

Chapter 2

Coal in the Seven EAS Countries

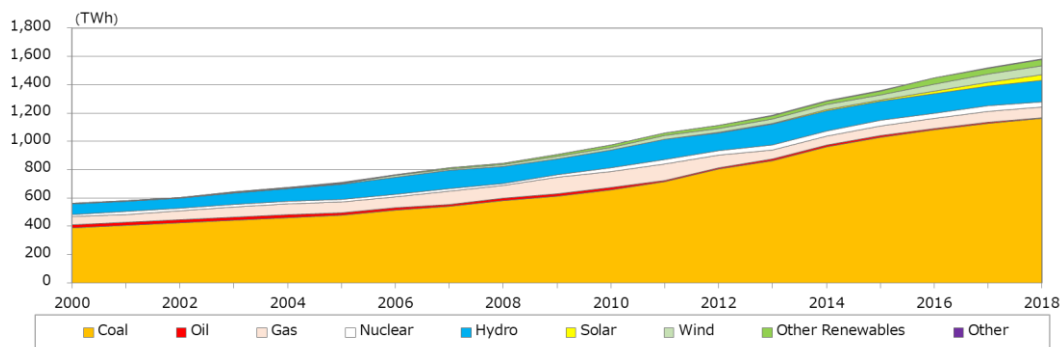
While coal divestment is gaining momentum, especially in Europe, many EAS countries rely on coal-fired generation to meet rapidly growing power demand. This chapter looks at coal in the power mix and coal-fired power development in the seven EAS countries: India, Indonesia, Malaysia, Myanmar, the Philippines, Thailand, and Viet Nam.

1. India

1.1. Coal in the power mix

India's power generation has almost tripled since 2000 with an annual growth of 5.9% and reached 1,583 TWh in 2018. With abundant domestic coal, coal has been the largest source of power generation in India. Coal-fired power generation has tripled since 2000 with an annual growth of 6.3%.

Figure 2.1: Power Mix in India



	2000 (A)	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018 (B)	Share (2018) %	CAGR ('00-'18) %	B/A
	GWh													
Coal	390	477	657	716	803	862	962	1,030	1,080	1,128	1,161	73.3	6.3	3.0
Oil	22	18	18	10	10	13	14	11	9	8	8	0.5	-5.5	0.4
Gas	56	75	113	114	87	64	62	68	72	76	74	4.6	1.5	1.3
Nuclear	17	17	26	32	33	34	36	37	38	38	38	2.4	4.6	2.2
Hydro	74	108	125	142	126	148	143	136	138	142	151	9.5	4.0	2.0
Solar	0.002	0.003	0.126	1	2	4	6	10	19	26	40	2.5	73.3	19864.1
Wind	2	6	20	25	30	33	36	35	48	55	64	4.1	22.4	38.2
Other Renewables	1	5	15	17	20	23	25	26	43	43	45	2.8	21.8	34.9
Other	1	1	2	2	2	2	3	3	3	3	3	0.2	9.2	4.9
Total	562	708	975	1,060	1,115	1,184	1,287	1,358	1,449	1,519	1,583	100.0	5.9	2.8

CAGR = compound annual growth rate.

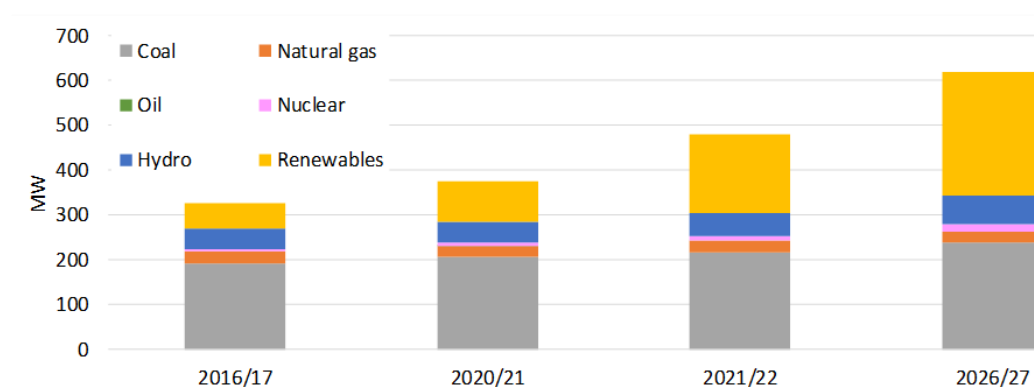
Source: IEEJ, based on IEA's 'World Energy Statistics and Balances 2020', July 2020.

1.2. Coal-fired power development

As of fiscal year (FY) 2020/21, India's installed power generation capacity was 479,418 MW, consisting of coal with 217,302 MW⁸ (55% of the total capacity); renewables⁹ 90,399 MW (24%); hydro 45,699 MW (12%); gas 24,957 MW (7%); and nuclear 6,780 MW (2%) (Ministry of Power, 2020).

The Central Electricity Authority released the 'National Electricity Plan' in January 2018. This plan projects the country's electricity demand to grow by 6.6% annually from FY2016/17 to FY2026/27, and nearly double during the period. It also projects that power generation capacity will increase by 89% from FY2016/17 and reach 619,066 MW in FY2026/27. Under this plan, coal will increase generation capacity by 24% during the same period, which is a more moderate pace than renewables (+380%), nuclear (+149%), and hydro (+42%).

Figure 2.2: Power Generation Capacity in India



	2016/17 (A)		2020/21		2021/22		2026/27 (B)		CAGR (A-B)
	MW	%	MW	%	MW	%	MW	%	
Coal	192,163	59%	205,855	55%	217,302	45%	238,150	38%	2.2%
Natural gas	26,167	8%	24,957	7%	25,735	5%	25,735	4%	-0.2%
Oil	-	-	510	0%	-	-	-	-	-
Nuclear	6,780	2%	6,780	2%	10,080	2%	16,880	3%	9.6%
Hydro	44,478	14%	45,699	12%	51,301	11%	63,301	10%	3.6%
Renewables	57,244	18%	90,399	24%	175,000	37%	275,000	44%	17.0%
Total	326,832	100%	374,199	100%	479,418	100%	619,066	100%	6.6%

CAGR = compound annual growth rate.

Notes: Renewables include small hydro projects, biomass gasifier, biomass power, urban and industrial waste power, and solar and wind energy. The installed capacity of renewables in FY2020/21 as of 30 November 2020.

Source: IEEJ, based on Central Electricity Authority, 'National Electricity Plan', January 2018; and Ministry of Power (2020).

⁸ It includes lignite-fired power plants.

⁹ Renewables include small hydro projects, biomass gasifier, biomass power, urban and industrial waste power, and solar and wind energy.

