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Three scenarios for coal power in Vietnam

Minh Ha-Duong[1]

2019-06-22

Abstract: This note offers three narratives about the future of coal based electricity generation in Vietnam. "Blazing up" corresponds to the power development plan 7 revised and updated as of March 2019. "Closed window" tells what we think would happen under pure market forces. "Coal peak" tells what could happen if the State continues to steer the electricity system into the energy transition, decisively and without imposing high costs to stakeholders.

The problem: stranded assets and coal exit trajectories

A global analysis of 6,685 coal plants[1] finds that it is now cheaper to build new renewable generation than to run 35 percent of coal plants worldwide. For those companies, holding on to coal power plants assets is not economically interesting, even if they are fully amortized. This is already happening: American utilities Xcel in Colorado[2] and NIPSCO in Indiana[3] are retiring coal-fired power plant to build new capacity based on renewable energy sources with storage.

The same report concludes that by 2030, renewables beat out most of today's existing and planned coal-fired generation in Vietnam, the average plant age at retirement will be 13 years, and this creates a 11.7 billion stranded assets risk. Based on investors' reaction to Genco 3's initial public offering, it is clear that markets do not see a very profitable future for Vietnamese generation companies holding lots of coal assets.

Narratives

We name the three stories "Blazing up", "Closed window" and "Coal peak". The first one corresponds to the power development plan 7 revised and updated as of March 2019. The second story tells what we think would happen under pure market forces. The third story tells what could happen if the State continues to steer the electricity system into the energy transition, decisively and without imposing high costs to stakeholders.

Blazing up: Coal power generation units come online according to the "Expected" date listed in[4]. The plan to procure a fleet of Build-Operate-Transfer projects goes on with small acceptable delays, foreign investors are satisfied by the 12% internal rate of return allowed in their Power Purchase Agreements[5]. The government interprets "No new coal" policy to mean that projects lacking an investor as of 2019 are not pursued, and no new projects are registered beyond those existing in PDP7A. Units are decommissioned after 40 years.

Closed window: Investors recognize that the economic window to build new coal generation projects in Vietnam is closed. Only already permitted coal power generation units with a scheduled completion in or before 2025 are kept. The government terminates all other projects on the basis of Circular 43[6], bringing relief to investors who were struggling to obtain financing and the administrative and the social licenses to operate. It is realized after 2035 that operating coal power plants is loosing money, so EVN decommissions the plants as soon as the BOT investor transfers them back to the State. Subcritical units cease operations after 20 years, the others after 24 years. Exit from coal is complete by 2050.

Coal peak: The pilot renewable energy auctions for solar and wind in 2020 reveal that

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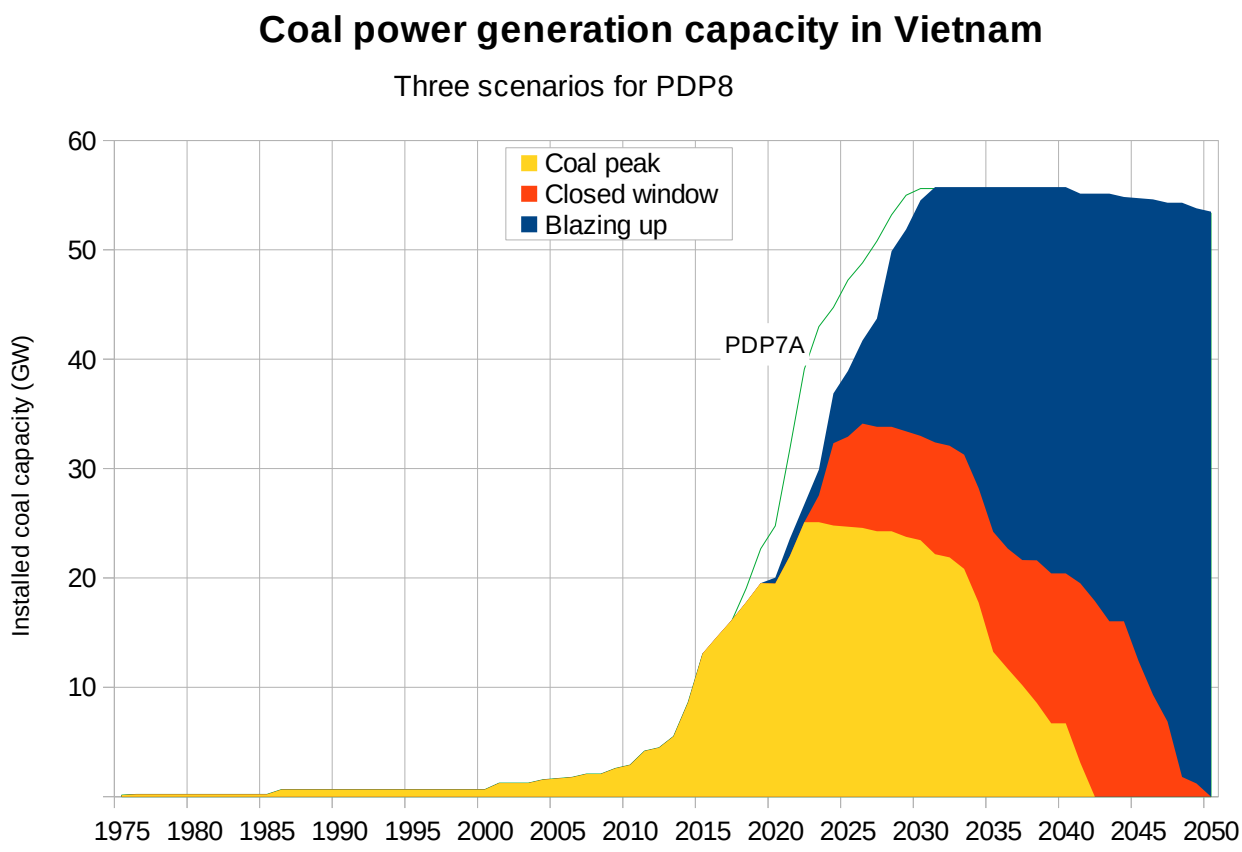

