Indonesia Energy Transition Outlook 2021

Tracking Progress
of Energy Transition
in Indonesia

IESR
Institute for Essential Services Reform

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Foreword

After four years reviewing Indonesia's clean energy progress and publishing an annual report, we think it is the time to expand the analysis beyond the sector and focus on tracking the energy transition progress. Starting 2021, we are delighted to announce that our Indonesia Clean Energy Outlook (ICEO) is transformed into Indonesia Energy Transition Outlook (IETO). This change indicates the importance of energy transition, as well show IESR's firm commitment to support energy transition in the country.

Fossil fuels still play a major role in the current energy system and replacing them with clean energy infrastructures are imperative in the energy transition process. IETO includes the analysis of the fossil fuel sector, in addition to renewable energy and energy efficiency progress. Also to measure energy transition progress for the first time, we introduced the Energy Transition Readiness Framework as a tool to track Indonesia's energy transition path year-on-year. It is not exhaustive and we can examine its use and improve it in the future.

COVID-19 and its impacts marked the year 2020. The magnitude of the outbreak is unprecedented, and it has been disrupting all sectors, including the energy sector. It disrupts demand and supply, as well as the market. In Indonesia, the pandemic had caused a drop in the final energy consumption. We have seen low capacity addition of renewables in the power sector. Overall investment in the sector has paced down.

However, we can see some good and promising progress with solar PV as it continues to grow, led by solar rooftop at commercial and industrial segments and new projects on floating PV. Despite the lack of long-term commitment to decarbonize the power sector, Indonesia's oil and coal companies have displayed interests in making or planning for investment in renewables. This development is good news for Indonesia that needs about US$5 billion annually until 2025 on renewables to meet the 23% renewable energy target in the national energy mix.

The year 2021 is a pivotal moment for Indonesia to define its future energy system. It is the year that renewables energy should grow significantly, otherwise it will be too late. We are five years from meeting the renewable energy target. Global landscape has shifted toward net zero emission as some developed and emerging economies announced their long-term decarbonisation target. Some countries and companies have announced to stop supporting coal projects. Unfortunately Indonesia is still not aligned with those trends and lack behind our peers.

IESR believes that the covid-19 pandemic has heightened the awareness that we need to change the way we treat our planet. It also gives opportunity to recover better and greener. Therefore alignment economic recovery plans with acceleration of renewable energy deployment and energy efficiency is one of smart recovery strategies. As mobilizing billion investment is the challenge, improving enabling conditions make Indonesia renewable energy sector attractive to attract investment in clean energy projects is imperative so it could create new industries and jobs and revive the Indonesian economy.

These insights in the report are expected to assist policy makers and society in general to make bold steps in pursuing energy transition and decarbonization for the future of humanity.

Fabby Tumiwa
Executive Director:
Institute for Essential
Services Reform (IESR)

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List of Abbreviations (1)

AC	:	Air Conditioner
ADB	:	Asian Development Bank
APAMSI	:	*Asosiasi Pabrikan Modul Surya Indonesia* (Indonesian Solar Module Manufacturers Association)
APROBI	:	*Asosiasi Produsen Biofuel Indonesia* (Indonesian Biofuel Producers Association)
ASR	:	Abandonment and Site Restoration Fund
B3	:	*Bahan Berbahaya dan Beracun* (Toxic and Hazardous Material)
B30	:	Biodiesel and diesel blend with blending ratio of 30% biodiesel
BAU	:	Business as Usual
BOE	:	Barrel Oil Equivalent
BOO	:	Build-Own-Operate
BOOT	:	Build-Own-Operate-Transfer
BOPD	:	Barrel Oil Per Day
BPDPKS	:	*Badan Pengelola Dana Perkebunan Kelapa Sawit* (The Oil Palm Plantation Fund Management Agency)
BPS	:	*Badan Pusat Statistik* (Central Statistical Agency)
BPP	:	*Biaya Pokok Produksi* (Power Generation Cost)
BPPT	:	*Badan Pengkajian dan Penerapan Teknologi* (Agency for the Assessment and Application of Technology)
BSCFD	:	Billion Standard Cubic Feet Per Day
CCGT	:	Combined Cycle Gas Turbine
CCoW	:	Coal Contract of Work, or PKP2B (*Perjanjian Karya Pengusahaan Pertambangan Batubara*)
CFPP	:	Coal-Fired Power Plant
CLASP	:	Collaborative Labeling and Appliance Standards Program
COD	:	Commercial Operation Date
CPO	:	Crude Palm Oil
CSO	:	Civil Society Organization
DGE	:	Directorate General of Electricity of MEMR
DGNREEC	:	Directorate General of New, Renewable Energy and Energy Conservation of MEMR/EBTKE
DME	:	Dimethyl Ether
EBTKE	:	*Direktorat Jenderal Energi Baru Terbarukan dan Konservasi Energi* of MEMR
EPT	:	Energy Policy Tracker
EV	:	Electric Vehicle
FAME	:	Fatty Acid Methyl Ester
FPV	:	Floating Solar Photovoltaic
GDP	:	Gross Domestic Product
GEUDP	:	Geothermal Exploration Upstream Development Project
GHG	:	Greenhouse Gas
GREM	:	Geothermal Resource Risk Mitigation
HBA	:	*Harga Batubara Acuan* (Coal Reference Price)
ICP	:	Indonesian Crude Price
IEA	:	International Energy Agency
IEEFA	:	Institute for Energy Economics and Financial Analysis
IGCC	:	Integrated Gasification Combined Cycle Power Plant
IPP	:	Independent Power Producer
ISPO	:	Indonesia Sustainable Palm Oil
IUP	:	*Izin Usaha Petambangan* (Mining Permit)
IUPK	:	*Izin Usaha Pertambangan Khusus* (Special Mining Permit)
kWh	:	KiloWatt Hours
LCOE	:	Levelized Cost of Electricity
LCR	:	Local Content Requirements (*Tingkat Komponen Dalam Negeri, "TKDN"*)
LNG	:	Liquified Natural Gas
LPG	:	Liquified Petroleum Gas
MBOE	:	Thousand Barrel Oil Equivalent
MEMR	:	Ministry of Energy and Mineral Resources
MEPS	:	Minimum Energy Performance Standards
MMBtu	:	Million British Thermal Unit

List of Abbreviations (2)

MODI	:	Minerba One Data (a database dashboard for coal and mineral directorate)
MoI	:	Ministry of Industry
MoF	:	Ministry of Finance
MoHA	:	Ministry of Home Affairs
MoT	:	Ministry of Transportation
MPWPH	:	Ministry of Public Works and Public Housing
MTOE	:	Million Tonne of Oil Equivalent
Mt CO2	:	Million Ton of Carbon Dioxide Emission
MWh	:	Megawatt-hour
NRE	:	New and Renewable Energy (Energi Baru dan Terbarukan, "EBT")
PELNI	:	*Pelayaran Nasional Indonesia*, an SOE company
Perpres	:	*Peraturan Presiden* (President Regulation)
PISP	:	*Pembiayaan Infrastruktur Sektor Panas Bumi*
PJB	:	*Pembangkitan Jawa Bali*
PLN	:	*Perusahaan Listrik Negara* (Indonesia's state-owned electric utility company)
PLTBg	:	*Pembangkit Listrik Tenaga Biogas* (Biogas Power Plant)
PLTD	:	*Pembangkit Listrik Tenaga Diesel* (Diesel Power Plant)
PLTS	:	*Pembangkit Listrik Tenaga Surya* (Solar Power Plant)
POME	:	*Pelaporan Online Manajemen Energi* (Energy Management Online Reporting System)
PPA	:	Power Purchase Agreement
PSC	:	Production Sharing Contract
PT	:	*Perseroan Terbatas* (Limited Company)
RE	:	Renewable Energy
RPS	:	Renewable Portfolio Standard
RUEN	:	*Rencana Umum Energi Nasional* (The National Energy Plan)
RUPTL	:	*Rencana Umum Penyediaan Tenaga Listrik* (PLN's electricity supply business plan)
SBN	:	*Surat Berharga Negara*/Government Securities
SME	:	Small and Medium Enterprises
SOE	:	State-Owned Enterprise
SPBKLU	:	*Stasiun Penukaran Baterai Kendaraan Listrik Umum* (Public EV Battery Exchange Station)
SRUT	:	*Sertifikat Registrasi Uji Tipe* (Type Test Registration Certification)
TOE	:	Tonne of Oil Equivalent
TWh	:	Terrawatt-hour
Q	:	Quarter
VA	:	Volt-Ampere (a unit for describing power connection)
VAT	:	Value Added Tax
WA	:	Work Area (Wilayah Kerja)
YoY	:	Year-over-year/year-on-year

01

Executive Summary

image source : Unsplash

COVID-19 and its Impacts on the Energy Sector

- The year 2020 was marked by the COVID-19 pandemic which has put a stop to the majority of the economic activities and pushed Indonesia into its first recession since the 1998 crisis. To avoid economic shock, the government of Indonesia has allocated at least 6.76 billion USD for different energy types as government commitment to the national economic recovery, such as subsidies and incentives. However, the government failed to envision green recovery in its economic stimulus. Support for clean energy development only accounted for 3.5% of the total budget, according to the Energy Policy Tracker. Indonesia has missed the opportunity to make the good use of environmentally-relevant recovery stimulus to further accelerate Indonesia's energy transition process.

- The COVID-19 pandemic significantly affected the global energy sector with the energy sector demand plunged to a level below the previous years. However, even though fossil fuel demand shows a downward trend and has reached the steepest decline, renewable energy continues to grow albeit rather slowly. Indonesia has experienced similar situation in which the final energy consumption was declined by 16.8% yoy (per Q3 2020) compared to the previous year.

- Likewise, the overall investment in the energy sector has signified a downturn. Coal sector investment bore the most severe brunt, with only 50.3% realization against the government-set target for 2020.

Status and Development in the Fossil Fuel Sector

- Indonesia's coal production exceed the level set of 550 million tons for 2020. However, due to a decrease in domestic and export demand of coal, the realization has only reached at 85% and 80% respectively. Since 72% of coal demand is targeted for the export market, the decline of coal demand in coal export destination countries, such as China and India (a total of 47 million ton decrease yoy October), has impacted the Indonesia coal production absorption. Furthermore, the imbalance of coal supply and demand in international market has shattered the coal sales price to a lower level at 49.4 USD/ton and was indicated as the lowest level ever since 2015.

- The coal power plant capacity has continued to increase. Additional 520 MW is added within the first half of 2020, bringing the fleet capacity to 35.2 GW. As there is no further updates announced so far and according to the latest RUPTL 2019-2028, it is projected that Indonesia coal power capacity will grow and reach 57 GW by 2028.

- The government has planned to move forward with the coal downstream industry development despite the alert of economic risks for this industry. According to the latest government projection, the coal downstream industry could potentially consume about 51.5 million tons coal by 2040. As of now, there are nine incentive proposals discussed among three different ministries. Given the potential incentives/subsidies required for realizing the coal downstream industry, the initiative might burden the government budget instead of saving it.

- The government sets a target to increase the current oil and gas production targets from 0.7 million BOPD and 5.5 BSCFD of oil and gas, respectively, to 1 million BOPD and 12 BSCFD by 2030. To achieve the targets, the government strive to improve the investment attractiveness in the oil and gas sector through a number of policies, including the reintroduction of cost recovery PSC.

Progress in Energy Efficiency

- Indonesia's final energy intensity in pre-COVID years (2017-2019) has started to increase largely due to the increase of fuel consumption in transportation sector. This means that the final energy intensity reduction has deviated from the RUEN's pathway, which stated a 1% annual reduction from 2015 until 2025.

- Since 2018, MEMR started the extensive discussions to increase Minimum Energy Performance Standards (MEPS) for Air Conditioners and introduce MEPS for other appliances. Nevertheless, there were no further updates until the end of December 2020.

- Huge potential of achieving energy efficiency target through green building concept is wasted, primarily due to funding shortfall and lack of monitoring and implementation.

Progress of Renewable Energy in the Power Sector

- In 2020, some renewables projects' completion—mostly geothermal and hydropower—were faced with logistical challenges and construction delays due to the COVID-19 social restriction measures. Specific to hydropower projects, a total of 561 MW that was targeted to come online in both 2019 and 2020 were delayed.

- Renewable power capacity grew modestly in 2020. By Q4 2020, Indonesia only added a total of 187.5 MW, mostly from hydropower. Solar stood at the second place with a total of 28.8 MW, mainly from rooftop solar installation and 2017's IPP projects that came online last year. With this addition, total renewable energy installed capacity reached at 10,491 MW in Indonesia, a 1.8% yoy increase.

- Compared to other renewable power generation, solar PV keeps growing despite the pandemic. Despite missing this year's RUEN target (900 MW), the outlook for utility-scale solar development is bright, as indicated by the government's plan to accelerate solar development, recent record-low bids that hit 3.68 USD¢/kWh for floating PV projects, and industrial rooftop PV that is starting to show some appetite.

- The government set up a roadmap for geothermal power development with the aim to increase the geothermal capacity from 2.13 GW in 2019 to 7.87 GW in 2030 and 9.3 GW in 2035. The target was moved five years than the original plan in RUEN for 2030. The government drilling program and de-risking facility in the exploration phase for private and SOE which was funded by the geothermal funds, were the key supports for realizing the plan.

- The second amendment to the MEMR Reg. 50/2017 (MEMR Reg. 4/2020) removed BOOT policy and provided better terms for renewable power generation. Meanwhile, the much-awaited presidential regulation on renewable electricity tariff has already shown positive impressions, according to our survey. On that note, the positive effect of the regulation still remains to be seen.

- The new and renewable energy bill mark a serious effort from the government to foster higher renewable deployment in the country. The bill has been included in the national legislative program 2021 (Prolegnas). However, there are critics for the bill as it carried business interest with the inclusion of "new energy" and nuclear.

Progress in Electric Vehicle Adoption and EV Ecosystem Development

- Electric vehicles failed to achieve 2020 adoption target set in RUEN, that is 900,000 units. By September 2020, Indonesia only recorded a total of 2,279 EVs, of which 85% was electric two-wheelers. In terms of production target set by the MoI, electric cars was only able to attain 0.15% of the production target, while electric two-wheelers was able to grasp 0.26% of production target.

- More public transport operators plan to adopt EVs in their fleet as compared to 2019, and more adoption targets are set. This includes ride-hailing and taxi companies, which operate a total of around 50 e-taxis and more than 100 electric two-wheelers. Furthermore, several partnerships were struck by the government (SOEs) and private sectors to promote EVs and build its charging infrastructure through demonstration projects which is set to commence in 2021. The government has also shown interest in adopting EVs for its officials.

- Total number of installed charging stations is 62 units, of which only 27 are for public use, the rest is for private use. This number still falls short of the target set by PLN, that is 180 units in 2020. In addition, the government launched public EV battery exchange station (SPBKLU) in order to accelerate the EV ecosystem development this year. In total there are nine SPBKLU units across the Jabodetabek area.

- Although there are more derivative regulations issued as a follow up of Presidential Regulation No. 55/2019, the overall regulatory framework is still not attractive enough to accelerate the adoption. More fiscal and non-fiscal incentives are needed for consumers and producers. Moreover, the lack of EV infrastructure, e.g. charging infrastructure (SPKLU and SPBKLU), also provides another barrier to achieve the set target.

- The battery and EV manufacturing industry are still at early development stages. Several investments have been made by local and foreign companies for battery-grade raw materials preparation, EVs manufacturing, and battery recycling. More investments are planned by the government through consortium of several SOEs and several major foreign EV and battery manufacturers. The overall investment is growing given the huge market potential and the availability of resources in Indonesia.

Progress in Clean Fuels

- B30 implementation, which is expected to drive domestic biodiesel consumption, falls slightly of target (8.5 out of 9.6 million kL) due to lower fuel consumption during the pandemic. Meanwhile, biodiesel export practically stopped this year due to the declining of energy demand and coupled with China's increasing biodiesel production as well as EU's policy to impose import duty on Indonesian biodiesel.

- Palm oil fund runs into deficit due to plummeting oil price in 2020, as the amount of subsidy required increases, despite the additional IDR 2.8 trillion provided from the state budget as part of the economic recovery program. The spending for biodiesel subsidy reached IDR 25.7 trillion by December 2020, while the revenue from palm export levy was only IDR 17-18 trillion.

- As the price gap between biodiesel and petro diesel was widened, the government revised the biodiesel reference price formula from 100 to 80 USD/MT. Subsequently, the government raised the export levy of CPO two times in June and December from 55 USD/ton up to 255 USD/ton. In the previous report, we estimated that the palm oil fund will run out by 2027. Nevertheless, given the current commodity price, the fund might be depleted in 2021. IESR estimates that the spending for biodiesel incentives will outstretch IDR 12 trillion, much higher than the revenue from export levy in 2021.

- Government's plan to increase biodiesel blending to 40% in 2021 is postponed due to the lack of available government budget for subsidy as an impact of the decline of crude oil price This will further increase the financial support needed for biodiesel program.

- In an attempt to improve the sustainability of palm oil production, the government has issued several regulations on Indonesian Sustainable Palm Oil (ISPO) this year where it mandates all oil palm plantations to be ISPO-certified, while previously biofuel suppliers are exempted. The effectiveness of the regulations will remain to be seen, as since ISPO establishment in 2011 the implementation has so far been questionable.

- The government appears to reinforce palm oil based drop-in biofuels, as the bioethanol program has been largely unsuccessful. Earlier this year, Pertamina has successfully conducted a production trial of pure green diesel in its existing refinery in Dumai. Pertamina has also planned to produce 26.000 bbl of green diesel by 2024. Regardless of the optimism, however, the government is likely to end up in subsidizing more green diesel as the cost of green diesel is higher than biodiesel based on the global experiences.

Prospect in the Energy Transition in Indonesia

- This year, IESR developed a transition readiness framework that comprises of four key metrics to measure the progress of energy transition in Indonesia. The framework is focused on the transition in the power sector. This framework can be used to monitor the progress how the barriers and challenges are identified and how they are addressed.

- There are still a number of aspects that can be improved to accelerate the power sector transition. One of the first priorities could be the strengthening government political commitment to energy transition. This firm commitment has to come from President and openly support by other key ministries, including Ministry of Finance and Ministry State-Owned Enterprises that control the business strategy of PLN and Pertamina, two main SOEs that play key role in fostering or delaying energy transition in Indonesia.

- As energy transition will have impact to emission reduction, this commitment to energy transition can be followed by increasing the climate ambition aligning Indonesia NDC with Paris Agreement's target and time frame. Aligning the climate goal into power sector planning will improve the confidence of all stakeholders to invest in clean power projects.

- Other area is the regulatory framework that requires improvement followed by implementation. The issuance of a long waited presidential regulation on renewable energy price could send positive signal to investor and increase attractiveness of renewable energy sector to draw investment.

- Indonesia's fossil fuel companies have shown interest in renewable energy sector. The most progressive one is the oil and gas companies such as SOE like PT Pertamina, which considers renewable energy as a prominent business development in the future. Several coal companies have also operated or has envisaged a plan to build renewable energy power plants. However, there is no full commitment to the transition as no fossil fuel companies have declared it in their strategy.

02

Indonesia's Energy Transition:

The race to meet the Paris Agreement goals

image source : Unsplash

The declining costs of solar and wind have been driving the energy transition forward

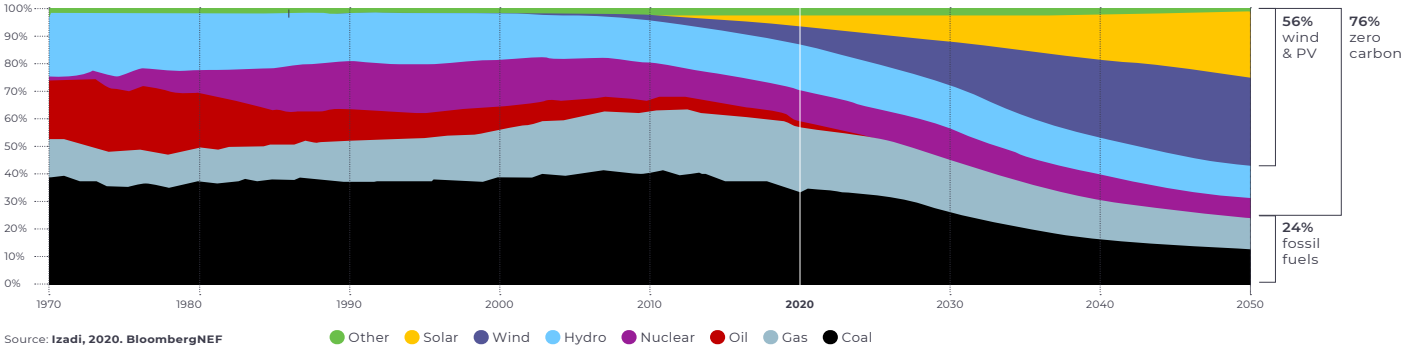
- The technological innovation and massive scale of deployment have enabled the rapidly declining cost of renewable energy, spearheaded by the solar and wind technologies. In just one decade (2010-2019), the PV module and wind turbine price has fallen by 89% and 59% respectively. The surge of these variable renewable energy has also been followed by the battery storage technology improvement with the Li-ion battery pack price decreased by 89% in the same period (Izadi, 2020).

- BloombergNEF and IEA has forecasted that the share of solar and wind would amount to 56% of global electricity generation. Out of USD 15 trillion new investment in power generation capacity going to 2050, 74% will go to wind, solar and storage capacity (Izadi, 2020).

