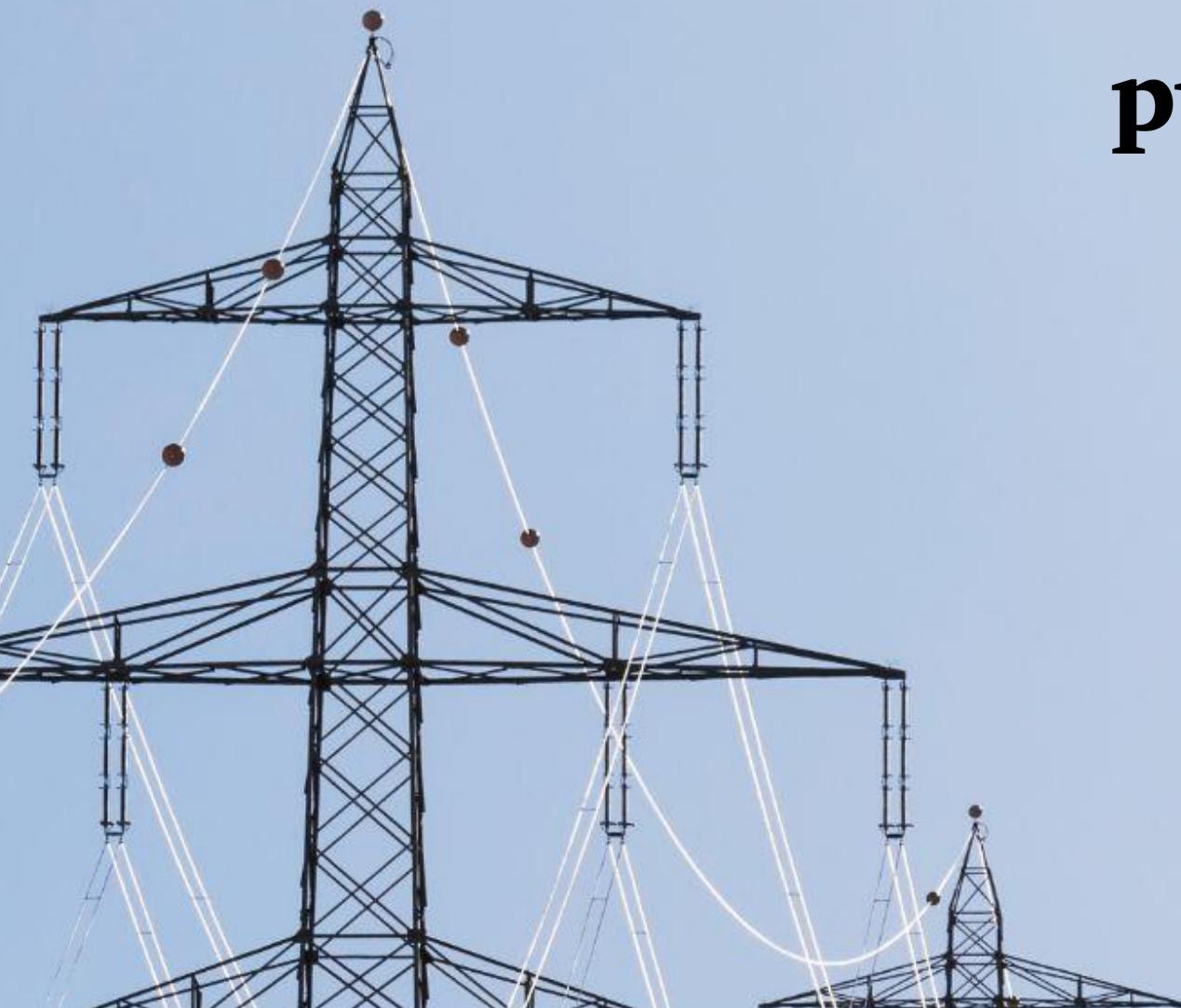


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Vietnam's Eighth National Power Development Plan (PDP VIII)