Figure 1: Three trajectories for coal power generation capacity in Vietnam.

procuring electricity from domestic renewable sources is more competitive than the price[5] given to foreign companies to build and operate plants running on imported coal – the BOT program is not cost-efficient. In the same year, power shortages impress that this program has not been effective either to provide energy security. Investors who are not committed yet leave ship, seeing that coal assets will loose profitability shortly: no new coal plant starts construction after 2019, and none is commissioned after the end of 2022. The 13th National Congress in January 2021 adapts the Asian concept of ecological civilization as a key goal for Vietnamese society, and directs the country to accelerate the energy transition. MONRE imposes stricter pollution control norms, MOF raise fossil fuel taxes and import duties. The National Assembly votes a 2021 Renewable Energy Law, it enacts Renewable Portfolio Standards also for BOT plants. In application, Prime Ministers orders MOIT to submit a coal exit plan to be integrated in PDP8 revision. Coal power plants cannot operate profitably after 2035, they are decommissioned at 20 years. The coal exit is complete before 2045.

Trajectories

We simulated the trajectories corresponding to these narratives using a table of coal power generation units in Vietnam, according to the March 2019 report by EVN[4]. The thin line above the Blazing Up scenario represents PDP7A coal generation capacity objectives formulated in 2016. The capacity gap in 2020 compared to the plan has been partially filled by overachieving the solar PV capacity objectives. In terms of area under the curves on the 2020 – 2050 interval –roughly proportional to greenhouse gases emissions– the Closed Window scenario is 45% of the Blazing Up scenario, and the Coal Peak 27%.

Comparison with other scenarios

We reviewed existing studies on Vietnam power system development, to understand how our scenarios compare to their viisions about the future of coal in the country. Figure