- By 2030, constructing a new renewable power plant would be cheaper than running the existing coal and gas power plants in any place in the world. In majority of the countries, this is achieved even before 2025 (Mckinsey, 2019). The forecast indicates that it is not profitable to build new fossil fuel power plant. For Indonesia, an estimated of a USD 35 billion coal power plant fleet would be stranded under BAU scenario(Gray, et. al., 2018), and the number could increase if more coal plants are built in the coming years.

- Indonesia power sector development has gone against the global energy transition trend. Moreover, under BAU scenario, Indonesia is also set to miss its RUEN target. Striving for the RUEN target of 23% renewable energy mix by 2025 make it compulsory for the country to build more renewable power plants and decommission some fossil fuel power plants, especially the coal power plants.

Global electricity generation



Source: **Izadi, 2020. BloombergNEF**

The energy transition pathway compatible with Paris Agreement means more renewables and less coal in the power sector as soon as possible

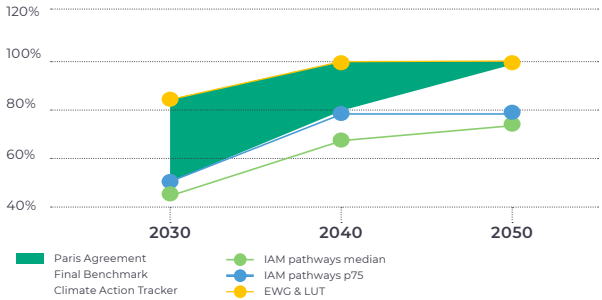
- Indonesia has ratified the legally-binding global climate change target, Paris Agreement, through Law No 16/2016. Thus, the country must prioritize efforts to reduce the GHG emission considerably and limit the rise of global temperature below 1.5 °C against pre-industrial level.

- Indonesia's contribution is crucial as the country is among the top ten largest GHG emitters in 2018 (excluding LULUCF emission). Even though the Indonesia's per capita emissio is still about half the world average, the growth is strong with CAGR 5.4% between 2015-2018, while the world per capita emission has been declining in the same period (Ritchie & Roser, 2017).

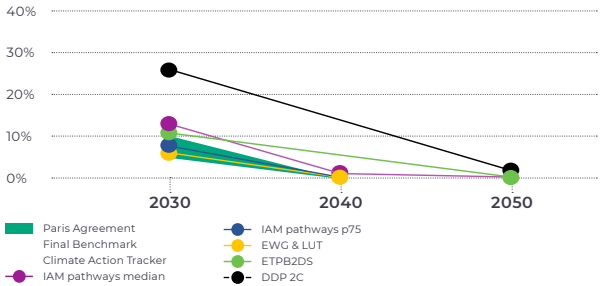
- Several global models from various institutions concluded that reaching Paris Agreement target for Indonesia means that, share of renewable energy electricity in the power sector must be increased (50-85% share by 2030), while share of coal should be diminished (5-10% share by 2030) (CAT, 2020). As of 2020, the share of RE electricity is only 14.9% while coal is more than 60%.

- Reflecting from the NDC target, Indonesia has not been ambitious enough to pursue the Paris Agreement target. The country's development strategy in the next ten years must exercise the coal-phase out plan and support accelerated renewable power plant deployment.

Share of RE from total electricity generation



Share of coal from total electricity generation

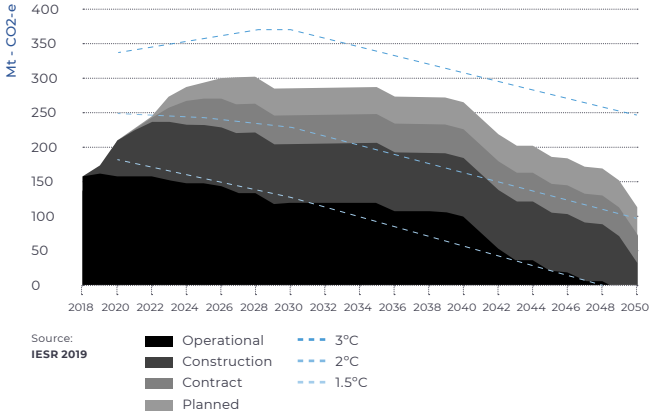


Source:
Climate Action Tracker, 2020

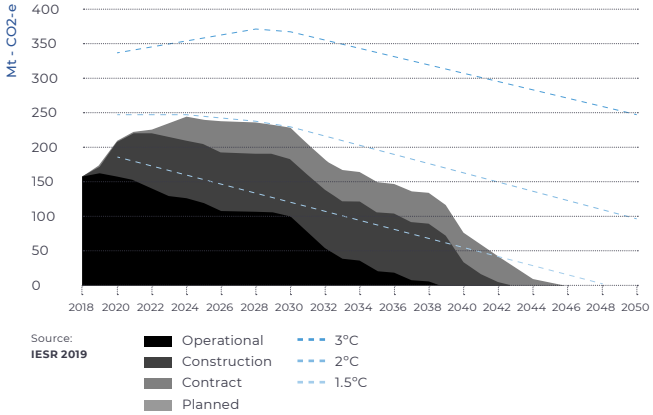
Legend:
IAMs Integrated Assessment Model
EWG & LUT Energy Watch Group LUT university
ETPB2 DS IEA Energy Technology Perspectives: Beyond 2 Degrees Scenario
DDPP 2C Deep Decarbonisation Pathway Project

The aggressive policy is required to realign power sector development with the Paris Agreement target

Projected Coal Power Plant GHG emission based on RUPTL 2019-2028



Projected Coal Power Plant Emission based on RUPTL 2019-2028 with policy intervention



- GHG emission from coal power plant might increase to more than 300 million ton CO2-e before 2028, assuming all the coal power plant is operational as planned in RUPTL 2019-2028 (left figure). In 2022, Indonesia is projected to surpass the 2°C GHG emission pathway. If there is no more coal power plant built afterwards and the operating coal power plant is decommissioned after 30 years of operating lifetime, the GHG emission will still not be able to catch up to the 2°C emission target.

- Realigning GHG emission of coal power plants to the 1.5°C pathway will require an aggressive policy which include the moratorium of planned coal power plants and accelerated decommissioning of coal power plants under 20 years lifetime. Indonesia would still hit the 2°C pathway between 2024-2030 before gradually decreasing and reach zero emission (all coal power plants are already phased-out) by 2047 (right figure).

- The accelerated coal power plant phase-out would also give room for renewables to increase their share in the power sector amid the slower electricity demand growth and oversupply condition.

03

Status Update

image source : Freepik.com

COVID-19: A year in review

- Macroeconomic impact to global energy demand
- Economic recovery

image source : Freepik.com

The pandemic put Indonesia's economy into recession, the government failed to see opportunities to recover the economy through clean energy development

- Indonesia's economic growth slows down this year due to the rapid escalation of the COVID-19 pandemic. Q3 2020 data showed that Indonesia experienced its first recession since the 1998 crisis. Latest, the MoF predicted that 2020's growth would fall between -2.2% to -1.7%. ADB and World Bank predicted that Indonesia's economic growth would decline to -2.2%.

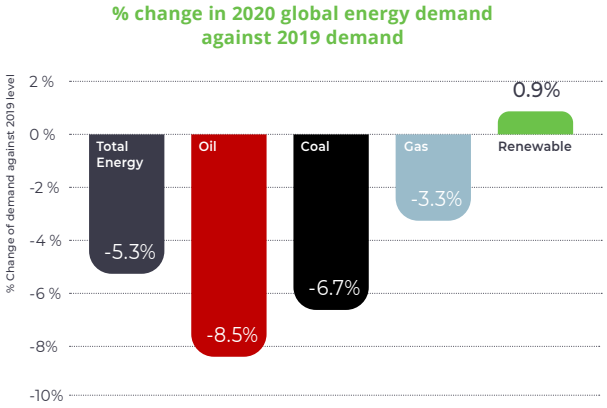
- The readjustment of the state budget was required to accommodate the pandemic response. As a result, MEMR had to cut one-third of its budget, of which 45% was drawn from renewable programs. It consisted of solar panel-related projects, such as solar-powered street lights and solar rooftop for public buildings, including government offices and houses of worship.

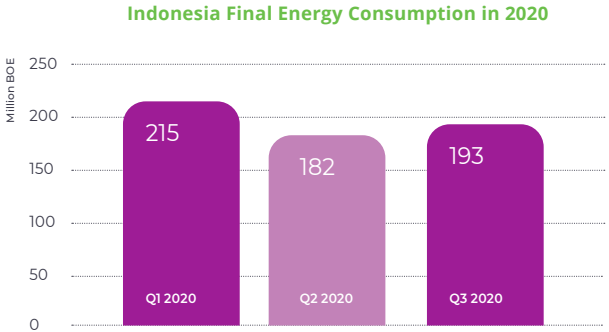
- In the national economic recovery program, Indonesia allocates huge amount of money amounting to $6.76 billion for different energy types - at least $6.52 billion of the budget allocation goes to fossil fuel energy support (Energy Policy Tracker, 2020). Approximately 84% of the budget is utilized to compensate Pertamina and PLN. The recovery program is subsequently aimed at providing energy safety nets, with its enforcement towards electricity tariff exemption for 450VA customers and a 50% discount on subsidized 900VA customers.

- Evidently, the recovery program is still lacking in support of clean energy development. Several countries have used a larger share of the environmentally-relevant recovery stimulus, concurrently Indonesia overlook the opportunity by only allocating a lower portion of environmentally-relevant fiscal spending (O'Callaghan et al., 2020; Vivid Economics, 2020). This will further slow down Indonesia's transition process that has already fallen behind the global trend.

Source: **MoF & BPS, 2020**

COVID-19 hit hard global and local fossil-based energy demand





Source: **IEA WEO 2020, Data & information center of MEMR**

- The fight against COVID-19 pandemic is still underway and the world has to limit the economic activities which disrupt the development of global economy and energy demand. The latest IEA outlook forecasted that the global energy demand was declined by 5.3% in 2020 compared to 2019 level.
- The global demand of coal and oil reached the steepest decline with a reduction rate of 6.7% and 8.5% respectively in 2020. At the same time, the abatement of gas demand was only 3.3%. In contrast, the renewable energy demand has continued its growth—although in slower pace—with 0.9% growth.
- Further analysis by IEA argued that coal demand will never recover its 2019 level and could even potentially double its current decline by 2030. This trend inevitably will also impact Indonesia coal export and revenue, considering that Indonesia is one of the largest coal exporters globally.
- Indonesia has also experienced the same trend with YoY Q3 final energy consumption decline by 16.8%. Final energy consumption has fallen in Q2 2020 but has slightly recovered in Q3.
- The impact is also encountered by Indonesia's SOE, not only due to declining energy demand, but also fluctuations of exchange rate and fall of ICP. Pertamina recorded a loss of Rp 11.13 trillion in the 1st semester of 2020.

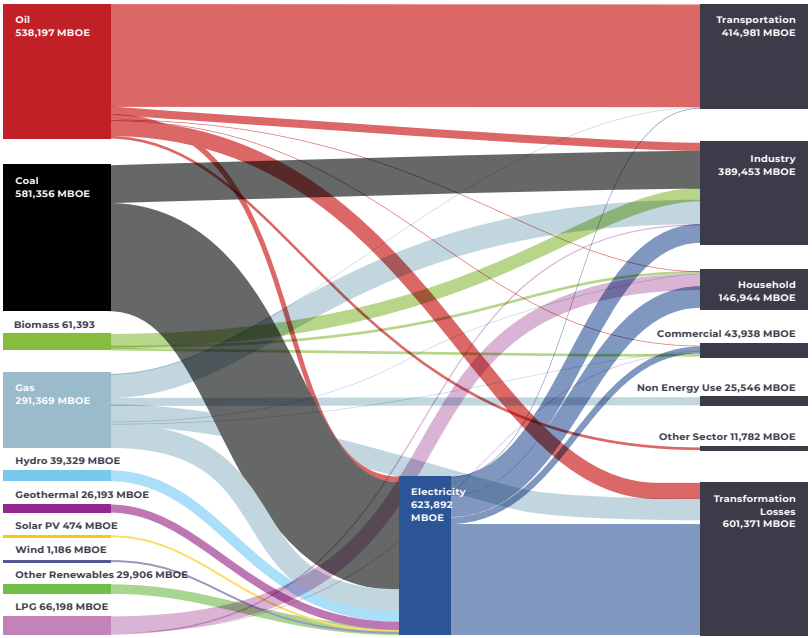
Indonesia's Energy Overview

- The Indonesia Energy Balance
- State and Development of Fossil Fuel Sector
- Investments Realization in Energy

image Source : Pexel

Fossil fuels still dominated the 2019 energy supply, the transport and industry sectors reigned as primary consumers

Indonesia primary energy supply and final energy consumption 2019

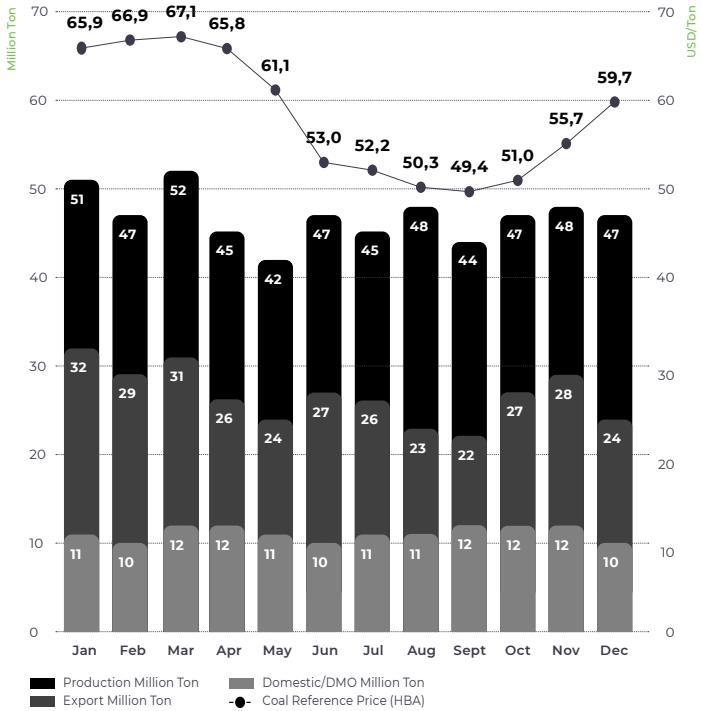


Source: **adapted from MEMR (2020a)**

- In 2019, coal and oil were the largest sources of primary energy demand with a share of 35.9% and 33.7% respectively.
- More than 99% of the energy consumption in the transport sector was petroleum-based.
- The highest transformation losses were coming from the electricity sector due to:
  - The large share of coal as the primary fuel in power generation (66.4%) but with low efficiency (59% of final electricity consumption or about a25.8% efficiency).
  - The renewable primary energy supply is usually calculated in its raw form (kinetic energy from the flow of hydro, solar irradiance hitting the solar panel) and calculated by assuming a certain efficiency.

Indonesia retained its coal production amid the trend of falling coal export demand due to the COVID-19 pandemic

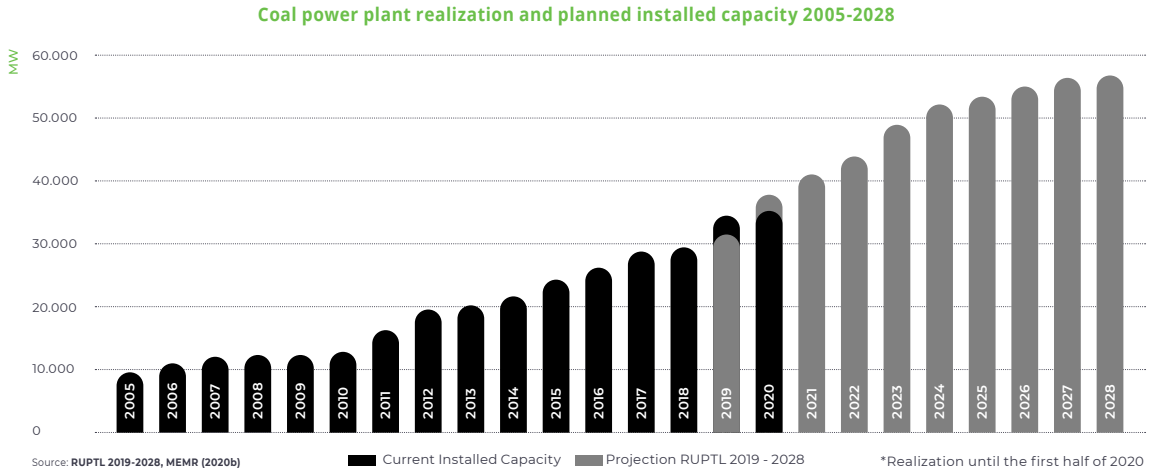
Coal production, export, and domestic consumption in 2020



Source: **Minerba one data (MODI), BPS (2020)**

- The national coal production has kept up with the government target of 550 million tons set early this year. The annual coal production reached 561.7 million tons or 102% of the target.
- Coal demand for export and domestic use experienced a decline in 2020 with demand target realization only reached 80.7% and 85%, respectively. Since 72% of Indonesian coal is targeted for the export market in 2020, a decrease in global coal demand will directly affect the demand for Indonesian coal.
- Coal oversupply in the international market corrected coal sales prices in 2020. Affected by the trend, the Indonesian coal reference price (HBA) dropped to 49.4 USD/ton level in September, the lowest level since 2015. The low coal sale prices further put pressure on domestic coal producers.
- Coal exports to India and China declined by 21.2% and 20.6% respectively, giving a total decline of 47 million tons y-o-y in October. The biggest export decline to China was low-calorie, lignite coal (around 72%). Exports to other countries such as Hong Kong, Taiwan, and South Korea also saw a modest drop.

Contrary to the global trend, Indonesia continues to boost the use of coal in power plants and the coal downstream industry



- Indonesia's coal power capacity continued to rise, reaching 35.2 GW in the first semester of 2020. The increase was contributed by the 35,000 MW project which mainly coal-fired power plants. While the COVID-19 pandemic has delayed some coal plant construction, the government has no intention to lower its coal capacity target at 57 GW by 2028.

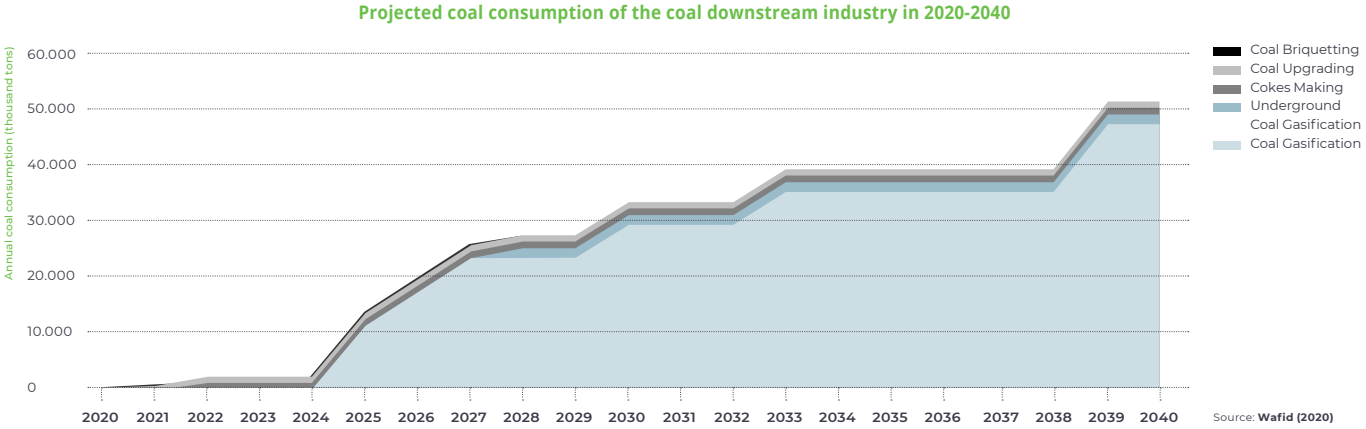
- The government plans to accelerate the coal downstream industry development and hopes that such development will create new demand for domestic coal and bring a multiplier effect to the local economy. The latest government target of the coal downstream industry far exceeds the RUEN target of coal gasification at 44 MW IGCC and DME production at 1 million tons by 2025.

- Indonesia's plan for its coal industry is a stark contrast to global trends where more countries around the world, including Indonesian coal export destinations, declare their commitments to becoming carbon neutral by 2050 (e.g. Japan, South Korea) or by 2060 (China). The intention to continue coal development in the country will give a wrong signal to the market that is increasingly transitioning away from fossil fuels.

The coal and mineral law revision: a try-hard attempt to revitalize the sunset industry

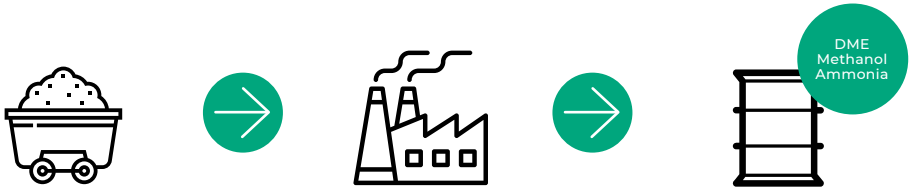
- The coal & mineral bill revision was already proposed in 2019 but delayed due to massive street protest. However, the bill is enacted in May 2020 during the COVID-19 lockdown after an accelerated discussion within the House of Representatives. Critics have been aimed on the content and the legislative process of the bill which are deemed to favour the coal mining companies.
- The coal and mineral law revision came in time for the first generation CCoW (which hold 60% share of Indonesia's coal production) whose contract is expiring in the next few years. PT Arutmin is the first one to extend their mining contract to a 10-years special mining permit/IUPK early November 2020. With the extended mining permit, this would potentially lock-in the coal production in the future.
- The law revision is claimed to give the needed certainty for at least 7 large coal mining companies seeking for refinancing plan of their 2.9 billion USD obligation and bank loan which will due by 2022. The law revision is claimed to give the needed certainty for at least 7 large coal mining companies seeking for refinancing plan of their 2.9 billion USD obligation and bank loan which will due by 2022.
- The law also promotes the coal downstream industry and provides incentive by easing of mining permit continuation until the depletion of reserve if the coal production is integrated with the downstream processing industry. The job creation law has given additional incentive of removal of royalty obligation for coal mining company which has developed the downstream industry.
- The removal of royalty obligation stipulated in the job creation law would actually contradict the government intention when releasing the coal and mineral law revision in early 2020, which aim to increase the share of state revenue coming from the mining sector.