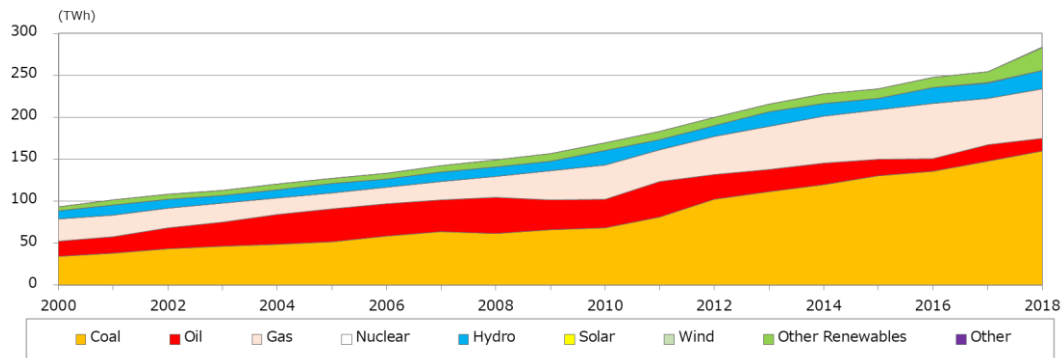
There have not been outstanding opposition campaigns against CFPPs so far in India. As far as the latest developments are concerned, the National Thermal Power Corporation Ltd (NTPC), India’s largest energy conglomerate, commissioned the country’s first USC-based units (660 MW x 2) of Khargone Super Thermal Power Station in Madhya Pradesh state (NTPC, 2020) in 2019 and 2020.

2. Indonesia

2.1 Coal in the power mix

Indonesia’s power generation has tripled since 2000 with an annual growth of 6.4% and reached nearly 284 TWh in 2018. Coal has been the largest power source, followed by natural gas. Coal-fired power generation has increased nearly fivefold since 2000 with an annual growth of 9%.

Figure 2.3: Power Mix in Indonesia



	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	Share (2018)	CAGR ('00-'18)	B/A
	(A)											(B)		
	GWh											%	%	
Coal	34,002	51,793	68,445	81,090	102,166	111,252	119,532	130,508	135,358	147,875	160,021	56.4	9.0	4.7
Oil	18,342	39,299	34,150	42,178	29,919	26,752	26,152	19,650	15,704	19,413	14,879	5.2	-1.2	0.8
Gas	26,090	19,086	40,247	38,137	45,453	51,490	56,025	58,894	65,699	55,320	59,421	20.9	4.7	2.3
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	n.a.	n.a.
Hydro	10,016	10,725	17,456	12,419	12,799	16,923	15,162	13,741	18,677	18,632	21,636	7.6	4.4	2.2
Solar	0	0	1	1	3	5	7	5	21	29	91	0.0	n.a.	n.a.
Wind	0	0	4	5	5	0	0	4	6	6	190	0.1	n.a.	n.a.
Other Renewables	4,875	6,626	9,452	9,572	9,670	9,578	10,980	11,172	12,452	13,299	27,221	9.6	10.0	5.6
Other	0	0	0	15	15	20	18	10	3	295	311	0.1	n.a.	n.a.
Total	93,325	127,529	169,755	183,417	200,030	216,020	227,876	233,984	247,920	254,869	283,771	100.0	6.4	3.0

CAGR = compound annual growth rate.

Source: IEEJ, based on IEA’s ‘World Energy Statistics and Balances 2020’, July 2020.

2.2. Coal-fired power development

As of 2018, Indonesia's installed power generation capacity was 56,510 MW, consisting of coal 26,411 MW (47% of the total capacity); gas 16,424 MW¹⁰ (29%); oil 6,658 MW (12%); hydro 4,939 MW (9%); and renewables 2,078 MW (4%).¹¹

The Ministry of Energy and Mineral Resources released '*Rencana Umum Ketenagalistrikan Nasional (RUKN) 2019–2038*' (National Electricity General Plan) in August 2019. This plan projects the country's electricity demand to increase at an annual growth of 7.9% and reach 1,361 TWh in 2038, a more-than-fourfold increase from 2019. The Indonesian government has tried to fully utilise natural resources, including coal, to develop additional power generation capacities to meet the country's growing electricity demand despite opposition campaigns of local and international environmental groups against CFPPs. At the workshop for this study, the Indonesian government confirmed its intention to continue using coal for power generation, although it plans to expand renewables significantly.

RUKN 2019–2038 projects additional generation capacities coming online between 2019 and 2038, amounting to 267 GW. Following natural gas, coal will be the second-largest in terms of additional capacities during the same period.¹² The recent two coal power projects are both in Java. PT Shenhua Guohua Pembangkitan Jawa Bali¹³ commissioned the country's first two USC-based units (1 GW each) in 2019–2020 at Java 7 coal-fired power station in Banten Province, the easternmost of Java. PT. Bhumi Jati Power¹⁴ is building nos. 5 and 6 USC-based units (1 GW each¹⁵ 2021) adjacent to the existing four units at the Tanjung Jati (Java 4) coal-fired power station in Central Java.¹⁶

¹⁰ It includes gas turbines, gas cogeneration, and gas and oil dual fuel power plants.

¹¹ PT. PLN (Persero), Rencana Usaha Penyediaan Tenaga Listrik (RUPTL) 2019–2038, 20 February 2019.

¹² Kementerian Energi Dan Sumber Daya Mineral, RUKN 2019–2038, 1 August 2019.

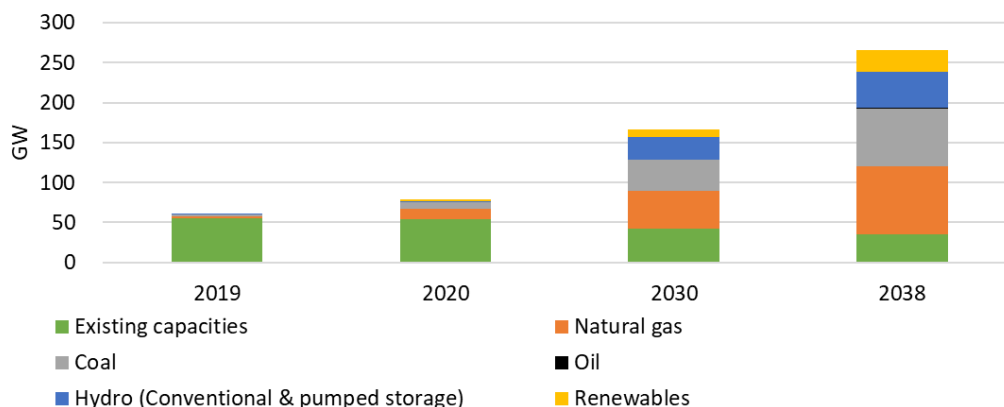
¹³ It is an independent power producer (IPP) owned by PT Pembangkitan Jawa Bali (a subsidiary of PLN), the national electric power company) and China Shenhua Energy Co., http://www.xinhuanet.com/english/asiapacific/2019-12/13/c_138629371.htm.

