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Who will pay for Vietnam's energy transition in years of climate, energy, and health crisis?

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How to finance the development of the Vietnam power system in the coming years? For the new solar and wind projects, market mechanisms such as auctions, direct power purchase agreements and self consumption will attract private investors. Options to finance thermal power projects are not so clear-cut, now that high fossil fuels prices question their profitability. Can State owned enterprises self finance without increasing the energy prices to the average citizen?

Keywords: Energy transition; Policy; Finance; LNG; Markets

1. Introduction: from a health crisis into an energy crisis on top of a climate emergency

Buckle up, our century has entered an area of turbulence. The World Health Organization declared COVID-19 a pandemic in March 2020: it had caused an excess mortality of over 21.4 million deaths by May 2022 [1]. Lockdowns and other measures in reply to the pandemic caused a global recession: the global economy contracted by 3.5 % in 2020, a seven points loss compared to the forecasted 3.4 % growth rate [2]. The demand drop in the recession depressed the price of fossil fuels to record lows: for example the price of natural gas for Northern Asia (ANEA index) went from a peak of 6.50 USD / MMBtu on 2019/10 to a low of 1.80 USD / MMBtu on 2020/05 [3].

The world's economy recovered strongly in 2021, but the Russia-Ukraine war starting late February 2022 set back the prospects for a return to balanced growth. Energy prices went climbing: by March 2022, the spot price for natural gas in Asia had reached to a monthly average of 39.30 USD / MMBtu. During that period, various utilities switched to using more coal instead of gas. Carbon dioxide emissions increased by over 2 billion tonnes in 2021, rebounding to their highest level in history [4]. It is now clear that human-induced climate change is widespread, fast and increasing, causing dangerous and widespread disruption in nature and affecting the lives of billions of people: water cycle chaos and high temperature anomalies are observed everywhere, with a record warming of +38.5 C above normal at Dome C on the Antarctic Plateau measured on March 28th.

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To sum up, in 2022 the world moved from a health crisis into an energy crisis, with the added problem of rising prices since 2021, on the background of a climate emergency. Vietnam fared comparatively better than average. By May 2022, its had accumulated 438 confirmed COVID-19 deaths per million people, compared to 797 for the world (Our World in Data). When the world's economy contracted by 3.5 % in 2020, Vietnam's economy grew by 2.9 % (idem). According to Vietnam's General Statistical Office, the average consumer price index grew by 1.84 % in 2021, compared to 4.7 % in the US for example [5].

2. High fossil fuel prices to remain high

The international oil and gas markets recovered from their February – March fever. But prices remain higher than they were before the COVID crisis, see Figure 1. Fossil fuels are very much like other commodities or stocks: analysts spend lots of efforts to understand their future prices, but that effort yield little robust predictive knowledge. Deep uncertainty and surprises are the norm. Within these predictability limits, we argue that two forces are pushing the market prices to remain relatively high in the forthcoming three years: geopolitical uncertainty and climate policy.

- Geopolitical uncertainty: After the COVID crisis dip, crude oil prices bounced back to over $100 per barrel during the strong recovery year 2021. The Russia-Ukraine war dashed any expectations for a return to pre-crisis levels. Oil and gas exports from Iran and Russia are facing serious political constraints. The US shale oil industry shows capital discipline,

Figure 1: Price of Liquefied Natural Gas in Asia since 2015. The JKM index spiked to over 50 USD/MMBtu in March 2022 and still remains well above its pre-covid levels. Source: Tradingviews.

restraining its expansion speed. Thus, the crude oil market remains driven by the OPEC+ cartel, which has interest to keep prices high.

- Climate policy: From a physical perspective, no new fossil fuel infrastructure is admissible. The amount of carbon in fossil fuel reserves already in exploitation exceeds what is compatible with a 1.5 °C global warming [6]. The economic perspective is more nuanced: as more severe climate policies bear on the use of fossil fuels, opening new fields and mines becomes less profitable. This is why capital is moving towards other industries, and the oil and gas companies consistently under-performed other economic sectors on the stock market during the last 15 years. Less investment in production capacities means less supply, translating into higher prices. For example the Liquefied Natural Gas market is already supply-constrained, and will remain so for several years as additional liquefaction facilities only start being build.

High fossil fuels prices drive inflation. In the five months of 2022, the general average consumer prices index was up 2.25% in Vietnam compared to the same period in 2021, mainly due to a 16.6 % increase in transportation costs [7]. Besides transport, increasing energy prices impact other sectors of Vietnam's economy. Oil and gas are used to make fertilizers – therefore food. Chemicals, iron and steel, cement, pulp and paper, and aluminium are energy-intensive industry. Last but not

Figure 2: Thi Vai terminal, the first facility to import liquefied natural gas in Vietnam, is due to complete construction in 2022. Source: Google Earth.

least, if a country relies on imported coal and gas to produce its electricity, high fuel costs will translate into high electricity costs.

