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Vietnam's plans and strategies in accordance with Vietnam's commitment to achieve carbon neutrality

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Abstract

With a young population of more than 96 million by 2019, Vietnam is one of the fastest-growing economies in Southeast Asia and the fourth largest GHG emitter the region. Since the early 2010s, Vietnam has been facing increasing pressure to control its emissions and shift to a low-carbon economy in decades to come. This pressure is from both international and domestic, reflecting Vietnam's role in global/regional mitigation efforts, as well as the growing demand by citizens for better environmental conditions. In Vietnam's nationally-determined contribution to the 2015 Paris Agreement on climate change, the country has not yet mentioned its carbon emissions peak but the country committed to reducing the emission from 8 to 25% as compared to the baseline by 2030. Given that the energy sector would play the most important role in the national NDCs' implementation, the Politburo of Vietnam has recently issued Resolution 55 on the orientation on Vietnam's national energy development strategy to 2030, with a vision to 2045, which presents the overall target of firmly ensuring national energy security as well as the high engagement of the country to achieve its NDCs' targets through energy activities. This paper reviews some recent energy figures and climate targets for intensely understanding about the country's climate mitigation efforts in the energy sector in decades to come.

JEL Classification: L94, O13, P28, P48, Q48

Keywords: NDCs, energy, Vietnam, perspective, climate policy

1. INDC and the latest NDC of Vietnam

Vietnam's emission per capita, regardless their remarkable growth in the last two decades, still remains far below the global average. However, Vietnam's carbon intensity is still considerable, which has increased significantly in the last decade due to an increasing consumption of fossil fuels. In addition to that, Vietnam's energy intensity has increased in the last decade and higher than China and other countries from ASEAN region.

A constructive engagement in the arena of international climate change mitigation is considered to contribute towards establishing a good international reputation for Vietnam as a 'reliable partner' in the region, which could then have positive spillovers to other policy arenas, such as trade negotiations or investment treaties. The most relevant example for this argument is that, on 12th February 2020, the EU-Vietnam free trade and investment protection deals have been approved by the Parliament of EU (European Parliament 2020). This remarkable

milestone has opened up many opportunities for the implementation of Vietnam's NDCs as technology transfer and investment flows from EU to Vietnam are highly expected to be stronger and faster in years to come.

As a member of the Climate Vulnerable Forum (CVF)¹, Vietnam knows that their people experiencing some of the worst impacts of climate change, and inaction to combat the climate change is no longer an option. Vietnam has recently implemented a variety of policies relevant to climate change mitigation. Internationally, the country has contributed to greater ambition in the Paris Agreement of a global goal to limit temperature increase to 1.5 degrees Celsius, under the motto "1.5 degrees to thrive". Viet Nam's INDCs has set a target of a reduction of 8% of total GHG emissions by 2030 compared to the baseline (Table 1), equivalent to 62.65 MtCO₂e, with domestic resources. This target could be increased to 25%, equivalent to 197.94 Mt CO₂e, if international support is received through bilateral and multilateral cooperation, as well as through the implementation of new mechanisms under the Paris Agreement (The Government of Viet Nam 2015).

Vietnam has submitted its updated Nationally

Determined Contributions (NDCs) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2020. To prepare for the COP26 conference in Glasgow this November, the president of Vietnam emphasized, at the Leaders Summit on Climate, the commitment of the country in this updated NDC to reduce its emissions in 2030 by 9 per cent unconditionally, with domestic resources, and by 27 per cent conditional on bilateral and multilateral support with the updated baseline of 2014. The total greenhouse gas (GHG) emissions in 2030 in the Business As Usual (BAU) scenario would be 927.9 MtCO₂eq, about 3 times higher than the 2014 emissions of 284 MtCO₂eq (Table 2). Emissions from energy would be 684 MtCO₂ in 2030, accounting for 74% of total BAU emissions – including 452.3 MtCO₂eq in emissions from electricity. Energy is thus by far the largest contributor to GHG emissions. GHG emissions from energy production and consumption are the bulk of Viet Nam's current and future emissions, quadrupling between 2010 and 2030 in absolute total, and making up 86% of total GHGs emissions in 2030, according to the baseline scenario. The economic, social and environmental co-benefits of mitigation actions in the energy sector will very likely also support the

achievement of Vietnam's NDCs. Viet Nam could achieve the NDC targets by 2030 with stronger policies to increase renewable energy deployment and the rate of energy efficiency. This will also provide

many related benefits such as a cleaner and healthier environment for people, e.g. because current plans for more coal-power plants could result in serious human health problems because of air pollution.

2. The energy sector and its contribution to NDCs of Vietnam

2.1. Current development status

Vietnam is one of the largest electricity markets in ASEAN, driven by low-cost resources such as hydro, gas and coal recently. The country has supplied electricity to 99.98% of communes and 98.83% of rural households with relatively low cost in comparison to neighboring countries (EVN 2018). Vietnam's carbon emissions have grown by more than 10% in most years after 1990. Large increases of carbon intensity after the 1990s can majorly be attributed to an increased use of oil, but coal also plays a significant role. During the period 2000 – 2010, coal is the main driver of the carbonizing the Vietnamese energy system, with annual increases ranging from 2 to 5 percent per year. Since last 10 years, total power capacity from fossil fuels in Vietnam has always accounted for more than 40 percent, notably this rate is more than 50 percent in the two recent years: 2018 and 2019 as presented in Figure 1 (NLDC 2020). Notably, the power capacity from coal has increased to 19 800 MW by 2019 from 3 790 MW in 2010, about 5 times higher for a period of 9 years.

policies for the energy transition towards a cleaner energy development in Vietnam, it is expected that by 2030, 47.3 billion kilowatt-hours of electricity in the country will come from wind and solar energy. Under the revised National Power Development Plan 7 (PDP 7R) of the government, renewable energy will account for about 20% of the national electricity capacity in 2030. Upcoming National Power Development Plan 8, which is under the preparation by MOIT, is expected to give more ambitious targets of renewable energy from solar and wind power, including floating solar and offshore wind power.