Insights and key considerations for investors

August 2023

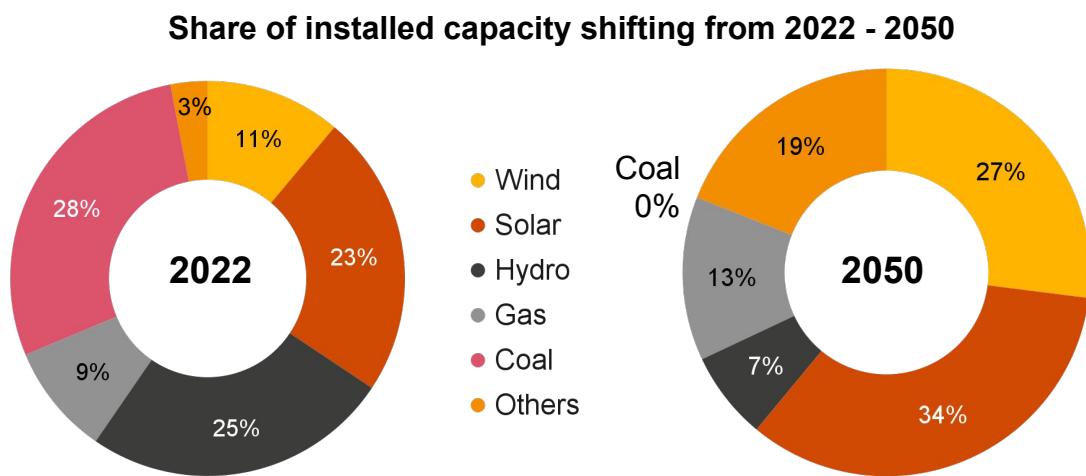


The Power Market landscape

Vietnam's ambition in shifting towards renewable energy

The market has welcomed the long-awaited PDP VIII, approved in late May of this year, which provides an ambitious plan through 2030 with a vision towards 2050. After a number of delays brought on by the pandemic, shifting policy priorities and commitments, and dialogue with industry stakeholders, the PDP VIII lays out a vision for investment in Vietnam's power sector through 2050.

As it stands, PDP VIII presents an ambitious shift for Vietnam's generation mix away from coal, and heavily weighted towards renewables and new technologies such as battery storage, hydrogen, and ammonia, underpinning the government's international commitments to reach NetZero by 2050. The plan addresses some outstanding uncertainties within the industry, although it introduces additional challenges regarding actual implementation and a pathway forward for investors and all industry stakeholders.



Strategic investment in power generation and infrastructure is paramount

Vietnam's economic growth has been driven by strong infrastructure investment, as well as an affordable generation mix leading to attractive residential, commercial, and industrial power rates. This has led generally to the broad-based growth of export-oriented manufacturing, an overall attractive investment environment, and support for a growing domestic consumer market.

The projection and aspiration of potentially joining the G20 by 2050 will require ongoing significant, strategic investments in power generation and infrastructure to support the estimated 5-7% economic growth over the next three decades. The recent PDP targets average power generation exceeding GDP growth. This amounts to a roughly 2x projected growth to 150 GW in installed capacity by 2030, and 500 GW by 2050.

Nearly 700 billion USD in investment would be required over the next three decades in new and retrofitted generation, as well as in grid infrastructure to achieve these ambitious targets. Government authorities, international development organizations, as well as public and private investors must work together in order to make this growth and transition a success.

Power development in the PDP VIII

1. Traditional technologies

Coal, Gas, and Hydroelectric power have driven Vietnam's growth over the past two decades, still accounting for two-thirds of total capacity, and nearly 95% of generation. This is set to change according to the updated PDP, driven by Vietnam's commitments to reduce its overall carbon emissions.



Coal is targeted to be completely phased out by 2050 through either decommissioning or transition of fuel.



Gas will continue to be a core part of the energy mix, as roughly 30 GW of LNG projects are slated to come online over the next decade. These crucial projects are in various stages of development and regulatory processes.

With the first LNG projects waiting to make it past the post, investors, authorities, and all stakeholders should expedite regulatory processes and negotiations to realize their potential. New baseload capacity is sorely needed to avoid power shortages and additional financial difficulties for both offtake and investors.