¹⁴ It is an IPP owned by PT. United Tractors, Sumitomo Corporation, and The Kansai Electric Co.

¹⁵ Commercial operation date.

¹⁶ <https://www.bhumi-jati.co.id/project-profile/background-and-introduction.html>.

Figure 2.4: Power Generation Capacity in Indonesia



	2019		2020		2030		2038	
	GW	%	GW	%	GW	%	GW	%
Existing capacities	55	90%	54	68%	42	25%	35	13%
Additional capacities								
Natural gas	3	5%	13	16%	47	28%	85	32%
Coal	2	3%	8	10%	40	24%	73	27%
Oil	0.1	0%	0.1	0%	0.1	0%	0.1	0%
Hydro (Conventional & Pumped storage)	1	2%	2	3%	28	17%	46	17%
Renewables	0	0%	2	3%	9	5%	27	10%
Total	62	100%	79	100%	166	100%	267	100%

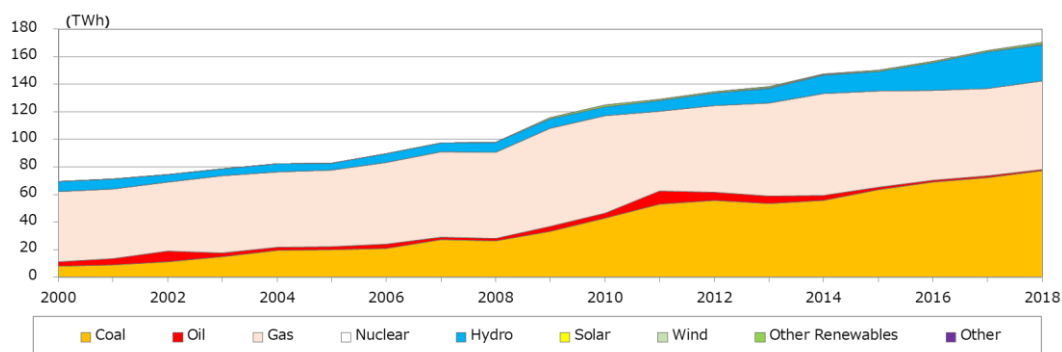
Source: IEEJ, based on Kementerian Energi Dan Sumber Daya Mineral, 'Rencana Umum Ketenagalistrikan Nasional 2019–2038' (RUKN 2019–2038), 1 August 2019.

3. Malaysia

3.1. Coal in the power mix

Malaysia's power generation has increased by 2.5 times since 2000, with an average annual growth rate of 5.1% and reaching 170 TWh in 2018. Coal-fired power generation increased tenfold from 2000, with an average yearly growth rate of 13.7%, overtaking natural gas in 2016.

Figure 2.5: Power Mix in Malaysia



	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	Share (2018)	CAGR ('00-'18)	B/A	
	(A)										(B)	%	%		
	GWh														
Coal	7,691	19,991	42,839	52,983	55,788	53,372	55,827	63,474	69,153	71,959	77,286	45.3	13.7	10.0	
Oil	3,600	2,203	3,670	9,450	6,014	5,339	3,490	1,739	1,184	1,527	1,048	0.6	-6.6	0.3	
Gas	50,998	55,287	70,795	58,158	62,649	67,761	73,836	69,962	65,234	63,273	63,886	37.5	1.3	1.3	
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	n.a.	n.a.	
Hydro	6,966	5,191	6,472	7,623	9,056	10,586	13,388	13,924	20,019	26,575	26,325	15.4	7.7	3.8	
Solar	0	1	0	0	47	141	227	273	310	330	573	0.3	n.a.	n.a.	
Wind	0	0	0	0	0	0	0	0	0	0	0	0.0	n.a.	n.a.	
Other Renewables	0	0	1,006	1,065	819	1,140	701	751	760	839	1,352	0.8	n.a.	n.a.	
Other	0	0	4	4	8	9	0	0	0	0	0	0.0	n.a.	n.a.	
Total	69,255	82,673	124,786	129,283	134,381	138,348	147,469	150,123	156,660	164,502	170,469	100.0	5.1	2.5	

CAGR = compound annual growth rate.

Source: IEEJ, based on IEA's 'World Energy Statistics and Balances 2020', July 2020.

3.2. Coal-fired power development

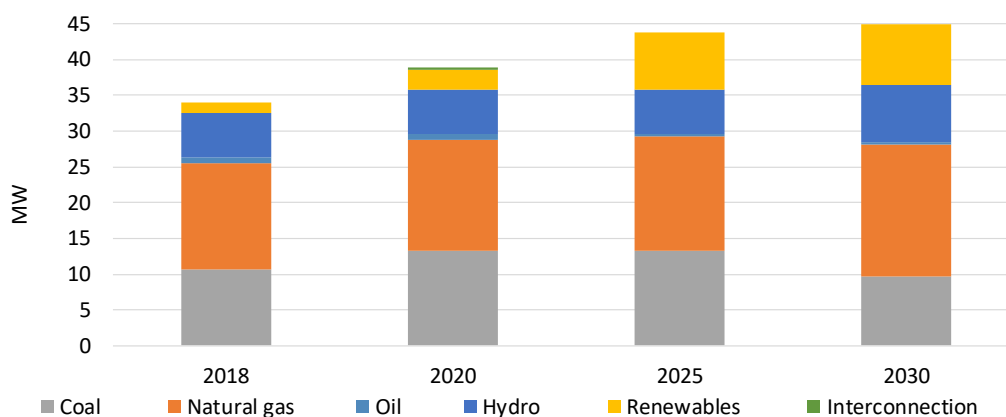
As of December 2018, Malaysia's installed power generation capacity was 33,991 MW, consisting of gas 14,853 MW (44% of the total capacity); coal 10,660 MW (31%); hydro 6,168 MW (18%); renewables 1,497 MW (4%); and oil 812 MW (2%) (Energy Commission, 2020a).

The Malaysian government is preparing the Twelfth Malaysia Plan (12MP), a national development plan for 2021–2025 until 2030. Under 12MP, the government targets an average yearly growth rate of 4.7% to achieve a GDP of RM3.4 trillion within 2021–2030 (Ministry of Economic Affairs, 2019). However, the projection of electricity demand in 12MP is not yet available.