During last two years, thanks to the attractive Feed-in-Tariffs for solar power, the development of renewable energy in Vietnam has made significant progress (see Figure 2 (VIR 2019)). Notably, with a record level of solar power facilities put into operation, Vietnam has become a very active and attractive renewable energy market in Southeast Asia. However, this incredible development is also posing new challenges for the steady development of the national grid, as well as land use, electricity pricing, human and financial resources, and especially for equitable and sustainable development, that is, to ensure that no one is left behind because of losing their livelihoods, jobs, or agricultural land in the process.

Unit: CO₂ equivalent mil tons, Source: Nguyen Khac Hieu et al. 2015: MONRE 2015

	2010	2020	2030
Energy	141.1	389.3	675.5
Agriculture	88.3	100.8	109.3
Waste	15.4	26.6	48.0
Land Use, Land-Use Change and Forestry	-19.2	-42.5	-45.3
Total	225.6	474.2	787.5

Table 1. National baseline scenario of GHG emissions by sector for the INDCs of Vietnam

Unit : MtCO ₂ eq.	2014	2020	2030
Baseline	284	528.4	927.9
Unconditional scenario			844.0
Conditional scenario			677.1

Table 2. Vietnam greenhouse gases emissions scenarios according to the updated NDC (2020)

¹ <https://thecvf.org/web/climate-vulnerable-forum/cvf-participating-countries/>: CVF is the group of the world's most disaster-prone, climate-vulnerable countries. There are 10 Asian members: Afghanistan, Bangladesh, Bhutan, Cambodia, Mongolia, Nepal, the Philippines, Sri Lanka, Timor-Leste, and Vietnam.

With decreasing costs of renewable electricity and favorable

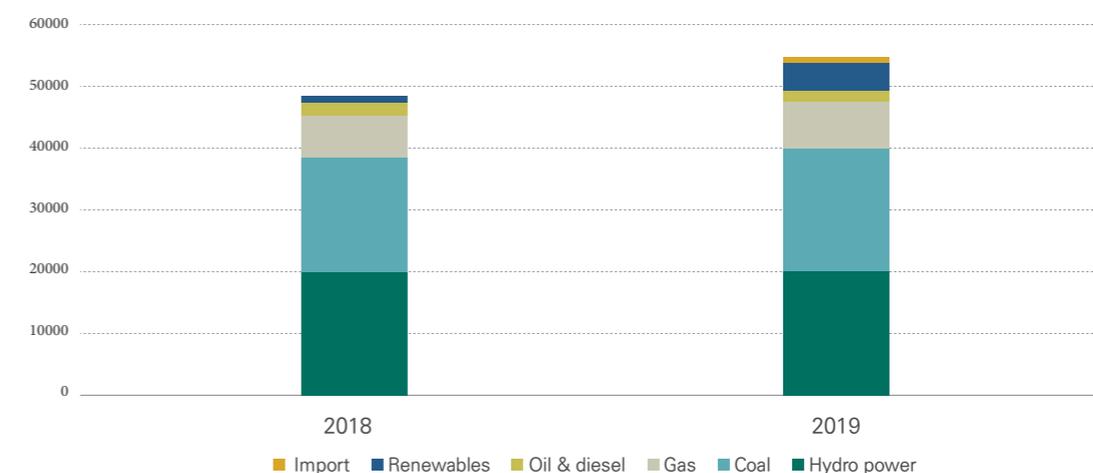


Figure 1. Installed Capacity Power (MW) of Vietnam in 2018 and 2019

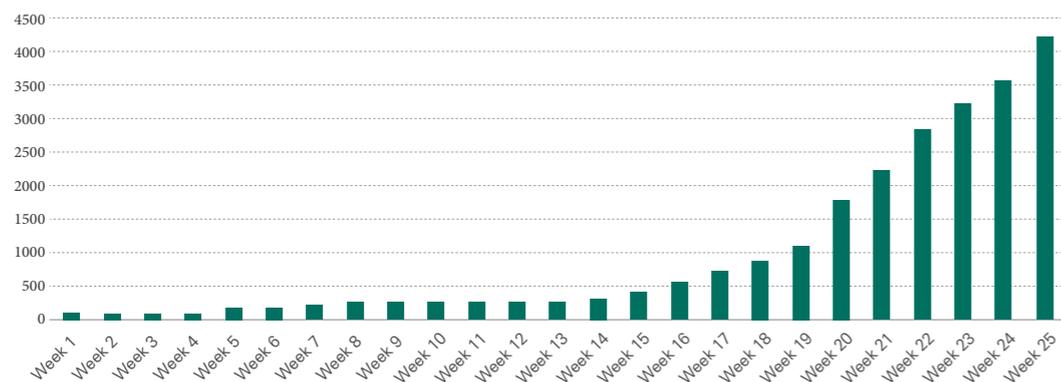


Figure 2. Growth of renewable electricity capacity (MW) in Vietnam during the first 6 months of 2019