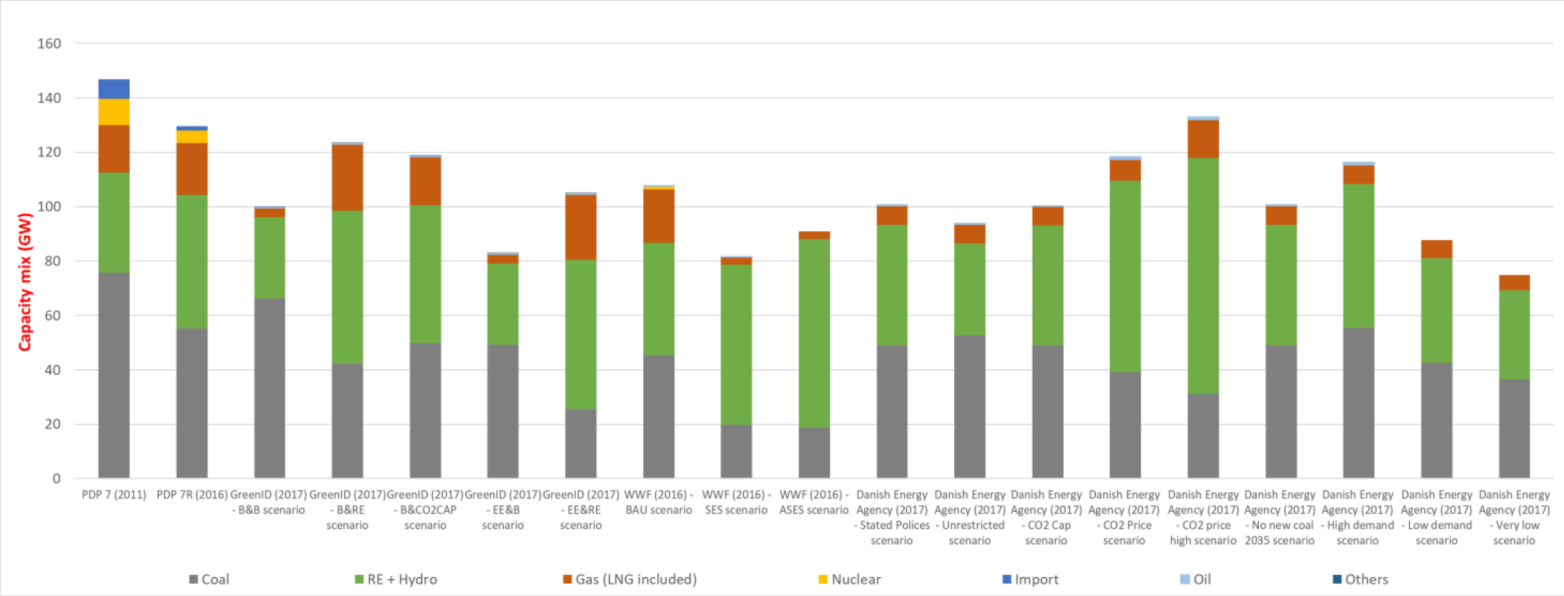

Figure 2: Capacity mix (MW) by fuel type in 2030 in existing scenarios

2 below plots the capacity mix by 2030 for 19 scenarios reviewed, belonging to 5 studies.

Coal is still dominant in term of installed capacity in the previous PDP 7 (2011) and current planning PDP 7R (2016). By 2030, we observed that the group of scenarios with highest installed capacity on coal is with 75.7 GW in the PDP 7 (2011) and 55 GW in the PDP 7 revised (2016). The "Blazing up" scenario is very close to the latter, by definition.

The "Closed Window" scenario reaching 33 GW of coal generation capacity in 2030. This is close to Vietnam Energy Outlook 2017[8] scenarios "CO2 price high". While it is natural to see where our scenario fit in the variety of trajectories from the Outlook 2017, our scenario was designed independently based on the free market forces drivers. The coincidence of our "Closed window"scenario with the Outlook 2017 scenario driven by a CO2 shadow price increasing to 40 USD/t in 2030, then 45 USD/t in 2035 – 2050, can be interpreted as follows: Vietnam is a small open economy. Its infrastructure building is influenced by international market conditions. In international market there are forces against coal power generation. The effective magnitude of these forces is coherent with the magnitude of the shadow price.

The group of scenarios with target on RE is situated at the lowest range of coal installed capacity with 18.7 GW (WWF 2016 - ASES) and 19.8 GW (WWF 2016 – SES), also including GreenID (2017) EE & RE scenario. The "Coal peak" scenario is close to the latter, it mostly updates it based on the same fundamental idea: only coal plants already under construction go forward.

In conclusion, which scenario will come out closest to reality depends more on policy and investment choices than on chance, so one can not say that any scenario is more *probable* that another. These trajectories are not forecats, only narrative tools to support the policy discussion.

Acknowledgements

This note presents these scenarios for coal power in Vietnam constructed by VIET as part of a larger study on the engineering and economic implications of alternative power development plans for Vietnam, conducted with two other think tasks: Agora Energiewende (Berlin) and Institute for Sustainable Future (Sydney). The author acknowledges research assistance from Minh-Quan Tong and Hoang Nguyen, VIET data officers for Tables 2 and 3. Figure 2 is by Hoang Anh Tran and Nguyen Trinh Hoang Anh, VIET analysts. We thank all reviewers inside and outside VIET.