Jimah East (1 GW x 2) in the Malay Peninsula and Balingan (312 MW x 2) in Sarawak, which commenced commercial operations in 2019, are the newest CFPPs in Malaysia. They may be the last ones as no specific CFPPs are currently scheduled. The largest power generator, Tenaga Nasional Berhad (TNB), has pledged not to invest in a greenfield coal plant in its investor presentation in December 2020 (TNB, 2020). The ageing CFPPs in Kapar (1,486 MW owned by Kapar Energy Ventures Sdn Bhd) and Manjung (2,070 MW owned by TNB Janamanjung Sdn Bhd) are scheduled to retire in 2029 and 2030, respectively (Energy Commission, 2020b).

The Malaysians have a strong interest in environmental issues, such as the growing use of renewables and recycling. However, opposition campaigns against CFPPs have not been outstanding in the Malay Peninsula as the newly installed coal-fired plants are highly efficient and have a cleaner operation.

Figure 2.6: Power Generation Capacity in Malaysia



	2018 (A)		2020		2025		2030 (A)		CAGR (A-B)	Change (B/A)
	MW	%	MW	%	MW	%	MW	%		
Coal	10,660	31%	13,284	34%	13,284	30%	9,728	22%	-0.8%	-8.7%
Natural gas	14,853	44%	15,514	40%	15,986	36%	18,430	41%	1.8%	24.1%
Oil	812	2%	825	2%	333	1%	333	1%	-7.2%	-59.0%
Hydro	6,168	18%	6,198	16%	6,198	14%	7,975	18%	2.2%	29.3%
Renewables	1,497	4%	2,749	7%	8,074	18%	8,527	19%	15.6%	469.5%
Interconnection	0	0%	386	1%	0	0%	0	0%	n.a.	n.a.
Total	33,991	100%	38,956	100%	43,876	100%	44,994	100%	2.4%	32.4%

CAGR = compound annual growth rate.

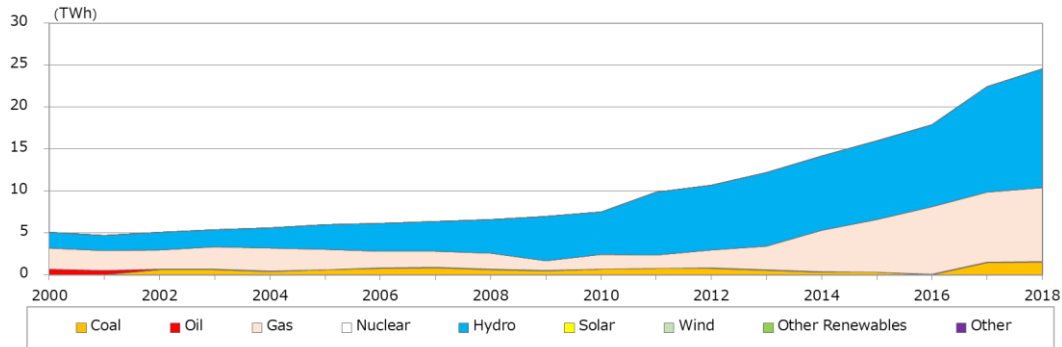
Source: IEEJ, based on Energy Commission (2020a, 2020b), SESB (2019), Sarawak Energy website, <https://www.sarawakenergy.com>.

4. Myanmar

4.1. Coal in the power mix

Myanmar's power generation was 25 TWh in 2018, nearly a fivefold increase from 2000. Hydro and natural gas are the primary sources of power generation in the country. Hydropower had the most significant share (56%) in total generation, followed by natural gas (34%), together totalling 90% of the mix. Figure 2.7 shows the power mix of Myanmar since 2000.

Figure 2.7: Power Mix in Myanmar



	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	Share (2018)	CAGR ('00-'18)	B/A
	(A)										(B)	%	%	
	GWh													
Coal	0	589	671	724	771	569	286	285	10	1,415	1,543	6.3	n.a.	n.a.
Oil	691	34	33	38	51	61	65	55	61	69	77	0.3	-11.5	0.1
Gas	2,535	2,396	1,734	1,588	2,144	2,794	4,977	6,231	8,052	8,345	8,798	35.8	7.2	3.5
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	n.a.	n.a.
Hydro	1,892	2,997	5,105	7,518	7,766	8,823	8,829	9,399	9,744	12,584	14,126	57.5	11.8	7.5
Solar	0	0	0	0	0	0	0	0	11	9	10	0.0	n.a.	n.a.
Wind	0	0	0	0	0	0	0	0	0	0	0	0.0	n.a.	n.a.
Other Renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	n.a.	n.a.
Other	0	0	0	0	0	0	0	0	0	0	0	0.0	n.a.	n.a.
Total	5,118	6,016	7,543	9,868	10,732	12,247	14,157	15,970	17,878	22,422	24,554	100.0	9.1	4.8

CAGR = compound annual growth rate.

Source: IEEJ, based on IEA World Energy Statistics and Balances 2020, July 2020.

Coal-fired power generation was 1,543 GWh in 2018, accounting for only 6.3%. Currently, only one CFPP operates in the country: Tigyit (120 MW) in southern Shan State, which commenced commercial operations in 2005. Tigyit is a mine-mouth power plant located near the Tigyit coal mine. There has been local opposition against the mining activities and power plant operations due to local health concerns and social impacts, leading to the Tigyit power plant's experiencing operational disruptions in 2014.¹⁷ In 2016, a commercial agreement with a Chinese engineering company was reached to upgrade and operate the existing Tigyit plant.

4.2. Coal-fired power development

As of 2019, Myanmar's installed power generation capacity was 5,632 MW, consisting of hydro 3,255 MW (58%); gas 2,217 MW (39%); coal 120 MW (2%); diesel 92 MW; and renewables 40 MW.¹⁸

¹⁷ Environmental Justice Atlas, <https://ejatlas.org/conflict/tigyit-coal-power-plant-shan-state-myanmar> (accessed December 2020).

