Malaysia	2		2	4
Southern-Eastern System				1	1
3	Sarawak - P.Malaysia			1	1
Grand Total		15	5	25	45

- 16 bilateral power interconnection projects,
- 15 existing projects (14 being put into commercial operation)
- 5 on-going projects
- 25 future projects

“The specific plan of the APG is to realize the vision of all-around regional power energy cooperation at bilateral, sub-regional and region-wide level”

Overview of ASEAN Interconnection Projects

Status	MW
Existing	5502
Ongoing(up to 2021)	2209~2279
Future	18969~22369
Grand Total	26680~30150



3 Sarawak → Peninsular Malaysia						
No.	Project	System	Type	COD	MW	STATUS
1-	Sarawak - Peninsular Malaysia	HVDC - 500 kV	PP	TBC	2x800	Future
TOTAL					1600	
Grand Total					1600	
4 Indonesia → Peninsular Malaysia						
No.	Project	System	Type	COD	MW	STATUS
1-	Melaka - Pekan Baru	HVDC - 250 kV	PP	TBC	600	Future
TOTAL					600	
Grand Total					600	
6 Eastern Malaysia → Indonesia						
No.	Project	System	Type	COD	MW	STATUS
1-	Sarawak - West Kalimantan	HVAC - 275 kV	EE	2015	230	Existing
TOTAL					230	
Grand Total					230	



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Key Points Highlighted

- *The main objectives of establishing the ASEAN Power Grid are:*
 1. *to promote more efficient, economic, and secure operation of power systems through harmonious development of national electricity networks in ASEAN by region-wide interconnections;*
 2. *to optimise the use of energy resources in the region by sharing the benefits;*
 3. *to reduce capital required for generation capacity expansion;*
 4. *to share experiences among member countries; and*
 5. *to provide close power cooperation in the region.*
- *The ASEAN member states (AMS) have had a long-standing goal of integrating their power systems.*
- *The overarching aim is to develop the ASEAN Power Grid (APG), which composed of a series of cross-border interconnectors.*
- *Power trade across the APG lines that currently exist is primarily bilateral.*

Thank you

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