Coal downstream industry could do more harm than good given the required subsidies



- The existing facilities (as of November 2020) are two coal briquetting facilities (PT BA and PT Thriveni), one coal upgrading (PT ZJG), and one cokes making facility (PT MEK). The full operations of these facilities would consume about 1.25 million tons of coal annually.
- The value-added industries in development pipeline is dominated by coal gasification (coal to methanol and coal to DME projects). Four facilities from four coal companies are undergoing feasibility studies with a total annual coal consumption potential of 18.8-20.3 million tons. Additionally, another five coal to DME projects are planned.
- Current government projection of coal consumption from the value added industry could reach 51.5 million tons by 2040. Most of coal gasification products would be for DME production which is expected to reach 12 million tons and aimed to meet the LPG consumption and reduce its import by 30-40%.
- The feasibility of the coal to DME project is questionable. Recent analysis from IEEFA showcased that the PT BA's 2 billion USD of coal to DME project would potentially resulted in annual operational loss of 377 million USD. On the other hand, the MEMR claimed that the project could actually produce NPV of 350 million USD. The difference in the feasibility analysis result come from the uncertainty in the project (which results in different assumptions used).

Other options are available for Indonesia to reduce LPG imports and avoid the risky coal downstream industry development



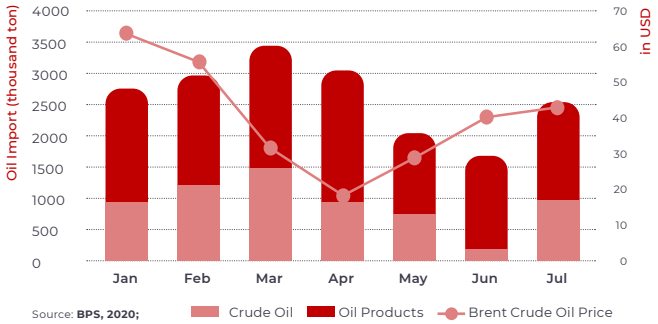
Proposed Incentives:

Coal Supply	Processing Plant	Product Demand/Offtaker
0% royalty obligation	Tax holiday (Corporate tax)	Product/DME benchmark price
Coal benchmark price	VAT exemption for processing plant	LPG subsidy relocation
Mining permit duration	VAT exemption for EPC cost	Offtaker certainty

- The government has formed five different working groups to plan a roadmap for increasing coal development (downstream industry) and utilization. There are nine incentives proposed and being discussed between three different government ministries (MEMR, MoF, MSOE) to support this.
- The commodity price variability introduce the high risk element in the coal downstream industry project. For example, the MEMR feasibility study use a 20-21 USD/ton coal input price, but the recent Indonesian Coal Index 5 (ICI 5) has indicated the risk in this assumption as the low quality coal GAR 3400 has increased its sale price from 19.38 USD/ton in November to 23.31 USD/ton in December 2020.
- Another risk involved is the long term infrastructure lock-in on the supply and demand side. The Lemigas study conclude that the similar characteristic of DME and LPG allow for blending of 20% DME to LPG without the need to change the current cooking stove. However, the 100% substitution of LPG to DME would require a new stove for DME.
- Considering the risk involved, the government should also consider other options to reduce LPG import and avoid going all-in the coal downstream industry. One of the options could be the relocation of LPG subsidy to induction stoves procurement for the low-income people and increase renewable energy mix in electricity.

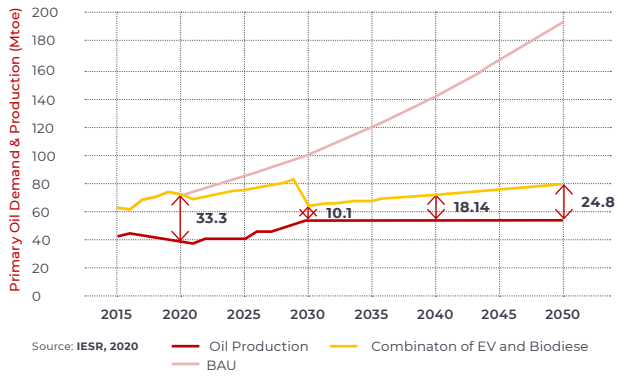
Long-term strategy is needed to reduce oil demand and relieve burden in trade balance significantly

Crude oil & oil products import volume and crude oil price in 2020



Source: **BPS, 2020;**

Primary oil demand and production projection 2015-2050



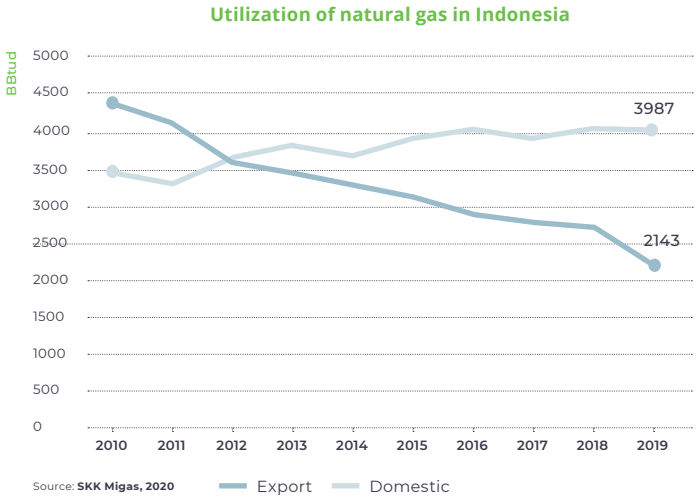
Source: **IESR, 2020**

- With the fall of global crude oil price since April 2020, Indonesia stand to benefit and manage to reduce the crude oil and oil products import value by 37.5% YoY July with a mere 7% reduction in volume or about 18.5 million ton. The overall trade balance for oil has improved from -9.2 billion USD in 2019 to -5.6 billion USD in 2020.

- The upstream oil and gas sector is targeted to increase production from current level of 710 thousand bopd (38 Mtoe) to 1 million bopd (53.3 Mtoe) by 2030. However, under current economic growth, oil demand is projected to increase to 100.2 Mtoe by 2030, pressing the country to increase its import volume higher than current level.

- Based on IESR study, through combination of increasing EV penetration and increase use of biodiesel, the primary oil demand could be kept at the level of 63.5-78.1 Mtoe between 2030-2050 (yellow line bottom graph). Assuming that the oil production could reach the government target of 1 million bopd by 2030, the gap of oil demand and oil production could be minimized, thus potentially reducing the negative oil trade balance.

Support for domestic use of gas creates an unlevel playing field for renewable energy

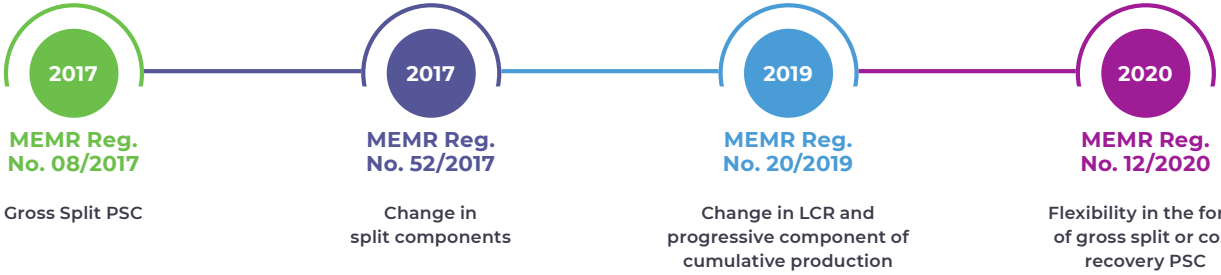


- The use of domestic natural gas in Indonesia has outpaced exports in recent years. To continue the trend, the government has stipulated:
  - MEMR Regulation No. 8/2020 strictly puts the gas price at USD 6 per MMBtu at the plant gate of several industries to support the manufacturing industry (help increase its competitiveness), create a multiplier effect, and improve efficiency.
  - MEMR Regulation No. 10/2020 regulates the gas price for power plants at USD 6 per MMBtu to increase the use of natural gas for power generation and ensure the availability of natural gas supplies at a new price adjustment.

- To support the implementation of these regulations, the government has prepared fiscal incentives (foregone revenue) as much as IDR 121.78 trillion. In return, the government expected a reduction in energy subsidies (through a reduction in electricity and fertilizer subsidies) and an increase in tax revenues from the industrial sector. The government will receive a net benefit of IDR 3.25 trillion when implementing the policies, a relatively small figure compared to the high risk it should bear when the industry beneficiary is underperforming.

- The gap between the initial prices of natural gas and the determined price at the upstream industry will be borne by the government through the reduction of state revenue from the production sharing. Based on our calculation, with gas fuel prices range from 7 USD/MMBtu to 6 USD/MMBtu, LCOE of gas power plants could decrease by 7-11%. This support, therefore, creates an unlevel playing field for renewable energy that does not receive the same amount of support from the government.

Reintroduction of cost-recovery PSC is welcomed although it is still unclear if it will increase investment in the upstream oil & gas sector



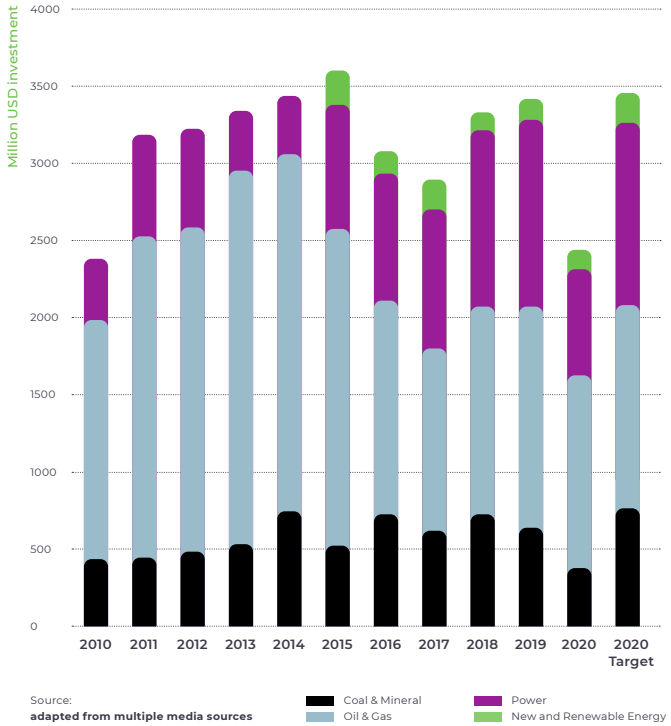
- To increase investment in the upstream oil and gas sector, the government reformed the investment cooperation contract in 2017 by introducing the gross split production sharing contract (PSC) to replace the cost recovery PSC. Since its introduction until September 2019, the gross split scheme has only been used for 45 work areas (WA) (MEMR, 2020d). The number does not necessarily represent attractiveness, considering that there were several companies that divested or did not extend their contracts in Indonesia.

- Since the gross split PSC was deemed as unattractive, the government issued the MEMR Regulation No. 12/2020 to reintroduce back the cost recovery PSC and provide options for investors to choose one of the PSC schemes. However, the MEMR reserves the right to decide the final form of PSC used by considering the level of risk, investment climate, and maximum benefit for the state (SSEK, 2020). While the new regulation is welcomed, clarity on how MEMR determines the PSC, the type of "other forms of cooperation contracts", and options to convert existing gross split PSC into cost recovery PSC are still needed (Baker McKenzie, 2020).

- The new flexibility is expected to help Indonesia increase its oil and gas production from around 0.7 million BOPD and 5.5 BSCFD in Q3 2020 (MEMR, 2020c) to 1 million BOPD and 12 BSCFD by 2030 respectively. The target shows that the government still sees oil and gas as important sources of energy for the country. However, it is still unclear whether this regulation can significantly increase investment in the upcoming years considering that the sector has been negatively affected by the pandemic. In 2020 alone, there were no auctions held by the government.

Overall energy investment has shrunk due to project delays and lack of new investment. Coal investment has suffered the most.

Investment realization in the energy sector, 2010-2020



Source:
adapted from multiple media sources

- Investment realization in the energy sector in 2020 was below the government target, accounting for 70.5% of the target. The decline was mainly due to lower commodity prices triggered by lower energy demand during the COVID-19 pandemic, making new investments unattractive.
- Low investment realization was also seen in the power sector with investment in renewable energy only reached USD 1.36 billion (68% of target). The low realization was tightly attributed to project delays and the restriction on imports of electrical equipment. By the first semester of 2020, PLN contributed to 66% of investment realization in the sector.
- The oil & gas sector was in a better condition by achieving 94% of investment target in 2020. To encourage investment further, the government has released nine incentive packages to increase the investment appetite in the upstream oil & gas sector. The incentives include the postponement of the Abandonment and Site Restoration (ASR) fund, VAT exemption for LNG, accelerated depreciation, tax holiday for income tax, and indirect tax exemption.
- Low commodity prices and challenges in smelter development caused lower investment realization (50.3%) in the coal and mineral sector in 2020, a stark contrast to 2019 when the realization exceeded the target.

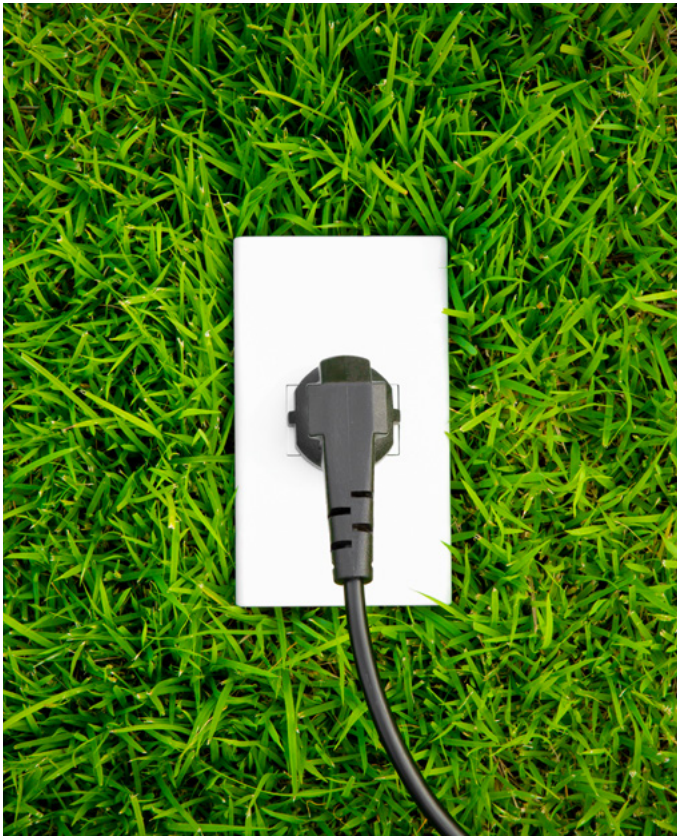
Fossil fuel companies have shown interests in renewable energy, but have yet to commit to decarbonization

At the global level, renewable energy is increasingly gaining traction in the market. Currently, the world's largest solar and wind power generator NextEra Energy has surpassed majors fossil fuel companies such as Exxon and Chevron in market capitalization. In addition, more global fossil fuel companies have pledged to become carbon neutral by 2050 and started diversifying their businesses into renewable energy.

In Indonesia, several fossil fuel companies have also shown interests in renewable energy, namely:

- PT Pertamina has allocated USD 8.3 billion for the development of geothermal (1.4 GW) and other renewable power plants (3.6 GW) as well as batteries for electric vehicles. In its latest annual report, the company acknowledged new and renewable energy projects as their quick-wins.
- PT MedcoEnergi has set its five-year target to add more renewable energy projects into the company's portfolio by developing the Ijen geothermal plant (2x55 MW), Bali PV (2x25 MW), Sumbawa PV (26 MW), and other hydro/mini-hydro power projects across Indonesia.
- And several other coal companies (e.g. such as PT Sumber Energi Sukses Makmur (SESM), PT Adaro Energy, PT Bukit Asam) which have operated or planned to build renewable-based power plants. The government and some coal companies have also started to initiate the development of solar PV at former mining sites outside forest/conservation areas.

While the new trend has been positive, these fossil fuel companies have yet to commit to becoming carbon-free by 2050. In addition, more companies in the fossil fuel sector in Indonesia need to follow suit.



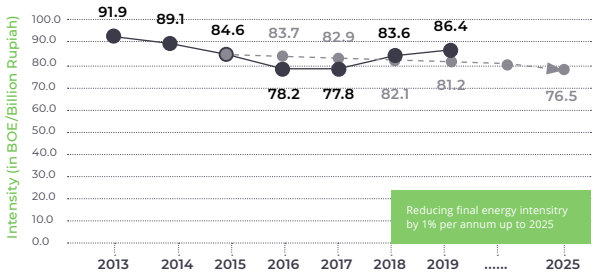
Progress in Energy Efficiency

- State and Development of Energy Efficiency
- Investments Realization in Energy Efficiency

Reducing Indonesia's final energy intensity will depend on efforts to reduce the transportation sector consumption

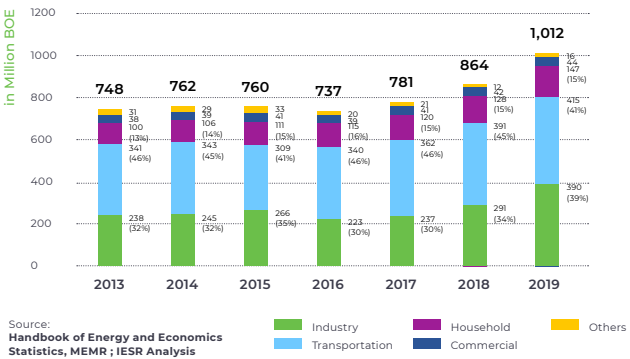
- By using the energy intensity in 2015 as a basis, a 1% annual reduction as stated in RUEN means, that by 2025, the final energy intensity is 76.5 BOE/billion rupiah. Looking at the first graph, Indonesia energy intensity started to increase starting from 2017 and has deviated from the RUEN's pathway mainly due to consumption increased in the transportation sector.
- Even though final energy consumption in the transportation sector only increased by 7% on average between 2017-2019 (compared to 28% in the industry), transportation sector contributes much smaller than industry to the Indonesian GDP (EBTKE, 2020). Reflecting this on the energy intensity definition, the numerator increased bigger than the denominator, hence the increase in the final energy intensity.
- To achieve the 2025 target, Indonesia energy intensity must decline significantly from 2020. Transportation sector, as the biggest contributor, must become the focus moving forward.

Final energy intensity, 2013-2019



Source:
Handbook of Energy and Economics Statistics, MEMR ; IESR Analysis

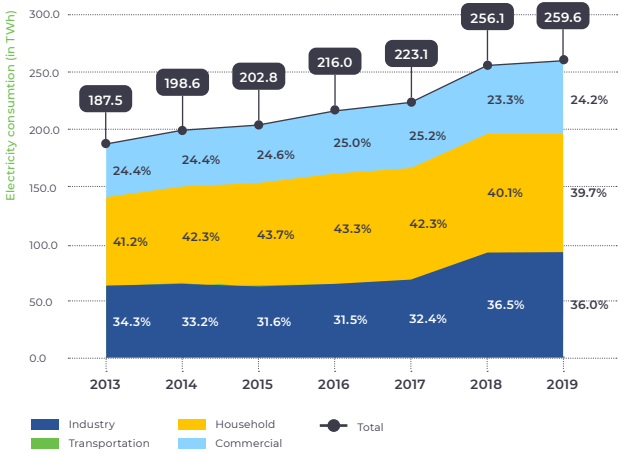
Indonesia final energy consumption 2013-2019



Source:
Handbook of Energy and Economics Statistics, MEMR ; IESR Analysis

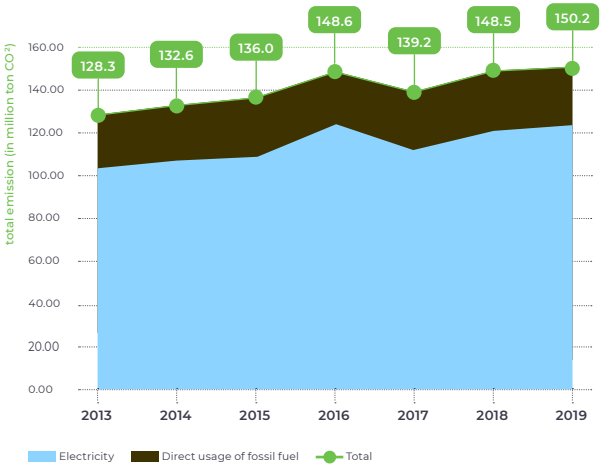
As the largest consumer of electricity, the building sector is key to emission reduction efforts

Final energy intensity, 2013-2019



Source: **Handbook of Energy and Economics Statistics, MEMR ; IESR Analysis**

Indonesia final energy consumption 2013-2019



Source: **Handbook of Energy and Economics Statistics, MEMR ; IESR Analysis**

- Rank third after transportation and industrial sectors, building sector (commercial and residential), represents 20% (on average from 2013-2019) of the Indonesian final energy consumption. However, looking specifically at the electricity consumption in all sectors, it was unmistakable that building sector consumes 66% on average of the total Indonesia's electricity consumption.

