Indonesia Clean Energy Outlook

Tracking Progress and Review of Clean Energy Development in Indonesia

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I M P R I N T

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Foreword

Indonesia Clean Energy Outlook (ICEO) is one of IESR flagship annual reports. ICEO, published since 2017, aims to track the clean energy development in Indonesia and its progress over time as well as identifying challenges and opportunities in the following year. The report also includes policy review and analysis, status updates, and special reports on specific topics.

Over the years, we strive to improve the coverage and thoroughness of our analysis in this report. The third edition of ICEO curates perspectives from stakeholders in the clean energy sector and combines them with in-depth research to deliver a strategic and independent analysis of how clean energy is progressing in the country. For the first time, ICEO also includes special reports on two progressing topics, namely solar energy and electric vehicles.

The clean energy development in 2019 was, to some extent, in line with our analysis in the previous ICEO. Overall, our review shows that the clean energy development and investments in Indonesia remained low. However, we also observed that the appetite for rooftop solar PV was growing with government ministries, private companies, and homeowners were showing an increased interest in the technology. Biofuel consumption increased as the B20 program took off early this year. In energy efficiency, the efforts to lower final energy intensity should be focused on three sectors with highest energy consumption, particularly the transportation, industrial, and residential sectors. In the transportation sector, a new presidential regulation on EV signaled a strong political will in developing the new technology in the country. However, it needs more than just a regulation to jumpstart EV industry and increase the EV penetration to 20% of new vehicle sales in 2025.

Overall, some improvements are needed to ensure the energy transition is happening in Indonesia. **The findings in this report should be used as a wake-up call for President Joko Widodo**, that he needs to consolidate his best efforts to reach the RUEN target in 2025. To stay on track, not less than 35 GW of renewable energy capacity have to be added by 2025, translating into $70 to 90 billion investments in the sector.

Lastly, through ICEO, IESR intends to inform policymakers and all stakeholders in the power sector of the policy effectiveness and the improvements needed to help accelerate the clean energy development in the country. By doing this, hopefully, Indonesia can ensure the energy security, economic competitiveness, and transition toward a sustainable energy system in the near future.

IESR

December 2019

Fabby Tumiwa
Executive Director

Content

Glossary

AC : Air Conditioner
ADB : Asian Development Bank
B20 : 20% Biodiesel Blending Programme
B30 : 30% Biodiesel Blending Programme
BAT : Best Available Technology
BAU : Business As Usual
BEV : Battery Electric Vehicle
BOE : Barrel of Oil Equivalent
BOOT : Build, Own, Operate and Transfer
BPDPKS : Badan Pengelolaan Dana Perkebunan Kelapa Sawit
BPP : Biaya Pokok Penyediaan Pembankit
BPPT : Badan Pengkajian dan Penerapan Teknologi
BUMN : Badan Usaha Milik Negara
CFL : Compact Fluorescent Lamp
COD : Commercial Operation Date
CPO : Crude Palm Oil
DGNREEC : Directorate General New Renewable Energy and Energy Conservation
EBTKE : Energi Baru Terbarukan dan Konservasi Energy
EE : Energy Efficiency
EER : Energy Efficiency Ratio
ESCO : Energy Services Company
FAME : Fatty Acid Methyl Esters
FC : Financial Closing
FOLU : Forestry and Other Land Use
GNSSA : Gerakan Nasional Sejuta Surya Atap
HEV : Hybrid Electric Vehicle
IEA : International Energy Agency
IO : Izin Operasi
IPP : Independent Power Producer
IUPTL : Izin Usaha Penyediaan Tenaga Listrik
LBNL : Lawrence Berkeley National Laboratory
LCOE : Levelized Cost of Electricity
LCRS : Least Cost Routing
LTSHE : Lampu Tenaga Surya Hemat Listrik
LCGC : Low Cost Green Car
MEMR : Ministry of Energy and Mineral Resources
MEPS : Minimum Energy Performance Standard
MOI : Ministry of Industry
NMLM : Nested Multinomial Logit Mode
OEM : Original Equipment Manufacturer
POME : Pelaporan Online Manajemen Energi
PHEV : Plug-in Hybrid Electric Vehicle
PLN : Perusahan Listrik Negara
PLTS : Pembangkit Listrik Tenaga Surya
PLTB : Pembangkit Listrik Tenaga Bayux
PLTBm : Pembangkit Listrik Tenaga Biomassa
PLTA : Pembangkit Listrik Tenaga Air
PLTM : Pembangkit Listrik Tenaga Mini-Hydro
PLTP : Pembangkit Listrik Tenaga Panas Bumi
PPA : Power Purchase Agreement
PSO : Public Service Obligation
PUPR : Kementrian Pekerjaan Umum dan Perumahan Rakyat
PLN : Perusahaan Listrik Negara
PV : Photovoltaic
RENSTRA : Rencana Strategi
R&D : Research and Development
RPJMN : Rencana Pembangunan Jangka Menengah Nasional
RUEN : Rencana Umum Energi Nasional
RUED : Rencana Umum Energi Daerah
RUPTL : Rencana Usaha Penyediaan Tenaga Listrik
RE100 : Renewable Energy 100%
SLO : Sertifikat Laik Operasi
SOE : State Owned Enterprise
SPKLU : Stasiun Pengisian Kendaraan Listrik Umum
TKDN : Tingkat Komponen Dalam Negeri
TOE : Ton of Oil Equivalent
VAT : Value Added Tax