Sources cited

1. Gray, M., Ljungwaldh, S., Watson, L. & Kok, I. *Powering down coal. Navigating the economic and financial risks in the last years of coal power*. (Carbon Tracker Initiative, 2018).
2. Pyper, J. Xcel to Replace 2 Colorado Coal Units With Renewables and Storage. *gtm: GreenTechMedia* (2018). Available at: https://www.greentechmedia.com/articles/read/xcel-retire-coal-renewable-energy-storage. (Accessed: 5th June 2019)
3. Walton, R. NiSource subsidiary announces plan to end coal use within 10 years. *Utility Dive* (2018). Available at: https://www.utilitydive.com/news/nisource-subsidiary-announces-plan-to-end-coal-use-within-10-years/532876/. (Accessed: 5th June 2019)
4. Hoang Quoc Vuong. *Progress of implementing some key power source projects in PDP VII revised - Tình hình thực hiện các dự án điện trong Quy hoạch điện VII điều chỉnh*. (MOIT, EREA, 2019).
5. Cao Quoc Hung. *Circular 56/2014/TT-BCT on method of determination of electricity generation costs, sequence of inspection of power purchase agreement (PPA)*. 50 (Ministry of Industry and Trade, 2014).
6. Trần Tuấn Anh. *Circular 43/2016/TT-BCT on Commitments for Project Development and Mechanism of Handling Electrical Factory Projects Not Performing a Practice Progress*. 11 (Ministry of Industry and Trade, 2016).
7. Tran, H. A., Nguen Trinh Hoang Anh & Ha-Duong, M. A critical review of energy scenarios in Vietnam: Low-carbon options and policy implications. (2019).
8. MOIT. *Vietnam Energy Outlook Report 2017*. 78 (2017).

Supplementary material: data tables

Table 1: Coal power installed capacities (in MW) at key planning years for the three scenarios

Year	Blazing up	Closed window	Coal peak
2000	645	645	645
2005	1 655	1 655	1 655
2010	2 889	2 889	2 889
2015	13 103	13 103	13 103
2020	20 032	19 482	19 482
2025	38 937	32 917	24 687
2030	54 537	32 993	23 453
2035	55 737	24 225	13 239
2040	55 737	20 415	6 710
2045	54 727	12 430	0
2050	53 493	0	0

Table 2 (on next page) defines which plants gets to be build when, in the scenarios.

Table 3 (on page following table 2) lists plants already operating, already canceled, and those announced in the PDP7A as contingent on the renewable energy not meeting their objectives.