Source: EVN

	MW	Share (%)
Coal	21.6	31.10%
Gas	7.1	10.30%
Hydro	20.8	30.00%
Renewables	17.5	25.30%
Oil	1.5	2.20%
Import	0.6	0.80%
Others	0.2	0.30%
Total	69.3	

Table 3. Vietnam's Power Mix by sources in 2020

By the end of 2020, the total installed capacity of power sources of the whole system reached 69,300 MW, an increase of nearly 14,000 MW compared to 2019, of which the total capacity of renewable energy sources was 17,430 MW (an increase of 11,780 MW compared to 2019), and accounted for 25.3%. The scale of the electricity system in Vietnam ranks 2nd in ASEAN region and 23rd in the world. The output of electricity produced and imported for the whole system in 2020 is 247.08 billion kWh, up 2.9% compared to 2019.

2.2. Future development plans

Available scenario analyses for Vietnam predict a continuation of the observed trend in the future, with energy demand increasing substantially in the upcoming decades. In its national energy plan, Vietnam expects energy demand to increase by factor

four until the year 2025 (compared to 2005 levels) in baseline scenarios of most studies, mainly driven by industrialization and rising household income. Scenarios expect a huge part of the demand to be covered by (carbon-intensive) coal (Table 4). In consequence, emissions from its energy sector are expected to more than double until 2020 (251 mil tCO₂e) and quadruple by 2030 (471 mil tCO₂e) as stated in its Second Communication to the UNFCCC (MONRE 2010).

Vietnam is as richly endowed with renewable energy sources such as solar, wind and bio energy spreading over the country. Over the last decades, the country has been experiencing a sustainable energy development, starting with large hydro power in 1970s then solar and wind power by late 2000s as a driving force for meeting the power demand of the whole economy. The renewable energy sector of Vietnam has got

Source: MOIT

Power capacity (MW)	2010	2014	2030 (PDP7 revised)	2030 (1st draft PDP8)
Total	21,542	34,524	129,500	137,700
Hydro	8,124	13,617	22,000	24,800
Coal	3,941	9,843	55,000	37,300
Oil	575	537	-	-
Gas	7,402	7,914	1,900	28,900
Small hydro and RE	500	2,054	2,700	39,800
Import	1,000	559		5,700

Table 4. Power capacity by sources of Vietnam up to 2030

high attention from both public and private players. The lessons gained from different types of renewable energy projects reveal that with a careful forward planning, renewable energy can provide far-reaching benefits on the three domains of sustainability: economic, environmental and social to Vietnam.

According to the World Bank (WB), Vietnam has a theoretical and technical potential of 475 GW of offshore wind power. In a report by the Danish Energy Agency (ERA and DEA 2019), Vietnam has a fully viable potential of 162 GW; of which 132 GW of offshore wind power in the seabed depth of less than 50 m and 30 GW use floating foundation technology. With its potential and advantages, the development of offshore wind power in Vietnam in the Draft Power Master Plan VIII is considered by many experts and businesses as one of the solutions to help Vietnam ensure its supply target. enough electricity with decreasing electricity prices, not having to depend on imported raw materials, improving the localization rate, creating many new jobs, reducing carbon emissions as committed by the Government.

In the most recent draft of Power Development Plan VIII, installed power capacity from the renewable

3. Consistent policies on climate change and clean energy during the last 10 years in Vietnam

In 2012, the Government issued the National Green Growth Strategy, which aims to reduce energy

primary sources would play a significant share of the national power mix in the coming decade. For the first time in Vietnam, defining the concept of an offshore wind power project (an area with a seabed depth greater than 20m), the power capacity from offshore wind power is separate from onshore wind power and close to the seabed in the first draft PDP VIII. In this draft, offshore wind power capacity is from 2-3 GW by 2030, accounting for 1.45% to 2% of the total capacity by 2030.

In the 2nd draft released, the total installed capacity of the baseline reaches 130,371 MW and 143,839 MW at the high load scenario. Renewable energy ((including wind power, solar power, biomass) will increase from about 17,000 MW at present to 31,600 MW in 2030, accounting for about 24.3% of the total installed capacity of the whole system. Large, medium and small hydroelectricity and storage hydroelectricity are 17.7% - 19.5%; PDP VIII minimizes the development of new coal-fired power plants. The total installed power capacity from coal in the baseline in 2030 is 40,700 MW (28.3% - 31.2%), about 15,000 MW lower than the PDP VII revised. gas and oil thermal power plants (including LNG) reached about 21.1% - 22.3%.

consumption as a percentage of GDP by 1-1.5% annually up to 2020 and reduce greenhouse gas emissions from energy by 10% to 20% compared with normal development. By 2030, greenhouse gas emissions from energy would be 20% to 30% lower than the normal development option.

Vietnam's Renewable Energy Development Strategy for 2030 with a vision to 2050 was published in 2015. The share of renewable electricity (including large and small hydropower) in total electricity production is to reach 38% by 2020, 32% by 2030, and 43% by 2050. The target of this Strategy is reflected to some extent in the Draft National Power Development Plan for 2021-2030 period with a vision to 2045 (DraT PDP8).