This is what Vietnam plans to do – import fuels. According to the current Power Development Plan, 23 GW of gas-to-power generation capacity are authorized to be build between now and 2030. Figure 2 illustrates the first liquefied natural gas import facility being constructed in Thi Vai, to feed the new Nhon Trach 3 & 4 power plants.

In 2019, the Bac Lieu LNG power project was added to the Masterplan after its investors proposed to sell electricity at 7 UScent/kWh. This figure now appears too optimistic. The problem is, for an LNG power plant to sell electricity at the price of 8 - 9 UScent/kWh, the input LNG price must be around 12 USD/MMBTU. If the LNG price is up to 40 - 50 USD/MMBTU, then the electricity selling price cannot be below 20 UScent/kWh. EVN will only buy very limited quantities at that price [8]. LNG delivered to Asia costs around 20 USD/MMBTU in the summer of 2022. The economic conditions are the same for all private companies holding LNG to power projects authorized to build in Vietnam. They will not invest unless they get reasonable perspective to make profits. With the high costs of LNG, projects will be delayed.

3. Renewable electricity avoids fuel costs, but has system costs

This is not the first time that a generation of thermal power projects get delayed in Vietnam. This was already the case a few years ago [9]. The policy response to avoid power shortage was to install

Figure 3: A partially completed coal power center surrounded by new solar farms in Tuy Phong, Bình Thuận, Việt Nam. The red marker shows the empty Vĩnh Tân 3 project site. Source: Google Earth.

renewable energy sources. Figure 3 illustrates that story. The Vĩnh Tân power centre was initially planned with four projects. The photo shows that only three out of four projects are build. The second lot from the left is empty (see red marker with a star). This is the Vĩnh Tân 3 project, a 1,980 MW plant scheduled to connect in 2018. The main investor One Energy (Hong Kong) withdrew. Now the site is surrounded by solar farms (see all blue markers with a dot).

In 2017, Decision 11 kickstarted the renewable electricity sector in Vietnam by giving a feed-in tariff of 9.35 UScent/kWh to solar projects. In 2020 Decision 13 reduced this to 7.09 UScent/kWh, still offering a tariff of 8.38 UScent/kWh for rooftop solar power projects. In 2018, Decision 39 promulgated a tariff of 8.5 UScent/kWh for onshore wind power projects, and 9.8 UScent/kWh for offshore. That led to a rush of new capacity installation, mostly by private investors.

These prices are not sustainable for EVN's balance sheet. The average retail electricity price in Vietnam is equivalent to 8.3 UScent/kWh according to Decision 648/QD-BCT from 2019. A company cannot survive long-term if sells retail for less than it buys wholesale ! Fortunately, the costs for the next wave of solar and wind farms in Vietnam are likely going to be lower. Even if the price of PV modules and wind turbines are not declining as fast as they used to, due to general inflation in materials and shipping costs, compared to 2017-2018 the sector is mature in Vietnam, and the industry has made five years of technical progress. According to [10], « *the global weighted-average levelized cost of electricity of onshore wind fell 56% between 2010 and 2020, from USD 0.089/kWh in 2010 to USD 0.039/kWh in 2020* » and « *the global weighted-average levelized cost of electricity for utility-scale PV projects fell by 85% between 2010 and 2020.* »

Moreover, the costs of renewable electricity in Vietnam will be lower than the numbers seen so far because the procurement mechanisms will be market-based: competitive auctions and direct power purchase agreement. The results of recent solar and wind auctions in most other countries are way lower than the FIT given in Vietnam in 2017-2020. For example, PV auctions lowest bids around 1.3 UScent/kWh have been seen in Abu Dhabi, in Portugal and in Chile.

To sum up so far, solar and wind farms can be installed in one-two years and do not have fuel bills, making them cheaper to use in the long run than thermal power plants. They require more upfront capital, but this capital does not have to come from the Government's budget. Most renewable generation capacity in Vietnam was from private capital. Is the energy transition problem solved then?

Unfortunately, no. Mobilizing private capital to install renewable power generation sources solves only half of the problem. Developing a reliable electricity system requires much more than building plenty of renewable-based generation capacities. It requires a) sufficient transmission and distribution networks, b) backup capacities for the times when the renewable power sources are not available, and c) flexibility solutions to compensate for the short-term variability of solar and wind.

Up to 2022, the transmission problem was the most urgent: many new solar and wind farms had to reduce production because the grid could not deliver it to customers. The existing hydro and natural gas power plants provided for backup capacity and flexibility. These would not be enough if solar and wind power generation expand much. Before discussing who will pay for these investments, let us see if they can be avoided.