- This electricity consumption contributes the most to the emission of the building sector at an average of 81.3% from 2013-2019, especially because Indonesian power generation is still dominated by fossil fuels, which causes a high grid emission factor. Data from Directorate General of Electricity (DGE) of MEMR shows that in 2017 the emission factor average of Indonesian grid was at 0.745 million ton CO2/TWh. The rest of emission comes from direct use of fossil fuels, like biomass for cooking.

Long-awaited regulation updates to improve energy labelling and standards for several household appliances

AC MEPS and Labelling (in Btu/h.W)

Star	Existing[a]	Proposed[b]
1	8.53	12.68
2	9.01	15.43
3	9.96	20.79
4	10.41	24.96
5	-	27.46

Note
a : AC's MEPS as per MEMR Regulation 57/2017
b : Proposed Efficiency in CSPF starting from 2021 as presented to MEMR and its stakeholders in December 2019 (Letschert, 2020)

Source: **Letschert (2020)**

Appliances	CLASP Standard met by the available models in the Indonesian market (in%)	Final energy savings potential in TWh (2020-2030)	CO2 Mitigation potential in Mt (2020-2030)
Non-ceiling fan	66	10.2	9.07
Refrigerator	60	4.4	3.9
Rice cooker	57	3.7	3.3

Source: **CLASP (2020a, 2020b, 2020c)**

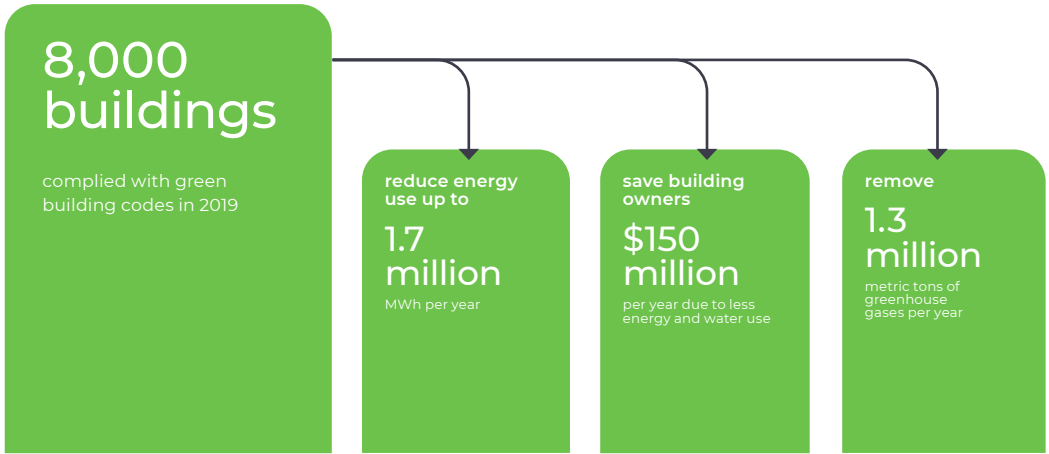
- There hasn't been update to the levels of Indonesian Minimum Energy Performance Standards (MEPS) for Air Conditioners (ACs). Based on public meeting held on December 2019, this AC MEPS and labelling has been agreed to be improved (Letschert, 2020). However, until today, we are yet to see revision to MEMR Regulation 57/2017.
- An end-use survey and market studies by CLASP (2020a, 2020b & 2020c) reported that maximum only 66% home appliances, namely fan, refrigerator, and rice cooker, based on available performance data in the Indonesian market, meet MEPS proposed by CLASP. It means, there is still at least 34% appliances from these 3-types that are least efficient.
- By adopting the proposed MEPS by CLASP, Indonesia would gain a significant energy savings of at least 18.3 TWh from 2020 to 2030 and mitigate GHG emissions of at least 16.3 Mt CO2 for the same period of time.
- During stakeholders meeting early this year, CLASP has presented their proposed MEPS to revise the existing DGNREEC Draft. Based on CLASP reports, these proposals are going to be adopted, however we are yet to see these new MEPS officially in MEMR Regulation.

Huge potential to reduce emissions from buildings, green building initiative lacks incentives to attract building owners

- IFC projected investments in green buildings in Indonesia can reach $200 billion from 2020 to 2030, with 80% of the investments will be in the residential sector. Efficiency potential from buildings is enormous considering that the construction sector grows by 7-8% annually (GBPN, 2020). With support from local governments, such as reduced property taxes for green buildings in Bandung (IFC, 2020), more investments in environmentally friendly buildings are expected to come.

- Indonesia currently has no standards of electricity intensity in the building (in kWh/m2) since the removal of MEMR Reg. 13/2012 on electricity conservation that set annual electricity consumption at 102-168 kWh/m2 for efficient buildings. The removal of this regulation in 2018 was part of President's instruction to cut red tape. Our interview with EBTKE reveals that the new electricity intensity standard will be incorporated in the much-awaited revision of Government Regulation No. 70/2009 on energy conservation (or in its related ministerial regulation). The ministry promised a stricter standard with the new standard will be set based on 500 surveys on energy use in different types of building.

- While Indonesia and some cities in the country have set green building codes for new and existing commercial and residential buildings, the green building market is still nascent. According to the MEMR, one of the main barriers to green building program is the lack of funding from local governments. From three cities (Jakarta, Bandung, and Semarang) that have already had green building codes, only Bandung provides incentives for building owners that implement the codes.



Source: **IFC**

The much-expected revision on energy conservation regulation will expand the scope of the energy management program

Government regulation No. 70/2009 on energy conservation requires energy consumers with **energy consumption larger or equal to 6000 TOE per year to carry out energy management** by implementing measures to conserve energy, performing regular energy audits, and annually reporting the results of energy management to the government through the Energy Management Online Reporting System (POME).

In 2019, there were 304 large energy consumers/ energy-intensive companies subject to the energy management program. However, **only 148 companies reported their energy management programs in that year**. The perceived intangible benefits, rewards, and retributions of reporting to POME are some of main reasons behind the low participation of this program (IESR, 2019).

The government signals to **revise the Government Regulation No. 70/2009 on energy conservation** aimed to set a legal framework for businesses in the energy conservation service industry, expand the mandatory energy management program from energy consumers with **energy consumption larger or equal to 6000 TOE per year to consumers with energy consumption larger or equal to 4,000 TOE per year** (in the industrial, transportation, and power sectors) and to consumers with energy consumption of 500 TOE per year in the building sector. The MEMR promised to launch the revision by mid 2021.

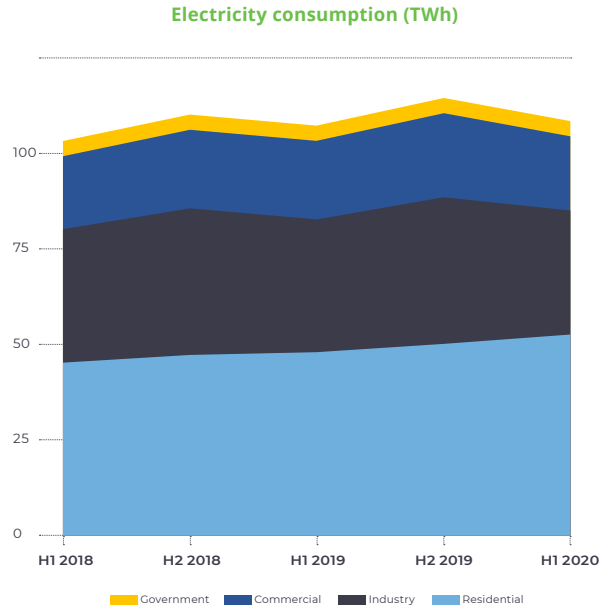
In early 2020, the MEMR expressed its intention to significantly increase the energy audits and surveys, develop financing models for energy efficiency programs, and continuously monitor and evaluate the programs. Aligned with this target, the ministry recently **upgraded the Energy Management Online Reporting System (POME)** and will integrate it into the Energy Conservation Information System (SINERGI) (MEMR, 2020). The new POME added some new features such as **Energy Consumption Intensity (IKE), emission reduction and energy saving calculator,** making consumers easier to benchmark their energy consumption against that in similar industry.

Progress of Renewable Energy in the Power Sector

- Power Capacity Addition
- Power Sector Investment Realization
- Solar PV Development

image source : Unsplash

Record low electricity consumption amid obligation to pay IPPs

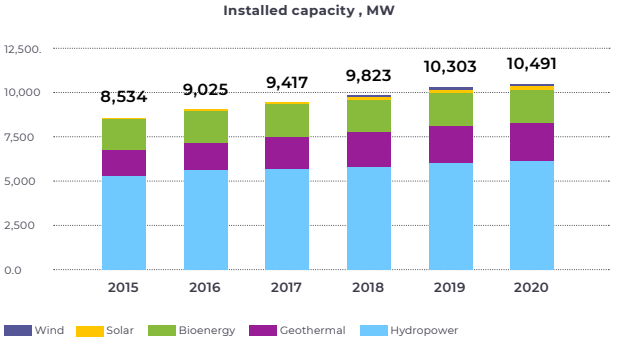


Source: **PLN, 2020**

- By September 2020, PLN only sold 181,638 GWh of electricity, a 0.6% increase YoY. The modest growth was mainly contributed by the residential sector, small and medium enterprises (SME), and agricultural industry (Harsono, 2020).
- While PLN's revenues saw a modest increase of around 1.4% YoY, profitability turned negative IDR 12.2 trillion (USD 872.8 million) by September 2020. This contrasts with IDR 10.8 trillion profit in the third quarter of 2019. This year's losses were mainly due to weak rupiah and lower energy demand during pandemic.
- Despite the low profit, PLN is facing payment obligations to IPP at USD 7.8 billion in 2020 and will continue to grow to USD 10.7 billion in 2021 (Brown, 2020). Most of the payment will be paid for coal power purchased under the take or pay scheme which requires PLN to absorb power generated by IPP or pay penalties if it fails to do so.
- PLN's financial burden is expected to increase considering that electricity tariffs have been flat since 2017. Moreover, to increase purchasing power, the government of Indonesia has required PLN to provide free electricity for 450 VA consumers and 50% discount for subsidized-900 VA consumers since April 2020. While subsidies are available, oftentimes, it takes a long time before subsidies are disbursed to PLN.

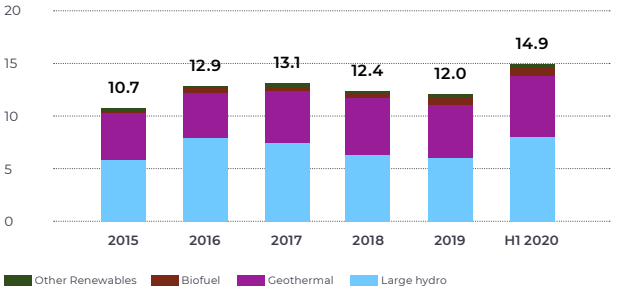
Pandemic hampers new installation, but does not affect renewables generation

Installed renewables capacity 2015-2020



Notes: Q4 2020, except solar PV (Q3 2020)
Source: 2015-2020 data from MEMR, except for solar PV
Solar PV: 2015-2019 data from DGNREEC, 2020 data from (DGNREEC and IESR analysis)

Renewables share in electricity generation,2015-2020



Source: **MEMR (DGE and DGNREEC); IESR Analysis**

- By Q4 2020, Indonesia only added 187.5 MW, almost exclusively from hydropower (145 MW) and solar PV (28.8 MW). Meanwhile, MEMR targeted 687 MW new installed capacity this year. Some of notable projects came online in 2020 are PLTA Poso Peaker 1st expansion (60 MW), PLTS Isimu (10 MW), PLTS Kuta/Sambelia (5 MW), PLTBm Merauke (3.5 MW), and PLTM Bakal Semarak (5 MW). With this addition, total renewable installed capacity reached 10,491 MW in Indonesia, a 1.8% increase year-on-year.
- The share of renewable energy in electricity mix increased to 14.9% by semester I 2020, driven by mainly the increased generation from hydropower, and less significantly geothermal.
- Despite the decline of total electricity generation during the first half of 2020, generation from renewables was still on track to meet the target of 39.9 TWh set by the MEMR (including 5.5 TWh of biofuel utilization).
- The largest source of renewable energy in Indonesia, solar energy, had been utilized 181.2 MW by October 2020, a modest increase compared to 152 MW capacity in 2019. As much as 13.7 MW came from rooftop solar, while the rest were from utility-scale solar projects.

Replacement of old diesel power plants and biomass co-firing in CFPP as a strategy to increase renewables in the near future

- As a strategy to increase renewables share in the power sector, the government plans to replace old fossil fuel power plants with renewables. In early 2020, PLN has listed more than 2,000 diesel power plants with total capacity of 1.8 GW, 23 CFPP with total capacity of 5.7 GW, and 46 CCGT with total capacity of 5.9 GW. The ministry and PLN are currently identifying the potential diesel plants to be replaced with renewables. Meanwhile, the replacement of CFPP and CCGT program is still under assessment in the ministry and there is no update until the end of 2020.

- According to MEMR, the first phase of “diesel plants replacement program” covers about 925 units PLTD in 200 locations with total capacity of 160 MW. The PLTD could be totally replaced by renewables power plants, which technology depends on the local potential. For the relatively new diesel plants, they could be hybridized with intermittent renewables. In the "dedieselization” roadmap, the first phase is targeted to COD in 2022, while the second and third phases are targeted to COD by 2024 (Hutajulu, 2020).

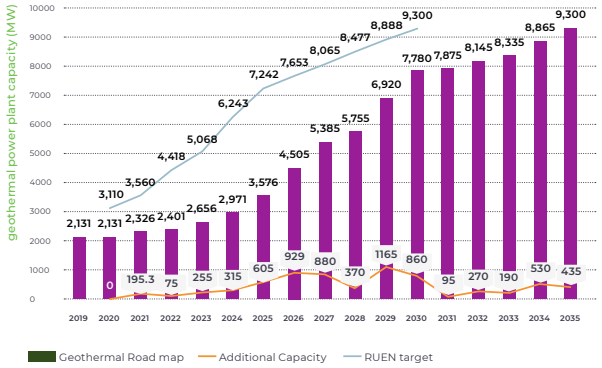
- The government is pursuing biomass co-firing in the existing CFPP as a strategy to increase the share of renewable and reduce GHG emission from the power sector. As of September 2020, co-firing has already been tested in 114 CFPPs, with 3% biomass share for large CFPPs and up to 20% biomass share for small CFPPs. By the end of 2020, six CFPPs have commercially implemented co-firing utilizing waste material as feedstock: CFPP Paiton (2 x 400 MW) and CFPP Pacitan (2 x 315 MW) operated by PJB using saw dust, CFPP Jeranjang (3 x 25 MW) and CFPP Suralaya (4 x 400 MW) operated by Indonesia Power using municipal solid waste and rice husk, and CFPP Ketapang (2 x 10 MW) and CFPP Sanggau (2 x 7 MW) operated by PLN using palm kernel shell.

- It is important, however, for the government to ensure the sustainability of the sourced biomass feedstock, especially when non-waste feedstock is used. Else, the strategy would drive land-use change—be in indirectly or directly—that causes more greenhouse gas emissions overall.

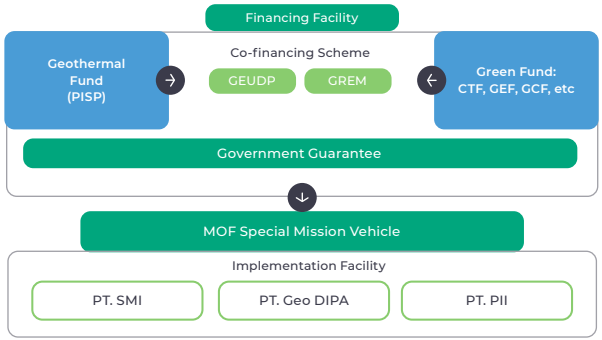
Optimizing geothermal fund is critical, but other risks & challenges still remain

- In mid 2020, the MEMR released a geothermal power roadmap consisting of 177 geothermal projects planned until 2030 with a total capacity of 5,877 MW (total installed capacity of 8,007 MW). The required investment is estimated at USD 29.39 billion.
- Driven by project completion delays in 2020 due to COVID-19, the roadmap has been revised to reach 7,870 MW installed capacity by 2030. The 140 MW (Sorik Merapi 2, Rantau Dedap, Sokoria) planned for COD in 2020 will be rescheduled to 2021. The new plan is proposed to be integrated in the upcoming RUPTL 2021-2030. The latest roadmap will fall short of 2025 RUEN target of 7,242 MW and will catch up to the 2030 RUEN target of 9,300 MW by 2035.
- There are three geothermal funds available, namely: PISP (Geothermal Sector Infrastructure Financing), GEUDP (Geothermal Exploration Upstream Development Project) and GREM (Geothermal Resource Risk Mitigation). The GREM will provide derisking facility or loan forgiveness for failure in geothermal exploration by SOE. The scheme will be expanded to include private sector as well. On the other hand, the GEUDP will support the government drilling program. Additionally, there are explorations funded by the state budget for 20 geothermal work areas with a potential of 683 MW (conducted by geology agency MEMR) and SOE synergy programs.
- The current effort (and fund) has been focused on mitigating the exploration risk. Other risks in geothermal power development, e.g. pricing regulation, community resistance, resource location in protected areas, remains to be tackled.

Planned geothermal power capacity 2019-2035



Geothermal funds scheme



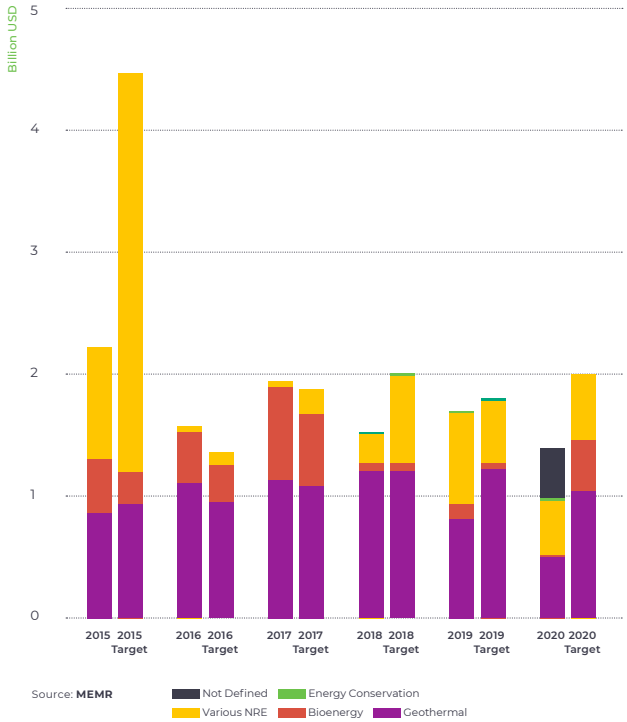
Renewables investment missed the 2020 target

- Total investment from renewables in 2020 reached USD 1.4 billion, or only 60% of the USD 2.3 billion initial investment target in MEMR's Renstra. Geothermal and other renewables are the main driver of the investment. Investment in other renewables and energy conservation is close to achieving the target, while the investment in bioenergy is way off, with only less than 1% of the target is realized.

- As observed everywhere else, the pandemic has slowed down project activities, and thus, played a part for the delayed investment. While it is tempting to blame the lack of investment on the pandemic, it is important to realize that there is no significant change in the regulatory framework, which has been acknowledged as the main obstacle of renewable growth. The expected reintroduction of feed-in-tariff policy has not been realized until the end of the year, putting the investor into uncertainty.

- Specific to hydropower projects, a total of 561.5 MW of installed capacity that was set to come online last year was delayed in part due to construction delays due to COVID-19 and financing issues. Currently there is a total of 197 projects with a total capacity of 6.68 GW in the pipeline, of which 95 of them are facing disruptions and 94 has yet to be listed in PLN's RUPTL.

Renewables investment (2015-2020)



Source: **MEMR**

MEMR Regulation No. 4/2020: Better terms for renewables, high anticipation of new renewable tariffs

MEMR Reg. No.50/2017

Low BPP makes renewables development in Java-Bali unattractive, BOOT scheme for all renewables prevents power plant to be used as collateral.

MEMR Reg. No.53/2018

No changes in renewable tariffs and BOOT scheme. Biofuel is added as renewable source to generate electricity.

MEMR Reg. No.4/2020

PLN may purchase electricity through direct appointment mechanism. Removal of BOOT scheme, must-run status of all renewable plants. No changes in tariffs.

- The second amendment of MEMR Reg. No. 50/2017, MEMR Reg. No. 4/2020, provides major changes including possibility for PLN to procure electricity through direct appointment, priority dispatch for all renewables plants regardless their capacity, the replacement of BOOT scheme with BOO scheme, a mandate for PLN to buy electricity produced from irrigation canals type-hydropower plants, and must-purchase status of waste to energy power plants in certain cities/municipalities. With these changes, the government aims to improve project bankability and increase renewable penetration in Indonesia.

- While the changes set up in the regulation no. 4/2020 may provide some relief for developers, the regulation does not resolve the greatest issue in the regulation 50 which is the renewable tariff setting. The government has promised to set new renewable tariffs through a presidential regulation on renewable energy but no information on the release date. The draft, however, has been discussed with market players at the president's executive office. Our survey to IPPs shows that most of them have positive impressions on the regulation although they acknowledge that the impact will depend on the tariffs set in the regulation.

