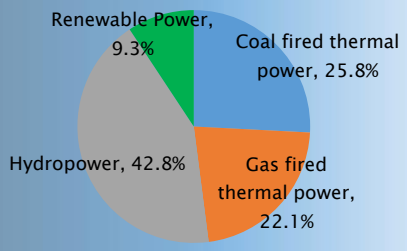
Vietnam: Renewable Energy

19 November 2019

Vietnam Power Mix



What's new?

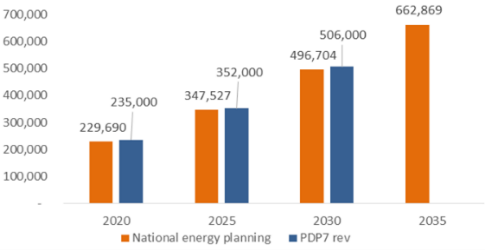
- Current overall power development plan implies a supply gap of 48 bn kWh in 2025.
- Renewable energy accounts for 9% of total power in Vietnam. Supportive policies include preferential purchase pricing, tax relief, and low-cost/free land use.
- Global renewable energy installation costs are in the range of fossil fuel power costs, and production costs are also converging.

Our view

- Supportive government policy led to substantial solar energy expansion in 2019. Wind power should also ramp up into 2021.
- Investable pure plays on renewable energy are still rare, but several stocks offer some exposure to the theme and should benefit from the undersupplied market.
- Key risks include a weak transmission system, policy, and counterparty risks.

Sector profile: Vietnam renewable energy has experienced strong growth over the past few years due to accommodative policies. As of July 2019, Vietnam had 5,038MW of renewable power capacity (89% solar, 11% wind), equivalent to 9.3% of total national installed capacity.

Electricity demand is set to soar



Accommodative policies

	Solar power	Wind power
Current capacity	4464MW	435MW
Legal framework	11/2017/QĐ-TTG 02/2019/QĐ-TTg	37/2011/QĐ-TTg 39/2018/QĐ-TTg
Date effective	Before Jul 1 2019	Before November 1 2021
Power purchasing	Power generation UScent 9.35 /kWh Proof UScent 9.35 /kWh	Onshore UScent 8.5 /kWh Offshore UScent 9.8 /kWh
Tax incentives	0% CIT (first 4 years) 0% import tax	0% CIT (first 4 years) 0% import tax
Land use	Entitled to free land or reduced land use fees	Entitled to free land or reduced land use fees

Key stocks

Year to Dec	*PE (x)	PB (x)	ROE (%)	ROA (%)
POW	16.6	1.3	7.8	3.2
GEX	9.2	1.7	19.1	6.1
NT2	8.5	1.6	20.0	9.7
PC1	8.6	0.9	11.1	4.9
FCN	4.3	0.6	14.3	5.8
GEG	26.2	2.5	7.8	4.8

Source: Bloomberg
*TTM PER

Vietnam Renewable Energy

Will Vietnam go green?

Vietnam is vulnerable to input shortages and environmental issues. As highlighted in our recent initiation on POW, we estimate that electricity demand should grow at 11% per year in 2020-25E, which translates to a shortage of 48 bn kWh or worse by 2025. The concern is that electricity shortage may be resolved at the cost of the environment. The current plan is for coal to account for 53.2% of production by 2030. We estimate that CO2 emissions from coal-fired power plants could reach 103 mn MT in 2030, up from 44mnMT in 2020. However, we estimate that CO2 emissions would be 57% or 59mn tons lower in 2030 if the planned additional coal-fired power capacity were replaced by renewable energy.

Accommodative policies for renewable energy. Although not reflected in the revised power development plan 7 (Rev PDP7), the government is committed to developing renewable energy as demonstrated by policies such as attractive power pricing, tax reliefs, low-cost/free land, and long (20-year) PPA contracts. This has led to a quick ramp-up of solar power capacity, which reached 4,464 MW as of July 2019 (+49% YTD). This is five times the Rev PDP7 target of 850 MW for 2020. We expect wind power capacity to deliver similarly rapid growth over the next two years due to similarly effective accommodative policies.

The cost of renewable energy is closing on that of fossil fuel power. Global installation costs of renewable energy are in the range of those of fossil fuel energy. Generation costs of renewable energy are also falling quickly, according to McKinsey statistics.

Renewable energy to benefit from huge investments. The government plans to invest USD 148 bn in 2016-2030 to ensure sufficient power for 7% annual economic growth. Investable pure plays on green energy are hard to identify, but listed companies that provide some exposure to this theme include PC1, GEG, GEX, TV2, and FCN.