¹⁸ U Han Zaw, Current Status of Myanmar's Electricity Sector, Ministry of Electricity and Energy, The Republic of the Union of Myanmar, Bangkok, March 2019

The government approved the National Energy Policy in 2014, which includes the Energy Sector Development Plan. According to the Plan, new power plants to be constructed by FY2030/31 will be based on the following energy mix: hydro 38% (8,896 MW); natural gas 20% (4,758 MW); coal 33% (7,940 MW); and renewables 9% (2,000 MW).¹⁹

As indicated in the Plan, coal was expected to play a more significant role in Myanmar's power mix to meet the nation's growing energy demand, as hydro and gas resources had their limits to expand further. In this background were several CFPP development projects with an aggregate installed capacity of 3,325 MW upon the Plan's endorsement.²⁰ However, due to widespread public opposition, including residents and environmental groups, coal-fired power development projects have been stalled (EuroCham Myanmar, 2018). Local policymakers and residents have continuously challenged the operation of the existing Tigyit plant. However, the central government sees the merit in having the power plant supply electricity to the region.²¹

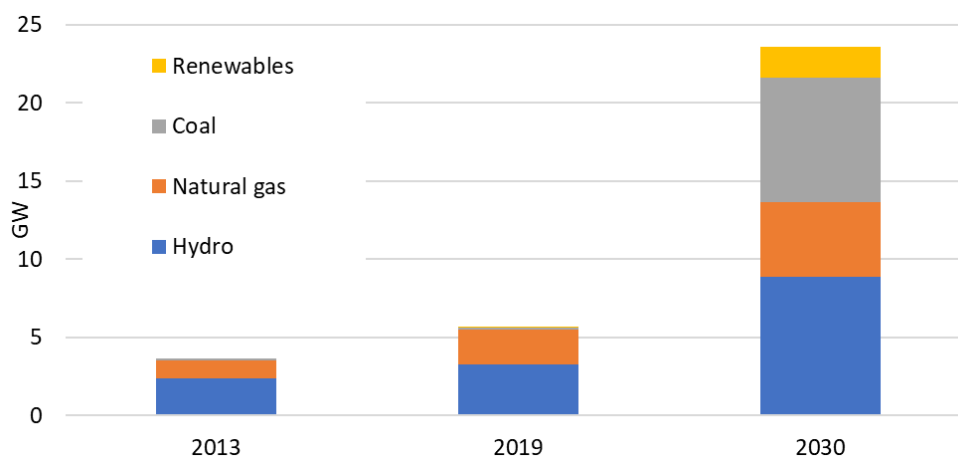
An ERIA study forecasted electricity demand to grow at a yearly average of 7%, a fivefold increase from 2016 to 78 TWh in 2040 (ERIA, 2020a). Against the backdrop of widespread opposition against coal-fired power generation projects, the Myanmar government is expected to review the Power Development Plan. However, due to the coup in February 2021, most policies, including the Power Development Plan, seem to stall.

¹⁹ National Energy Policy, National Energy Management Committee, The Republic of the Union of Myanmar, 2014

²⁰ Ibid.

²¹ <https://www.iea-coal.org/myanmar-government-rejects-motion-to-shutter-polluting-chinese-owned-coal-plant/>

Figure 2.8: Power Generation Capacity in Myanmar



	2013 (A)		2019		2030 (B)		CAGR (A-B)	Change (B/A)
	MW	%	MW	%	MW	%		
Hydro	2,361	65%	3,255	58%	8,896	38%	8.1%	277%
Natural gas	1,152	32%	2,217	39%	4,758	20%	8.7%	313%
Coal	120	3%	120	2%	7,940	34%	28.0%	6517%
Renewables			40	1%	2,000	8%	n.a	n.a
Total	3,633	100%	5,632	100%	23,594	100%	11.6%	549%

Note: Excludes diesel engine generators.

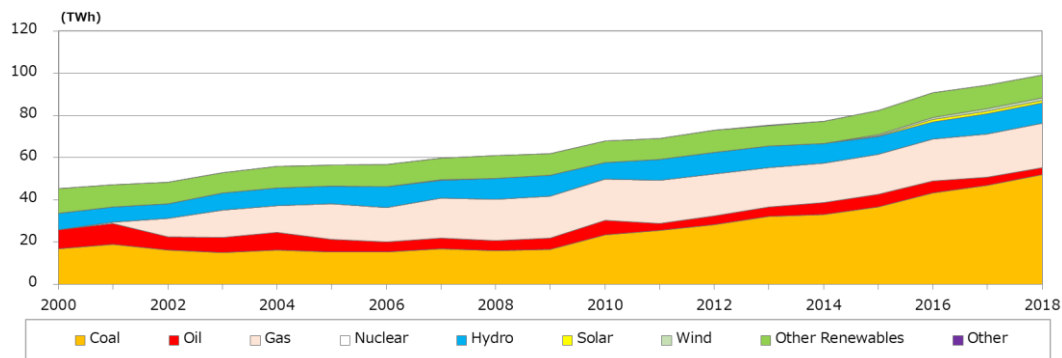
Source: IEEJ, based on National Energy Management Committee (2014) and ERIA (2020b).

5. Philippines

5.1. Coal in the power mix

Philippine power generation has more than doubled since 2000, with an annual growth of 4.5%, and reached 99 TWh in 2018. Coal has been the largest power source since 2000, followed by gas. Coal-fired power generation has more than tripled since 2000, with an annual growth of 6.5%.

Figure 2.9: Power Mix in the Philippines



	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	Share (2018)	CAGR ('00-'18)	B/A
	(A)											(B)		
	GWh											%	%	
Coal	16,663	15,257	23,301	25,342	28,265	32,081	33,054	36,686	43,303	46,847	51,932	52.4	6.5	3.1
Oil	9,185	6,141	7,101	3,398	4,254	4,491	5,708	5,886	5,661	3,787	3,173	3.2	-5.7	0.3
Gas	17	16,861	19,518	20,591	19,642	18,791	18,690	18,878	19,854	20,547	21,334	21.5	48.6	1254.9
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	n.a.	n.a.
Hydro	7,799	8,387	7,803	9,698	10,252	10,019	9,137	8,665	8,111	9,611	9,384	9.5	1.0	1.2
Solar	0	2	1	1	1	1	17	139	1,097	1,201	1,249	1.3	n.a.	n.a.
Wind	0	17	62	88	75	66	152	748	975	1,094	1,153	1.2	n.a.	n.a.
Other Renewables	11,626	9,902	9,949	10,036	10,414	9,787	10,471	11,392	11,787	11,273	10,957	11.0	-0.3	0.9
Other	0	0	7	22	18	30	33	19	9	10	11	0.0	n.a.	n.a.
Total	45,290	56,567	67,742	69,176	72,921	75,266	77,262	82,413	90,797	94,370	99,192	100.0	4.5	2.2

Source: IEEJ, based on IEA's 'World Energy Statistics and Balances 2020', July 2020.

5.2. Coal-fired power development

As of 2019, the country's installed power generation capacity was 25,531 MW, comprising coal 10,417 MW (41% of the total capacity); oil 4,262 MW (17%); hydro 3,760 MW (15%); renewables 3,639 MW (14%); and natural gas 3,453 MW (14%) (DOE, 2020).