New and Renewable Energy Bill: a move in the right direction although not entirely sustainable

While the bill is intended to bring hope and certainty to renewable energy development in Indonesia, particularly making the future law as a legislative basis for other derivative regulations that have been scattered over different legislations and been prone to changes and preferences of sectoral ministers (Sastrawijaya et.al, 2020), some articles in the bill have been criticized due to the inclusion of nuclear energy and other forms of fossil fuel energy as "new energy."

The drafted law was initially focused on renewable energy before nuclear power advocates intervened the law-making process and demanded the inclusion of nuclear energy and change the name from renewable energy bill to new and renewable energy bill. CSO coalition for clean energy, however, is against the "new" energy and recommend the removal of articles on nuclear energy from the bill and instead incorporate them in the existing Law No. 10/1997 on nuclear (IESR, 2020). In addition, some environmentalists object to the categorization of palm oil biodiesel as a renewable fuel in the bill considering the potential impacts such fuel has on the environment (Gokkon, 2020).

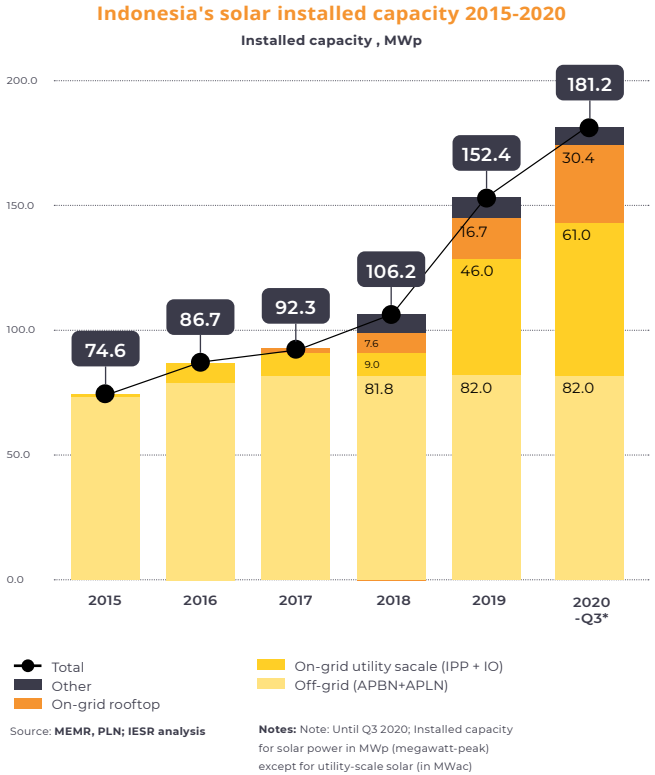
New Energy	● New energy includes nuclear and fossil-based energy such as (grey) hydrogen, coal bed methane, liquefied coal, and gasified coal. ● The construction of nuclear power plants is determined by the central government after consultation with the House of Representative. The supervision will be performed by a nuclear power regulator agency set up by government.
Renewable Energy	● Mandate the Renewable Portfolio Standard (RPS) for fossil-based power generators, renewable energy certificates can be purchased by generators that fall to comply with RPS ● Fiscal and non-fiscal incentives for renewable energy generators and fossil-based power generators that comply with RPS. ● Ease the process to get licenses and permits for renewable energy projects.
Pricing Mechanism	● The bill adopts the use of feed-in-tariffs (FIT) to pay for renewable energy projects. The tariffs will be set based on type and characteristic of technology, location and/or capacity, market index price of bio fuels, and reverse auction mechanism.
Renewable Energy Fund	● Require central and local governments to set up a renewable energy fund that will be managed by the Ministry of Finance. The fund will be sourced from state budget, provincial budget, levy on fossil fuel exports, carbon trading, and renewable energy certificates. ● The fund will be used to provide finance and incentives for renewable energy projects, compensation for renewable companies, R&D, and capacity building for local renewable workers.

Progress in Solar Energy Development

- Utility-scale Solar
- Floating PV
- Rooftop Solar

image source : IESR 2020

Solar keeps growing despite the pandemic, but nowhere nears RUEN's target for 2020



Source: **MEMR, PLN; IESR analysis**

Notes: Note: Until Q3 2020; Installed capacity for solar power in MWp (megawatt-peak) except for utility-scale solar (in MWac)

- Until Q3 2020, Indonesia added 28.8 MW of solar PV installation, slightly lower compared to 2019's addition at 46.2 MW (until Q4 2019).
- The addition is largely contributed by two segments: utility-scale solar/IPP projects (15 MWac) and rooftop solar (13.7 MWp). The IPP projects coming online this year were projects with PPAs signed in 2017, i.e. PLTS Isimu (10 MWac) in Gorontalo and PLTS Sambelia (5 MWac) in Lombok, West Nusa Tenggara. This completes all commercial operation dates of all solar PPAs signed in 2017.
- Rooftop solar installed capacity grew by 13.7 MWp to 30.4 MWp by Q3 2020, where approximately half of the number was from the industrial segment. Rooftop solar now accounts for 16.7% of total solar PV installed capacity, compared to only 11% in 2019.
- Out of the total 30.4 MWp, on-grid PLN consumers dominates (63% or 19.22 MWp). The remaining 37% (11.18 MWp) is from non-PLN consumers: the holders of "Wilayah Usaha" and off-grid users).
- Compared to other renewables in terms of power generation capacity addition—and given the pandemic—solar is evidently growing better than most, second only to hydropower at 145 MW. Biomass fills the third place at 13.7 MW addition, while the remaining renewables, such as geothermal and wind, are stagnant this year (see Page 42). However, solar growth this year is still far from RUEN's target for 2020 at 900 MW.

The government is showing more ambition to accelerate solar development

- In order to achieve RUEN's 6.5 GW target by 2025, the government has updated their strategies as follows:
  - **Utility-scale solar development** at post-mining sites with a total capacity of 2.3 GW: Bangka Belitung (1.25 GW), West Kutai (1 GW), and Kutai Kartanegara (53 MW);
  - **FPV development** across Java and Sumatra with a total capacity of 857 MW;
  - **USD 1 billion rooftop solar program** "Surya Nusantara", an initiative proposed by IESR. The program aims to divert electricity subsidy for PLN's consumers to rooftop solar installation amounting to 1 GWp/year, starting 2021 and lasts for 5 years;
  - **"SOEs Synergy"** *(Sinergi BUMN)*, a plan to install a total of 1.4 GWp rooftop solar across SOEs' facilities by 2025
- Since late 2019, the government has been working on a presidential regulation on renewable energy tariffs, including solar energy. Feed-in tariff is to be used for small utility-scale solar (≤ 5 MW) and ceiling price-based (competitive bidding) is designated for medium-to-large utility-scale solar (> 5 MW).
- Numerous statements in 2020 showed government's intent to have more ambitious solar target of 17.6 GW by 2035, comprising of utility-scale solar farms, substitutions of diesel PPs, and rooftop solar development (Harris, 2020).

Utility-scale solar development

Target: 13.5 GW by 2035
Target price: <4 US¢/kWh

Including solar PV built in post-mining areas, unproductive lands, reservoirs for FPV, and large-scale solar development in Eastern Nusa Tenggara (2 GW).

Substitution of diesel PPs with solar PPs

Target: 1.2 GW by 2035
Target price: ~10.7 US¢/kWh

Converting old (>15 years) diesel power plants to solar + storage to reduce local power generation cost (BPP)

Massive rooftop solar development

Target: 2.9 GW by 2035

- Government buildings (111.7 MW)
- SOEs facilities (1.4 GW)
- Industrial and business (624.2 MW)
- Household (648.7 MW)

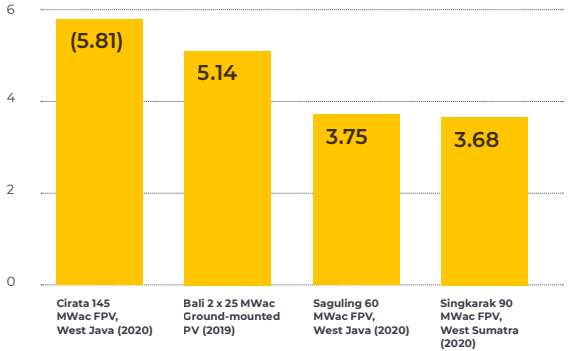
FPV to take the lead in utility-scale solar development

Ground-mounted solar projects are going nowhere

- In March 2020, PLN invited pre-selected developers to bid in two separate 50 MW solar projects in Central Java and West Java. However, according to a source involved in the process, both tenders were postponed until further notice by PLN due to the pandemic. There are no other ground-mounted solar project biddings this year.
- The PPA for Bali 2 x 25 MWac ground-mounted solar projects is expected to be signed in early 2021.

Indonesia's solar auction bid prices

Bid price, US¢/kWh (PPA price in parenthesis)



Source: **MEMR, IJGlobal; IESR analysis**

"Water-breaking" for Cirata 145 MWac FPV was completed

- The PPA for Cirata FPV project has been signed by PJB Investasi–Masdar consortium with PLN in January 2020. With an agreed PPA price of 5.81 US¢/kWh, the project is expected to commence commercial operation in 2022 (EBTKE, 2020).
- The project was officially kicked-off on Dec 17 and is currently at financing stage. It is expected to achieve financial close by May 2021 (Mulyana, 2020). The construction of the project will be divided into two phases: 50 MWac completed by the end of 2021, and the remaining 95 MWac by the end of 2022.

Record-low bids in FPV projects

- In the second half of the year, there were two record-low bids for FPV projects, i.e., Saguling 60 MWac FPV in West Java and Singkarak 90 MWac FPV in West Sumatra. The auction was performed by one of PLN's subsidiaries, PT Indonesia Power, acting as an equity partner with 51% shares.
- The lowest offer for Saguling 60 MWac FPV project is 3.74 US¢/kWh, while the Singkarak 90 MWac FPV project is offered at a record-low price of 3.68 US¢/kWh (Yap, 2020). The numbers are 30% lower than 2019's bid in Bali 2 x 25 MWac ground-mounted solar PV.

Regulatory update opens up the new FPV market

MPWPH Reg. No. 27/PRT/M/2015

Construction of multi-purpose dams

MPWPH Reg. No. 6/2020

Allows the utilization of FPV on dam's water surface area (man-made reservoir)

Regulatory update permits FPV on dams

- Following the PPA signing of Cirata FPV project, MPWPH issued a ministerial regulation (MPWPH Reg. No. 6/2020) to support the development of solar power plant on man-made reservoirs.
- The regulation is an amendment of the previous MPWPH Regulation No. 27/PRT/M/2015, regulating the construction and management of dams. The amendment now allows 5% of the dams' water surface area (reservoir) to be used for FPV.
- Developers are now waiting for the ministry to issue a technical instruction (*petunjuk teknis,* or *"juknis"*), particularly on how 5% area measurements is defined.

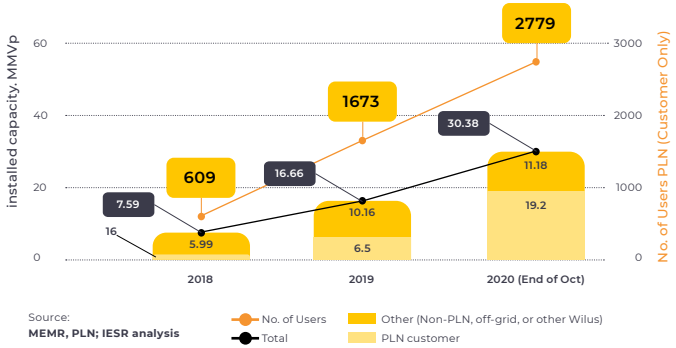
The update could boost FPV development

- Floating PV is seen as more attractive by project developers, as it does not present land acquisition problems. Grid interconnections are also available for location with hydropower dams. These factors could drive down costs as seen in recent record-low bids.
- The government is currently tapping into this high potential of FPV. Beyond the already listed FPV projects in PLN's RUPTL 2019-2028 (totaling 857 MW), there are at least 3.8 GW of FPV technical potential—assuming the 5% allowed area (Hamdi, 2020).
- IESR's recent analysis also found FPV potential of 723 MWp on 42 dams across Central Java alone, assuming 5% reservoir surface area under normal water level condition. Considering available reservoir area, the estimation could be expanded to 10–30% depending on the dams' type and function.

The industrial sector is driving the growth in rooftop solar segment

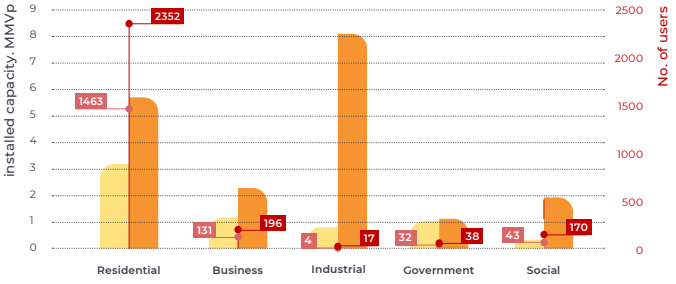
- Until October 2020, MEMR recorded a total of 30.38 MWp of rooftop solar installed capacity, compared to 16.16 MWp at the end of 2019. Almost two-third of the current installed capacity are from PLN customers from different sectors.
- Although the number of users has increased by 1,106 over January-October, the capacity growth is largely contributed by only a small number of industrial rooftop solar projects, adding 7.2 MWp from PLN customers. Industrial rooftop solar users increased to 17 from 4 in 2019.
- Some notable industrial rooftop solar projects this year included Coca Cola Amatil's Cikarang plant (7.13 MWp), Danone-AQUA's Klaten plant (2.91 MWp), Softex (0.63 MWp), and Fonterra (0.38 MWp).
- This highlights a serious commitment from the private sector for sustainability and operational cost-efficiency. Danone, for example, is planning to install rooftop solar at its 17 other plants with a total capacity of 15.6 MWp by 2023 (Rahman, 2020).
- The availability of leasing scheme (zero CAPEX) combined with the reduction of capacity charge as stipulated by MEMR Reg. 16/2019 has proven to improve project feasibility for industrial consumers, as shown by the realization this year.

Rooftop solar installed capacity and user growth, 2018-2020



Source:
MEMR, PLN; IESR analysis

Rooftop solar growth by segment, 2020

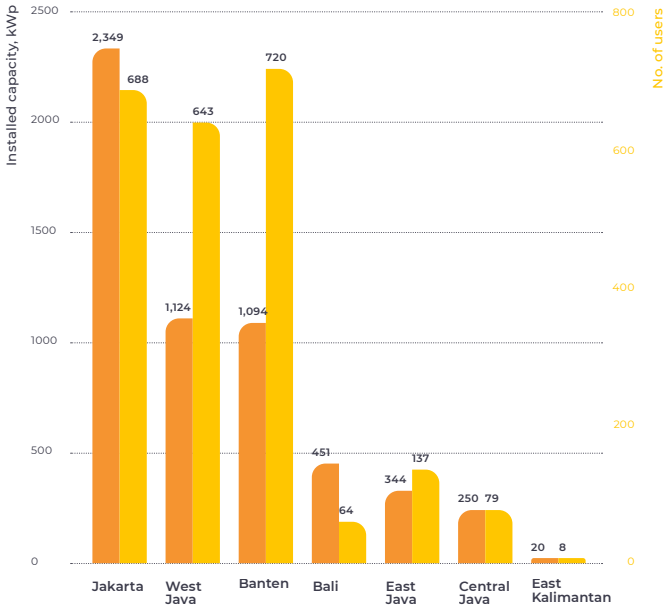


Source:
PLN; IESR analysis

Residential solar is growing amidst the pandemic, yet huge potential is still largely untapped

- By October 2020, residential solar installed capacity grew by 2.5 MWp to 5.68 MWp, compared to 3.17 MWp at the end of 2019. In terms of user growth, there was an addition of 889 new users (growing by 60.7%), amounting to 2,352 residential solar users.
- Although several solar EPC companies reported a doubling growth in sales due to COVID-19 pandemic, this year's user growth is actually lower than 2019's, which added 1,064 new users (yoy). Given Indonesia's residential rooftop technical potential at 194 to 655 GWp (IESR, 2019), 2020's addition is still unexceptional.
- Residential solar still represents the largest share of users by segment, accounting for 84% of total rooftop solar users from all sectors (2,779 users as of October 2020). It must be noted that residential solar market appears to concentrate in major cities/ region, i.e., Jabodetabek, Banten, and West Java, due to availability of information and solar contractors, also lifestyle preferences.
- Procedure comprehension for grid-tied rooftop solar and the availability of bi-directional meter are still lacking in many PLN's regional offices. With increase in interests from different sectors, PLN's regional offices reported difficulties in processing the applications. Furthermore, the request for bi-directional meter can take much longer than the 15 work days stated in MEMR Reg. No. 49/2018. Several users noted that it can take somewhere between 3 to 6 months, depending on the region. PLN should be aware of this issue to improve practices and implementation of the regulation across Indonesia.

Residential rooftop solar installed capacity by region, 2020

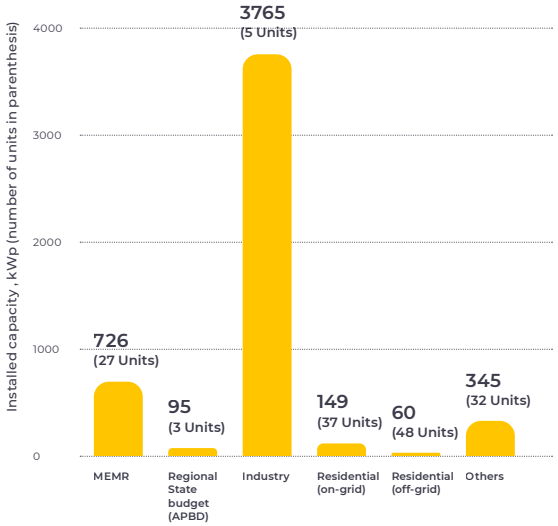


Notes: Until October 2020
Source: **PLN**

Central Java Solar Province Initiative: a year after

- September 2020 marks the first anniversary of Central Java's declaration to be the first solar province in Indonesia. By the same month, Central Java recorded a total of 5.1 MWp of new solar installed capacity with a total of 147 users, compared to only 155.2 kWp and 40 users in September 2019.
- The largest addition came from industrial sector, accounting for 73% (3.7 MWp) of the total installed capacity addition, with only 5 new projects. The largest contributor is Danone-AQUA's recent 2.91 MWp rooftop solar installation at its Klaten factory. The remaining number is spread across different sectors, including at the Dinas ESDM's buildings, provincial APBD projects, and residential sectors.
- Central Java Governor's Circular No. 671.25/0004468 played an important part in encouraging both private and public sectors to use rooftop solar.
  - In the public sector, following the release of the circular, 17 regional apparatus organization (*organisasi perangkat daerah*, "OPD") has planned to install rooftop solar at their buildings this year. The realization, however, has been hampered by budget reallocation due to COVID-19 pandemic.
  - The private sector also perceived the circular as a positive support from the local government. Several companies mentioned it as one of deciding factors for them to install rooftop solar.
- Dinas ESDM Jateng observed several challenges in accelerating rooftop solar adoption in the region, including low public awareness on clean energy, limited availability of solar contractors/installers in the region, and long waiting period for bi-directional meter replacement.

Central Java Solar Province Realization in 2020



Source: **Central Java's energy agency (*Dinas ESDM Jateng*)**

Progress of Electric Vehicles Adoption and EV Ecosystem Development

- Private Transportation
- Public Transportation
- Charging Infrastructure
- Supply Chain
- Manufacturing

image source : Unsplash

Electric vehicles fail to achieve 2020 target as current adoption rate is still very low

- According to Ministry of Transportation, there were 2,279 electric vehicles with SRUT (type test registration certification as roadworthy clearance) by September 2020. It is a 75% increase of the figures in 2019.
- In contrast to the targets set by MoI in 2020, electric cars managed to attain only 0.15% of the 150,000 units sales/ production target and electric two-wheelers reached a mere 0.26% of the 750,000 units sales/production target.
- Out of all registered EVs, electric two-wheelers make up most of the fleet with 1,947 units, followed by e-cars with 229 units. Additionally, there are also 100 electric 3-wheelers, most were already procured before the release of Presidential Regulation 55/2019, and 3 electric buses.
- Several public transport operators have introduced EVs in their fleet. A ride-hailing platform, Grab, currently operates 20 e-taxis, while BlueBird has already operated 30 e-taxis since last year. Electric two-wheelers are also promoted by Grab and Gojek, with more than 100 units are deployed. The electric two-wheelers are of mixed ownership with the OEMs, the units are available for rent to the drivers.
- Recently, there have been several partnerships between government and private sectors to promote EVs and build its charging infrastructure. These include commercial pilot project between Pertamina and Gojek targeted to commence in 2021; and collaboration between PLN, Hyundai, Wuling, Grab, and Gesits to deploy EVs along with its charging stations.