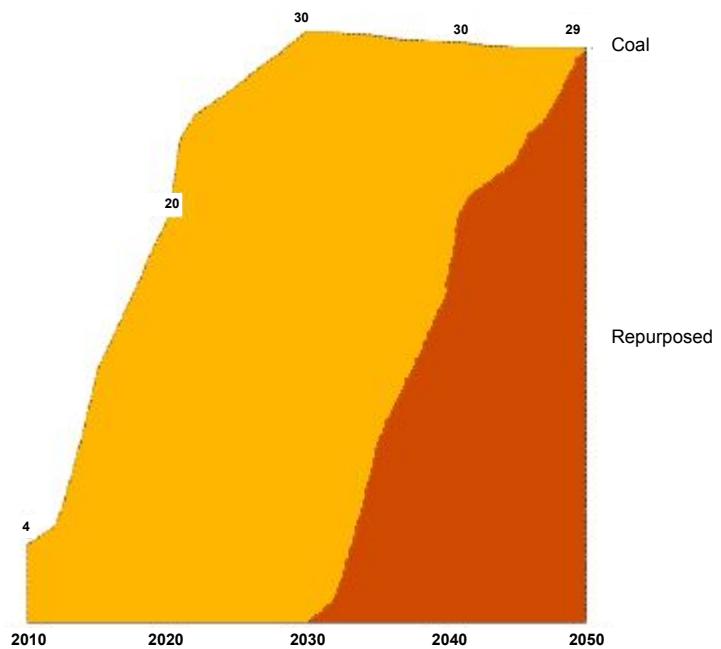


Hydroelectric power has been a foundation of Vietnam's generation mix for decades, supporting low-cost power driving economic growth.

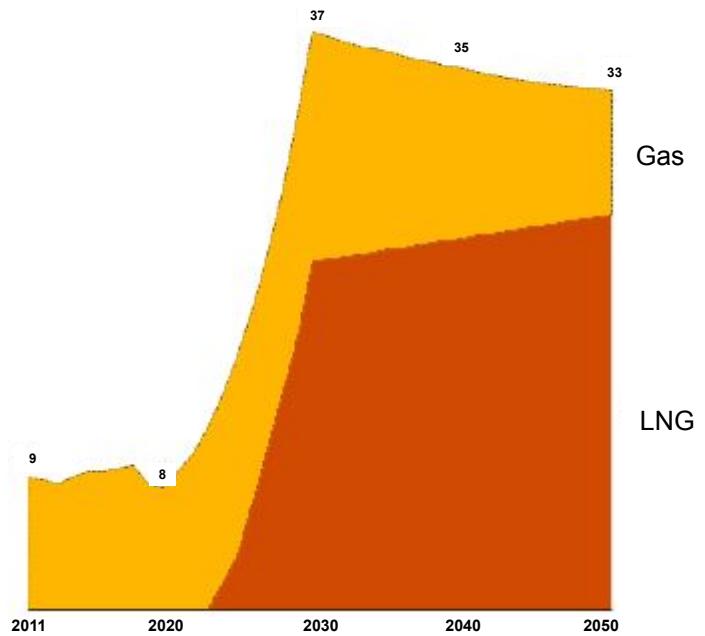
Overall development in the market is relatively tapped out, and PDP VIII projects slow growth to 2050, adding only 6-7 GW.

As a result, hydropower is projected to reduce from 25% of total installed capacity today to less than 10% by 2050.

Coal is expected to phase out by 2050, through introduction of alternative fuels



Build out of gas from both domestic sources as well as LNG, though decrease through 2050 to curb emissions



Power development in the PDP VIII

2. Renewable technologies

Solar and Wind power have enjoyed a blistering eight years of growth, from essentially zero installed capacity in 2014 to nearly 30 GW today. No country in the world has added more renewable power as a share of total installed capacity over the same period.

However, this has not come without its own share of challenges. An underdeveloped and ageing grid has led to transmission and distribution issues, including curtailment of both wind and solar generation. Early renewable projects also secured high-cost feed-in-tariffs in FIT-1 and FIT-2 regimes. While encouraging investment in the sector, this has also burdened EVN with a high cost of purchased power from these projects.