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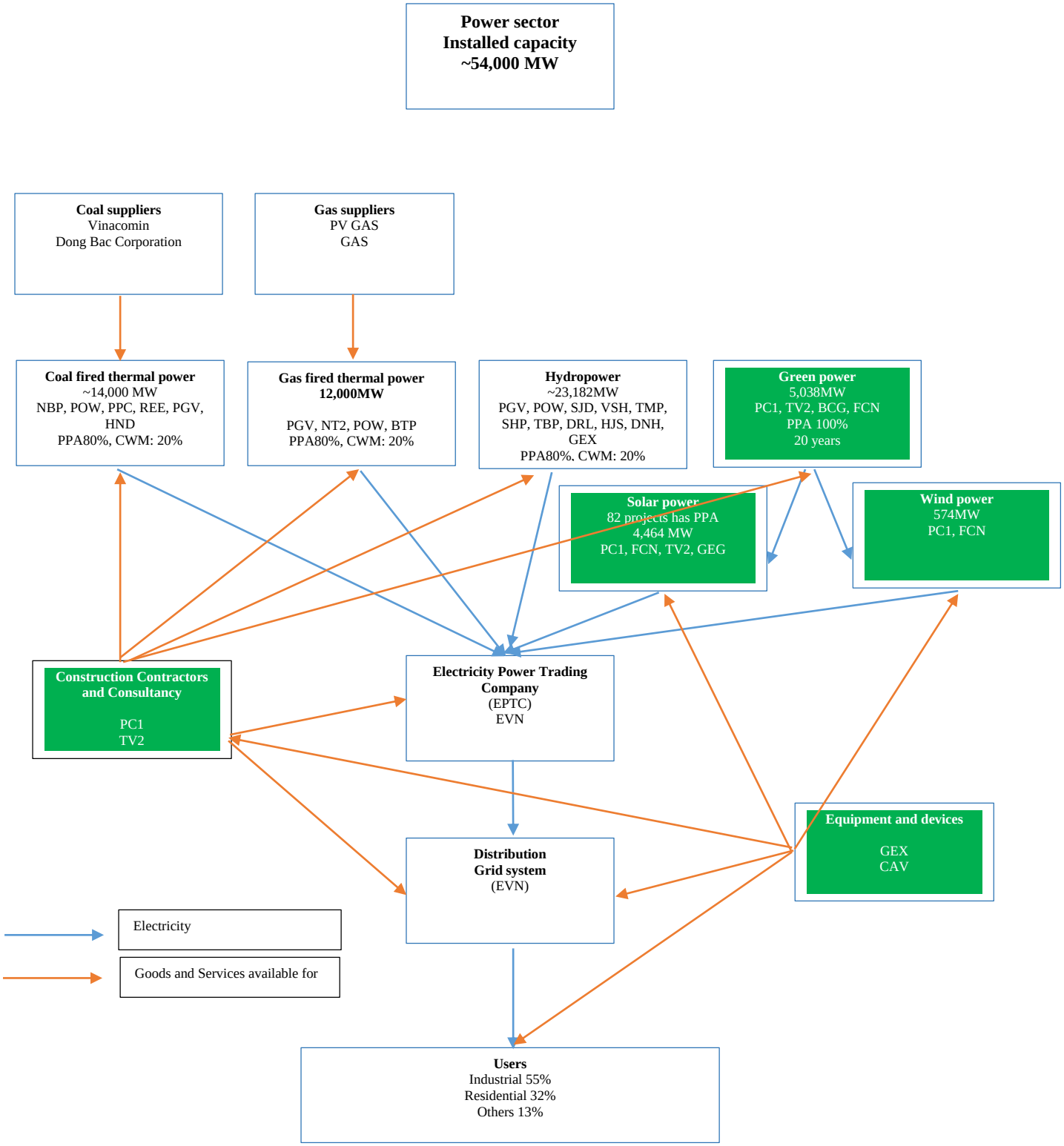


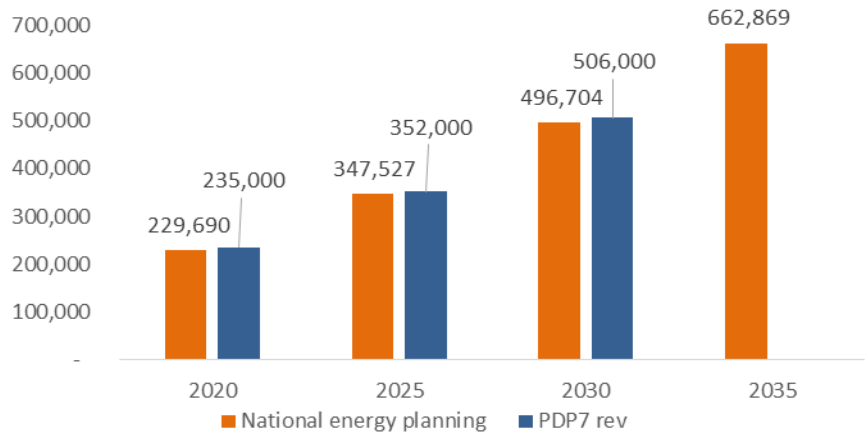
Source: EVN, Yuanta Vietnam

Vietnam's electricity shortage should increase to 48 bn kWh by 2025

Rev PDP7 is aimed at ensuring sufficient electricity supply to drive economic growth of 7% annually in 2016–2030.