The Department of Energy (DOE) projects the country's electricity demand to grow by about 5% annually and will reach 49,287 MW by 2040. To meet this demand growth, 43,765 MW additional capacities must come online (DOE, 2017). As 'DOE stands with its technology-neutral position, ... 'all types of technologies are welcome as long as they are efficient, reliable, and able to provide the least-cost option and flexibility in the system'.²²

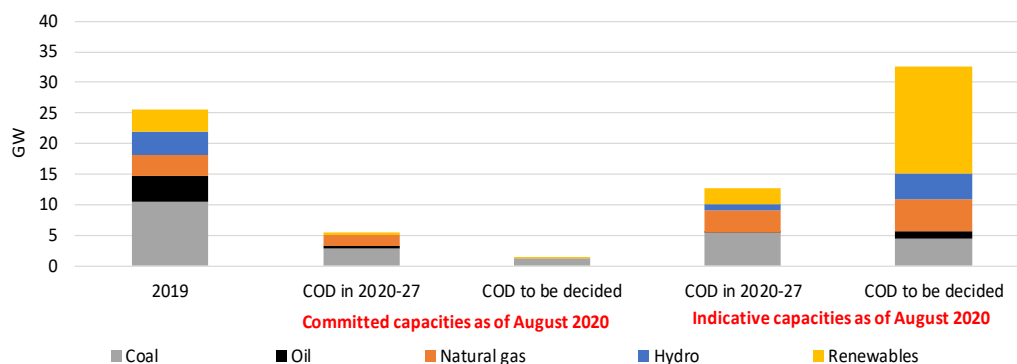
As of August 2020, 6,733 MW committed capacities are expected to come online and provide additional capacities to the system. Committed capacities come from power generation projects, which already secured financing. Amongst the committed capacities, 5,530 MW are to start commercial operations by 2027, 50% of which are CFPPs. These committed CFPPs include the GNPowder Dinginin's supercritical units (600 MW x 2) scheduled to be commissioned in 2021 and the Atimonan One Energy's No. 1 unit (600 MW) scheduled to be commissioned in 2024 in Luzon, the largest and most populous island of the Philippines. On the other hand, the remaining 1,203 MW committed capacities have no target commissioning dates yet; all these are CFPPs. These projects are

²² The Department of Energy website, <https://www.doe.gov.ph> (accessed January 2021).

still acquiring various permits, approvals, and licences, and may or may not have a definite timeline for commercial operations.²³

Although local and international environmental groups oppose new CFPPs in the Philippines, the campaigns have failed to attract considerable support in the country in great need of additional electric power supply. However, amongst major local conglomerates actively involved in power generation, the Ayala Corporation firstly revealed its plan in April 2020 to divest from CFPPs by 2030 (Jiao and Murtaugh, 2020).

Figure 2.10: Power Generation Capacity in the Philippines



	2019		Committed capacities as of August 2020				Indicative capacities as of August 2020				2040	
	MW	%	COD in 2020-27		COD to be decided		COD in 2020-27		COD to be decided		MW	%
			MW	%	MW	%	MW	%	MW	%		
Coal	10,417	41%	2,791	50%	1,200	100%	5,400	43%	4,403	13%	–	–
Oil	4,262	17%	426	8%	0	0%	36	0%	1,325	4%	–	–
Natural gas	3,453	14%	1,750	32%	0	0%	3,600	28%	5,158	16%	–	–
Hydro	3,760	15%	0	0%	0	0%	979	8%	4,287	13%	–	–
Renewables	3,639	14%	564	10%	3	0%	2,685	21%	17,496	54%	–	–
Total	25,531	100%	5,530	100%	1,203	100%	12,700	100%	32,670	100%	43,765	100%
			6,733				45,370					

COD = commercial operation date.

Source: IEEJ, based on DOE (2020a, 2020b, 2017).

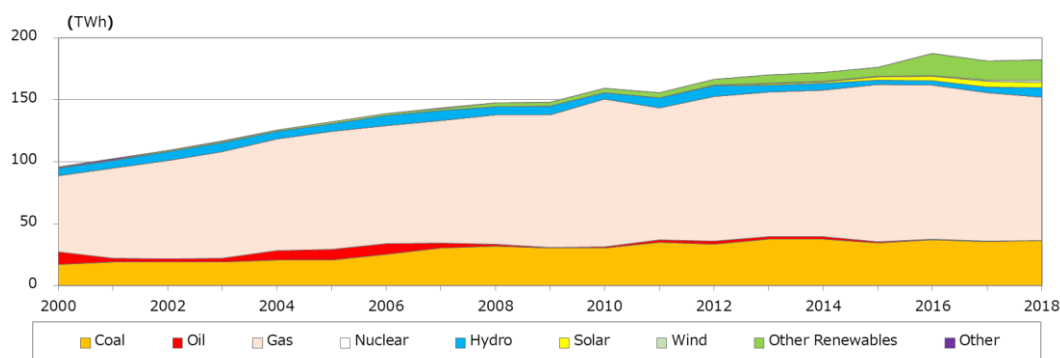
²³ The Department of Energy, Private Section Initiated Power Projects (Luzon) Committed as of 31 August 2020, Private Section Initiated Power Projects (Luzon) Indicative as of 31 August 2020, Private Section Initiated Power Projects (Visayas) Committed as of 31 August 2020, Private Section Initiated Power Projects (Visayas) Indicative as of 31 August 2020, Private Section Initiated Power Projects (Mindanao) Committed as of 31 August 2020, Private Section Initiated Power Projects (Mindanao) Indicative as of 31 August 2020, Power Development Plan 2017–2040.

6. Thailand

6.1. Coal in the power mix

Thailand's power generation has almost doubled since 2000 with an annual growth of 3.6% and reached 182 TWh in 2018. Natural gas has been the largest source of power generation since 2000, followed by coal, including domestic lignite. Coal-fired power generation has more than doubled since 2000, with an annual growth of 4.3%.

Figure 2.11: Power Mix in Thailand



	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	Share (2018)	CAGR ('00-'18)	B/A
	(A)										(B)	%	%	
	GWh													
Coal	17,083	20,482	30,047	34,809	33,363	37,627	37,579	34,582	36,920	35,605	36,408	20.0	4.3	2.1
Oil	10,028	8,724	1,177	2,062	2,427	1,677	1,721	1,014	570	305	178	0.1	-20.1	0.0
Gas	61,639	95,621	119,349	106,566	117,058	117,006	118,560	126,986	124,760	120,015	115,640	63.4	3.6	1.9
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	n.a.	n.a.
Hydro	6,026	5,798	5,537	8,163	8,754	5,748	5,540	3,752	3,527	4,694	7,565	4.1	1.3	1.3
Solar	0	0	20	95	493	1,080	1,385	2,378	3,377	4,543	4,537	2.5	n.a.	n.a.
Wind	0	0	0	5	141	305	305	329	345	1,109	1,641	0.9	n.a.	n.a.
Other Renewables	511	1,532	3,392	4,291	4,406	6,705	7,169	7,447	18,055	15,443	16,328	9.0	21.2	32.0
Other	690	40	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0
Total	95,977	132,197	159,522	155,991	166,642	170,148	172,259	176,488	187,554	181,714	182,298	100.0	3.6	1.9

Source: IEEJ, based on IEA's 'World Energy Statistics and Balances 2020', July 2020.