The Vietnam National Energy Efficiency Program 3 (VNEEP 3) for the period of 2019 – 2030 has an energy-saving rate of 5.0 to 7.0% of the total national energy consumption up to 2025. Power losses are to fall below 6.5%, and the average consumption rate of some specific industries and sub-sectors would be lower. By 2030, total national energy consumption would fall by 8-10%, power losses would drop below 6.0%, and the average consumption rate of some specific industries and sub-sectors would fall.

Most recent high-level guidelines for clean energy development in Vietnam by the Politburo

In Feb 2020, Resolution 55 issued by the Politburo of Vietnam re-confirms the importance of the energy sector to implementation of NDCs, the climate change mitigation, and economy of Vietnam in decades to come (Vietnam's Politburo 2020). This is the first time the highest political unit of Vietnam issues a particular resolution, for the energy sector, presenting the long-term targets of firmly ensuring national energy security and sustainability with strong links to the implementation of the NDCs of Vietnam. The Resolution sets out the goal of providing stable and high-quality energy at affordable prices for powering rapid socio-economic sustainable development of the country. This presents obviously a strong engagement of Vietnam in achieving its NDC targets as well as its long-term energy sustainable development. The sector must ensure country's defense and security at both local and national levels; improve the living standard, and contribute to protecting ecological environment protection. Particularly, the Resolution gives quite high ambitious targets of renewable energy development and GHG emission reductions from the energy sector, as presented in Table 5 and Table 6.

Feed-in-Tariff for Renewable energy: the most

important financial tools for promote RE technologies

Viet Nam has issued a number of support policies with feed-in-tariffs (FITs) for different renewable energy technologies. FITs are the price at which the off-taker must buy RE from the plant owner for the economic lifetime of projects of 20 years. The first FITs for solar PV, issued in 2017, are 9.35 USD cents per kWh. The Vietnamese government has recently re-set new, unfortunately lower, FITs rates for utility-scale and rooftop solar installations. In this policy, floating PV projects appear as the first time to benefit the FITs. PV developers will only qualify for the new rates if they put their projects into commercial operation by Dec. 31, 2020. The main progress was made with solar power. Nearly 16.5 GW of solar farms and rooftop solar were commissioned within 2 years (2019-2020), which increased the share of solar power capacity in the power mix from negligible at the end of 2018 to 25% by the end of 2020. All other projects afterwards will be subject to price determination through a competitive bidding process. Due to the negative impacts of the Covid-19 on the sector, the timeline for this new FITs seems too short and unrealistic for new investors. Therefore, new solar PV projects in Vietnam should prepare for the option of solar auction in their financial calculation.

After the first FITs for wind power, issued in 2011, failed with only 3 projects in 7 years and the total capacity was below 200MW, the revised FIT for onshore wind power in 2018 is 8.5 USD cents per kWh and for off-shore wind power the FITs are set at 9.8 USD cents per kWh, which must be operating before 1 November 2021. Table 7 presents the current support mechanisms for renewable energy technologies (VIET 2019).

Energy Efficiency Technologies in the NDCs

Although the energy intensity of Vietnam is relatively higher than China and other countries in ASEAN, energy intensity of the country has been decreasing with successful implementation of energy saving programs since last 15 years. In 2018 Vietnam's energy intensity has remained at 499 kgOE/1.000 USD since 2015 (General Statistics Office of Vietnam 2019). Comparatively low energy efficiency and high

CO₂ intensity in the present situation, and according to current power demand projections also in future, suggests a significant potential for improvement of energy efficiency, reducing energy demand and

limiting emissions growth. The technologies that shaped the commitments in the NDC for improving energy efficiency, reducing energy demand, and reducing emissions are listed in Table 8.

	2030		2045		2050	
	TPES	%RE	TPES	%RE	TPES	%RE
Resolution 55	175-195	15-20	32=0-350	25-30		
The development strategy of renewable energy of Vietnam by 2030 with a vision to 2050*	194	32.3			314	44

Table 5. Total primary energy source (TPES, mil TOE) & percentage from renewable energy (%RE) by year

Year	2030	2045	2050
Resolution 55	15	20	-
The development strategy of renewable energy of Vietnam by 2030 with a vision to 2050	25	-	45
The Nationally Determined Contribution of Vietnam*	Unconditional scenario	4.4	-
	Conditional scenario	9.8	-

Table 6. Mitigation of greenhouse gas emissions (%) in the energy activities compared with the baseline

RE type	Technology	Price type	2050
Small hydroelectricity	Power generation	Avoided cost published annually	598-663 VND/kWh (by time, region, season) 302-320 VND/kWh (excess electricity compared to the contract) 2158 VND/kW (capacity price)
Wind power	Power generation	FIT price 20 years	8.5 US¢/kWh (on shore) and 9.8 US¢/kWh (off shore)
Solar power	Power generation	FIT price 20 years	7.09 US¢/kWh for ground-mounted PV plants 8.38 US¢/kWh for rooftop PV arrays 7.69 US¢/kWh for floating solar projects over a period of 20 years
Biomass energy	Cogeneration Power generation	Avoided cost published annually	5.8 US¢/kWh (for cogeneration) 7.5551 US¢/kWh (North) 7.3458 US¢/kWh (Central) 7.4846 US¢/kWh (South)
Waste to energy	Direct burning Burning of gases from landfills	FIT price 20 years FIT price 20 years	10.5 US¢/kWh 7.28 US¢/kWh