As discussed in our initiation report on POW, Rev PDP7 is aimed at ensuring sufficient electricity supply to drive economic growth of 7% annually in 2016-2030. Production targets include 235-245 bn kWh by 2020, 352-379 bn kWh by 2025, and 506-559 bn kWh by 2030. These forecasts are based on the assumption of electricity consumption CAGR of 8.0%-8.6% in 2020-2030.

Fig 1: Electricity consumption forecasts (GWh)

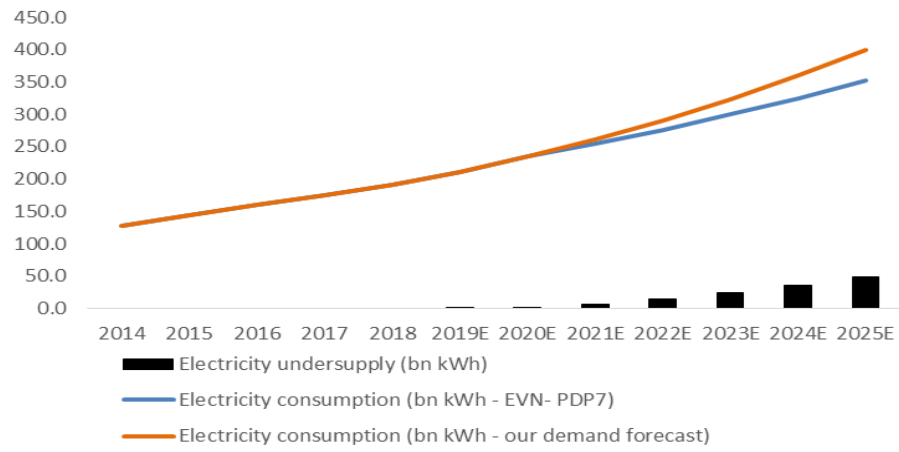


Source: Rev PDP7, Energy Institute, MOIT

The electricity market will be undersupplied by 48 bn kWh.

We estimate that by 2030 the electricity market will be undersupplied by 48 bn kWh. Assuming that electricity-GDP elasticity remains at 1.6x, the five-year average, electricity consumption will have to grow at 11% annually (not 8.6% as indicated in Rev PDP7) to support annual GDP growth of 7% in 2020-2025. On this basis, we estimate that Vietnam must be able to produce a total of 400 bn kWh by 2025, ahead of the government's forecast of 352 bn kWh in Rev PDP7.

Fig 2: Electricity consumption forecasts (GWh)



Source: Rev PDP7, Yuanta Vietnam

We believe that the undersupplied market drive electricity price up.

The undersupplied market could be worse than our expectation because of delays in power plant installations. Rev PDP7 calls for total additional capacity of coal- and gas-fired power at 37,700MW by 2023. However, only eight projects with capacity of 8,460MW have been initiated so far, leaving 22 other projects (~29,240MW) untouched and unlikely to be completed by 2023. Thus, we believe that the undersupplied market is driving electricity pricing higher. Average purchasing prices have risen gradually over time, reflecting increased production costs. As of April 2019, EVN's average purchasing price reached VND 1,417/kWh, +16.7% YoY and +5.7% YTD, and +24.6% higher than its average price of Jan 2015.

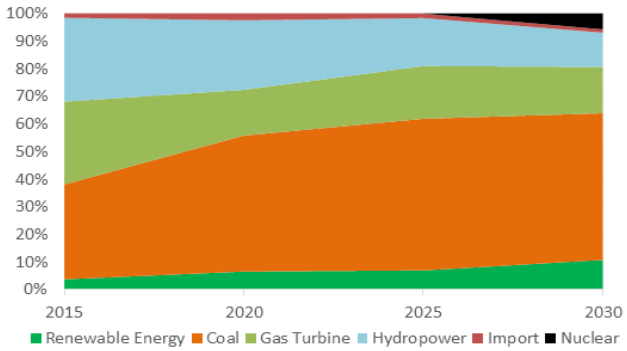
Current power plan: vulnerable to environmental issues and input shortages

Power policy calls for coal to account for 42.6% of the country's power capacity and 53.2% of production in 2030.

Heavy reliance on traditional power sources

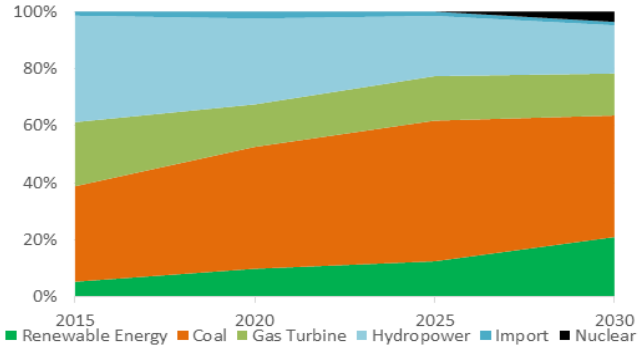
In our view, coal is the main focus of the current power development plan. According to **Revised Power development plan 7** (Rev PDP 7), coal is expected to account for 42.6% of the country's power capacity and 53.2% of production in 2030. These figures are substantially higher than historical levels. For example, total installed capacity of coal-fired thermal power accounted for just 33.5% of Vietnam's overall installed capacity and 34.4% of power production in 2015.