4. Who is going to pay for … demand reduction?

The best answer to the problem of financing the additional transmission capacity, the backup power sources, and the flexibility solutions is: to avoid needing them. The major ways to slow the growth of the power system are: Energy efficiency policies, distributed generation like incentives to install rooftop photovoltaic systems, and dynamic demand side reduction programs:

- Improving energy efficiency usually involves investing in newer equipment and adopting smarter energy management practices. Energy savings lead to costs savings which can pay back from the investment. It is up to energy users, be they private companies, individual households or public organisations, to identify and invest in the energy-savings measures with the best payback. When energy users do not take such initiatives, there is room for energy service companies to invest in the energy efficiency improvement, taking a fraction of realised energy savings as payment. This business model is known to work in many countries, not yet in Vietnam. On average, the Vietnam economy uses energy less efficiently than comparable countries do. Said differently, there is unrealised energy efficiency potential. The State needs intervention to accelerate the adoption of energy efficiency improving projects.
- The leading distributed generation technology at the moment, to reduce the demand of electricity from the grid, is rooftop solar. Starting from 378 MWp in 2019, the national PV rooftop capacity rose to 9.6 GWp in 2020, spread across over 100,000 systems (see http://solar.evn.com.vn). Many are not built by the building owner, almost all are financed by the private sector. In 2021, incentives to invest in the rooftop solar sector went down, but there is still a demand for carbon-neutral electricity source from private industrial companies and households. There is also the potential to equip the public sector organisations such as schools, hospitals and administrations. Rooftop PV systems can technically provide more benefits to the grid than simply daytime demand reduction, by including battery storage and a smart connected bidirectional meter. This will be economically relevant at the 10-years time horizon.
- Demand response management modifies the consumer demand for electricity. Demand side reduction programs are often the operated by power companies. It may seem counter-intuitive to ask a company to reduce its demand – even for a State company. But there are hours of the day when the power companies are selling electricity at a loss, specially when

load peaks have to be met by generating electricity from expensive gas turbines. In these cases, reducing the peak demand is profitable for the power company. It allows to avoid installing power generation capacities. Smart appliances and the internet of things promise exciting opportunities for demand response management.

The bulk of investment for demand-side reduction will come from the private sector. The State's function is to enable the markets. It can also lead by example. In a carbon-neutral society all levels of the administration – Central, Provincial, Municipal – will provide green and smart public services. It is only a question of time.

As effective as the demand reduction measures are, they will not be sufficient to avoid the need for investment in expanding Vietnam's electricity system. Figure 4 shows that a high-income country lifestyle entails four times as much electricity use as what Vietnam produces today. High income countries are taking the lead against greenhouse gas emissions, and managed to transition to a decreasing electricity production trajectory around 2007. By the time Vietnam's socio-economic development reaches the high-income status, technical progress might allow to live comfortably