Table 7. Summary of current price support mechanisms for renewable energy types

Cost: per tonne GHG emission mitigation	
Negative cost (=financial benefits)	<ul style="list-style-type: none"> • High efficiency residential lighting • Cement-making technology improvements • Brick-making technology improvements • Passenger transport mode shift – private to public • Freight transport switch from road
Very low costs	<ul style="list-style-type: none"> • High efficiency residential air conditioning • High efficiency residential refrigerators • High efficiency commercial air conditioning

Table 8. Energy efficiency technologies to reduce energy consumption and GHGs emissions in Vietnam

The technologies listed in Table 8 were all judged to be negative or low cost, meaning that they should be implementable with minimal external support, or even lead to profits of entrepreneurs. The high energy consuming industries must adopt energy efficiency measures with priority, such as steel and aluminum, cement, pulp and paper, beverage and fertilizer industries. Aided by international projects, Nationally

Appropriate Mitigation Actions (NAMAs) have been formulated to improve energy efficiencies and reduce emissions in several industrial sectors. NAMA proposals sometimes include elements of Public Private Partnerships, with some public financing or ODA for e.g., capacity building and investment in technologies by private businesses.

4. Energy policy perspectives for the climate targets of Vietnam

Given that emissions from energy activities of Vietnam are expected to more than double by 2020 and nearly five time by 2030 compared to 2010 levels (Table 1), it is obvious that if higher-bound reduction targets of 20% in 2020 and 30% in 2030 compared to the baseline will be achieved, the result will be considerable as compared to today's level. Especially in view of the considerable negative-cost or low-cost mitigation options identified in recent reports by MONRE to UNFCCC, the potential for emission reductions seems to be significant. As discussed earlier, Vietnam's main motivation in its emission reduction efforts seems to be not only directly related to climate change mitigation but also reaping ancillary benefits as in the energy sector in particular and in the whole economy in general. To attain these objectives, a set of policies and actions must be conducted harmonizely.

Power sector reform

There are numerous factors that will be crucial for the success of the policies for climate change and clean energy development in Vietnam. First, the

electricity market development pathway and other reforms announced in the power sector, particularly with respect to pricing structures, are at the heart of a potential success. It is difficult to judge from the outside how different forces in Vietnam will react on electricity prices to increase and subsidies to be cut. However, the pressure on Vietnamese policy makers facing the high budget deficit, a banking crisis and stagnating growth rates could be sufficient to push through the necessary reforms despite the resistance of powerful interest groups. The Government owns and directly manages the State-Owned Enterprises (SOEs) that hold the majority of electricity generation and has a monopoly of the transmission and distribution of electricity. Since 2000s, the Government has passed policies to encourage all economic sectors to invest in and produce renewable electricity. A road map to establish the competitive retail electricity market was also approved and being implemented, in which the goal is to have the market officially operated in 2024. This introduction of retail electricity competitive market in Vietnam could offer an opportunity for decentralized power systems where consumers can choose the power suppliers to buy their electricity from. The future power grid should be able to accommodate this and to manage the penetration

of more intelligent devices, electric vehicles, variable renewable energy.

Incentives for renewable energy and introduce external costs in the power generation

The most important global trend over the past years and into the foreseeable future is the decreasing cost of renewable energy. Renewable energy technologies have become much cheaper in the four years since the formulation of the NDC. GreenID (2017) analysed the levelized costs of energy /electricity (LCOE) of all sorts of power technologies under Vietnamese conditions in different years. Figure 4 gives their LCOE estimates for 2017, based on technology and price assumptions for that year as deemed applicable in Viet Nam. This included estimates for renewable energy costs under the Vietnamese conditions: solar PV LCOE of 8.84 USD cents/kWh and wind power

LCOE of 8.77 USD cents/kWh.

While LCOEs in Figure 4 exclude external costs, the ones in Figure 5 consider social and environmental, called "external", costs. Fossil fuel based power would be made more expensive by phasing out all indirect support and by "internalizing" costs to the environment, health and livelihoods.

External costs can be internalized through fees, taxes or for example carbon-cap-and-trade systems. It would make the fossil fuel based part of the power mix more expensive and provides an upward pressure on the retail price. It means that the full cost of electricity would shift to companies and electricity consumers, and no longer depend partially on the State and tax payers. It would also increase the RE share, which is at the moment more expensive than the lowest cost