Fig. 3: Electricity production mix



Source: Rev PDP7

Fig. 4: Electricity installed capacity mix



Source: Rev PDP7

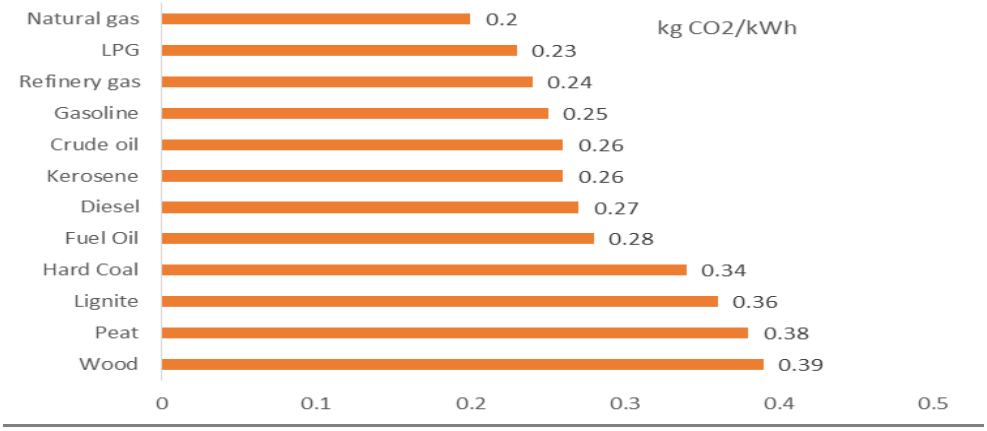
Thus, Vietnam is vulnerable to environmental issues and input shortages

A reliance on conventional power sources leaves Vietnam vulnerable to input shortages. The Vietnam Coal Industry Development Plan (VCIDP) forecasts domestic coal exploitation to remain at 57 mn tons by 2030. This would imply 1.9% CAGR in 2016-2030 and is obviously much slower than the 8.9% coal demand CAGR forecast for the same period. This is likely to add to coal-fired power production costs because imported coal is typically more expensive than domestic coal.

We estimate that CO2 emissions from coal-fired power plants would reach 103 mn MT in 2030, 2.3x higher than the 44mn MT forecast for 2020.

We estimate that CO2 emissions from coal-fired power plants would reach 103 mn MT in 2030, up from 44mnMT in 2020, if Rev PDP7 is executed as presented. This estimate is based on the assumption that 1 kWh of electricity produces 0.34kg CO2. Recent incidents regarding poor air quality in Hanoi and Ho Chi Minh City are widely believed to be attributed to dense traffic, construction emissions, and waste burning. Overuse of traditional power sources may worsen the already polluted environment.

Fig 5: Coal is the most polluting source of fossil power



Source: www.volker-quaschning.de

Vietnam has a more environmentally friendly option

If the additional coal-fired power capacity is replaced by renewable energy, Vietnam will cut CO2 emissions by 57% or 59mn tons by 2030.

This story could be different if Vietnam instead focuses on renewable energy. We estimate that Vietnam would cut its CO2 emission by 57% or 59mn tons by 2030 if the additional coal-fired power capacity is fully replaced by green and renewable energy sources such as solar and wind.

Fig 6: Less coal-fired power = reduced emissions (annual estimates)

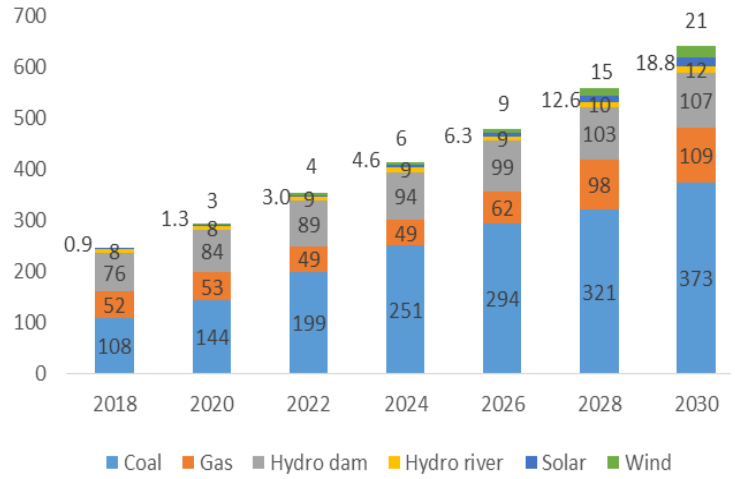
	Total electricity demand (bn kWh)	Coal fired power production (billion kWh)	CO2 emission (mn tons)
2020	265	131	44
2030	572	304	103
Less coal fired power, less emission	307	174	59

Source: Rev PDP7, Yuanta Vietnam

McKinsey has proposed a more environmentally friendly renewables-led pathway to meet electricity demand. Under this plan, coal-fired thermal power production would only account for 26% of national production in 2030 (instead of the 53.2% in Rev PDP7).