2020	**Status Quo**	**229** Units	**1,947** Units
2025	**Adoption Target** (By RUEN)	**2,200** Units	**2.1 M** Units
	Production Target (By MoI)	**400 K** Units	**1.76 M** Units

Source: **Ministry of Transportation (2020)**

Derivative regulations of Presidential Regulation No. 55/2019 are ill-favored

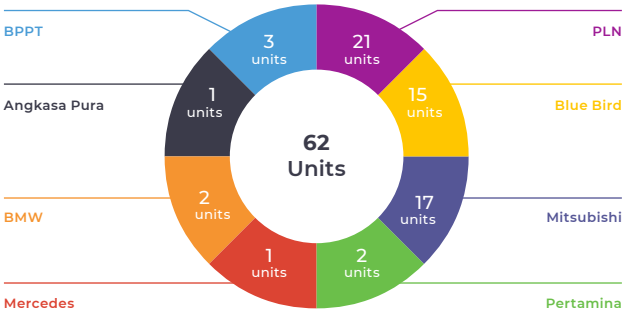
As a follow-up of Presidential Regulation No. 55/2019, several regulations were issued. Fiscal incentives are given, such as exemptions of luxury tax and vehicle title transfer fee in some cities. However, these are still insufficient to bring down EVs purchase prices to be more comparable with conventional vehicles. EVs demand will not increase without more attractive incentives.

MoHa Reg. No. 8/2020	MEMR Reg. No. 13/2020	MoT Reg. No. 65/2020	Governor of Jakarta Reg. No. 3/2020
• It sets basic calculation and cap for EV Vehicle Tax and Vehicle Transfer Fee in 2020 • It needs further implementing regulations from local governments	• It addresses charging plugs standardization, business schemes, incentives, and electricity tariff policy for charging and public transport operators	• It legalizes the conversion of conventional motorcycles to electric in public repair shop that is authorized by the government	• Battery electric vehicles are exempted from vehicle title transfer fee (BBNKB) • It is effective until 31 December 2024
Assessment			
More tax exemptions for VAT, income tax and import duty, are needed to slash EV prices down to around 10% above conventional vehicles prices of the same type to make it competitive	To draw more private investments, it is necessary to give financial incentives to lower battery charging and swap stations upfront costs, and to ease licensing process	Public awareness on the regulation and benefits is still limited. More campaigns and public messaging are essential	Attracting buyers requires more non-fiscal incentives (e.g. bus lane allowance, EV special zones) and financial incentives, such as free parking, free road toll, and others

A higher target of public charging development is needed to align with EV adoption targets

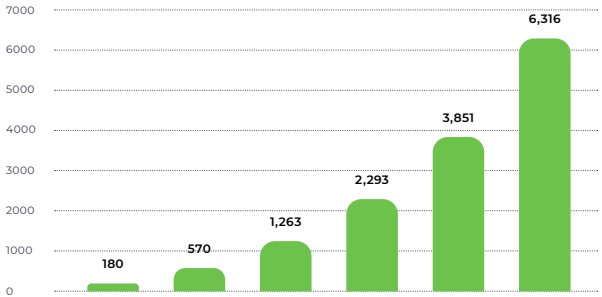
- Total number of charging stations installed is 62 units across Indonesia, of which 27 units are for public, and the rest are for private use.
- Most of them are provided by PLN as mandated by the Presidential Regulation No. 55/2019. Private chargers are mainly built by manufacturers and taxi operators in their own facilities.
- The number of public charging stations still falls short of the target set by PLN. Currently, it is only 15% of this year's target of 180 units.
- The target set by PLN in the public charging station roadmap (2020-2024) is not aligned with the targeted number of EVs in 2025, since planned charging stations will only cater 114,000 e-cars by then. The target from MoI aims for more than 400,000 e-cars in 2025, cumulatively.

Charging stations in operation



Source: **DJK, 2020**

Roadmap of public charging stations



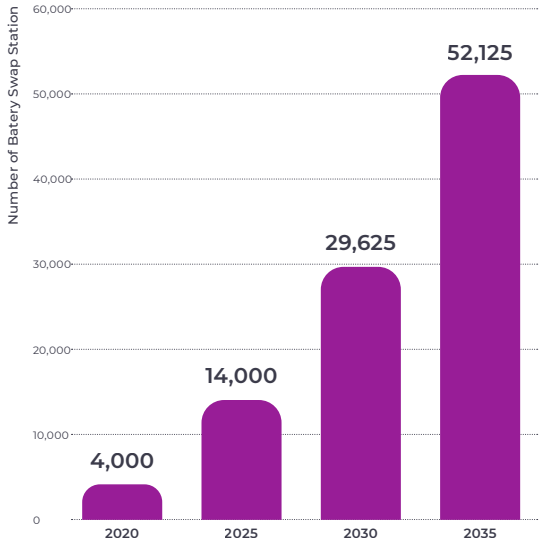
Source: **DJK, 2020**

- The IEA recommends a 1:10 ratio of public charging connections to EVs (IEA, 2018). In the early stage of EV adoption, it is important to maintain or improve that ratio.
- Several successful countries, such as Norway, US, and China, each has ratio of below 1:25 after EV market is more developed.
- Indonesia is still pale in comparison. IESR analysis on PLN's SPKLU roadmap and national EV adoption target shows a mismatch: the roadmap will only amount to a mere 1:70 ratio of public charging stations to EVs in 2025. That is more than 500,000 EVs to only 6,316 public charging stations.

Public battery swap stations are promoted to alleviate range anxiety among electric two-wheelers drivers

- The government officially commenced the operation of public EV battery exchange station (SPBKLU) in early November 2020, as an effort to accelerate the establishment of EV ecosystem.
- The operations of SPBKLU at three different locations in Jakarta were virtually launched by the Minister of Energy and Mineral Resources on November 3. MEMR collaborated with several entities, including ride-hailing platform, battery swap station operators, and manufacturers for the launching.
- In total, there are currently nine SPBKLU units: six SPBKLU units in South Jakarta City, one SPBKLU unit in Tangerang City, and two SPBKLU units in South Tangerang City.
- Roadmap of public battery swap stations developed by BPPT is already being used by PLN as the guide to develop battery swap stations across Indonesia.
- Referring to the roadmap, the current number of public battery swap stations is still far from the target. In 2020, the roadmap projects 4,000 battery swap stations installed and 14,000 stations in 2025.
- Contrary to the public charging stations roadmap, the roadmap for public battery swap stations is aligned with the government's electric two-wheelers adoption target in 2025, which expects an additional 2,000,000 electric two-wheelers on the road. However, the current pace of development needs to be accelerated to achieve the targets.

Roadmap of public battery swap stations



Source: **DJK, 2020**

Investments are still concentrated in raw materials for lithium-ion battery production, more needed throughout the entire EV supply chain

1. Raw Materials Extraction
2. Refining
3. Battery Manufacturing
4.
5.

- Two industrial estates in Indonesia are designated to facilitate battery-grade mineral processing and nickel production: Morowali Industrial Area (IMIP) in Morowali, Central Sulawesi and Weda Bay Industrial Area (IWIP) in Halmahera, North Maluku. Both locations are strategic for nickel production due to their abundance of nickel deposits, having a total of around 23% of global laterite nickel ore deposits (Van Der Ent et al., 2013). Several companies in both areas are to produce nickel sulphate and cobalt sulphate as inputs for battery cell production. Two companies in IMIP plan to start production in 2021, one company in IWIP aims for 2023.

	Located in Morowali Industrial Area (IMIP)		Located in Weda Bay Industrial Area (IWIP)
Companies	**PT QMB New Energy Materials** a JV between China (GEM Co.,Ltd. and Brunp Recycling Technology Co., Ltd., Tsingshan), Indonesia (PT IMIP), and Japan (Hanwa)	**PT Huayue Nickel Cobalt** a JV between five Chinese companies	**PT Halmahera Persada Lygend** a JV between Indonesian Harita Group and Chinese company Ningbo Lygend
Production	Nickel and cobalt compounds	Mixed Hydroxide Precipitate (MHP) to make nickel and cobalt compounds	Nickel and cobalt compounds
Annual Production Capacity	150 kilotons nickel sulphate, 20 kilotons cobalt sulphate, 30 kilotons manganese sulphate, and 50 kilotons nickel hydroxide	MHP containing 60 kilotons nickel and 7.8 kilotons cobalt	240 kilotons nickel sulphate, and 30 kilotons cobalt sulphate,
Total Investment	Around USD 1 billion	Around USD 1.2 billion	Around USD 1 billion

- There is a concern related to the waste disposal of PT QMB New Energy Materials and PT Huayue Nickel Cobalt as they plan to dump their tailings to the deep sea. The plan is being opposed due to its damaging potential to marine and coastal areas.
- A domestic company, PT International Chemical Industry, plans to start battery cells production of 256 MWh/year by early 2021. A consortium of SOEs, including MIND ID, Antam, Pertamina and PLN, is also being formed with a target to produce 33 GWh/year of battery cells.

The domestic production of electric two-wheelers is still limited, major automakers plan to produce electric cars in Indonesia

1.


2.


3.


4. EV Manufacturing


5.


- On the EV manufacturing side, there is still limited local production of electric two-wheelers. Local producers are still struggling as the overall demand is still low, thus hindering sales improvement. Several ride-hailing platforms have established cooperation with electric two-wheelers companies: Grab with Kymco, and Gojek with Gesits and Viar. More promotional projects and cooperation are needed to spread awareness of electric two-wheelers to the public.
- There are no domestic facility to produce electric cars as of now. Several plans for investments were made by several car companies. Two major companies, Hyundai (South Korea) and Toyota (Japan), have committed to invest approximately USD 2 billion and USD 2.8 billion, respectively, to build factories and do production in Indonesia. Hyundai plans to begin production in early 2022 and aims to sell 70,000 - 250,000 units of electric cars per year. Meanwhile, Toyota stated to start production within 5 years.
- To date, only PT MAB (Mobil Anak Bangsa) has started producing e-bus in Indonesia with annual production capacity of 100 units. The demand for e-buses almost entirely comes from the city of Jakarta, which plans to introduce e-buses into Transjakarta (BRT bus system in Jakarta) fleet. Other foreign e-bus manufacturers, such as BYD from China, are also vying to introduce their models for Transjakarta.

	Four Wheelers (or more)	Two or Three Wheelers
Local Producer	1 company	15 companies
Brand	MAB (e-bus)	Viar, Gesit, Selis, MIGO, United, Tomara, ECGO, Volta, Unify, Electro, Sunrace, Artas, Gelis, Benelli, Keeway, Kymco
Production Capacity	1,200 units/year	877,000 units/year

Source: **Source: Ministry of Industry, 2020**

The existing recycling facility of lithium-ion batteries is facing barriers to producing battery-grade materials

Battery Recycling

- Currently there is one battery recycling company in Indonesia, PT Indonesia Puqing Recycling Technology from China. The company already has recycling technology to yield up to 12,000 tons of nickel-cobalt-manganese hydroxide per year.
- The company has established a facility in Morowali, Central Sulawesi, and is ready to apply its technology to produce battery-grade materials through the recycling process of used batteries. However, there are existing barriers for this early stage development:
  - **Input materials are not sufficient:** the plant is designed to process 12,000 tons of spent lithium-ion batteries/year. However, Indonesia currently generates only 16.7% of that (2,000 tons/year). Therefore, the company has to import used batteries as additional inputs.
  - **Restrictions on the import of waste lithium-ion batteries:** all types of waste batteries are listed as hazardous wastes in Government Regulation No. 101/2014 on Hazardous Waste Management. Import of hazardous waste is prohibited as regulated in Law 32/2009 on Environmental Management.
- While still early, the recycling facility can spur the development of solution for the future environmental impacts of spent lithium-ion batteries. Battery recycling industry is needed to avoid negative impacts of spent batteries landfilling, such as fire hazards due to overheating , or soil and groundwater supplies contamination due to leaching of lithium or other metals.
- Moreover, the recycled materials can be used for new EV battery production, thus making the manufacturing process more cost-efficient. Battery recycling industry will yield positive environmental and economic impacts.

Different vehicle types, different challenges to address

Low public awareness: there are already different models and incentives for electric two-wheelers, yet the public has limited awareness on that. More promotions and campaigns on electric two-wheelers along with its benefits and incentives are crucial

High upfront cost: although produced locally, key components are still imported. Total price can be 30-35% higher than conventional motorcycles with similar features

Inadequate public charging infrastructure: with limited range of only 40-80 km/full charge, more public charging and battery swap stations are needed

Limited performance: current electric two-wheelers in Indonesia have top speed of around 70 km/h, compared to 100 km/h of similar conventional ones. A survey indicates that people are willing to pay 7-13% higher for electric two-wheelers with 10 km/h faster speed (Guerra, 2019)

Low public awareness: lack of promotion through social media and lack of demonstration/pilot projects

High upfront cost: e-cars are still exclusively imported. Even with current taxation scheme, at minimum, e-cars are still IDR 100 million pricier than conventional cars of the same type

Limited non-fiscal incentives: non-fiscal incentives prove to be crucial for EV adoption in other countries. Free parking, EV special zones creation, and ease of licensing could be key

Inadequate public charging infrastructure: range anxiety still dwells within consumers, particularly with current limited public charging stations

Limited supply: no local production, and there are limited availability of models in the market. Pressure from the supply side can be created through restrictive regulations, e.g. fuel economy standard and binding targets

No specific targets for large-scale deployment: there is no national targets for e-bus deployment, there are only scattered local initiatives

High cost of fleet and charging infrastructure: e-bus alone costs double the conventional bus, with charging infrastructure, it will cost even more. This is worsened by limited financing mechanisms in Indonesia

Lack of business model options: there is limited options of business models for bus operators, thus forcing them to shoulder huge financial risks

Slow licensing process: long and slow licensing processes for new e-buses is delaying the e-bus pilot projects commencement

Limited e-bus suppliers: there is limited e-bus suppliers active in Indonesian market, only 1 local company namely PT MAB and Chinese BYD that have supplied e-buses

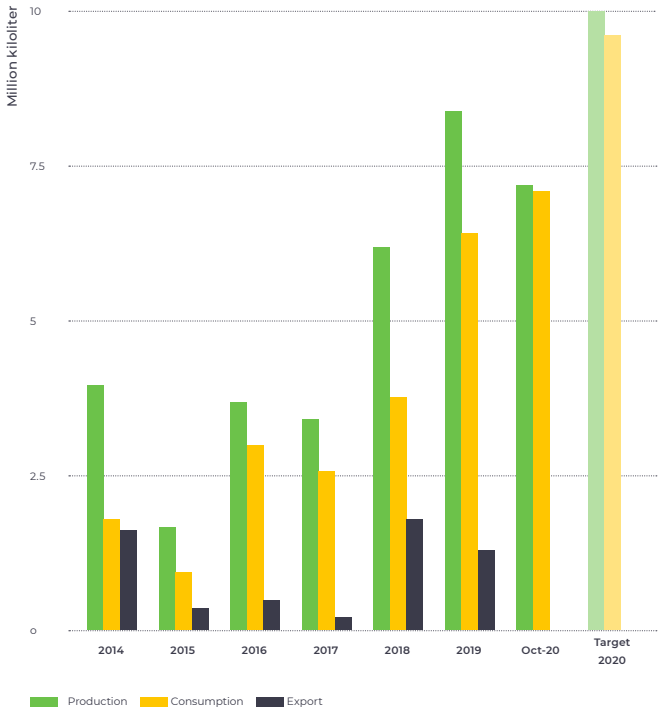
Progress in Clean Fuels

- Biofuel
- Green Diesel

image Source : Unsplash

The B30 program uplifted domestic biodiesel consumption although the pandemic slowed it down

Biodiesel production and consumption in 2014-2020



Source: **APROBI**

- The upgrading from B20 to B30 program is expected to increase biodiesel consumption to 9.6 million kiloliter this year. However, due to the pandemic, biodiesel consumption is expected to reach only 8.5 million kiloliters (Hasan & Hidayat, 2020), which indicates an increase of 2.1 million kiloliters from 2019. Biodiesel export has stopped this year. EU's policy to impose import duty on Indonesia's biodiesel, China's increasing biodiesel production capacity, and declining energy demand are the main reasons for the export drop.

- A total of 3.9 million kiloliters new FAME biodiesel plants were initially planned to be commissioned this year. However, there are some delays due to the pandemic, resulting only 4 new plants with 1.2 million kiloliters capacity have been commissioned this year. Another 5 plants with 2.7 million kiloliters capacity are targeted to be commissioned in 2021.

- The initial plan to expand the biodiesel blending to 40% in 2021 is now postponed to 2022 due to lack of available funding for subsidy. With the crude oil price decline, the financial support required for biodiesel program increases. MEMR is currently conducting test for B40 program, with 3 technology options: 40% FAME, 30% FAME + 10% DPME (upgraded FAME), and 30% FAME + 10% HVO (green diesel). The test result has not been released yet.

- There is still no production of bioethanol fuel in 2020 despite the target of 20% blending. This is the result of high production cost and lack of subsidy. Earlier this year, the government planned for an implementation of E2 (2% bioethanol blending in gasoline) in East Java, but it still has not been realized until the end of the year. There was not any incentive schemes and the discussion of this program was stopped due to the pandemic.

The implementation of new regulations aimed to mitigate the environmental and social risks of biofuels is far from optimal

- Palm oil industry, as the sole feedstock for Indonesian biodiesel, has long been criticized for its negative environmental and social implications. Within the past year only, there were several investigations exposing various damages, including labor rights violations (involving sexual abuse and child labor), forest conversion and burning, corruption, and fake permit (The Gecko Project, 2019; AP, 2020a, 2020b; BBC, 2020).

- The government has issued regulations in attempt to address these sustainability issues. Most recently, the government issued Presidential Regulation No. 44/2020 on Indonesia Sustainable Palm Oil certification in March 2020. It mandates all oil palm plantations to be ISPO certified, while previously biofuel suppliers are exempted. It also includes financial support for the certification of smallholders and inclusion of private and independent actors in the ISPO committee. As a follow-up, in November 2020, the Minister of Agriculture Regulation on ISPO implementation was issued.

- Since the establishment of ISPO in 2011, only 5.45 million hectares (33% of total plantation area) were certified, with 95% of those areas were corporate plantations. Meanwhile, 40% of the total plantation area were managed by the smallholders. The ISPO implementation so far is being questioned. Forest Watch Indonesia (2017) found that there were ISPO certified plantations still involved in deforestation and social conflicts. An upgrade of the ISPO principles are required to ensure its effectiveness.

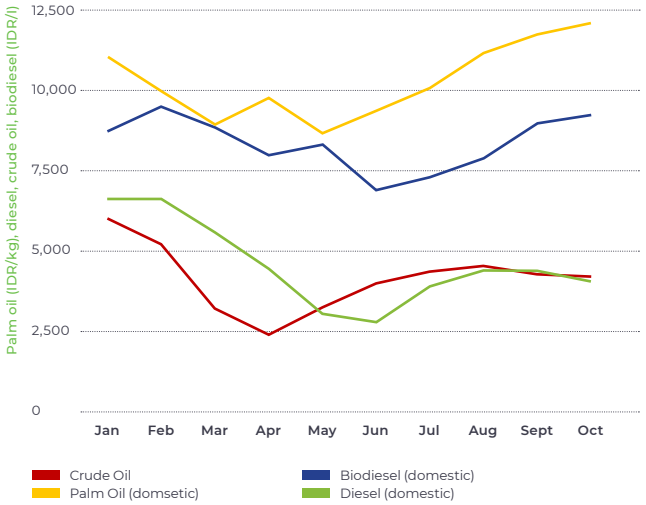
- As a part of palm oil moratorium, the government in 2019 released the consolidated number for land coverage of palm oil plantations at 16.38 million hectares, with 3.4 million hectares located in forest area. However, CSOs are still questioning the lack of data transparency, for example on the detailed data of the locations and permit status, including those in the forest area. From the local government, only one province and three regencies has adopted local level regulations, while other five provinces and six regencies stated their commitment to the moratorium (Sawit Watch et al., 2020).

- In its 2020-2024 Renstra, the government targets 17.4 billion liters of domestic biofuel consumption by 2024, equals to about 15 million ton CPO, double of the current level. The palm oil export is expected to reach 31.7 million ton in 2020. Therefore, further expansion of palm oil plantation is not necessary to fulfill the domestic biofuel demand. This would, however, diminish the palm oil export and consequently available fund for biodiesel incentive. If the CPO export is still pushed to collect revenue, the additional demand would require almost 3 million hectares, assuming similar land productivity as 2019.

The palm oil fund runs into deficit due to low oil price

- Due to the pandemic, in 2020 the oil price plummeted from USD 60/bbl in January to USD 20/bbl in April, then recovering to about USD 40/bbl in June. This lead to the widening price gap between biodiesel and petro diesel, and consequently increases the amount of subsidy required.
- BPDPKS estimated that until December 2020, they would collect IDR 17-18 trillion revenue from export levy, while disbursing IDR 25.7 trillion (Reuters, 2020). As the price gap widened, the government revised the biodiesel reference price formula, by lowering the conversion factor from USD 100/MT to USD 80/MT. This reduced the biodiesel price by approximately IDR 250/liter, or was equal to IDR 2.1 trillion of subsidy reduction.
- In June, the government raised the export levy of CPO to USD 55/ton at all CPO prices. In December, the export levy was further increased progressively, from USD 55/ton for CPO price below USD 670/ton up to USD 255/ton for CPO price above USD 995/ton.
- As part of economic recovery program and as a response of the pandemic, the government has allocated IDR 2.8 trillion from Indonesia's state budget to subsidize biodiesel through BPDPKS.