Unit	Sponsor	Capacity (MW)	Status mid 2019	PDP7A	Blazing up	Closed window	Coal peak
Duyen Hai-3 Extension	Electricity of Vietnam	660	4 construction	2019	2019	2019	2019
Vinh Tan-4 extension	Electricity of Vietnam	600	4 construction	2019	2019	2019	2019
Duyen Hai-2 Unit 1	Janakuasa SDN BHD	600	4 construction	2021	2021	2021	2021
Hai Duong Unit 1	JAKS Resources, China Power Engineering Consulting Group	600	4 construction	2020	2021	2021	2021
Hai Duong Unit 2	JAKS Resources, China Power Engineering Consulting Group	600	4 construction	2021	2021	2021	2021
Song Hau-1 Unit 1	PetroVietnam Power Corp	600	4 construction	never	2021	2021	2021
Song Hau-1 Unit 2	PetroVietnam Power Corp	600	4 construction	never	2021	2021	2021
Thai Binh-2 Unit 1	PetroVietnam Power Corp	600	4 construction	2017	2021	2021	2021
Duyen Hai-2 Unit 2	Janakuasa SDN BHD	600	4 construction	2021	2022	2022	2022
Na Duong 2	TKV	110	4 construction	2019	2022	2022	2022
Nghi Son-2 Unit 1	Korean Electric Power Corporation and Marubeni Group	600	4 construction	2021	2022	2022	2022
Nghi Son-2 Unit 2	Korean Electric Power Corporation and Marubeni Group	600	4 construction	2022	2022	2022	2022
Thai Binh-2 Unit 2	PetroVietnam Power Corp	600	4 construction	2018	2022	2022	2022
Long Phu-1 Unit 1	PetroVietnam Power Corp	600	4 construction	2018	2023	2023	never
Long Phu-1 Unit 2	PetroVietnam Power Corp	600	4 construction	2019	2024	2024	never
Quang Trach-1 Unit 1	Electricity of Vietnam	600	3 permitted	2021	2022	2022	2022
Quang Trach-1 Unit 2	Electricity of Vietnam	600	3 permitted	2022	2023	2023	never
Van Phong-1 Unit 1	Sumitomo Corporation	660	3 permitted	2022	2023	2023	never
Vung Ang-2 Unit 1	OneEnergy Co.	600	3 permitted	2021	2023	2023	never
Cong Thanh power station Unit 1	Cong Thanh Thermal Power Joint Stock Company	300	3 permitted	2020	2024	2024	never
Cong Thanh power station Unit 2	Cong Thanh Thermal Power Joint Stock Company	300	3 permitted	2020	2024	2024	never
Nam Dinh-1 Unit 1	Taekwang Vina Industry Joint Stock Company, First National Ope	600	3 permitted	2021	2024	2024	never
Song Hau-2 Unit 1	Toyo Engineering & construction	1000	3 permitted	2021	2024	2024	never
Song Hau-2 Unit 2	Toyo Engineering & construction	1000	3 permitted	2022	2024	2024	never
Van Phong-1 Unit 2	Sumitomo Corporation	660	3 permitted	2023	2024	2024	never
Vung Ang-2 Unit 2	OneEnergy Co.	600	3 permitted	2022	2024	2024	never
Nam Dinh-1 Unit 2	Taekwang Vina Industry Joint Stock Company, First National Ope	600	3 permitted	2022	2025	2025	never
Quynh Lap-1 Unit 1	Vietnam National Coal and Mineral Industries Group	600	3 permitted	2022	2026	2026	never
Quynh Lap-1 Unit 2	Vietnam National Coal and Mineral Industries Group	600	3 permitted	2023	2026	2026	never
Duc Giang - Lao Cai Chemical power station	Duc Giang - Lao Cai Chemicals Joint Stock Company	50	2 pre-permit	never	2020	2020	2020
Duc Giang - Lao Cai Chemical power station	Duc Giang - Lao Cai Chemicals Joint Stock Company	50	2 pre-permit	never	2020	2020	2020
Ha Tinh Formosa Plastics Steel Complex pc	Hu'ng Nghiep Formosa Ha Tinh	150	2 pre-permit	2020	2020	2020	2020
Ha Tinh Formosa Plastics Steel Complex pc	Hu'ng Nghiep Formosa Ha Tinh	150	2 pre-permit	2020	2020	2020	2020
Ha Tinh Formosa Plastics Steel Complex pc	Hu'ng Nghiep Formosa Ha Tinh	150	2 pre-permit	2020	2020	2020	2020
Hai Ha CHP power station Phase 1&2 Unit 1	Texhong Hai Ha Industrial Park Co.	50	2 pre-permit	2019	2022	2022	2022
An Khanh - Bac Giang power station	An Khanh - Bac Giang Thermoelectric Joint Stock Company	650	2 pre-permit	2023	2023	2023	never
Hai Ha CHP power station Phase 1&2 Unit 2	Texhong Hai Ha Industrial Park Co.	50	2 pre-permit	2019	2023	2023	never
Hai Ha CHP power station Phase 1&2 Unit 3	Texhong Hai Ha Industrial Park Co.	50	2 pre-permit	2019	2024	2024	never