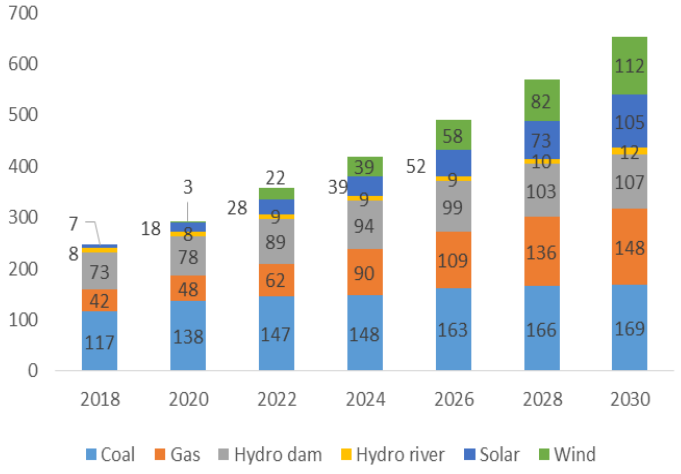
Renewable energy sources, including wind and solar power, would be utilized instead of coal in the McKinsey plan. Wind power would account for 17% of total power production while solar power would account for 16% in 2030.

Fig. 7: Rev PDP7 Electricity production mix



Source: Rev PDP7

Fig. 8: Renewable led pathway proposed by McKinsey



Source: McKinsey

McKinsey's renewable-led pathway would help Vietnam reduce CO2 emissions by 0.9 gigatons.

McKinsey estimates that the current power development plan (Rev PDP7) would produce total CO2 emissions of 3.5 gigatons (billion tons), much higher than that of the renewables-led option of 2.4 gigatons. McKinsey defines the renewables-led option as a power mix that places more emphasis on renewable and green energy.

Vietnam has experienced a surge in solar power capacity in 2019. As of June 2019, Vietnam had 4,464MW of solar power available for electricity production, almost 5 times what was planned in Rev PDP7 for 2020. In our view, this is because renewable energy enjoys accommodative policies and building capacity is relatively low cost.

Accommodative policies for renewable energy

Renewable energy is growing much faster than we had expected. By July 2019, there were 82 solar power projects with 4,464MW capacity, five times the level guided in the Rev PDP7 for 2020. We believe that this is because renewable energy enjoys accommodative policies including a long-term favorable purchasing price, tax incentives, and relatively open land use rights.

Favorable Purchasing Price

Unlike conventional power plants, the regulations mandate that buyers must buy part or all the power produced by the renewable (i.e., solar and wind) power plants at a fixed price for 20 years. The purchase price of renewable energy is thus more attractive than prices of fossil fuel energy sources, which have ranged from 4.47 US cents to 8.10 US cents over the last year.

Onshore wind power enjoys a preferential purchase price of 8.5 US cents per kWh.

By contrast, wind power enjoys purchase price of VND 1.928/kWh (8.5 US cents/kWh) for onshore wind power and VND 2.223/kWh (9.8 UScents/kWh) for offshore wind power. These are both higher than the overall previous average rate of VND 1,614/kWh (7.8 US cents/kWh). The preferential rates are applied to projects launched before November 1, 2021, as per Decision 39/2018/QĐ-TTg, supplementary decision 37/2011/QĐ-TTg. The promotion scheme purchase price is also attractive compared to that of traditional power sources (e.g., the gas fired ASP of VND 1600, or 6.8 US cents/kWh).

The purchase price of solar power is set at 9.35 US cents per kWh for projects that were launched before July 1 2019.

Solar power is now awaiting a new pricing scheme. Decision 11/2017/QĐ-TTg regulates the purchase price to be 9.35 US cents/kWh if the project was launched prior to July 1, 2019. The MOIT has proposed that a new pricing scheme to be enforced for 20 years for any project that comes into operation during July 1, 2019 to December 31, 2021, but this proposal has yet to be approved. This new proposed solar power pricing scheme would lower the purchase price for new projects to VND 1,620/kWh (7.09 US cents/kWh) for land-based projects and VND 1,758/kWh (7.69 US cents/kWh) for floating projects. However, pricing for the pre-July 2019 solar power projects will remain unchanged at the previous preferential rate of 2,156/kWh (9.35 US cents/kWh).

Tax incentives

Renewable energy companies are entitled to both CIT and import tax incentives.