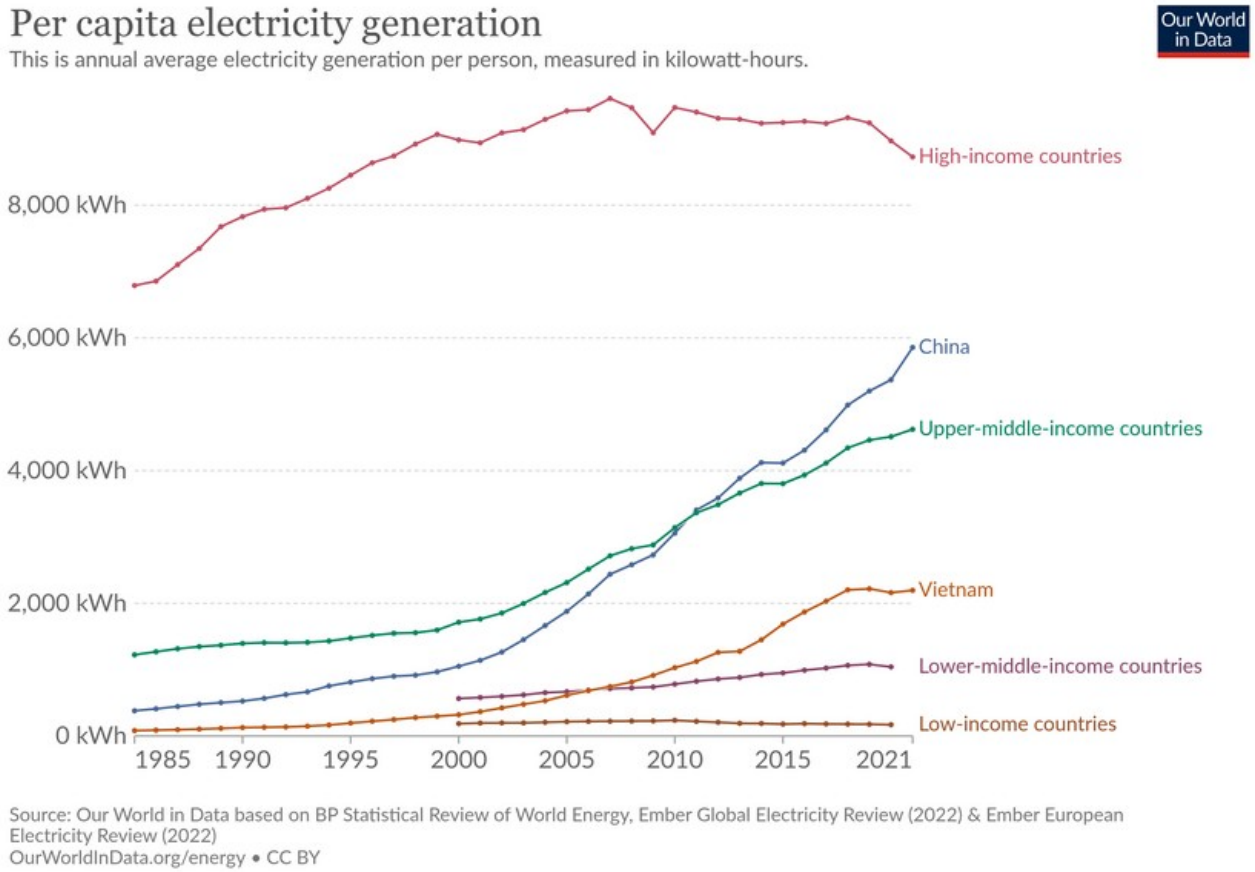

Figure 4: Electricity generation per person. High-income countries produce four times as much electricity per capita as Vietnam does. Source: Our World in Data

with less than 8000 kWh per year. This is still much more than what we have now. Vietnam is not avoiding a considerable power system size expansion.

5. Attracting the private sector

Installing additional production and transmission capacity, the necessary backup power sources, and the flexibility solutions requires to mobilize billions of dollar every year. In addition to new solar and wind farms, we are talking about new power lines and transformers, hydroelectric dams, interconnectors to neighbouring countries, pumped hydro storage, big batteries, internal combustion engine natural gas power plants, natural gas open or combined cycle power plants, and equipments to make coal power plants more flexible. There is no single solution to pay for all this. A package of policies and regulations is needed to finance the power system expansion.

One way to organise the electricity industry is to have a vertically integrated company providing everything. State-owned enterprises play a central role in Vietnam's power sector. They are still dominant, and we will discuss how to finance them in the next section. Considering the orientation of the economic policy strategy, we start by discussing how to attract investment from the private companies.

An electric system operator needs can be categorized in three kind: energy needs, capacity needs and ancillary services needs. Deregulation seeks to provide for some of these needs by private companies motivated by profits on **markets**. The fundamental mechanism of markets is that prices realize an equilibrium between supply and demand. When the demand for electricity needs is high, the prices increase, and this attract high-generation costs power producers such as those using natural gas to supply electricity. Conversely, when the demand is low, only low-cost power producers are in the market. The fundamental mechanism ensures an order-of-merit dispatch, which is economically efficient.

- In the *energy* market, producers are paid proportional to the kWh they deliver. The load dispatch centre calls power producers bid and uses the most competitive ones to set the day-ahead electricity production plans.
- The *ancillary services* are those needed to ensure the reliable operation of the grid. Some power plants must be guaranteed capable to restart without external power, in case of a blackout. Some facilities must regulate the frequency of the grid, fine-tuning their production to match the demand in real time. Other ancillary services include voltage control and maintaining ready an operating reserve in case another component of the system suddenly goes offline.
- In a *capacity* market, the producers are paid in advance proportionally to the maximum level of electric power they promise supply at a certain point in time in the future. If the system operator determines the need to have 93 GW between 14h and 17h in the summer of 2030 available, it could pay companies to provide guarantees that the supply will be available.

Energy markets are the most straightforward of these three. Vietnam had a competitive wholesale generation market since 2019. The current priority is to launch the competitive retail electricity market. It is possible, not given, that Vietnam uses ancillary services and capacity markets. But that future possibility can not be relied on in the short term to provide incentives to build natural gas power plants at the 2030 time horizon. And while ancillary markets are an incentive to attract investment in battery storage, they are limited in scale – "ancillary" means "of secondary importance".

Free market enthusiasts would argue that an unrestricted energy market can work as a capacity market: if the electricity prices are allowed to climb very high during super-peak hours, then peak plants will be profitable to build even if they are run few hours per year. The February 2021 blackouts in Texas, as illustrated in Figure 5, demonstrated that this theoretical idea is dangerous in practice. The Enron frauds in 2000-2001 leading to blackouts in California also demonstrated the vulnerability of a deregulated power market to manipulation.