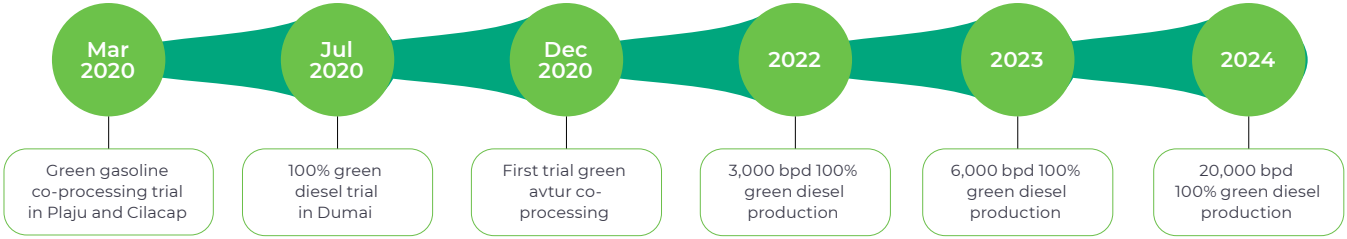
Crude oil, palm oil, and biodiesel price 2020



Source: **MEMR, World Bank**

- The World Bank projection expects crude oil price to only increase from USD 44/bbl in 2020 to USD 57/bbl by 2025, while CPO price will also increase from USD 723/MT in 2020 to USD 777/MT in 2025. Based on IESR's 2019 outlook, it is estimated that BPDPKS will run out of fund by 2027, assuming higher oil price and lower CPO price. With the updated crude oil and palm oil prices, our calculation shows that the fund depletion is potential to come as early as this year. Even with the new export levy scheme, there could be about IDR 12 trillion deficit in 2021, excluding the expenses for other programs such as replanting. This finding is similar to the estimation by Hasan & Hidayat (2020). The deficit might be avoided if CPO price averages USD 795/ton or crude oil price soars above USD 55/bbl this year.

Palm oil based drop-in biofuels are coming near despite high production costs and absence of regulation for its implementation



Source: **Pertamina**

- With the bioethanol program has been largely unsuccessful and biodiesel blending has reached quite a high ratio, the government appears to set palm oil based drop-in biofuels. This year, Pertamina has successfully conducted trial for green diesel production from pure palm oil feedstock (stand alone), instead of blended with crude oil (co-processing) as previously done in 2019. Earlier this year, Pertamina successfully conducted trials on co-processed green gasoline with 20% palm oil mixed with 80% crude oil, an improvement from the previous 15% ratio in 2019. Also, Pertamina plans to conduct the first trial for green avtur production (co-processing) by the end of 2020.

- The construction of a 20,000 bpd stand alone green diesel production facility is included as one of the priority projects in the RPJMN 2020-2024, targeting to start construction in 2022 and start producing in 2024. The estimated capital investment hits USD 650-850 million. In addition, Pertamina also plans to construct smaller 3,000 bpd and 6,000 bpd stand alone green diesel production facility in 2022 and 2023

.

- Government also seeks to revise the Permen 32/2008 on mandatory biofuel blending to accommodate the drop-in biofuels, as stated in the DGNREEC Strategic Plan. The current Permen only includes biodiesel, bioethanol, and pure vegetable oil, without clear targets for drop-in biofuels (green diesel and green gasoline).

- Despite the optimism, many studies and global experiences showed that production of the green diesel costs was higher than biodiesel. The government estimated that the selling price of green diesel could reach IDR 14,000, compared to about IDR 7,000-9,000 for biodiesel. Thus, the government might end up putting more money to subsidize the green diesel.

04

Indonesia's Energy Transition Assessment

image source : Unsplash

The power sector is the low hanging fruit in the Indonesian energy transition

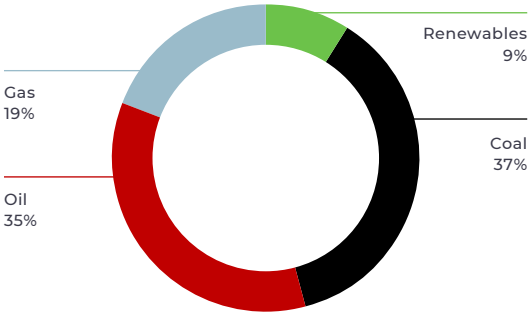
- Indonesia's energy system remains dominated by fossil fuels, reaching 91% in 2019 (exclude biomass). The power, transportation, and industrial sectors are the key sectors to undergo transformation and move away from fossil fuels to low carbon alternatives such as renewable energy.

- The decarbonization of the energy system is required to avoid catastrophic impacts of climate change while fostering a sustainable economic growth. Furthermore, deflationary costs of solar and wind power, have provided economical options for substituting fossil fuels in the energy system, especially in the power sector. Therefore, the opportunity exists and the power sector could be seen as the first step to kickstart the energy transition.

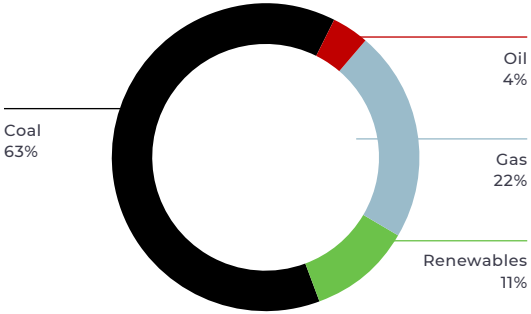
- In Indonesia, the power sector transition process has yet to begun as the renewable share in the electricity mix remains stagnant and the rapid deployment of renewables have been hindered by many challenges, especially those related with bankability issues, e.g. unfavorable tariff pricing and unbalanced risk allocation for IPPs. It is unfortunate given the massive potential of renewable energy in Indonesia and the benefit it can provide socially and economically compared to fossil fuel alternatives (e.g. green jobs, improvement in health and the environment). Identifying and addressing the challenges in the Indonesian power sector transition is therefore a must for a more sustainable growth.

- The power sector transition readiness framework is built upon our understanding of the key challenges of the Indonesian energy transition. We have also adapted some indicators from some literatures to highlight and assess these challenges better. The assessment is conducted through multiple methods including, survey, interview, direct and indirect assessment of certain documents or policies. The framework would be used to monitor the year-on-year progress of Indonesia to tackle the barriers and enable the energy transition in the country's power sector.

Primary Energy Supply 2019



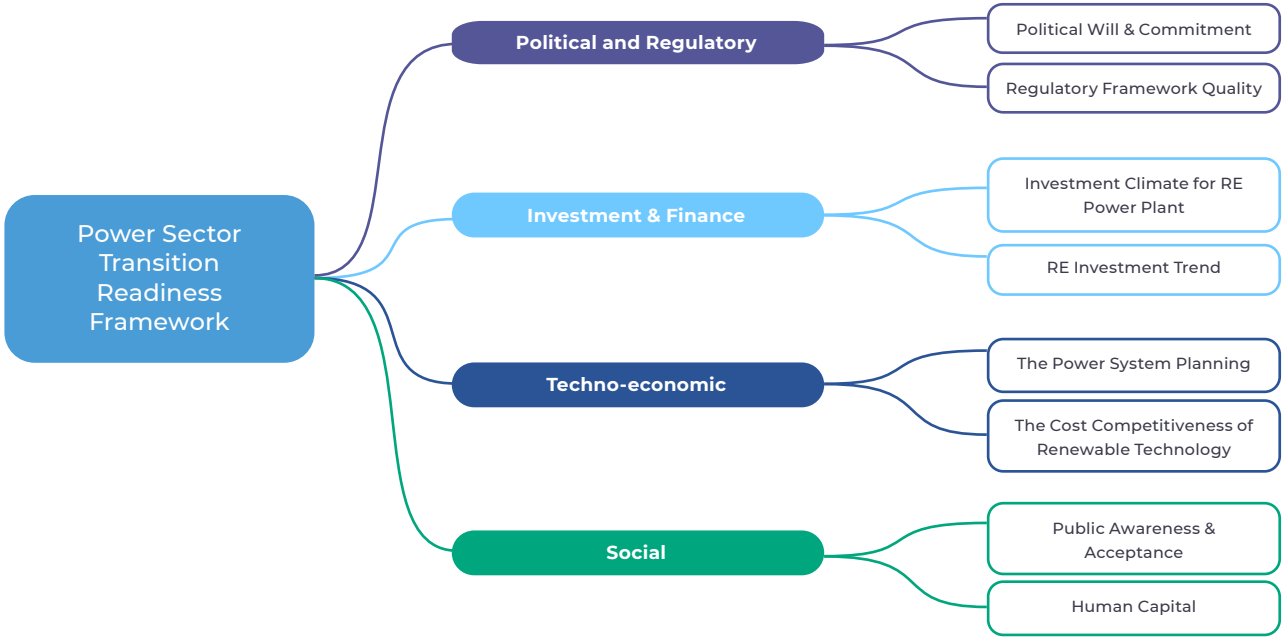
Electricity Generation Mix 2019



Source: **HEESI, 2020**

IESR's Transition Readiness Framework (TRF) as a tool to track the transition readiness of the Indonesian power sector

This year, we assess how Indonesia is doing in terms of its energy transition readiness **starting in the power sector,** using our Transition Readiness Framework (TRF), which is built upon our understanding of the key imperatives on the energy transition.



IESR's TRF aims at measuring and tracking the power sector readiness to a low-carbon energy sources in Indonesia. TRF might evolve depending on the rise of substantial aspects to be covered in order to enable the power sector transition in Indonesia

TRF: Indonesia's power sector is not ready for the low-carbon transition

Dimension	POLITICAL AND REGULATORY					TECHNO-ECONOMIC	
Variable	**Political Will & Commitment**			**Regulatory framework quality**		**Power System Planning**	**Cost competitiveness of renewable technology**
Ideal Condition	Current key policy target is sufficient to decarbonize power sector and limit global warming below 1.5 C	The amount of public finance allocated for achieving climate target and energy transition is sufficient and used effectively	The President and all government officials often use energy transition narrative, including narrative of high RE integration and coal phase-out	The regulatory framework in the power sector is stable and able to attract investment	Other related regulations (e.g. regulations of air quality, energy efficiency, EV, and rural electrification) are in line with efforts to decarbonize the power sector	Planned RE capacity is higher than planned fossil capacity, power system planning and grid codes allow flexibility and higher integration of RE into the grid	RE developers are able to use the most competitive RE technologies in their projects. Most of the technologies are locally produced.
Rating	Low	Low	Low	Low	Low	Low	Low
Least Ideal Condition	Current key policy target is insufficient to decarbonize power sector and limit global warming below 2 C	The amount of public finance allocated for achieving climate target and energy transition is insufficient	Energy transition narrative, including high RE integration and coal phase-out commitment, is never used by the government	The regulatory framework in the power sector is constanly changing and viewed by stakeholders as a barrier	Other related regulations (e.g. air quality, energy efficiency, EV and rural electrification) are not in line with efforts to decarbonize the power sector	Planned RE capacity is lower than planned fossil capacity, power system planning and grid codes prevent flexibility and higher integration of RE into the grid	RE developers are unable to use the most competitive RE technologies in their projects.

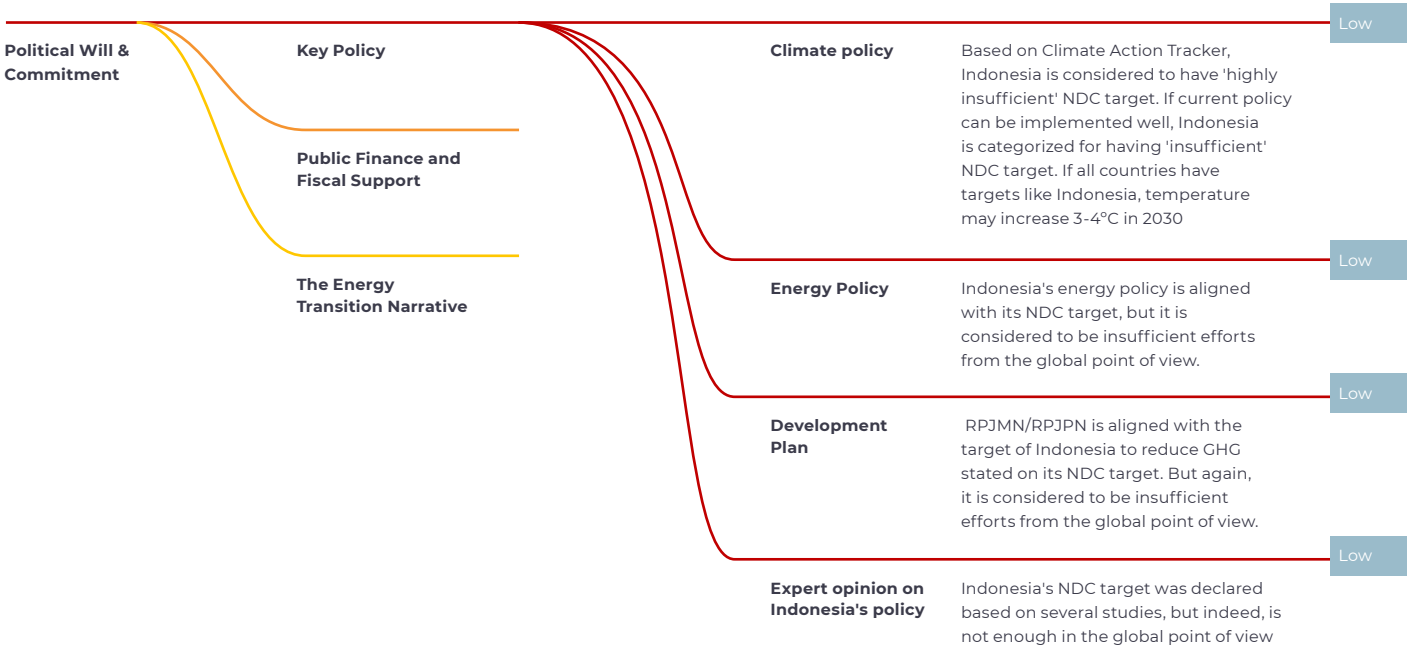
Dimension	INVESTMENT FINANCE				SOCIAL	
Variable	**Investment Climate for Renewable Energy Power Plant**			**Renewable Energy Investment Trend**	**Public awareness & acceptance***	**Human capital**
Ideal Condition	Country risk premium is low and instruments to derisk investment in RE power projects are available	Investment freedom index is high and new RE project permit/license project is streamlined	The ease of getting credit is high and local banks provide capital with attractive interest rates for renewable energy projects	Investment level is sufficient to support power sector decarbonization and achieve the Paris Agreement target	Public sentiment towards renewable energy is positive	Integration of green skills development into government programs
Rating	Medium	Low	Medium	Low	N/A	Low
Least Ideal Condition	Country risk premium is high and instruments to derisk investment in RE power projects are unavailable	Investment freedom index is low and permit process is considered as a barrier to RE development	The ease of getting credit is high and local banks provide capital with unattractive interest rates for renewable energy projects	Investment level is insufficient to support power sector decarbonization and achieve the Paris Agreement target	Public sentiment towards renewable energy is negative	The government has no specific strategy for green skills development

The variable marked with *
is not assessed for year 2020

Remarks on rating:

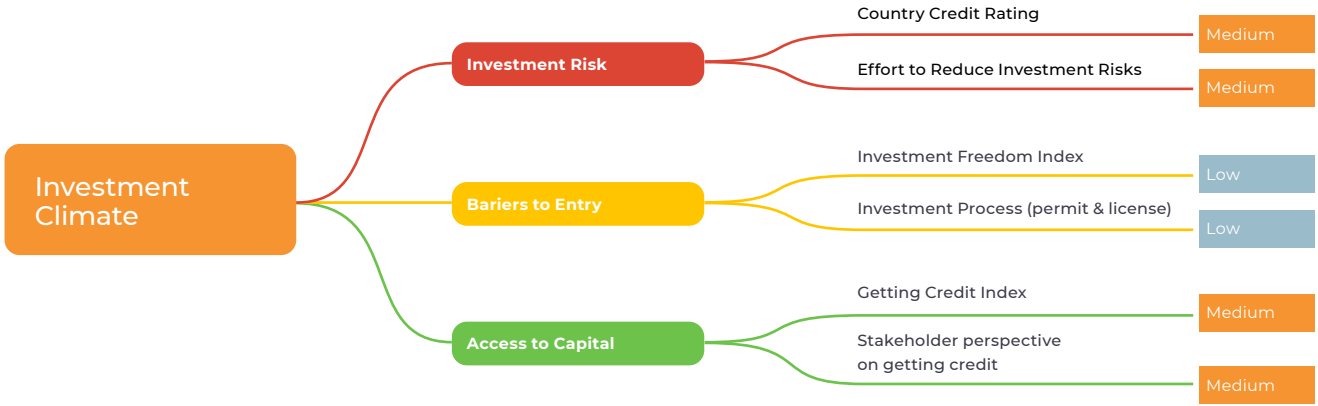
Low	The current status is close to the least ideal condition
Medium	The current status is in between the two conditions or neither of the two conditions
High	The current status is close to the ideal condition

Indonesia needs to substantially increase its climate ambition



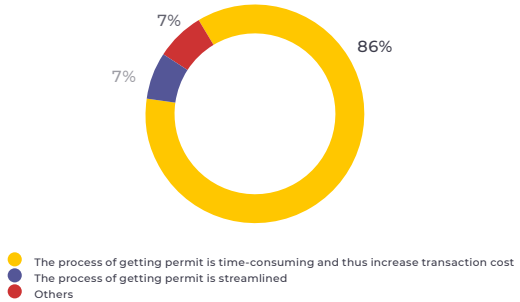
- Our assessment and interviews with stakeholders reveal that current policy target is insufficient to meet climate goals. The current target was built upon studies conducted in the past that may not reflect latest trends anymore. Therefore, it is important for the government to conduct new studies that can help readjust assumptions used to set new, more ambitious climate targets.

To improve the investment climate, more focus should be put on reducing barriers to investment



- Indonesia investment freedom index is categorized between “mostly unfree” and “repressed” according to the heritage foundation index of investment freedom. There is room for improvement to reduce the hurdles for foreign investors to make an investment in Indonesia.
- The process of getting permits and licenses for renewable energy projects still needs to be eased. As much as 86% the RE developers surveyed claim that the permit process is time-consuming and increases overall transaction costs.

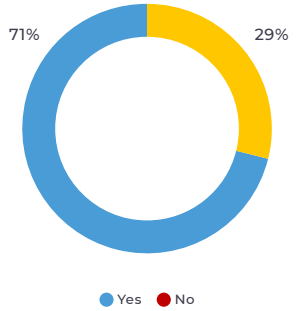
How do you view the bureaucracy process in getting permits for RE deployment?



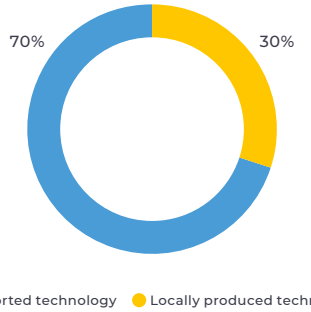
Local renewable technologies are still out of the picture

- From 14 RE developers surveyed, around 71% agreed that they can use most competitive technology available in the market for their Indonesian projects. However, 70% of them use imported technologies instead of local products.
- According to IRENA, purchase prices of utility-scale solar PV modules and inverters in Indonesia are USD 410.3 per kW and USD 31.3 per kW respectively. The solar module price is 15% higher than the average module price in 19 other countries (USD 357 per kW) and about 35% more expensive than the cheapest modules price in India (USD 277 per kW) or China (USD 266 per kW). Inverter prices in Indonesia, however, are 50% lower than the average prices in those countries.
- Higher PV module prices are likely due to local content requirements imposed in Indonesia. Local modules are less competitive than international prices since they lack economies of scale. According to data from MoI, there are 12 local solar module manufacturers with a total production capacity of 620 MWp per year. However, given the relatively small market, actual module production is only about 30% of the total production capacity.

Do you think you are able to use RE technology with the most competitive cost in your projects in Indonesia?



What technology do you use?



05

2021 Outlook

image source : Unsplash

Coal Sector Outlook

- Coal export is likely to rebound following the global economic recovery but not to the level of demand in 2019. The export demand would be driven by the increase demand from China with their policy of restricting import of Australian coal and prioritising coal from Indonesia, Russia, and Mongolia. The domestic coal consumption in the power sector would increase as there are additional coal power capacity in 2020. However, if Indonesia's coal production target remains as high as of 2019 while IEA predicts that global coal demand is projected to remain below 2019 level, it would potentially prolong the oversupply condition and the low coal sale price in 2021. In addition, the final investment decisions for global coal power plant continued to decline and only reached a little above 10 GW by the first half of 2020 (IEA, 2020b). Therefore, future investment on coal looks dim and it would be better for Indonesia to limit its coal production level and review coal power plant capacity planned under its 35 GW program.

- The government would go forward with coal downstream industry development, as it has been supported through the revision of Mineral and Coal Mining Law as well as Job Creation Law. Moreover, nine incentives being discussed by three different ministries to support the industry has given the signal for Indonesia's coal companies to move forward with the plan. However, as more financial institutions back-off from coal, international fundings for coal downstream industry would be limited and costly.

- **The coal downstream industry development should be reconsidered by assessing the potential lock-in of both infrastructure and carbon emission; potential fiscal burden and subsidies in the future.** The alternatives to coal downstream industry development should be pursued and linked with renewable energy deployment to support RUEN target of 23% renewable energy mix by 2025. One example is assessing the potential of substituting LPG import with rapid deployment of electric stoves coupled with increase of renewable share in power sector; instead of coal to DME.

- The global coal demand has peaked at 2013 and will continue to decline in the future. Therefore, as a major coal producing country, Indonesia should start to prepare for the transition away from coal. Since **the coal producing regions will be severely impacted by coal decline, local government in the region should consider to diversify its local economy and support alternative sector development.**

If Indonesia's coal production target remains as high as of 2019 while IEA predicts that global coal demand is projected to remain below 2019 level, it would potentially prolong the oversupply condition and the low coal sale price in 2021.

Oil & Gas Sector Outlook

- Based on the trend, Indonesia's oil and gas production has continued to decline in the past few years. With global demand and oil price slowly rising, the gap in oil trade balance is expected to widen again in 2021. As for gas, it is projected that there will be additional production through two national strategic programs that will be onstream at the end of 2021, namely Jambaran Tiung Biru (JTB) and Tangguh Train III.