Vinh Tan-3 Unit 1	OneEnergy, EVN, and Pacific Group	660	2 pre-permit	2022	2024	2024	never
Hai Ha CHP power station Phase 1&2 Unit 4	Texhong Hai Ha Industrial Park Co.	150	2 pre-permit	2022	2025	2025	never
Vinh Tan-3 Unit 2	OneEnergy, EVN, and Pacific Group	660	2 pre-permit	2023	2025	2025	never
Vinh Tan-3 Unit 3	OneEnergy, EVN, and Pacific Group	660	2 pre-permit	2023	2025	2025	never
Hai Ha CHP power station Phase 1&2 Unit 5	Texhong Hai Ha Industrial Park Co.	150	2 pre-permit	2022	2026	2026	never
Quang Trach-2 unit 1	Electricity of Vietnam	600	2 pre-permit	2028	2026	2026	never
Quang Tri-1 Unit 1	EGAT International (EGATi)	660	2 pre-permit	2023	2026	2026	never
Hai Ha CHP power station Phase 1&2 Unit 6	Texhong Hai Ha Industrial Park Co.	150	2 pre-permit	2022	2027	never	never
Quang Tri-1 Unit 2	EGAT International (EGATi)	660	2 pre-permit	2024	2027	never	never
Hai Ha CHP power station Phase 1&2 Unit 7	Texhong Hai Ha Industrial Park Co.	150	2 pre-permit	2022	2028	never	never
Hai Ha CHP power station Phase 3&4 Unit 1	Texhong Hai Ha Industrial Park Co.	300	2 pre-permit	2025	2028	never	never
Hai Ha CHP power station Phase 3&4 Unit 1	Texhong Hai Ha Industrial Park Co.	300	2 pre-permit	2028	2028	never	never
Hai Ha CHP power station Phase 3&4 Unit 1	Texhong Hai Ha Industrial Park Co.	300	2 pre-permit	2028	2028	never	never
Hai Ha CHP power station Phase 3&4 Unit 9	Texhong Hai Ha Industrial Park Co.	300	2 pre-permit	2025	2028	never	never
Hai Phong-3 Unit 1	Vietnam National Coal and Mineral Industries Group	600	2 pre-permit	2025	2028	never	never
Hai Ha CHP power station Phase 1&2 Unit 8	Texhong Hai Ha Industrial Park Co.	150	2 pre-permit	2022	2029	never	never
Hai Phong-3 Unit 2	Vietnam National Coal and Mineral Industries Group	600	2 pre-permit	2026	2029	never	never
Quang Tri-2 Unit 1	Korea Western Power Co	600	1 announced	never	2024	2024	never
Quang Tri-2 Unit 2	Korea Western Power Co	600	1 announced	never	2024	2024	never
Quang Trach-2 unit 2	Electricity of Vietnam	600	1 announced	2029	2026	2026	never
Quynh Lap 2 unit 1	BOT	600	1 announced	2026	2027	never	never
Tan Phuoc 1 unit 1	Electricity of Vietnam	600	1 announced	2027	2027	never	never
Dung Quat Special Economic Zone power st	J-Power	2400	1 announced	never	2028	never	never
Quynh Lap 2 unit 2	BOT	600	1 announced	2027	2028	never	never
Tan Phuoc 1 unit 2	Electricity of Vietnam	600	1 announced	2028	2028	never	never
Tan Phuoc 2 unit 1	Electricity of Vietnam	600	1 announced	2028	2028	never	never
Long Phu 2 unit 1	BOT	660	1 announced	2021	2029	never	never
Tan Phuoc 2 unit 2	Electricity of Vietnam	600	1 announced	2029	2029	never	never
Dung Quat Special Economic Zone power st	J-Power	2000	1 announced	never	2030	never	never
Long Phu 2 unit 2	BOT	660	1 announced	2021	2030	never	never
Vung Ang 3 unit 1	BOT	600	1 announced	2024	2031	never	never
Vung Ang 3 unit 2	BOT	600	1 announced	2025	2031	never	never
Cam Pha 3 Unit 1	TKV	220	1 announced	2020	never	never	never
Cam Pha 3 Unit 2	TKV	220	1 announced	2020	never	never	never
Long An 1 unit 1	no investor	600	1 announced	2024	never	never	never
Long An 1 unit 2	no investor	600	1 announced	2025	never	never	never
Long An 2 unit 1	no investor	800	1 announced	2026	never	never	never
Long An 2 unit 2	no investor	800	1 announced	2027	never	never	never
Long Phu 3 unit 1	PVN proposed to transfer	600	1 announced	2021	never	never	never
Long Phu 3 unit 2	PVN proposed to transfer	600	1 announced	2022	never	never	never
Long Phu 3 unit 3	PVN proposed to transfer	600	1 announced	2022	never	never	never
Quang Ninh 3 unit 1	no investor	600	1 announced	2029	never	never	never
Quang Ninh 3 unit 2	no investor	600	1 announced	2030	never	never	never
Dong Nai Formosa Unit 3	IPP	150	1 announced	2016	never	never	never
Rang Dong cogeneration	IPP	100	1 announced	2025	never	never	never