Even energy markets have limits. In Vietnam as in other countries, the renewable electricity sector was started by giving Feed-in-tariffs to producers. Indeed solar farms could hardly be profitable if selling on the market, because they all produce at the same time, which makes the electricity market prices very low during sunshine hours (check the market at http://nldc.evn.vn). The next moves will be to conduct auction where solar or wind projects will bid for a selling price to EVN, with the lowest bidders winning. Renewable energy projects can participate in Vietnam's electricity market, but are expected to have a contract-for-difference directly with a third party buyer who will guarantee them income regardless of the market price they receive from EVN .

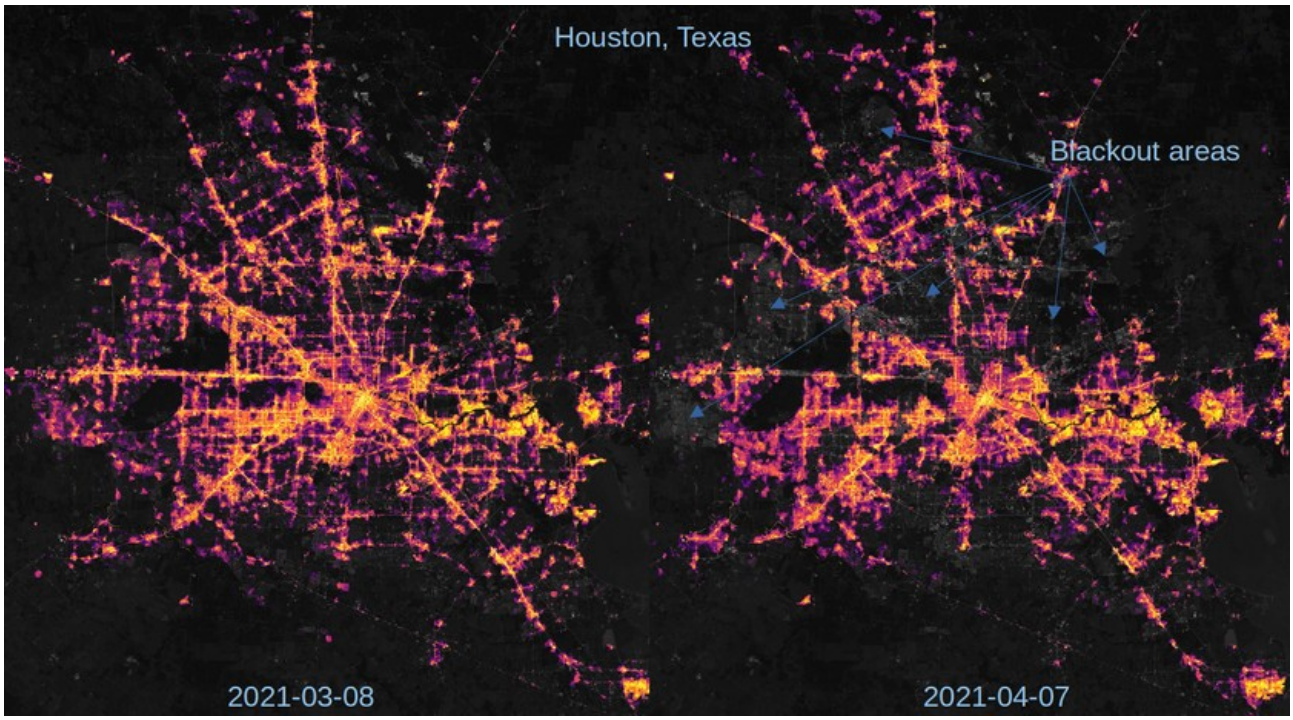

Figure 5: Winter 2021 blackouts in Houston illustrate the failure of an unregulated electricity market.

Considering the limits of markets to motivate investors in grid, capacity and ancillary services , another way to involve the private sector is to **bundle some system costs into the contracts** that investors in power projects have to follow. Here are two examples:

- In Vietnam, adding a two-hours battery storage component to PV projects would be technically useful. Such a battery could cycle almost daily to store electricity during the afternoon production peak and to dispatch it during the evening consumption peak. It could avoid costly grid upgrades. Yet the policy discussions in 2018-2019 concluded that mandating storage for PV projects in Vietnam was premature. As nowadays most new projects in California, Australia, or China include a battery storage component, the discussion in Vietnam will have to be revisited.
- New power generation projects are normally only responsible to build a medium-voltage power line to connect their site directly to the substation. In the offshore wind industry, multiple projects could connect to a common offshore platform far from the coast, and then pool their resources to build the connection cable to the national high voltage grid shore. Financing high-voltage transmission cable connecting multiple wind farms could arguably be a contribution of the offshore wind industry to the national transmission network.