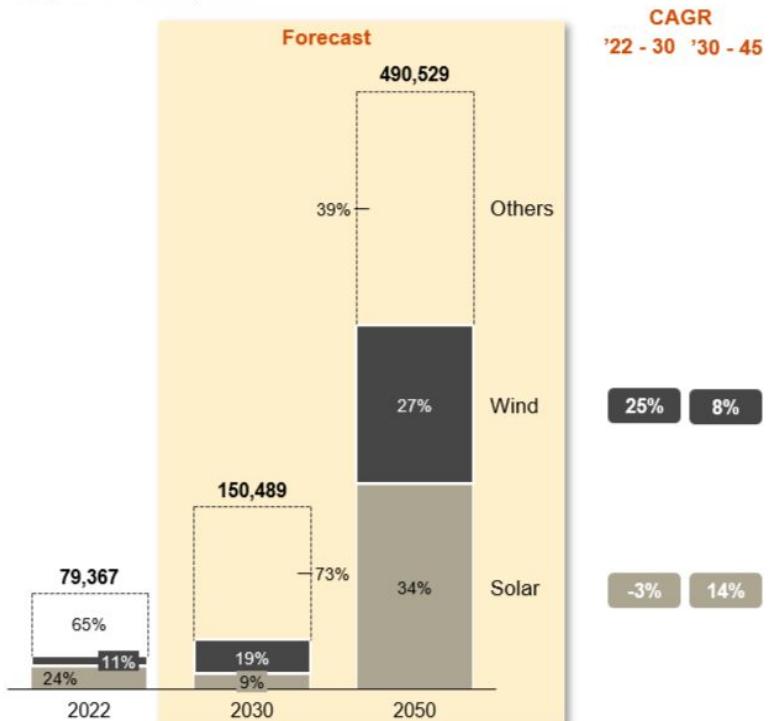
PDP VIII lays out a plan to significantly increase both solar and wind capacity, comprising over 60% of total installed capacity by 2050 across all technologies.



Solar power enjoyed rapid growth from 2015 to 2021, with a first wave of large, ground-mounted project development giving way to the rooftop solar boom, totaling nearly 20 GW of installed solar power.

PDP VIII focuses on growth for rooftop solar, aiming for a tepid 2.6 GW increase by 2030, though achieving total solar capacity of nearly 170 GW by 2050. The Plan also states a target that half of all buildings would be powered by rooftop solar, although it provides limited guidance in the way of implementation.

Total Installed Capacity
MW, 2022 – 2030F, 2050F



Wind power has grown as well to nearly 10 GW over the past eight years. This is expected to grow to roughly 30 GW by 2030, and over 130 GW by 2050. An ambitious element of PDP VIII is the capacity target for wind, both onshore and offshore.

The PDP also mentions the establishment of two interregional renewable energy service centers. These clusters may drive renewable generation, manufacturing of equipment, and provision of related services. However, the plan also offers limited guidance on how or where these may be established.

Power development in the PDP VIII

3. New technologies

The PDP VIII lays out targets for newer technologies in Vietnam's market, aiming to provide a vision for potential investors and developers to introduce and expand these technologies in Vietnam's context.



Battery storage is expected to have a significant and necessary role alongside the growing renewable capacity, with 300 MWh targeted by 2030 and 26 GWh by 2050. The plan lays out these targets at the grid level, though currently companies and investors have been installing behind-the-meter systems with no-export technology, testing the technology and business model within the market. Crucially, as a key difference from other power markets, Vietnam has restricted the export of excess power from a behind-the-meter system, which significantly shifts the strategy for potential investors.



Separately, PDP VIII addresses other technologies such as **biomass, waste-to-energy, and both hydrogen and ammonia** fuel for thermal power generation. Both biomass and waste-to-energy are expected to exhibit modest growth, due to the nature of the fuel, serving mostly localities in both rural (biomass) and urban (WTE) contexts. Hydrogen and ammonia are slated to play a more crucial role in Vietnam's energy transition, with the conversion of both coal and gas plants identified as an important milestone to reduce carbon emissions. It remains to be seen how efficiently, economically, and successfully this fuel transition could be implemented, given that there is limited advancement globally on these cutting edge technologies to date.



Key considerations for investors

Investment opportunities

Despite the challenges within PDP VIII and its ultimate implementation, there remain significant opportunities for investors in the future of Vietnam's power sector.

The size of the pie is quite attractive, with an **estimated c. 650 bn USD required in investment** for both generation and infrastructure over the next 30 years. The market is in need of qualified investors to support the overall energy transition and ramp-up.