Unit	Sponsor	Capacity (MW)	Status mid 2019	PDP7A	Blazing up	Closed window	Coal peak
Long Son Chemical Unit 1	IPP (Cogeneration)	75	9 cancelled	2017	never	never	never
Long Son Chemical Unit 2	IPP (Cogeneration)	75	9 cancelled	2018	never	never	never
Long Son Chemical Unit 3	IPP (Cogeneration)	75	9 cancelled	2018	never	never	never
Luc Nam Unit 1	IPP	50	9 cancelled	2022	never	never	never
Ninh Binh Unit 1	Ninh Binh Thermal Power JSC	25	5 operating	1974	1974	1974	1974
Ninh Binh Unit 2	Ninh Binh Thermal Power JSC	25	5 operating	1974	1974	1974	1974
Ninh Binh Unit 3	Ninh Binh Thermal Power JSC	25	5 operating	1974	1974	1974	1974
Ninh Binh Unit 4	Ninh Binh Thermal Power JSC	25	5 operating	1974	1974	1974	1974
Uong Bi power station I Unit 1	EVN Genco No 1	50	5 operating	1975	1975	1975	1975
Uong Bi power station I Unit 2	EVN Genco No 1	55	5 operating	1976	1976	1976	1976
Pha Lai-1 power station Unit 1	Pha Lai Thermal Power JSC	110	5 operating	1986	1986	1986	1986
Pha Lai-1 power station Unit 2	Pha Lai Thermal Power JSC	110	5 operating	1986	1986	1986	1986
Pha Lai-1 power station Unit 3	Pha Lai Thermal Power JSC	110	5 operating	1986	1986	1986	1986
Pha Lai-1 power station Unit 4	Pha Lai Thermal Power JSC	110	5 operating	1986	1986	1986	1986
Pha Lai-2 power station Unit 1	Pha Lai Thermal Power JSC	300	5 operating	2001	2001	2001	2001
Pha Lai-2 power station Unit 2	Pha Lai Thermal Power JSC	300	5 operating	2001	2001	2001	2001
Dong Nai Formosa Unit 1	Hung Nghiep Formosa	150	5 operating	2004	2004	2004	2004
Dong Nai Formosa Unit 2	Hung Nghiep Formosa	150	5 operating	2004	2004	2004	2004
Na Duong-1 power station Unit 1	Vietnam National Coal and Mineral Industries Group	55	5 operating	2005	2005	2005	2005
Na Duong-1 power station Unit 2	Vietnam National Coal and Mineral Industries Group	55	5 operating	2005	2005	2005	2005
Cao Ngan power station Unit 1	Vietnam National Coal and Mineral Industries Group	57	5 operating	2006	2006	2006	2006
Cao Ngan power station Unit 2	Vietnam National Coal and Mineral Industries Group	57	5 operating	2006	2006	2006	2006
Uong Bi power station I extension	EVN Genco No 1	300	5 operating	2007	2007	2007	2007
Quang Ninh-1 power station Unit 1	Quang Ninh Thermal Power JSC	300	5 operating	2009	2009	2009	2009
Son Dong power station Unit 1	Vietnam National Coal and Mineral Industries Group	110	5 operating	2009	2009	2009	2009
Son Dong power station Unit 2	Vietnam National Coal and Mineral Industries Group	110	5 operating	2009	2009	2009	2009
Quang Ninh-1 power station Unit 2	Quang Ninh Thermal Power JSC	300	5 operating	2010	2010	2010	2010
Cam Pha power station Phase I	Vietnam National Coal and Mineral Industries Group	340	5 operating	2011	2011	2011	2011
Cam Pha power station Phase II	Vietnam National Coal and Mineral Industries Group	340	5 operating	2011	2011	2011	2011
Hai Phong-1 Unit 1	EVN Genco No 2	300	5 operating	2011	2011	2011	2011
Hai Phong-1 Unit 2	EVN Genco No 2	300	5 operating	2011	2011	2011	2011
Quang Ninh-2 power station Unit 1	Quang Ninh Thermal Power JSC	300	5 operating	2012	2012	2012	2012
Hai Phong-2 Unit 3	EVN Genco No 2	300	5 operating	2013	2013	2013	2013
Mao Khe Unit 1	Vietnam National Coal and Mineral Industries Group	220	5 operating	2013	2013	2013	2013