6.2. Coal-fired power development

As of 2018, the Kingdom's installed power generation capacity was 48,004 MW, comprising natural gas 28,718 MW; renewables 6,473 MW; coal including domestic lignite 4,637 MW; conventional hydro 3,918 MW; oil 380 MW; and imports from neighbouring countries 3,878 MW (National Energy Policy Council, 2019). The national power generation company, Electricity Generating Authority of Thailand (EGAT), operates the Mae Moh lignite-fired power plants²⁴ in the north of the kingdom. Independent and small power producers operate CFPPs based on imported coal around Bangkok, the capital city.

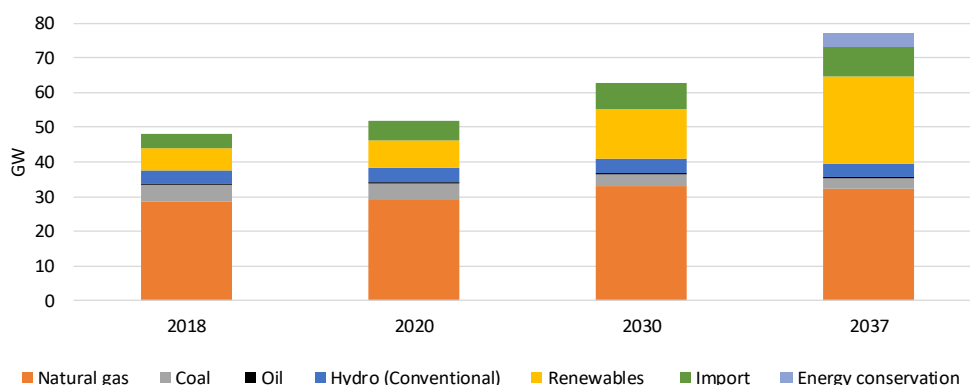
Major environmental disruptions, including health problems for the surrounding population, occurred due to sulphur dioxide emissions from the Mae Moh power plants from its commissioning in the 1960s, which created a strong anti-coal public opinion in

²⁴ At Mae Moh power plant, six old subcritical units (300 MW each) and a new ultra-supercritical (USC) unit (655 MW) are in operation. The newest one began commercial operations in 2019 to replace four old subcritical units (150 MW each).

the kingdom.²⁵ EGAT planned new CFPPs in the far south of Thailand,²⁶ but residents and environmental groups have strongly opposed for years, and the government eventually put them on ice.

The government approved the Thailand Power Development Plan 2018–2037 (PDP2018) in April 2019 and updated it in October 2020 as PDP2018 rev.1.²⁷ According to Thailand’s Board of Investment, PDP2018 rev.1 aims to increase the installed power generation capacity by 61% from 2018 to 77,211 MW by 2037. PDP8 rev.1 projected that coal-fired power generation capacity would decrease by 27% from 2018 to 3,370 MW by 2037, while gas and other renewables would increase by 12% and 288%, respectively.²⁸ New CFPPs scheduled in PDP8 rev.1 are (i) EGAT’s USC unit (600 MW) replacing two old subcritical units (300 MW each) at Mae Moh power plants, (ii) a 1 GW unit built in the eastern region, and (iii) another 1 GW unit built in the southern region.²⁹

Figure 2.12: Power Generation Capacity in Thailand



	2018		2020		2030		2037		CAGR (A-B)	Change (B/A)
	MW	%	MW	%	MW	%	MW	%		
Natural gas	28,718	60%	29,331	56%	33,224	53%	32,112	42%	0.6%	12%
Coal	4,637	10%	4,637	9%	3,377	5%	3,370	4%	-1.7%	-27%
Oil	380	1%	380	1%	380	1%	65	0%	-8.9%	-83%
Hydro (Conventional)	3,918	8%	3,918	8%	3,918	6%	3,918	5%	0.0%	0%
Renewables	6,473	13%	7,957	15%	14,461	23%	25,086	32%	7.4%	288%
Import	3,878	8%	5,721	11%	7,509	12%	8,661	11%	4.3%	123%
Energy conservation	0	0%	0	0%	0	0%	4,000	5%	n.a.	n.a.
Total	48,004	100%	51,943	100%	62,868	100%	77,211	100%	2.5%	61%

CAGR = compound annual growth rate.

Source: IEEJ, based on National Energy Policy Council (2019).

²⁵ The problems have been settled once flue gas desulphurisation devices were retrofitted to the power plants and financial compensation was paid by EGAT for damages.

²⁶ Krabi project (800 MW x 1) and Thepa project (1 GW x 2) PDP2015 (Ministry of Energy, 2015)

²⁷ As of January 2021, available only in Thai.

²⁸ Thailand Board of Investment, accessed January 2021.

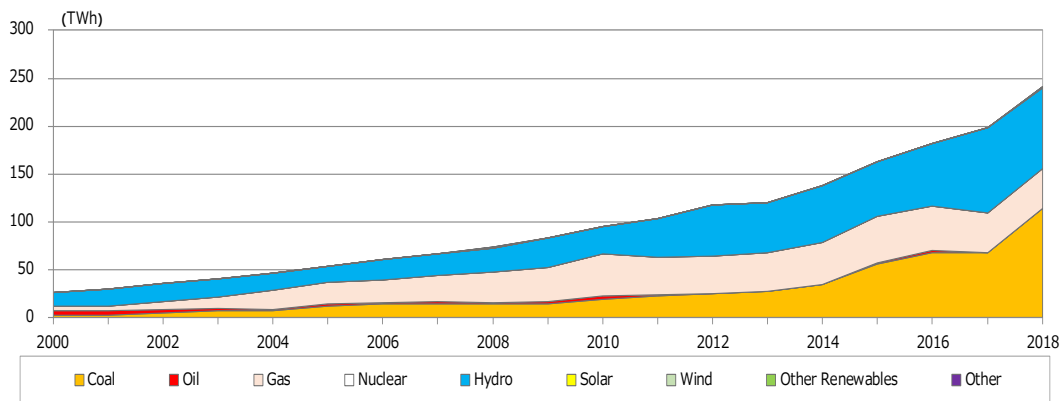
²⁹ The PDP rev.1 does not specify who will build the two 1 GW units in 2033–2034.

7. Viet Nam

7.1. Coal in the power mix

Viet Nam's power generation has grown ninefold since 2000 with an annual growth of 13% and exceeded 240 TWh in 2018. Coal-fired power generation has grown sharply by more than 36 times since 2000. As coal overtook gas and then hydro in 2015 and 2016, respectively, it has been the most significant power source since then.