As stated in Decision 11/2017/QĐ-TTg and Decision 37/2011/QĐ-TTg, renewable energy (i.e., solar and wind) is considered to be a special sector that is eligible for tax incentives, including beneficial rates on corporate income tax (CIT) and import taxes. Current CIT is based at 20% for most corporates. However, renewable energy companies enjoy four years of 0% CIT, then nine years of a 50% reduction in CIT (so a solar power producer's tax rate would be 10% assuming no changes to today's base tax rate of 20%), and then 15 years of a 10% reduction in CIT. Both decisions also made it clear that renewable energy projects are subject to 0% import tax on fixed asset purchases.

Free/reduced land costs for the renewable projects

Renewable energy companies are entitled to both CIT and import tax incentives.

Both solar and wind power are entitled to free land or reduced land use fees as stated in Decision 11/2017/QĐ-TTg (for solar) and Decision 37/2011/QĐ-TTg. This is due to the nature of the business—it requires a producer to obtain large areas of land, which would be nearly impossible and very likely unprofitable if it were not encouraged by the government.

Fig 9: Accommodative policies

	Solar power	Wind power
Current capacity	4464MW	435MW
Legal framework	11/2017/QĐ-TTG 02/2019/QĐ-TTg	37/2011/QĐ-TTg 39/2018/QĐ-TTg
Date effective	Before Jul 1 2019	Before November 1 2021
Power purchasing	Power generation UScent 9.35 /kWh Proof UScent 9.35 /kWh	Onshore UScent 8.5 /kWh Offshore UScent 9.8 /kWh
Tax incentives	0% CIT (first 4 years) 0% import tax	0% CIT (first 4 years) 0% import tax
Land use	Entitled to free land or reduced land use fees	Entitled to free land or reduced land use fees

Source: Yuanta Vietnam

Renewable energy is becoming cheaper compared to fossil fuel energy

Installation cost of solar power and wind power is approaching that of traditional fossil fuel power plants.

Renewable energy costs have been in a downtrend in recent years as technology develops. Our research suggests that the installation cost of solar power and wind power is approaching that of traditional fossil fuel power plants. Specifically, installation cost per MW (measured in hourly production) of solar power is about USD 1.1mn and for wind power is USD1.5mn, whereas that of coal-fired power is USD1.3mn and that of gas-fired power is USD1.1mn. However, it should be noted that solar power and wind power offer lower annual production hours than traditional power sources. For example, the maximum annual operating hours of coal-fired power is up to 6,500 hours and that of gas-fired is 6,000 hours, both of which substantially exceed solar power's average ~1,600 hours.

Fig 10: Installation cost of green power is approaching that of fossil fuel-based power sources

Developers	Projects	Type	Operations	Capacity (MW/MWP)	Investment (VND bn)	Investment (USD mn)	Investment (USD mn/MW)
POW	Vũng Áng 1	Coal fired thermal power	2015	1,200	28,739	1,275	1.1
PGV	Vinh Tan Thermal	Coal fired thermal power	2019	1,200	36,000	1,549	1.3
POW	Nhon Trach 1	Gas fired thermal power	2008	450	7,053	403	0.9
POW	Ca Mau 1	Gas fired thermal power	2008	750	6,572	376	0.5
POW	Ca Mau 2	Gas fired thermal power	2008	750	6,153	352	0.5
POW	Nhon Trach 2	Gas fired thermal power	2011	750	8,538	406	0.5
POW	Nhon Trach 3 & 4	Gas fired thermal power	2022	1300 - 1760	33,000	1,420	1.1
POW	Dakdrinh	Hydropower	2014	125	5,911	276	2.2
POW	Hua Na	Hydropower	2013	180	5,964	282	1.6
POW	Nam Cat	Hydropower	2012	3	131	6	2.0
FCN	Vinh Hao 6	Solar Power	2019	50	1,361	59	1.2
AC Energy	AC Energy	Solar Power	2019	330	7,000	301	0.9
GEX	GEX Ninh Thuan	Solar Power	2019	50	1,300	56	1.1
TV2	Sơn Mỹ 3.1	Solar Power	2019	50	1,149	49	1.0
BCG	BCG	Solar Power	2019	40	941	41	1.0
FCN	Vinh Hao 6, phase 2	Wind Power	2021	100	3,510	151	1.5
PC1	Lien Lap Wind farm	Wind Power	2021	48	1,800	77	1.6
BCG	BCG	Wind Power	2020	150	6,972	300	2.0

Source: Company data, Yuanta Vietnam

Overall production costs of renewable power is also achieving parity with nonrenewable on a global basis. According to the International Renewable Energy Agency (IRENA), global renewable electricity generation costs broadly match those of fossil fuel-based energy already. Specifically, IRENA statistics indicate that fossil fuel-based electricity generation costs fall in a range of USD0.05 to 0.17 per kWh. Meanwhile, the cost of onshore wind electricity is USD0.06 per kWh and that of solar is USD0.10 per kWh. IRENA also estimates that onshore wind and solar projects may be delivering electricity for as little as USD0.03 per kWh within the next two years, and offshore wind and solar may cost about USD0.06 to 0.10 kWh by 2020-2022.