- Efforts to reduce imports of crude oil, fuel oil, and LPG are planned through various transportation and cooking fuel diversification programs. The programs include increasing the use of biodiesel for transportation fuel and the use of electric stoves in 2021. There is also intention to replace LPG with the coal downstream industry product (coal to DME), but it would still take years to be realized. Thus, short term measures should be taken to limit the rise in oil consumption. Subsidy reform for gasoline and LPG could be an option, as it has been discussed for years. Additionally, accelerating electric two-wheelers penetration is a feasible option to limit oil consumption in the medium term.

- The low gas price set by the government in 2020 would potentially increase the share of domestic gas consumption in 2021, particularly from the industrial sector. However, the expected net-benefit for national revenue will not be achieved if there are underperforming industries.

- **Investment target in the upstream oil and gas industry will be increasingly difficult to obtain.** Global oil and gas companies likely will not significantly improve their capital expenditure budget in 2021. Thus, the competition for this limited investment capital at the global level will increase. In addition, uncertainty in domestic oil demand can lessen investors' interests.

- Private oil and gas companies in Indonesia with their large capital could take the lead to continue investing in renewable energy, as several announced investment plans have been made. The upcoming presidential regulation on RE tariffs could play an important role to fasten the pace.

With global demand and oil price slowly rising, the gap in oil trade balance is expected to widen again in 2021.

Energy Efficiency Outlook

- The number of green buildings will continue to grow in 2021 despite limited to no incentives from local governments to building owners implemented the green building concepts. At minimum, Indonesia will see the realization of new green buildings supported by IFC. The financial institution, together with the Green Building Council Indonesia, targets to certify at least 20% of new construction projects as green buildings in 2021, translating into 1.2 million metric tons of annual greenhouse gas emission reduction and $200 million of annual saving (Palmer, n.d.).

- It is still uncertain if the much-expected revision of Government Regulation No. 70/2009 on Energy Conservation will be issued this year considering that in 2019, the government also made a promise to release the revision in 2020 (IESR, 2019). However, if issued by mid 2021 as promised, the impact of the regulation on energy efficiency improvement would only be seen in 2022, when all new targets of energy consumer in the industrial, transportation, and power sectors (with energy consumption larger or equal to 4000 TOE per year) and in the building sector (with energy consumption larger or equal to 500 TOE per year) will have participated in the energy management program and reported the program outputs to POME.

- Overall, compared to renewable energy, energy efficiency still lacks support from the government. This is largely due to conflicting interests of increasing energy consumption and improving energy efficiency. Current electricity oversupply also contributes to the stagnation of energy efficiency efforts in the country. As reserve margin is projected to keep rising until 2025, energy efficiency will not easily get off the ground.

- Target to increase the adoption of induction stoves by 1 million by 2021 will become the first initiative that serve both interests - increasing electricity consumption while improving overall energy efficiency. Furthermore, the initiative is also aimed at reducing the huge burden of state budget due to LPG imports. However, the implementation of this initiative is predicted to be challenging, considering that induction stoves are relatively more expensive than gas stoves. They also require large amount of electricity, which means only houses with power capacity of 2200 VA or higher can use them.

The number of green buildings will continue to grow in 2021 despite limited to no incentives from local governments to building owners implemented the green building concepts.

RE in the Power Sector Outlook

- Continued impact of COVID-19 pandemic is likely to lower electricity demand this year. It is projected that demand growth for the next several years are lower than average growth in the past five years, ranging 4–4.5% per annum. **MEMR's DGE recently indicated that the total planned additional capacity (2021-2030) would be 15.5 GW lower—where 0.5 GW reduction are from renewables—than 56.4 GW planned in RUPTL 2019-2028** (Umah, 2021).

- **Current high reserve margin of PLN** affects the prospect of renewables capacity addition in Indonesia. **The continuation of the pandemic** that slows down electricity growth, **coupled with more thermal power plants that are entering commercial operation this year could hamper renewable energy uptake into the power system,** particularly in Java-Bali and Sumatra.

- New renewables capacity addition will remain below the required RUEN's target. IESR analysis shows that annual renewables capacity addition need to be around 2 to 3 GW until 2025 to achieve RUEN's target. However, IESR also predicts that new capacity addition will only be around 400-500 MW this year. Several expected capacity additions are projects that were supposed to reach commercial operation last year, primarily from geothermal and hydropower projects. Additionally, capacity additions from industrial rooftop solar and non-PLN projects are also to be expected.

- The key factors that could increase the renewable energy uptake are the improvement of the regulatory framework's quality, attractive renewables pricing, increased number of bankable projects, grid readiness to integrate large scale VRE and the transparency of PLN's procurement process.

- Renewables projects in Indonesia is often procured using a standalone, one-off auction, by means of traditional RFP by PLN. This is usually lacking in scale, stemming from the lack of commitment in the power system planning, hence failure to capitalize on the renewable energy economies of scale. Therefore, **PLN can start implementing large bundled RE auctions to procure renewables, as it has been proven effective to acquire low cost VRE.** More importantly, the government and PLN should plan a clear RE auctions schedule annually to send the right signal for long term investments opportunity.

IESR analysis shows that annual renewables capacity addition need to be around 2 to 3 GW until 2025 to achieve RUEN's target. However, IESR also predicts that new capacity addition will only be around 400-500 MW this year.

Solar PV Outlook

- The outlook for solar PV looks bright this year given the increasing customers' interest to install rooftop solar PV and government's ambition to accelerate solar adoption. In terms of capacity addition, rooftop solar is projected to have higher growth compared to utility-scale solar, since power supply adjustment by PLN means auctions are temporarily suspended. Even if the presidential regulation on RE tariff purchase is released in early 2021, the implementation and impacts will not be immediately evident.

- New developments for utility-scale solar, both ground-mounted PV and floating PV, are to be expected. However, given the power supply adjustments due to COVID-19, it remains uncertain whether PLN will hold any auctions later this year. According to PLN's list of procurement released in October 2020, PLN was planning to procure a total of six ground-mounted solar PV projects: two projects totaling 15 MWac with expected COD in 2021, three separate 50 MWac in West Java, Central Java, and East Java (expected COD in 2023), and a total of 155 MWac solar + storage project to replace old diesel generators in 200 locations.

- **Industrial segment will continue to be the main contributor to rooftop solar capacity addition in 2021, owing to the availability of financing scheme and economies of scale.** Residential segment is also expected to grow as more EPCs now market their products through various channels and also provide financing schemes for potential consumers. **Another good news is the government plans to evaluate the net metering policy: revising current tariff of 1:0.65 to 1:1.** The revision and improved process for net metering request could further boost the demand for residential solar, and should be supported by more distributed dissemination of information.

- Government's plan to develop massive rooftop solar program "Surya Nusantara", aiming to divert part of electricity subsidy of PLN's residential consumers (450 VA and subsidized 900 VA) with rooftop solar, could significantly boost capacity addition from the residential segment and in extension for RUEN target—if implemented this year. Additionally, **as local governments encourage centralized ground-mounted solar PV mini-grids for rural electrification, there is a growth prospect for off-grid installations.**

Rooftop solar is projected to have higher growth compared to utility-scale solar, since power supply adjustment by PLN means auctions are temporarily suspended.

EV Outlook

- As more fiscal and non-fiscal incentives are available for producers and consumers and more type of EVs available in the market, it is projected that the number of EVs will grow with a rate higher than last year. Most of the adoption is foreseen to occur in Jakarta and Bali due to the availability of local fiscal incentives, such as Vehicle Title Transfer Fee (BBNKB) discount or exemption, and non-fiscal incentives, such as free and/or dedicated parking and odd/even lane access. For two wheelers, there will be an increase in electric two-wheelers production and sales as more pilot projects involving the government, ride-hailing companies, taxi companies, and EV producers are commenced in 2021.

- **The government needs to focus on pushing electric two-wheelers first, since they have lower price gap with conventional motorcycles compared to cars. Financial incentives, such as VAT and registration taxes exemptions and/or direct subsidies, should be given to electric two-wheelers to make it competitive with their conventional counterparts.** A stronger signal to shift to electric two-wheelers can be attained through restriction of operational or sales of conventional motorcycles in cities.

- The number of electric cars are also expected to increase in 2021, as the government already planned to conduct public procurement of electric cars for ministerial official vehicles, starting with Ministry of Transportation as well as local governments. Furthermore, with the luxury tax exemption becomes officially valid after October 2021, electric cars adoption rate is projected to increase more significantly later in the year.

- With lower-cost electric car models, such as Hyundai Kona (~ IDR 650 million) and Hyundai Ioniq (~ IDR 620 million), are now readily available in the Indonesian market, electric cars are no longer exclusive to the upper class segment. It opens the door to upper middle class market. However, with competition from cheaper conventional vehicles, at minimum 18% lower in price in the same type of vehicle, the number of consumers will still be limited to early adopters and innovators. To actually tap the potential market, the government needs to give more supports: tax exemptions (especially VAT and import duties), adequate charging infrastructure, and more pilot and/or demonstration projects to increase public awareness.

It is projected that the number of EVs will grow with a rate higher than last year. Most of the adoption is foreseen to occur in Jakarta and Bali due to the availability of local fiscal and non-fiscal incentives.

- More charging infrastructure will likely be deployed in 2021, especially SPBKLU, as the government planned to have more than 4,000 units installed this year. Since the launching of first SPBKLUs last November, several private developers show interests to join the bandwagon. A major commitment is announced by OYIKA, a Singapore venture backed battery sharing company, expecting to install 1,000 units around Jakarta. To spur growth, the government should provide incentives for public charging infrastructure development, such as subsidies and low-interest loan to private sectors, as to make the investment more attractive.

- Several homegrown EV technologies, e.g. electric motor, controller, battery management system, and battery packs, have been developed for electric two-wheelers and cars. Institut Teknologi Sepuluh Nopember (ITS) managed to produce batteries for electric two-wheelers and electric cars with capacities of 1-3 kWh and 18-30 kWh, respectively (Wikarta, 2021). In 2021, apart from continuing R&D for those technologies, it is expected that several tests for commercialization with local industry partners would be performed. This effort should be prioritized for electric two-wheelers. When the battery technology and supply chain for electric two-wheelers are developed, scale-up is then more feasible for electric cars development.

- **Going forward, mass production of homegrown EV technologies are planned according to EV Core Components R&D Roadmap** (2019-2024) (Purwadi, A. 2020). However, it requires strong commitment from the government to bring in industry partners and investors to start commercialization. The government can provide fiscal incentives and direct funding for local manufacturers to give competitive advantage over foreign companies.

- It is also expected that more investments in the industry and supply chain development of EV and battery will flow this year; as more incentives are given to both producers and consumers, also with EV ecosystem slowly being built. **With more foreign companies entering Indonesia, the government should capitalize on the opportunity by ensuring technology transfer in international collaborations.** This is a crucial step to build domestic capability and to grow local EV industry.

Clean Fuels Outlook

- Increase in biodiesel blending rate in 2021 is unlikely, despite the expectation from the president and some government officials to start B40 this year. It is mainly due to the increasing cost gap between biodiesel and petro diesel, even if it is technically feasible to increase blending rate to B40. Moreover, **without alternative funding source for biodiesel program, there is a possibility that the B30 implementation this year will be hampered.** However, this might later change depending on the volatility of oil price, which is currently very uncertain.

- Various predictions estimate that IDR 37-54 trillion is needed to subsidize the B30 program, and the revenue from palm export levy might not be sufficient to cover that amount. An upgrade to B40 would obviously further increase the required subsidy if the gap between oil price and CPO price widen. BPDPKS expects to receive about IDR 36 trillion from export levy under moderate CPO price scenario.

- The MEMR decree allocates 9.2 million kiloliters biodiesel for domestic consumption in 2021. This will allow some export capacity, especially with the recent additional 1.2 million kiloliter production capacity (and another 2.7 million kiloliter expected in 2021) on top of the existing 12 million kiloliter production capacity. However, the export market is potentially less-prospective compared to 2018-2019; as China, a major export destination, has also increased their domestic biodiesel production capacity.

- **Government needs to find alternative ways to close the price gap of fossil fuel and biofuel.** Introducing special levy for petroleum fuel sales and using it to subsidize biofuel could be considered. During very low crude oil price, an additional levy will not increase fuel price, thus might prompt neutral public reception. However, this type of policy needs to be justified with improved transparency and sustainable practices of biofuel production. On the other hand, to buffer CPO price fluctuation, the government should consider to impose a domestic market obligation/DMO with a capped price (similar to coal sector) or with fixed price based on production cost and profit margin. It also should be noted that a DMO could pose as burden the CPO producers, especially the smallholders.

- The presidential regulation and ministerial regulation on ISPO need to be enforced and monitored closely. Following the ministerial regulation, government should issue written warning to palm oil companies without ISPO certification and allow a six-months period for them to be certified before their businesses are temporarily halted, followed by another six-months period before evoking their business license.

Increase in biodiesel blending rate in 2021 is unlikely due to the increasing cost gap between biodiesel and petroleum diesel.

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Appendix A - Energy Transition Readiness Framework (1)

No.	Dimension(s)	Variable(s)	Indicator(s)	Key point(s) to asses indicator	Means of Assesment	Data Source	Rating Guidance	
							Low	High
1	**Political and regulatory**	**Political will/ commitment** on decarbonizing the power sector	**Key policy documents** clearly stated the target to transition the energy/power system towards a low-carbon energy/ power system that is aligned with the Paris Agreement	**1. NDC target** (also whether Indonesia has a **net-zero carbon target**) **2.** KEN/RUEN **3.** RPJMN/RPJPN	**1.** Secondary data assesment **2.** Own assesment **3.** Stakeholder perspective through Interview	Climate Action Tracker (for NDC) KEN/RUEN RPJP/RPJMN Interview results assesment	Current key policy target is insufficient to decarbonize power sector and limit global warming below 2 C	Current key policy target is sufficient to decarbonize power sector and limit global warming below 1.5 C
			The government provides **financial and fiscal support** for power system transition/decarbonization	**1.** Amount & percentage of public finance allocated for supporting the climate change and energy transition **2.** Effectiveness/ impact of fund	**1.** Own assesment **2.** RE developers survey	APBN kita MEMR current budget & Renstra budget PMN for PLN's clean energy development	The amount of public finance allocated for achieving climate target and energy transition is insufficient	The amount of public finance allocated for achieving climate target and energy transition is sufficient and used effectively
			The government a**dopts energy transition narrative** which include **high RE integration and coal phase-out** commitment	**1.** Level of political actors adopting the energy transition narrative in public statement **2.** How the political actors define the energy transition	**1.** Media analysis for goverment officials statement	Press release from related ministries	Energy transition narrative, including high RE integration and coal phase-out commitment, is never used by the government	The President and all government officials often use energy transition narrative, including narrative of high RE integration and coal phase-out
		Regulatory framework quality	The existing **regulatory** framework support has **accelerated RE** deployment	**1.** The frequency and significancy of changes in the power sector regulation **2.** Attractiveness of regulatory framework for RE deployment **3.** Regulatory framework for creating RE demand	**1.** Own assesment **2.** RE developers survey	Own assesment Survey results assesment	The regulatory framework in the power sector is constanly changing and viewed by stakeholders as a barrier	The regulatory framework in the power sector is stable and able to attract investment
			There is **consistency between different government bodies** regulations **related to the power system**	**1.** Air quality regulations **2.** Energy efficiency regulation **3.** EV regulation **4.** Rural Electrification	**1.** Own assesment **2.** RE developers survey	Own assesment Survey results assesment	Other related regulations (e.g. air quality, energy efficiency, EV and rural electrification) are not in line with efforts to decarbonize the power sector	Other related regulations (e.g. regulations of air quality, energy efficiency, EV, and rural electrification) are in line with efforts to decarbonize the power sector
2	**Investment and finance**	**Investment climate for RE power plant**	**Investment risk**	**1.** Country credit ratings and risk premium **2.** Availability of derisking instruments	**1.** Secondary data assesment **2.** Stakeholder perspective through Interview (specific on currency risks, off taker risk, resource risk) **3.** RE developers survey	S&P, Fitch, Moody's, PWC country risk premia Survey results assesment	Country risk premium is high and there are no instrument to derisk RE power plant investment	Country risk premium is low and there are instrument to derisk RE power plant investment

Note: **Detailed methodology will be released on a technical note**

Appendix A - Energy Transition Readiness Framework (2)

No.	Dimension(s)	Variable(s)	Indicator(s)	Key point(s) to asses indicator	Means of Assesment	Data Source	Rating Guidance	
							Low	High
			Barriers to entry	**1.** Investment freedom **2.** Streamlined investment process for RE	**1.** Secondary data assesment **2.** RE developers survey	Investment freedom index (heritage foundation) Survey results assesment	Investment freedom index is low and permit process is considered a barrier for RE project implementation	Investment freedom index is high and new RE project permit/license project is streamlined
			Access to capital	**1.** Getting credit index **2.** Developer perspective of getting credit	**1.** Secondary data assesment **2.** RE developers survey	Getting Credit parameter from WB Ease of doing business Survey results assesment	The strength of credit system is low and not effective and local banks does not provide capital for renewable energy projects	The strength of credit system is high and effective and local banks can provide capital with attractive interest rate for renewable energy projects
		RE investment trend	The sufficiency of **RE and EE investments**	**1.** Total investment level in RE and EE	**1.** Secondary data assesment	EBTKE report	Investment level miss the set government target	Investment level is sufficient to support power sector decarbonization and achieve the Paris Agreement target
3	**Techno-economic**	**Power System Planning**	The **power system planning** with high RE integration	**1.** Planned installed capacity of RE vs FF plants **2.** Power system planning (power plant and transmission system) with flexible load and generation **3.** Updated grid code and must run status for RE power plants	**1.** Secondary data assesment **2.** Stakeholder perspective through Interview **3.** Own assesment on the existing grid code	RUPTL RUKN Interview results assesment Grid code regulation	Lower planned RE installed capcaity than FF and RE integration is not supported by grid code nor the planning processs	Higher planned RE installed capacity supported effectively by grid code and planning process
		The economic of renewable	Cost **competitiveness** of renewable technology	**1.** Technology purchase price **2.** Availability/production capacity of local manufacturer **3.** Competitiveness/quality of local RE technology	**1.** Secondary data assesment **2.** RE developers survey	IRENA cost of renewables (for PV only) Own Assessment Survey results assesment	RE developers are unable to use the most competitive RE technologies in their projects.	RE developers are able to use the most competitive RE technologies in their projects. Most of the technologies are locally produced.
4	**Social**	**Public awareness & acceptance**	General **public supports** on clean energy deployment	**1.** General public perception over renewable energy power plants	Not Assessed	N/A	Public sentiment towards renewable energy is negative	Public sentiment towards renewable energy is positive
		Human capital	**Capacity of human resources**	**1.** Government strategy/ plan for green skill/ jobs development	**1.** Own assesment	RPJMN Renstra Ministry of Manpower Renstra CMEA	The government has no specific strategy to promote green skills workers	Strategy for promoting workers with green skill is integrated in government program and work evaluation

Note: **Detailed methodology will be released on a technical note**

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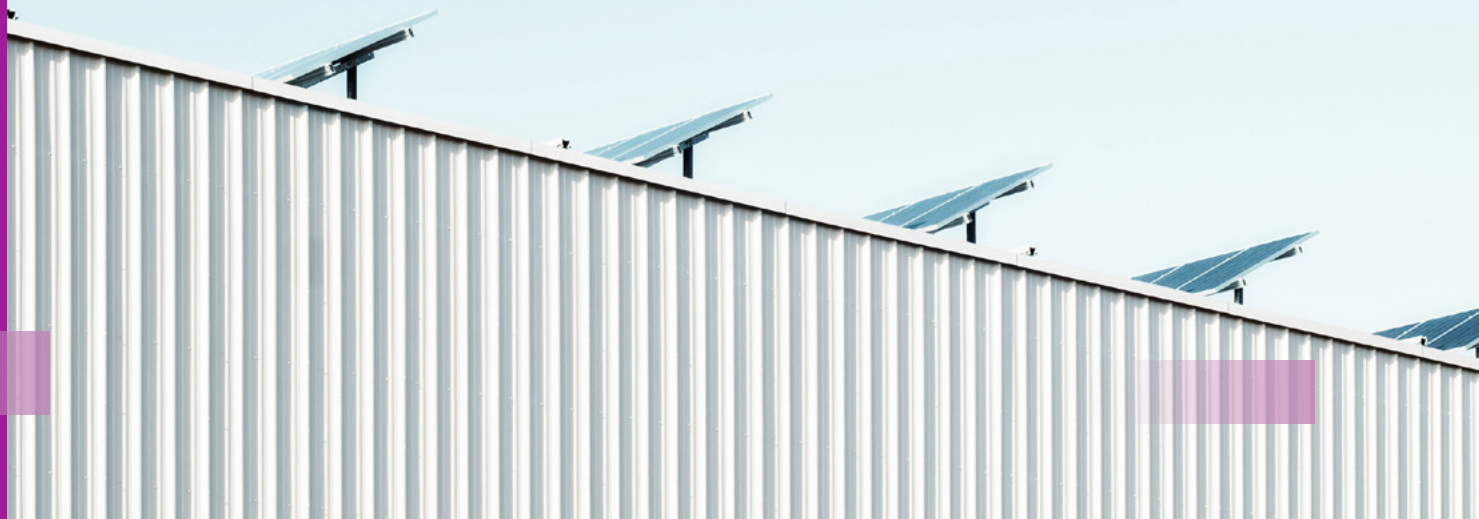

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