2019 Highlights and Key Findings

2019 Highlights

- Total renewables installed capacity -both ongrid and offgrid- until the end of 2019 is 10.17 GW, with 385 MW of new capacity added. Hydropower still dominates with 5.4 GW, followed by geothermal at 2.13 GW, bioenergy at 1.9 GW, mini/micro hydro at 464.7 MW, wind at 148.5 MW, solar PV at 152.4 MW, and waste power plant at 15.7 MW.
- Out of 75 renewables PPAs signed between 2017 and 2018, 27 PPAs are still looking for financial close (FC) and 5 PPAs have been terminated as of October 2019.
- Renewables investment only reached USD 1.17 billion as of September 2019, with investment in various renewables at USD 0.58 billion, in geothermal at USD 0.52 billion, in bioenergy at USD 0.06 billion, and in energy conservation at USD 0.01 billion.
- Biodiesel production as of October 2019 reached 6.96 million kL. Until the same month, 1.3 million kL biodiesel had been exported and 4.6 million kl had been consumed domestically.
- Indonesia's primary and final energy intensity in 2018 was 140.6 and 83.3 BOE/billion rupiah respectively from previous 134.6 and 78.7 BOE/billion rupiah in 2017. The composition of energy consumption in 2018 changed , with transportation sector at 42%, followed by industry at 36%, household at 16%, commercial at 5% and other sectors at 2%.
- Indonesia only has Minimum Energy Performance Standard (MEPS) for AC and CFL (2 out of the 12 planned) until 2019.
- Despite mandatory energy management for energy users with consumption more than 6,000 TOE annually, only 123 out of 306 identified companies in 2018 reported to MEMR through online reporting system.
- Local governments start to take charge in rooftop solar PV deployment; i.e. Jakarta's Governor Instruction No. 66/2019 which mandates the use of rooftop solar on government and certain public buildings, Bali's Governor Regulation No. 45/2019 on Clean Energy, and Central Java's Solar Revolution initiative and steps to drive rooftop solar use in those provinces.

2019 Highlights

- The government amended MEMR Regulation No. 49/2018 by issuing MEMR Regulation 13/2019 and Regulation 16/2019. These regulations increase the appetites for rooftop solar PV deployment, particularly for industrial and commercial buildings owners.
- The latest commissioned solar IPP project, PLTS Likupang (15 MW), is now the biggest solar power plant in Indonesia. The project secured 10 USD ct/kWh price on PPA signing in 2017 and started to operate in September 2019. Other projects commissionings are still pending due to local content issues.
- PLN has conducted the first tender of two solar power projects after two years issuance of MEMR Regulation 50/2017. The projects - located in Bali with capacity 25 MWp each- have secured bids at around 6 USD ct/kWh.
- Ministry of Energy and Mineral Resources (MEMR) of Republic of Indonesia has come up with a strategy to meet RUEN's 23% renewable energy mix target by 2025 by developing roadmaps for each technology.
- Government enacted Presidential Regulation 55/2019 on the acceleration of electric vehicles program. As of September, at least 40 electric cars are on the road with the majority are made up of electric taxi fleet and the rest are owned by government officials and upper class individuals. So far, Land transport sector shows positive response in adopting EV as a part of their fleet.
- With the mandate from government, PLN has built 8 electric vehicle charging stations (SPKLU) with 2 others already built by BPPT before. PLN plans to have 200 units by 2020, with longer-term target of having 7,146 units by 2030.
- Nickel and Cobalt (Lithium-ion battery raw materials) production facility has been established in Morowali, Central Sulawesi through investment of several foreign battery producers and OEMs. However, it requires more effort and commitment from the government and investors to develop the facility into a complete battery manufacturing hub.