A second way to work around the limits of markets is **public-private partnerships**. Many energy production projects led by EVN or PetroVietnam use joint ventures to bring in outside equity and technical expertise. This allows to de-multiply the public capital, in exchange for a share of profits and some control of the project's destiny. For example the Son My LNG terminal is led by PetroVietnam with the US company AES. Partnerships cannot make a project profitable if the technical and economic conditions are not favourable. One can worry that the Son My project's financial close, which was expected for 2022 when the joint venture agreement was signed, appears now delayed into 2023.

More recently, the electricity law has been recently modified to allow for the private sector to finance new electricity transmission lines. This is a promising mechanism, if delicate to implement. It cannot use the build-own-operate-transfer model, since the electricity network operation has to remain centrally operated for technical reasons. The grid operator decides which sources get to produce electricity, so it has to be an independent national load dispatch centre, to ensure all power producers are treated fairly in a competitive market. Moreover the power grid is a critical security infrastructure, so it has to be owned by national entities, at least for the high-voltage backbone lines.

6. Financing the state-owned sector

Having exhausted the ways to mobilize private capital to finance the energy transition, the remaining needs must be met through public funding. State owned enterprises operate the public

Nowadays the government does not issue metal coins or print suitcases of banknotes to give to its construction companies. But when a State-owned enterprise borrows money from the central national bank, the economic mechanism is identical: the central national bank creates money. This monetary creation also happens a domestic private bank issue a loan. The bank can credit the borrower's account without having to go find the same money elsewhere. Unlike you or me, it can lend money it does not have.

To limit the risk, banks must actually have 8% of the amount they loan in their own capital. If a bank has 1.5 billion USD of capital (e.g. *Techcombank*, one of the largest in Vietnam), it cannot have more than 18.75 billion USD of outstanding loans. This is at any time, across all economic sectors, so the capacity to issue new loans to any specific sector will be a few hundred million USD per year at best. Thus, private domestic banks are limited in the capacity to finance the energy transition, which requires billions of new capital every year.

Can't the State Bank of Vietnam just finance the energy sector by buying paper emitted by EVN and PetroVietnam, green bonds for example? After all, many central banks have been printing money generously during the COVID crisis. While they accommodated governments' spending to avoid an economic crisis in 2020 and 2021, most central banks are refocusing now on their main objective: to keep inflation low. This means less monetary creation.

Text 1: Monetary creation and banks lending limits

investment to ensure the country's access to reliable and affordable energy. Companies finance growth through three methods: raising equity, emitting debt and reinvesting profits.

Equity means bringing **new capital**. In the early stages of development, the State could borrow to build infrastructure through its general State budget**.** This is no more the case. The State is not looking to inject new capital in the public energy sector companies. On the contrary, the Commission for the Management of State Capital at Enterprises (CMSC) has a mandate to divest (Decision 26/2019/QD-TTg), that is sell the shares owned by the State.

The State can receive official development assistance loans (**ODA**) at preferential rates from partner countries. The potential for Vietnam to borrow money from other States to finance the energy transition is limited, as the national debt level is at the maximum permissible.

Instead of using ODA, State owned enterprises can emit **non-sovereign debt**, that is borrow abroad without guarantee from the State. EVN did this for the first time this year, borrowing EUR 80 million from the French development agency AFD to finance the Southern power distribution grid improvement. Countries have been talking about Climate finance for decades, but the increasing urgency of the climate chaos may at last motivate an effective mechanism to help finance the energy transition in countries like Vietnam. The Clean Development Mechanism was

not as environmentally effective as promised, it remains to be seen if a successor will do better and scale up.

Enterprises conducting projects in the energy sector, like all others, also use **commercial debt** subscribed by financial institutions. For example the Thi Vai LNG terminal on Figure 1 capital comes from US$85.5 million equity investment from PetroVietnam; US$80 million loan from three foreign banks HSBC (UK), Mega Bank and Taipei Fubon Bank (Taiwan); and US$81.2 million loan from two Vietnamese banks, Southeast Asia Commercial Joint Stock Bank and Vietnam Export Import Bank. Text 1 explains the financing limits of national banks.

Enterprises investing in large energy transition projects, for example energy storage or transmission network expansion to connect renewable energy sources, can raise funds directly from capital markets by emitting **green bonds**. Bonds allow a company to get money from numerous investors, unlike loans. Compared to a stock holder, the bond holder does not own a share of the company. It has a different risk: the issuer promises to pay dividends known in advance, and pay the capital back after a number of years. One of its advantages for the issuer is that global capital markets are very deep, so a company can borrow larger amounts with bonds than with loans. One of the disadvantages for the bond buyers is that it is difficult to assess the risk level of the investment. An individual investor cannot see if the company mobilizing money will really use it for sound business.