Energy companies should benefit as they help to power Vietnam's GDP growth in the years ahead.

The government plans to invest USD148 bn in 2016-2030 to ensure sufficient power for 7% annual economic growth in 2016-2030. Given the undersupplied market as discussed above, we believe that energy companies—including power generators as well as power infrastructure construction contractors—have plenty of room for growth in the years ahead.

In particular, we like companies that have exposure to renewable energy, which is becoming a preferred option as demonstrated by the accommodative policies and lower installation and production costs.

PC1 (Not rated): With over 50 years of experience, PC1 is Vietnam's market leader in the construction of power projects, transmission lines, and electricity substations (34% of FY2018 revenue). The company's other segments include property (19% of FY2018 revenue), hydropower (11%), and power grid equipment manufacturing (10%). PC1 recently invested in a 48MW wind power project. The project required VND1.8tn in capex, which was 30%/70% equity/debt financed. Thus, the company is exposed to both the undersupplied power market as well as an urgent need to expand the transmission system (grid system and stations) to handle the new capacity from renewable power generation. Please refer to our previous company visit note for more detail.

GEX (Not rated): A conglomerate with operations in two main areas: 1) electrical equipment and construction materials (80% of revenue), and 2) utilities, logistics, and real estate (19%). In addition, GEX owns c. 25% of VGC, a construction material and industrial/residential property firm. GEX plans to acquire VGC.

The company boasts widely recognized electrical equipment brands along the energy value chain: Cadivi, Thibidi, and HEM. GEX believes that it will benefit from increased investment in the undersupplied power sector. Government planning officials estimate that energy system investment of USD 148bn is required to ensure sufficient power for 7% annual economic growth in 2016-2030.

GEX plans to expand its renewable energy capacity to 500 MW over the next three years. GEX currently has three hydropower plants and one solar power plant with total installed capacity of 122 MW. GEX is developing three wind farm projects, which should enjoy beneficial incentives if they are launched before Nov 1, 2021. Please refer to our previous visit note for more detail.

FCN (Not rated): FCN is a leader in foundation engineering and underground construction in Vietnam. It has a solid track record in infrastructure and industrial projects including the HCMC and HN metro lines, Long Son Refinery, Nghi Son Thermal Power, and Hoa Phat's production plants. Civil engineering contractor Raito Kogyo (1926 JP, Not Rated) of Japan owns a 19.3% stake.

FCN has expanded its operations into renewable energy. FCN is investing VND 3,510bn (USD 150mn) in a new 100MW wind power project (Vinh Hao 6, Phase 2). Management plans to sell a 60% stake in this project after construction is complete. If the project is launched by November 1, 2021, FCN will be entitled to a purchase price of 1.928/kWh (8.5 US cents/kWh) as regulated by Decision 39/2018/QĐ-TTg. In 2Q19, FCN sold a 60% stake in its Vinh Hao 6 50MW solar power plant after its successful launch in 1H19; this sale added VND 45bn to 2Q19 profit. Please refer to our previous visit note for more detail.

GEG (Not rated) Gia Lai Electricity Joint Stock Company, a subsidiary of TTC group, is previously known as Gia Lai Kon Tum hydropower. The company is operating 14 hydropower plants with capacity of 84.1MW and 5 solar power plants with capacity of 260MW.

Gas fired thermal power, the least carbon-intensive fossil fuel energy, is crucial for ensuring the electricity system's smooth operations. Specifically, gas-fired power is fully deployed when hydropower is in the low season (2nd quarter). Renewable power is unstable because it depends on the sun and wind, and this instability can be mitigated by gas-fired power production. We believe that gas-fired thermal power should also benefit from the undersupplied market.

POW (BUY, Target Price: 17,457) is Vietnam's second largest independent electricity supplier with installed capacity of 4,208 MW, accounting for 7.8% of the nation's total installed power capacity. The firm's production sources comprise gas-fired thermal power (64% of the firm's power production mix), coal-fired thermal power (29%), and hydropower (7%). POW plans to capture the undersupplied market by expanding its installed capacity by at least 33% via two additional gas-fired thermal power projects, which we expect to be operational by 2023. **Please see our recent initiation report here.**

NT2 (HOLD-Outperform, Target Price: 29,195) is a 59%-owned subsidiary of POW that operates a 750MW modern gas-fired thermal power plant in energy-hungry southern Vietnam. NT2 signed a 25-year gas supply gas supply contract with PV GAS in 2010 and a 10-year power purchase agreement (PPA) with EVN in 2012. The main attraction for investors is the high dividend yield, which has remained above 10% since 2016. But PPA renegotiations could put this at downside risk. **Please see our recent initiation report here.**