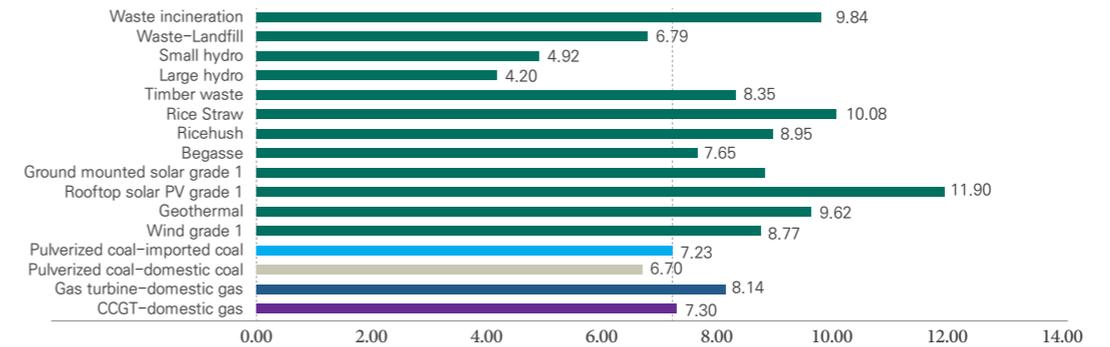


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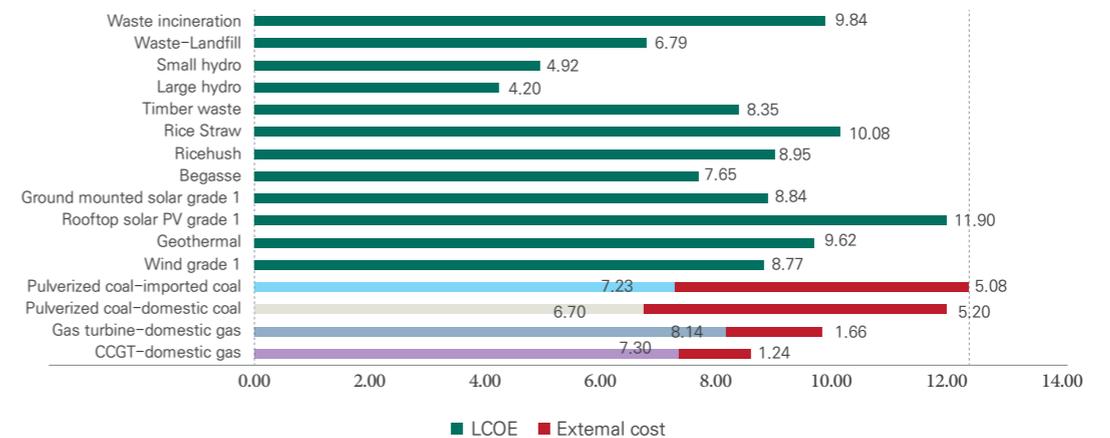


Figure 4. LCOEs in 2017 in Viet Nam, including external costs of fossil fuel generation technologies

fossil fuel generated power, but becomes relatively more economical. These measures will initially make the total power mix more expensive. However, RE will continue to become cheaper, as has happened in other countries, at a rate that will depend on capacity development and mechanisms such as the auctioning of concessions to build RE plants. Further reduction in the costs of RE and a larger RE share will then reduce the overall power mix cost.

“Net metering” of electricity production by rooftop solar PV systems on homes and businesses.

“Net-metering” allows residential and commercial customers to generate their own electricity from solar PV to feed electricity they do not use back into the grid. This feature in the solar PV regulation has started to be applied at a small scale. This may cover on-site demand during sunny hours, send excess power into the grid and draw from the grid when there is no sun. Based on current solar PV system costs on the Vietnamese market, this can already offset some of the retail tariffs in Viet Nam, making it financially attractive to some consumers. However, application of net-metering is administratively not yet sufficiently simple, and not yet applied by all branches of EVN.

Household participation: Internationally, private stakeholders in the electricity sector can participate in reducing GHG emissions, including the using-purpose change of low-productivity lands for renewable energy development, purchase of production land from local people, land leasing, and the use of land as shares. Among these models, using land as shares could be a sustainable mechanism for the case of Vietnam. Local people with land can become shareholders in renewable energy projects by contributing their plots of land, therefore, enterprises do not have to incur enormous amount of capital upfront for land compensation. In addition, people can participate in the protection and development of renewable energy areas, which would also mean protecting their own productive assets. This approach could help people earn dividends from electricity projects, and at the same time have a source of monthly income based on their own land and do not have to forgo the land permanently. Before implementing this model at wide scales, it requires a process of testing, cost-benefit

analysis, repurposing of land use, and provision of guidelines for provincial governments to work with investors. Most of all, this shareholder model requires a participatory process that includes landholders throughout the process of developing renewable energy projects.

Electrification of transport: Viet Nam has not yet highly addressed this opportunity in transport policies, energy policies, or the implementation of the NDCs but international developments such as the uptake of electric cars as well as regulation on phasing out of diesel and petrol cars is gathering pace. In combination with renewable electricity generation, the batteries of vehicles can be charged during supply peaks of intermittent solar and wind power, creating large “virtual” energy storage. As a result, national GHG emissions would be substantially mitigated when compared with the NDC targets. The electric transport could result in considerable emission reduction and major positive impact on urban air quality. Viet Nam should plan to benefit from this trend over the period to 2030.

Private Investments in Renewable Energy Development & Green Finance

The Government of Viet Nam has capped public sector debt. Foreign and domestic private capital will have to become the primary or even sole source of investment in future power production capacity. Till now, the private sector had spent about ten billion on RE projects, mainly in solar power, small-scale hydropower and also wind power. This includes a large share of international private finance. UNDP-Viet Nam reviewed (foreign) private investor interest and suggests that “at least USD 10 billion” foreign capital is immediately available “to support Viet Nam’s transition to cleaner energy and energy saving” “if barriers are removed” (UNDP 2018). According to existing plans, more would be needed for RE in particular, but the study found that external private capital can be mobilized. Achieving the NDC targets will require major investments, especially in the energy sector. Investment capital can be generated by the non-state sector. Vietnamese banks would be able to supply a large part of the required capital for EE investments. Foreign investment for RE is available,

and improved regulations are needed to unlock this, e.g. by making power purchase agreements (PPAs) bankable. Any public investment still allocated to the energy sector should be used strategically, for example for improving electricity transmission and distribution systems.