Key Findings

- PPA's bankability due to MEMR Regulation 10/2017 and 50/2017 are still the main issues for renewable project in 2019. 27 project with PPAs signed in 2017 are still struggling to be financially closed. Several IPPs managed to secure financing and reach financial close (FC) due to their strong project sponsors. For small IPPs, however, it is more difficult to get funding as they usually do not have creditworthy sponsors.
- A lack of investment in renewable energy signals lack of investor's confidence in this sector. Investors were discouraged by poor incentives provided by existing regulations and political situation due to election and government transition. By September 2019, investments only reached USD 1.17 billion or 65% of 2019 target at USD 1.8 billion. The largest contribution of investments in geothermal projects (USD 0.52 billion) also exhibits that investments in other types of renewables are greatly lacking. Overall, this level of investment is not on track with the level of investment required to meet 23% renewable energy mix target in 2025.
- Domestic consumption of biodiesel has increased from 3.8 million kL in 2018 to 4.6 million kl in 2019 (by October) due to the MEMR regulation No. 66/2018 on non-PSO biodiesel subsidies. We predict, at maximum, the consumption will reach 5.6 - 5.8 million kl by the end of 2019 or lower than the B20 target at 6.2 million kl. Most biodiesel blending facilities are located on the western part of Indonesia, while the demand is nationwide; this, coupled with limited transportation vessels, create uneven distribution. The target to increase the consumption to B30 in 2020 also raises a question on the sustainability of CPO Fund used to subsidize the biodiesel programs.
- Final energy intensity in 2018 increased compared to previous years due to the increase in final energy consumption of industrial and household sectors. To stay on track with RUEN's target of 1% annual final energy intensity reduction until 2025, Indonesia energy intensity must start declining from 2020 onwards.
- The issuance of MEMR Reg. No. 13/2019 and MEMR Reg. No. 16/2019 as amendments to MEMR Regulation No. 49/2018 bring positive signals to the market through the revisions of some clauses on operating license (IO), operational feasibility certificate (SLO), and capacity charge which were deemed as barriers to rooftop solar PV deployment in residential, commercial, and industrial sectors.

Key Findings

- This year sees solar PV slowly penetrates the market with a total of 46 MW installed capacity until November 2019. Interests are taking off in multiple sectors: number of homeowners using rooftop solar PV increases significantly, commercial and industrial consumers start to install a considerable capacity of rooftop solar. Different government institutions have also showing interests: SOEs have pledged to promote and use rooftop solar through their "Sinergi BUMN Program" (SOEs Synergy), PLN opens bid for utility scale solar power plants, Ministry of Public Works and Public Housing intends to use water dam for solar power plant, local governments take initiative to accelerate rooftop solar deployment.
- With the issuance of Presidential Regulation No. 55/2019 as the umbrella regulation for electric vehicles, more electric vehicles are being introduced, with public transport operators (taxis and public buses) acting as trailblazers. One taxi operator currently holds 70% share of electric car fleet. However, several challenges such as EVs'high price, inadequate charging points, and lack of consumer awareness stall the adoption. Furthermore, a detailed and specific roadmap for electric vehicles development is still missing. It is crucial to come up with one since it can provide guidance for all stakeholders to follow in the direction that the government intended.
- High purchase price of electric vehicles is the number one barrier of consumer adoption. In addition to the significant base price of electric vehicle, high import duty as well as central and local taxes (VAT, vehicle title transfer, import income tax) contribute immensely to the final purchase price. Around 50% of electric car price in Indonesia consist of imposed taxes and duties .
- Electric vehicle penetration model developed by IESR concludes that in order to achieve electric car sales target in 2025, government needs to set exemptions of all the levies mentioned above and provide direct subsidies to end users to cut 60% off final purchase prices. As for electric motorcycles, VAT and vehicle title transfer fee (Bea Balik Nama Kendaraan Bermotor/ BBNKB) have to be removed to slash 30% off the prices. In parallel, our model also shows that a minimum of 30,000 charging stations (SPKLU) have to be established by 2025 to sustain the EV sales growth over time.
- Electric motorcycles would contribute to emission reduction through its significant advantage in fuel economy compared to its conventional counterparts. However, electrifying passenger cars would not grant the same benefit in Indonesia's current condition. Operating electric cars has the potential to increase emissions overall unless grid emission factor drops down to 730 gr CO2/kWh at minimum (only feasible in 2025 under current PLN plan).