Mao Khe Unit 2	Vietnam National Coal and Mineral Industries Group	220	5 operating	2013	2013	2013	2013
Nghi Son-1 Unit 1	EVN Genco No 1	300	5 operating	2013	2013	2013	2013
Hai Phong-2 Unit 4	EVN Genco No 2	300	5 operating	2014	2014	2014	2014
Nghi Son-1 Unit 2	EVN Genco No 1	300	5 operating	2014	2014	2014	2014
Nong Son 1	Vietnam National Coal and Mineral Industries Group	30	5 operating	2014	2014	2014	2014
Quang Ninh-2 power station Unit 2	Quang Ninh Thermal Power JSC	300	5 operating	2014	2014	2014	2014
Uong Bi power station II extension	EVN Genco No 1	330	5 operating	2014	2014	2014	2014
Vinh Tan-2 Unit 1	EVN Genco No 3	622	5 operating	2014	2014	2014	2014
Vinh Tan-2 Unit 2	EVN Genco No 3	622	5 operating	2014	2014	2014	2014
Vung Ang-1 Unit 1	PetroVietnam Power Corp	600	5 operating	2014	2014	2014	2014
An Khanh-1 Unit 1	An Khanh Electricity JSC	58	5 operating	2015	2015	2015	2015
An Khanh-1 Unit 2	An Khanh Electricity JSC	58	5 operating	2015	2015	2015	2015
Duyen Hai-1 Unit 1	Electricity of Vietnam	622	5 operating	2015	2015	2015	2015
Duyen Hai-1 Unit 2	Electricity of Vietnam	622	5 operating	2015	2015	2015	2015
Ha Tinh Formosa Plastics Steel Complex pc	Hu'ng Nghiep Formosa Ha Tinh	150	5 operating	2015	2015	2015	2015
Mong Duong-1 Unit 1	Electricity of Vietnam	540	5 operating	2015	2015	2015	2015
Mong Duong-1 Unit 2	Electricity of Vietnam	540	5 operating	2015	2015	2015	2015
Mong Duong-2 Unit 1	AES-VCM Mong Dong Power Co Ltd	620	5 operating	2015	2015	2015	2015
Mong Duong-2 Unit 2	AES-VCM Mong Dong Power Co Ltd	620	5 operating	2015	2015	2015	2015
Vedan Vietnam Cogeneration power station	Vedan Vietnam JSC	60	5 operating	2016	2015	2015	2015
Vung Ang-1 Unit 2	PetroVietnam Power Corp	600	5 operating	2015	2015	2015	2015
Duyen Hai-3 Unit 1	Electricity of Vietnam	622	5 operating	2016	2016	2016	2016
Duyen Hai-3 Unit 2	Electricity of Vietnam	622	5 operating	2017	2016	2016	2016
Ha Tinh Formosa Plastics Steel Complex pc	Hu'ng Nghiep Formosa Ha Tinh	150	5 operating	2016	2016	2016	2016
Ha Tinh Formosa Plastics Steel Complex pc	Hu'ng Nghiep Formosa Ha Tinh	150	5 operating	2016	2016	2016	2016
Thai Binh-1 Unit 1	Electricity of Vietnam	300	5 operating	2017	2017	2017	2017
Thai Binh-1 Unit 2	Electricity of Vietnam	300	5 operating	2017	2017	2017	2017
Thang Long Unit 1	Hanoi Export-Import Company	300	5 operating	2018	2017	2017	2017
Vinh Tan-4 Unit 1	Electricity of Vietnam	600	5 operating	2018	2017	2017	2017
Lee & Man Unit 1	Lee & Man Vietnam Paper Limited Company	50	5 operating	2018	2018	2018	2018
Lee & Man Unit 2	Lee & Man Vietnam Paper Limited Company	75	5 operating	2018	2018	2018	2018
Thang Long Unit 2	Hanoi Export-Import Company	300	5 operating	2019	2018	2018	2018
Vinh Tan-1 Unit 1	China Southern Power Grid, Vinacomin	600	5 operating	2019	2018	2018	2018
Vinh Tan-4 Unit 2	Electricity of Vietnam	600	5 operating	2018	2018	2018	2018
Vinh Tan-1 Unit 2	China Southern Power Grid, Vinacomin	600	5 operating	2019	2019	2019	2019
Bac Lieu 1 #2	no investor	600	8 contingent	never	never	never	never
Vung Ang 3 #4	no investor	600	8 contingent	never	never	never	never
Bac Lieu 1 #1	no investor	600	8 contingent	never	never	never	never
Vung Ang 3 #3	no investor	600	8 contingent	never	never	never	never