Recently, Resolution 55 has opened opportunities for the private sector to participate in energy development. Task 4 of this Resolution asks to create a favorable and transparent environment; to public the planning and list of investment projects, to remove all barriers to attract and encourage private participation in investment, and to encourage and to attract foreign investment with scale, quality and efficiency for the energy sector.

The role of other countries and donors: Arguably, policy formulation in one country can be influenced by policies that have previously been adopted in other countries, described as policy transmission or translation. During last two decades, energy has become one of the priorities of Vietnam and key international development agencies such as World Bank, Asian Development Bank, EU Delegation to Vietnam, GIZ, USAID, AFD, etc. In June 2017, the Government of Viet Nam and its international Development Partners formally established the Viet Nam Energy Partnership Group (VEPG) with the aim to strengthen cooperation, dialogue and exchange of experiences and knowledge in the country’s Energy Sector. The overall objective of the Viet Nam Energy Partnership Group (VEPG) is to work towards effective and efficient international support to sustainable energy development in Viet Nam, in line with national law and international agreements of

5. Conclusion

Taking actions to combat the climate change is one of the priorities of the whole Vietnamese political systems. Coincidence that the energy sector is a strategic sector and this contributes major part of GHGs emission mitigation in Vietnam, the Politburo of Vietnam has signed the Resolution 55th on the National Energy Strategy to 2030, with a vision to 2045. This particular Resolution is the first one ever

which Viet Nam is a member. VEPG, with Ministry of Industry and Trade (MOIT), address key policy development processes and other activities to boost the development of the Vietnamese energy sector in five priority areas, including renewable energy, energy efficiency, energy sector reform, energy access, and energy data and statistics in the energy transition of the country. Bringing lessons learned from other countries to the case of Vietnam are one of many activities of VEPG. Working closely with the MOIT, VEPG is supporting Viet Nam to achieve the NDC targets with energy related projects

Developing a domestic carbon market: Improve quality and efficiency of state management works on NAMAs, credited NAMA through revision and supplementation and issue a number of policies and management tools related to carbon market; Develop market-based instruments, database system on GHG emissions and the roadmap to join the carbon market in the field of solid waste; Pilot credited NAMAs, develop reporting systems for GHG emissions and the roadmap to join the carbon market in steel production in Vietnam; Raise awareness and provide knowledge for management agencies from central to local authorities in management, control and supervision of the activities related to carbon markets and organizations and individuals involved in carbon market.

Customers in industrial parks, industrial clusters and processing zones will have opportunities to get direct power purchase agreement (DPPA) when coming revised regulations/mechanisms on control and operation of electricity market will allow the development of on-site and self-sufficient power generation plants in specific areas.

in the history aims to ensure energy security and sustainability with strong links to the implementation of NDCs. The transition of the energy sector with direction to renewable energy such as solar, wind, including floating solar and offshore is the key path to achieve both objectives on energy and NDCs. Stated in their latest NDCs, many countries committed to halve their emissions by 2030. Vietnam also plans to peak its net emission in the same year. With the rapid development of renewable energy, particularly

solar and both onshore and offshore wind energy, in Vietnam recently, the country has huge opportunities to achieve its emission reduction target in next decades. Under the current policy scenarios and with domestic resources, Vietnam can achieve its climate targets. However, with international supports, Vietnam still hardly can reach the high ambitious target of zero emission by 2050. This target even has never been appeared in the official policy in the country.

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Annex

Annex 1 Selected recent policies for environment protection and climate changes in Vietnam

- Decision No. 1183/QĐ-TTg dated August 30th, 2012 of the Prime Minister approving the National Target Program to respond to climate change in the period of 2012-2015 aims at reducing GHG emissions, developing a low carbon economy, participating in the international community to protect the Earth's climate system. The program piloted GHG mitigation models in priority areas, namely agriculture, forestry, land use, water, energy, transportation, construction.
- Resolution No. 24-NQ/TW dated 03rd, June 2013 issued by the 11th Central Committee of the Party on actively response to climate change, improvement of natural resource management and environmental protection has identified climate change adaptation as an opportunity to promote growth pattern transformation towards sustainable development and simultaneously to conduct adaptation and mitigation actions.
- Law on Environment Protection No. 55/2014/QH13 (The 13th National Assembly, dated June 23rd, 2014) provides statutory provisions on response to climate change, including assessing climate change mitigation and adaptation measures, managing GHG emission and regulating the roadmap and modality for participation in reducing global GHG in conformity with socioeconomic conditions and commitments made in the international treaties to which the Socialist Republic of Viet Nam is a party.
- Decision No. 403/QĐ-TTg dated March 20th, 2014 of the Prime Minister approving the National Action Plan on Green Growth in Viet Nam for the period of 2014-2020, including: (1) Setting up institutions and formulating green growth action plans at the local level; (2) Reducing the intensity of GHG emissions and promoting the use of clean and renewable sources of energy; (3) Greening production; (4) Greening lifestyles and promoting sustainable consumption.
- Decision No. 2053/QĐ-TTg dated October 28th, 2016 of the Prime Minister approving the Action Plan for Implementation of the Paris Agreement on climate change for the period of 2016-2020 aims to: 1) review existing regulations and develop a Decree on the roadmap and modality for GHG emission mitigation; (2) develop a carbon

market within the country; piloting the system, policies and market tools for mitigation of GHG emissions in potential sectors; and (3) develop and implement GHG mitigation and green growth proposals in accordance with national conditions for implementation of NDC.