Fig 11: Energy sector: key stocks

Tickers	Exchange	Name	ICB Sector Name	Current price (VND)	MKT Cap (USD mn)	P/E* (x)	P/B (x)	ROE (%)	ROA (%)	Dividend yield* (%)
POW	HOSE	PetroVietnam Power Cc	Electricity	13,650	1,374	16.6	1.3	7.8	3.2	
PGV	Upcom	Power Generation Corp	Electricity	10,000	894		1.1	(6.3)	(0.8)	
DNH	Upcom	DA Nhim-Ham Thuan-D	Electricity	26,500	481	8.7	1.9	22.6	15.3	8.3
GEX	HOSE	Vietnam Electrical Equi	Electronic &	20,650	433	9.2	1.7	19.1	6.1	
PPC	HOSE	Pha Lai Thermal Power	Electricity	27,500	379	8.6	1.5	17.2	13.5	9.8
HND	Upcom	HAI Phong Thermal Pov	Electricity	14,600	314	17.2	1.3	7.8	2.9	5.1
NT2	HOSE	PetroVietnam Nhon Tra	Electricity	23,200	287	8.5	1.6	20.0	9.7	3.9
GEG	HOSE	Gia Lai Electricity JSC	Electricity	28,250	248	26.2	2.5	7.8	4.8	2.5
VSH	HOSE	Vinh Son - Song Hinh H	Electricity	20,700	184	32.2	1.4	4.5	1.7	
PC1	HOSE	Power Construction JSC	Constructio	19,300	132	8.6	0.9	11.1	4.9	
CHP	HOSE	Central Hydropower JSC	Electricity	20,500	122	15.0	1.8	11.8	6.0	7.3
TMP	HOSE	Thac Mo Hydropower JS	Electricity	36,300	109	6.0	1.8	32.3	25.6	8.3
TV2	HNX	Power Engineering Cor	Constructio	89,000	92	8.7	2.5	33.1	12.0	
SHP	HOSE	Southern Hydropower J	Electricity	22,200	89	11.3	1.8	15.7	8.4	9.0
VPD	HOSE	Vietnam Power Develop	Electricity	16,000	73	10.1	1.3	13.7	6.8	6.9
TBC	HOSE	Thac Ba HydroPower JS	Electricity	24,500	67	8.7	1.6	18.7	17.8	8.2
SJD	HOSE	Can Don Hydro Power J	Electricity	21,000	62	11.8	1.6	13.3	8.0	11.9
FCN	HOSE	FECON Corp	Constructio	11,150	57	4.3	0.6	14.3	5.8	4.3
S4A	HOSE	Se San 4A Hydropower	Electricity	28,000	51	10.9	2.5	21.9	9.4	8.6
BTP	HOSE	Ba Ria Thermal Power .	Electricity	12,400	32	7.8	0.7	8.6	5.4	12.1
HJS	HNX	Nam Mu Hydropower JS	Electricity	25,000	23	11.5	1.8	15.8	10.8	4.0
DRL	HOSE	Hydro Power JSC - Pow	Electricity	54,100	22	9.9	3.9	41.8	41.4	10.2
KHP	HOSE	Khanh Hoa Power JSC	Electricity	9,790	17	12.0	0.6	5.0	1.9	5.1
PIC	HNX	PC3 - Investment JSC	Electricity	10,400	15	55.6	1.0	1.8	1.1	
NBP	HNX	Ninh Binh Thermal Pow	Electricity	12,200	7	4.2	0.6	15.7	9.3	9.8
Average					**223**	**13.5**	**1.6**	**15.0**	**9.2**	**7.5**
Median					**92**	**10.0**	**1.6**	**14.3**	**6.8**	**8.2**

Source: company data, Bloomberg, Yuanta Vietnam,
**Trailing 12M*

Key risks

Concentration & counterparty risks. The Vietnam Wholesale Electricity Market (VWEM) was officially launched in Jan 2019, after a one-year pilot period. VWEM has five buyers: EVN North PTC, EVN Central PTC, EVN South PTC, EVN Ha Noi PTC, and EVN Ho Chi Minh City PTC. However, all these buyers are still EVN subsidiaries (i.e., there is still only a single *de facto* buyer).

Weak transmission grid. By the end of 2018, Vietnam's power transmission grid had 8,000km of 500kV lines and 17,500 km of 200kV lines. However, the transmission lines are still overloaded. National Load Dispatch Center (NLDC) officials have disclosed that the unexpected growth in renewable energy has overloaded current transmission lines, resulting in low sales volumes. This highlights the urgent need to expand and upgrade the national grid.

Policy risk. Renewable power generators in the central provinces (Binh Thuan and Ninh Thuan provinces) have complained about actual sales volumes being weaker than what was established in their PPAs. The NLDC explains that this happened due to the weak transmission system. These solar energy power plants have been impacted the most by the grid issue, as they only generate power during the day time.

Appendix A: Important Disclosures

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