“

There were three things related to clean energy development that quite progressive in 2019: increase and interest in the use of **rooftop solar PV**, increase in **biodiesel consumption**, and a **stipulation of presidential regulations on electric vehicles**”

Agus Praditya Tampubolon, ICEO Lead Author

Status of Renewables Development

Renewables Investments

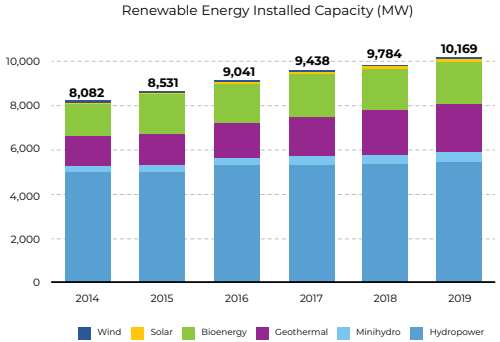
Biodiesel Program

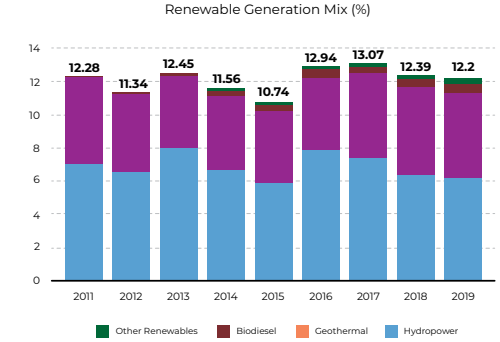
State of Renewable Energy Development in 2019

STATUS

Modest renewables growth marks the year of 2019

- Throughout 2019, Indonesia added 385 MW of renewables, giving a total of 10,169 MW of renewables or an increase of 3% year-on-year. Some of the new projects that came online in 2019 are PLTP Muara Laboh (85 MW), PLTP Sorik Marapi Unit I (42.3 MW), PLTP Lumut Balai Unit 1 (55 MW), PLTS Likupang (15 MW), PLTS Lombok (15 MW), and PLTB Jeneponto (72 MW).
- In the last six years, the renewables capacity has increased by 2.09 GW or an average increase of 348 MW per annum. Most of the capacity came from large hydropower and geothermal power plants with total capacities reached 5,389 MW and 2,130 MW respectively.
- In terms of generation, renewable only contributed to 12.2% of installed capacity mix in 2019. The renewable generation mix has been stagnant since 2011, ranging around 11% to 13% of electricity mix with hydropower and geothermal have been the main contributors to the mix.
- Solar energy, which is by far the largest renewable source in Indonesia, by November 2019 had only been installed at 152 MW or 0.028% of 536 GW of potential. Out of this 152 MW, around 11% or 16.6 MW were coming from rooftop solar PV.





Source: MEMR (2018), PLN (2019)

STATUS

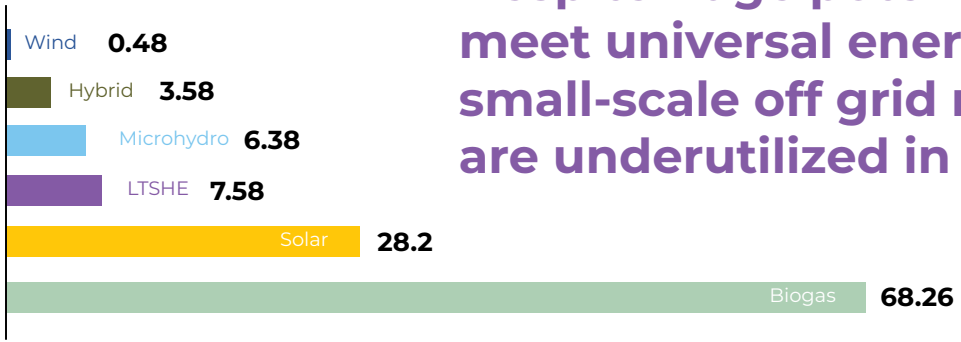
Indonesia set to miss all of 2019 renewable energy targets

RPJMN	RUEN	GNSSA
17 GW 16% primary energy mix by 2019	**13.9 GW** or 17.5% of total capacity by 2019	Rooftop in GigaWatt order before 2020

- The National Medium Term Development Plan (RPJMN) targets renewables capacity of 17 GW and renewables share in the primary energy mix at 16% by 2019. Meanwhile, in the National Energy Plan (RUEN), the government aims to increase renewables capacity to 13.9 GW by 2019 or 17.5% of total capacity in that year. With current renewables capacity a 10.17 GW , both the RPJMN and RUEN targets cannot be achieved this year.
- One Million Rooftop Solar Initiative (Gerakan Nasional Sejuta Surya Atap - GNSSA) which was declared on September 13, 2017 by MEMR and other stakeholders, including IESR, aspired to increase the use of rooftop solar PV in residential, comercial, public and government buildings, and industrial complexes to reach GigaWatt (GW) order before 2020. Despite some positive development this year, considering current adoption of rooftop solar PV at only 16.66 MW, this well-intentioned goal also seems difficult to achieve.
- Some challenges that hamper the meeting of renewables targets are frequent regulatory changes, unsupportive regulations (e.g. unattractive tariffs and unbalanced risk allocation), and inconsistent business processes. On the other hand, with so many renewables targets that are set to miss in 2019, questions can be raised on the assumptions used in the process of target makings and the commitments to meeting the goals.