A bond is 'green' when the company promises to use the money raised to finance projects that have a positive environmental impact. Socially and environmentally responsible investors prefer to buy green bonds than bonds which finance greenhouse gases emitting industries. This form of financing is developing fast on the international scene. Vietnam's bond market is young: the Government issued its first long-term bonds in 2015, and the corporate bonds sector only started growing after 2018. In 2020Q4, State-owned enterprises of Vietnam had only about seven billion USD bonds outstanding. Growing fast is difficult, but we anticipate that green bonds will play a large role for the coming decade.

Finally, State owned enterprises can **reinvest profits**, instead of distributing dividends as contribution into the State budget. PetroVietnam might have been assigned to build and operate power plants mainly because they had the financial capacities, even if it is not their core purpose. The government has a dilemma here. It regulates the prices of energy to keep them low for the benefit of the consumers. For example in 2022 the electricity retail prices will remain at their 2019 level. However at some point EVN may start loosing money if does not pass the higher fossil fuels prices to the consumers. In the years to come, increasing retail energy tariffs seem necessary to help State owned enterprises to invest in the infrastructure necessary for the energy transition. Nguyen et al. [11] demonstrated that a mixed financial model, which uses all forms of financing, was the most feasible option to build the Vietnam electricity transmission network. They argued that the current transmission fee, which is 86.25 VND/kWh according to Decision 1769-QD-BCT

dated 3/7/2020, was comparably low at it represented less than 5% of the electricity price, and would need to be gradually increased up to 168.79 VND/kWh by 2025, in order to cover EVN investment needs in the national power transmission system.
Different funding sources have different limits and different required levels of remuneration. Equity and reinvested profits are the cheapest to access but the most limited. International loans are more expensive, and the private sector require the highest rate of returns. The cost of debt depends on the credit rating of the borrower, which is a strong argument for avoiding the state owned enterprises making losses.

7. Who is going to pay for … higher energy prices?

The need to finance backup capacity and flexible sources is only one if the reasons pushing up the costs of electricity. There is also an increasing share of imported fossil fuels in the electricity mix, higher prices of fossil fuels on international markets since 2021 and a general increase in the costs of labour and all other inputs. Only one factor may decrease the average cost of electricity: competitive auctions to procure electricity from renewable sources. This may not be enough to avoid increasing the electricity retail tariff in Vietnam.
Since 2003 the electricity tariff have been used as a tool to fight against inflation and protect consumers. The last time the price rose in 2019, after a two years freeze, they went up by 8.36% from 1,720 VND / kWh (0.074 USD) to 1,864 VND / kWh (0.08 USD) exclusive of VAT. Since we cannot guess what the Government will choose, we discuss the consequences of a nominal increase of the average tariff by one US cent.
This amounts to a 12.6% increase, or 236 VND/kWh. The raise is much more than a doubling of the transmission fee just discussed. So it is not only enough to build the grid, there is money left to invest in backup capacity and flexibility sources –such as LNG plants, batteries and hydro storage– that the private sector will find difficult to finance under the current market conditions.
How far can the one cent raise go, more precisely? In 2020 EVN sold 217 billion kWh, so the one cent raise increases its income by 2.17 billion USD.
The Institute of Energy [12, p. 14] estimated the average annual investment cost for the power system over 2021-2030 to be 12.8 billion USD, including 9.5 billion USD for generation sources and 3.3 billion USD for the grid. The Bac Ai pumped storage project, with the capacity to release 1 200 MW of flexible hydroelectricity, costs about 1 billion USD [13]. The investment for the Nhon Trach 3 and 4 LNG power plants, which together provide 1 500 MW of flexible, LNG-based electricity, is about 1.4 billion USD.
Considering the system needs and the other reasons pushing up the costs, a 1 UScent/kWh price increase is a desirable order of magnitude. It would give EVN a respite of a few semesters to see at what price level the renewable energy auctions land.

Increasing the average electricity price has detrimental macroeconomic effects on inflation and growth. It is socially just to lessen the impacts on the poorest households. Progressive electricity tariffs are already in place to protect the low-income consumers: households consuming less than 50 kWh per month pay 1675 VND/kWh. Bigger consumers pay higher rates, up to 2927 VND/kWh for kWh above 400 kWh in the month. Even if the average tariff increases, it is possible to increase the redistribution towards to poor by keeping the low tariffs unchanged, or even decreasing them.