Prioritised large projects as listed in PDP VIII include both LNG-to-power projects, as well as transitioning coal projects. The significant growth in both solar and wind capacity, along with energy storage, also present investment opportunities.

Investors with experience in the development of next-generation power technologies from hydrogen and ammonia may take advantage of the c. 30-40 GW targeted by 2050 of these new technologies.

Potential investors should monitor upcoming regulatory clarification by means of a future PDP implementation plan, the renewable energy law, and associated regulations related to offshore wind development, direct PPAs, and others integral to the power development process.

Navigating investments and acquisitions in Vietnam would require adequate up-front research and advisory in commercial, regulatory, tax, and operational considerations.



Key considerations for investors

Outstanding challenges

Although PDP VIII was much anticipated and has been welcomed by investors, a number of challenges remain for implementation of the ambitious plan.

Specifically, regulatory considerations, dependence on foreign support, and lack of clarity on certain items of the Plan. Legally, a number of relevant regulations are still in draft or are insufficient at the moment to support the Plan.

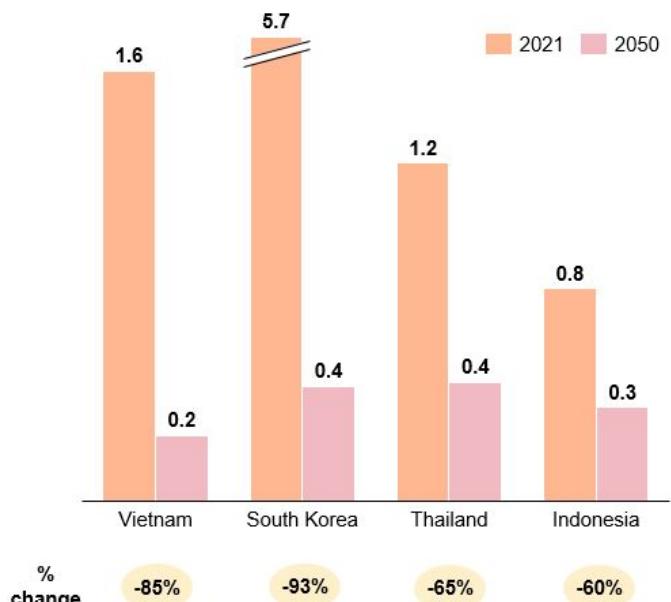
Significant new regulations to monitor include the updated land law, the anticipation of next year's renewable energy law, solidifying of RTS regulations (related to behind-the-meter configuration, battery storage), and Direct PPAs.

In the course of international commitments over the past three years, Vietnam is one of the three developing countries that have been aligned with the **Just Energy Transition Partnership (JETP)**, alongside South Africa and Indonesia.

It remains to be seen how this structure may or may not successfully funnel development funds to support Vietnam in the energy transition. Though the initial commitment of USD 7.5bn public plus USD 7.5bn of private investment is only a small step towards the estimated USD 650 bn required in the coming decades.

The PDP addresses this when it cites the JETP, and that the transition may depend on its tenets being "adequately and practically adhered to by international partners." Vietnam exposes itself to the possibility that international partners ultimately do not fulfill their commitments, thus increasing the burden on other institutions and investors to fill the gap.

Vietnam's emissions from power generation per capita compared to other countries in the APAC region
Million metric ton/population, 2021, Targets for 2050



Two additional items mentioned that require further detail are:

- The target is for half of buildings in Vietnam to use rooftop solar. It reiterates the regulatory determination to make rooftop solar a sizeable part of Vietnam's energy mix; although there is no indication on how this may be achieved;
- The reduction of emissions from power generation from roughly 340 mMT currently to 30 mMT by 2050, a level that which matches Vietnam's output in 1994, and the current output of Myanmar.

While benefits may come from such a transition, both authorities and investors should work together to ensure that the energy transition reinforces Vietnam's position as a top destination for foreign investment, as well as a burgeoning domestic economy.

Looking forward

PDP VIII is a great milestone in Vietnam's economic development of this decade, looking towards 2050.

Potential investors could find numerous opportunities throughout the industry for successful investment and strong returns, provided that prudent pre-investment analysis is performed for commercial, tax, legal, and technical considerations.

Although questions remain, the release of PDP VIII has provided all industry stakeholders with a clearer view of Vietnam's priorities moving forward in the sector.

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