- Resolution No. 120/NQ-CP dated November 17th, 2017 of the Government of Viet Nam on sustainable development in the Mekong River Delta region with the vision to 2050. The Mekong Delta region will be on a more advanced development level compared to the country as a whole, with advanced social structure; with per capita income higher than the national average, and with people's livelihood secured; the proportion of ecological agriculture and high-technology agriculture to be 80% and proportion of forest coverage to be increased to over 9% (compared to 4.3% now), along with efforts to preserve and develop important natural ecosystems.

Annex 2 Mitigation options in the Nationally Determined Contribution

- The energy sector consists of 17 options with the total mitigation potential of 65.93 MtCO₂e.
- The agricultural sector consists of 15 options with a total mitigation potential of 45.78 MtCO₂e.
- The LULUCF field consists of nine options with total GHG absorption potential of 66 MtCO₂e.
- The waste sector consists of four options with a total mitigation potential of 20.23 MtCO₂e.

In order to prepare for the global effort assessment in 2018 and to update the new policies related to climate change, Viet Nam is reviewing and updating the NDC, which is expected to be completed in 2019 with the following contents:

- To review policies related to energy, agriculture, waste and LULUCF;
- To update BAU and develop potential GHG mitigation options for energy, agriculture, waste and LULUCF for the period of 2020-2030;
- To analyze, compare and evaluate national efforts to achieve the mitigation target of 2030 in case of conditional contribution (25%) and unconditional contribution (8%) compared with BAU.

Energy Policies

- Decision No.37/2011/QĐ-TTg dated June 29th, 2011 of the Prime Minister on the provision of assistance in the development of wind power

projects in Viet Nam.- Decision No. 24/2014/QD-TTg dated 24 March 2014 of the Prime Minister on support mechanism for development of biomass power projects in Viet Nam.

- Decision No. 31/2014/QD-TTg dated May 05th, 2014 of the Prime Minister on supporting mechanisms for development of power generation projects using solid waste in Viet Nam.

- Decision No. 2068/QD-TTg dated November 25th, 2015 of the Prime Minister approving the development strategy of renewable energy of Viet Nam by 2030 with a vision to 2050. One of the objectives of the strategy is to develop and utilize renewable energy sources in a way that contributes to fulfilling the objectives of sustainable environment and development of green economy

- Decision No. 428/QD-TTg dated March 18th, 2016 of the Prime Minister approving the Revised Master Plan of National Power Development for the period of 2011-2020 with the Vision to 2030 (Master Plan VII-revised), in which the proportion of renewable energy (namely small hydropower, wind power, solar power, biomass power) in total electricity output is projected to reach 6.5% by 2020, 6.9% by 2025 and 10.7% by 2030.

- Decision No. 13443/QD-BCT dated December 08th, 2015 of the Minister of Industry and Trade approving the Green Growth Action Plan for the industry and trade sector for the period of 2015-2020, which concretizes the key tasks in the industry and trade sector to implement the objectives and mandates of the National Green Growth Strategy and National Green Growth Action Plan for the period of 2014-2020.

- Decision No. 11/2017/QD-TTg dated April 11st, 2017 of the Prime Minister on mechanisms for encouragement of development of solar power in Viet Nam.

- Decision No. 13/2020/QD-TTg dated April 6th, 2020 of the Prime Minister on mechanisms for encouragement of development of solar power in Viet Nam.

Analysis the long-term impact of low carbon transport policy in Jakarta city

Case study: electrification of vehicles and biofuel program

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Abstract

Under the Paris Agreement, the Jakarta city government as non-state actor is preparing the Indonesia first long-term strategy at sub-national/province level through the Low Carbon Development Strategy (LCDS) to achieve Jakarta's target 2050. The strategy was developed based on the existing masterplan and future development plan. The article aims to analyse the impact of strategy on public transport development, electrification of vehicles and biofuel program and its impact on GHG emission in Jakarta 2050. Two scenarios of business as usual associated GHG emissions without considering mitigation effort while countermeasures scenarios were developed to envision pathways to achieve low carbon city. We used a non-linear programming model ExSS GAMS v 23.3 to analyse the impact of transformative actions on transport sectors in Jakarta city. The use of alternative biofuel from the biodiesel for commercial trucks provide a large GHG emission reductions in the mid-term while the electrification of vehicles and improvement of fuel efficiency of public transport provide large GHG emission in the long-term. The massive developments of public transports supported by urban infrastructures such as pedestrian walkway encourages the modal shift from private vehicles, however, the impacts on GHG emission relatively small due to large share of travel demand by private vehicles. To maximising the impact of electrification of vehicles, upstream policy on renewable energy in necessary and combine with the downstream policies to increase diffusion of electric vehicles. A complimentary policies and strategies on travel demand managements is needed to increase the modal shift from private vehicles to public transport in Jakarta city.

Keywords: Low carbon transport, Jakarta city, electric vehicle, biofuel, modal shift

1. Introduction

Under the Paris Agreement, the Indonesian government begins to prepare a long-term strategy (LTS) to achieve GHG emissions reduction target

in 2050. In order to contribute to GHG emissions reduction of 29% (unconditional target) and 41% (conditional target) below the baseline, the energy sector should reduce its GHG emissions level in 2030 by 314 Mton CO₂e and 398 Mton CO₂e (Indonesia