Figure 2.13: Power Mix in Viet Nam



	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	Share (2018)	CAGR ('00-'18)	B/A
	(A)											(B)		
	GWh											%	%	
Coal	3,135	12,175	19,690	22,429	24,855	27,192	34,602	56,469	68,211	67,558	114,182	47.4	22.1	36.4
Oil	4,519	2,167	3,410	1,749	372	424	515	1,293	1,910	700	258	0.1	-14.7	0.1
Gas	4,356	22,319	44,148	38,827	39,426	40,862	43,263	48,147	46,055	41,020	41,729	17.3	13.4	9.6
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	n.a.	n.a.
Hydro	14,551	16,945	27,550	40,924	52,795	51,955	59,841	57,174	65,722	88,982	84,125	34.9	10.2	5.8
Solar	0	0	0	0	0	0	0	0	0	0	23	0.0	n.a.	n.a.
Wind	0	0	50	87	87	87	87	124	218	323	497	0.2	n.a.	n.a.
Other Renewables	0	50	55	55	56	57	58	70	68	76	126	0.1	n.a.	n.a.
Other	0	0	0	0	0	0	0	0	0	0	0	0.0	n.a.	n.a.
Total	26,561	53,656	94,903	104,071	117,591	120,577	138,366	163,277	182,184	198,659	240,940	100.0	13.0	9.1

CAGR = compound annual growth rate.

Source: IEEJ, based on IEA's 'World Energy Statistics and Balances 2020', July 2020.

7.2. Coal-fired power development

As of 2018, Viet Nam's installed power generation capacity was 48,573 MW, consisting of coal 18,516 MW (38% of the total capacity); hydro 17,031 MW (35%); gas 8,978 MW (18%); and renewables 3,476 MW (7%).³⁰

The Prime Minister approved the Revised National Power Development Master Plan for 2011–2020 with the Vision to 2030 (RPDP7) in March 2016.³¹ Compared to PDP7 of 2011, one noticeable change in the RPDP7 was a stronger emphasis on renewable energy development.³² However, coal is still projected to remain the largest power source in 2030 while renewables (hydro and other renewables) will more than double the capacity during the same period.

Viet Nam has strong opposition against CFPPs because of air pollution and their negative impacts on climate change. Local and international environmental groups have vigorously campaigned against specific CFPPs such as Van Phong 1³³ (660 MW x 2) and Vung Ang 2³⁴ (600 MW x 2).³⁵ Viet Nam's Ministry of Industry and Trade regards difficulty securing financing as a serious problem for coal power projects.

Viet Nam requires foreign investment to develop additional power generation capacities as its domestic financial institutions are not mature enough to support its power development plan.³⁶ It partly explains why a few CFPPs have been delayed by years and coal-divestment trends, especially from OECD countries.³⁷

³⁰ In addition to domestic power plants, Viet Nam utilises generation capacities in the neighbouring countries to import electricity (EVN, 2019).

³¹ Prime Minister's Decision on the Approval of the Revised National Power Development Master Plan for the 2011–2020 Period with the Vision to 2030, 18 March 2016.

³² Deutsche Gasellschaft für Internationale Zusammenarbeit (GIZ) GmbH; Vietnam Power Development Plan for the period 2011–2020 - Highlights of the PDP 7 revised.

³³ It is planned by Sumitomo Corporation.

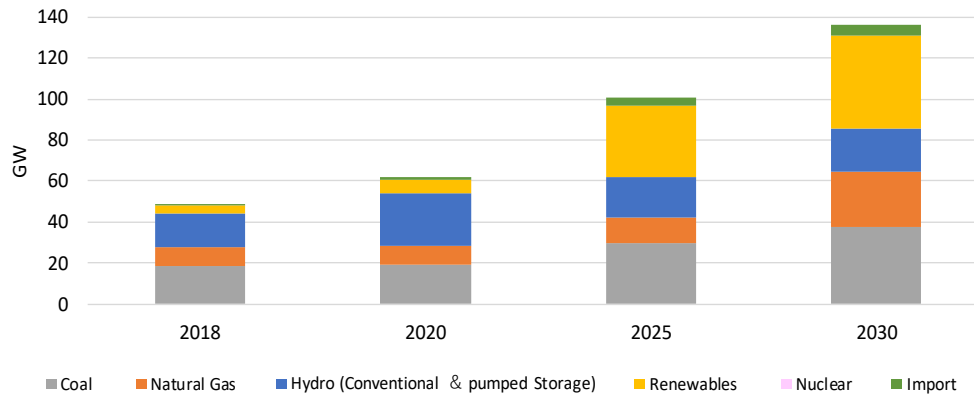
³⁴ It is planned by One Energy Asia, which is owned by CLP Holdings and Mitsubishi Corporation.

³⁵ Friends of the Earth Japan, 19 March 2019, <https://www.foejapan.org/en/aid/jbic02/vp/190319.html>, 29 December 2020, <https://www.foejapan.org/en/aid/jbic02/va/201229.html>

³⁶ Direct communication with the Vietnamese government.

³⁷ Viet Nam is not an IDA-eligible country. Therefore, OECD lenders are required to restrict financing on both supercritical and subcritical plants.

Figure 2.14: Power Generation Capacity in Viet Nam



	2018 (A)		2020		2025		2030 (B)		CAGR (A-B)	Change (B/A)
	MW	%	MW	%	MW	%	MW	%		
Coal	18,516	38%	19,200	30%	29,478	29%	37,398	27%	6.0%	102%
Natural Gas	8,978	18%	9,536	15%	12,546	12%	27,462	20%	9.8%	206%
Hydro (Conventional & pumped Storage)	17,031	35%	25,600	40%	19,686	19%	20,976	15%	1.8%	23%
Renewables	3,476	7%	6,336	10%	35,292	35%	44,850	33%	23.8%	1190%
Nuclear	0	0%	0	0%	0	0%	0	0%	n.a.	n.a.
Import	572	1%	1,536	2%	3,468	3%	5,658	4%	21.0%	889%
Total	48,573	100%	64,000	100%	102,000	100%	138,000	100%	9.1%	184%

CAGR = compound annual growth rate.

Source: IEEJ, based on EVN (2019) and the 'Prime Minister Decision on the Approval of the Revised National Power Development Master Plan for the 2011–2020 Period with the Vision to 2030', 18 March 2016.

According to the Power Sources Development Program, the government significantly revised the renewables' share in the power mix from the previous target of 21% to 32.5% in 2030. On the other hand, coal's share is expected to shrink from the previous 43% to 27.1% in 2030. This downward revision reflects the above-mentioned opposition against coal-fired power generation and delays of new coal power projects.