8. Conclusion

All countries are facing high fossil fuels prices on international markets. It is now cheaper to invest in solar and wind power generation capacities than in coal and gas thermal plants, even without accounting for the social costs of greenhouse gas emissions. Private capital is available, so market mechanisms such as auctions, direct power purchase agreements and self consumption will attract private investors into new solar and wind projects. But the solar and wind resource is variable, so to ensure reliable supply the power system needs to invest in backup capacity and flexibility solutions. In addition to these capital needs, a growing power system requires investment in the transmission and distribution grid.

How to finance the development of the Vietnam power system in the coming years? Who will pay for it? In reply we propose actionable solutions for Vietnam's power sector:

- Reduce the electricity load by promoting energy efficiency (industry standards, appliances labelling), decentralized power generation (solar rooftops with storage) and demand side management (smart meters, internet of things).
- Exploit the Block B offshore gas field. Contrary to the spot market LNG prices, the domestic gas production costs will be stable. Accept that these costs will be too high for baseload power. This is to provide flexibility and capacity services at scale.
- Promote renewable power sources. The government can give favourable. investment conditions and land leases, but its main duty is regulating markets. Drive onshore projects where there demand and grid capacity (in the Northern region), to minimize system costs. Promote the Joint Venture business model for offshore wind: the offshore oil and gas industry needs strategic reorientation to survive the energy transition and it has experience with leasing sea surface blocks and sharing profits.
- Increase the retail price of electricity so that EVN can invest itself, self financing is healthy. Take measures to lessen the burden on the average consumer, shift the burden of the energy bill to high-income households and the economic sector, especially energy intensive industries.
- Let State-owned enterprise raise capital for sustainable investments by taking debt on financial markets. Corporate finance based on bonds is cheaper and more scalable than project finance based on commercial debt. And if the political uncertainties about

development assistance and climate finance from developed countries, chances are that green bonds will be part of the solution.

Even if the electricity price increased by 1 cent/kWh in Vietnam next year, they would remain low compared to the competing countries [14], as Figure 6 shows. Moreover, prices will increase in other countries too. Thus a moderate increase in Vietnam's energy prices to ensure a reliable supply will not necessarily be a setback for Vietnam's macroeconomic competitivity. The energy transition challenge is for everybody, those companies solving it decisively will come out on top.

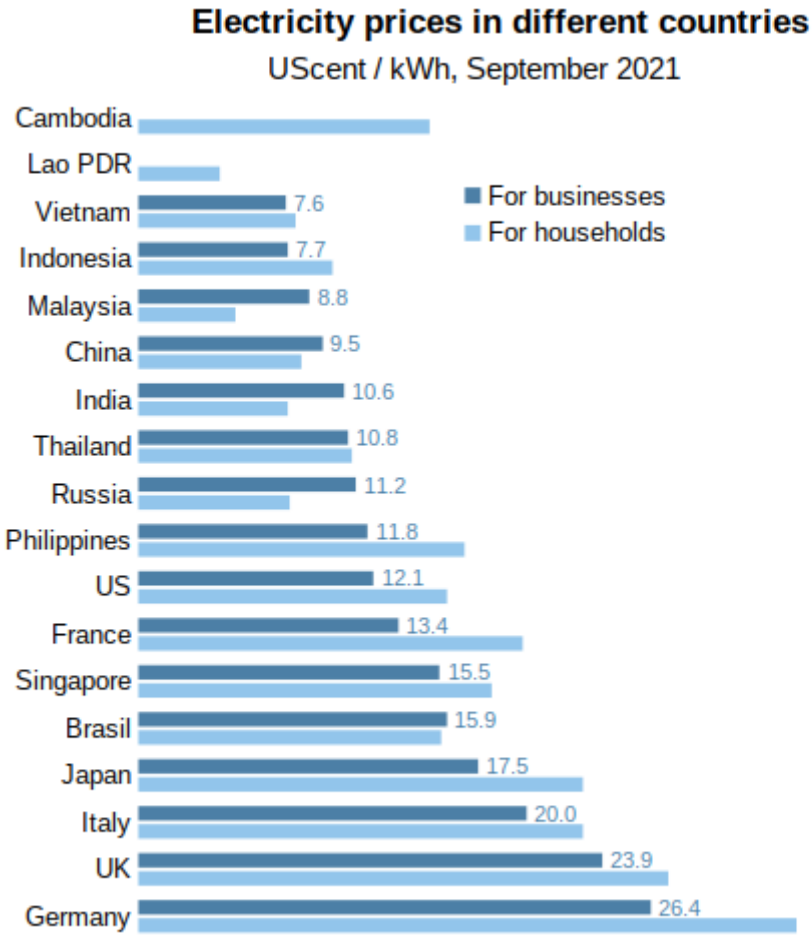

Figure 6: Prices of electricity in Vietnam compared to other countries. Vietnam has room to increase the tariff and remain competitive.

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