STATUS

Despite huge potential to help meet universal energy access, small-scale off grid renewables are underutilized in rural areas



Small-scale renewable off-grid systems in 2018 (MW)
Source: Handbook of Energy & Economic Statistics of Indonesia, 2018

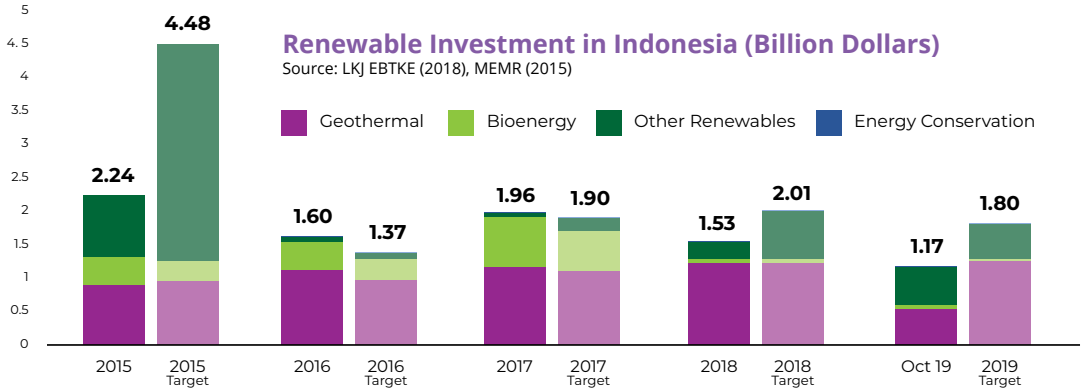
While the Indonesian government has committed to electrifying the whole country by 2020 (RUEN, 2017), there are still more than one million households without access to electricity, particularly in rural areas. The electrification ratio in East Nusa Tenggara, for instance, was only 62% in 2018, the lowest in Indonesia.

Large scale centralized power generation may not be suitable for the needs of rural areas. Instead, small-scale off-grid renewable generation systems can help electrify these areas cost-effectively.

Despite the potential, to date, the government has only installed 28.2 MW of solar PV, 480 kW of wind energy, 6.38 MW of microhydro off-grid systems and distributed 324,817 LTSHE packages to serve rural areas in the country (MEMR, 2018).

Geographical conditions, rural economic activities, funding schemes, and market structure are some of challenges that hamper the rural electrification program in Indonesia (IESR, 2019). Some IPPs reveal that PLN is oftentimes impeding the process of transferring its business areas (Wilayah Usaha) to IPPs, which is required by law to let IPPs sell electricity generated to local communities.

INVESTMENT

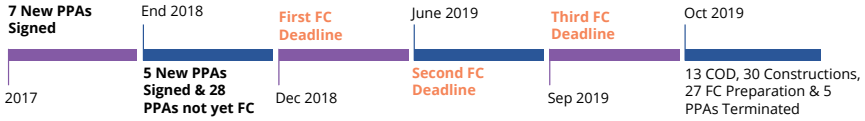


Stagnant, investment in renewable energy mainly came from geothermal projects

- By October 2019, total investment in renewable energy and energy conservation (REEC) reached USD 1.17 billion, accounted for 65% of investment target in 2019 at USD 1.8 billion. Most of investment in renewables came from geothermal power, contributing to 44% of total investment in 2019. While historically geothermal target had always been met each year, only USD 518 million have been invested by October 2019 or 42% of geothermal investment target at USD 1.23 billion. In addition, the largest renewable energy source in Indonesia, solar energy, is also underinvested.
- In general, the investment in REEC has been stagnant in the past five years, showing the low investment attractiveness in Indonesia. Over the years, the government also seems pessimistic about the investment in the sector as it lowered the target from USD 4.48 in 2015 to only USD 1.8 billion this year. It is also worth noting that the investment targets shown in the graph are targets set in MEMR's performance agreement (Perjanjian Kinerja) which are much lower than targets in MEMR's 2015-2019 strategic plan (Renstra).

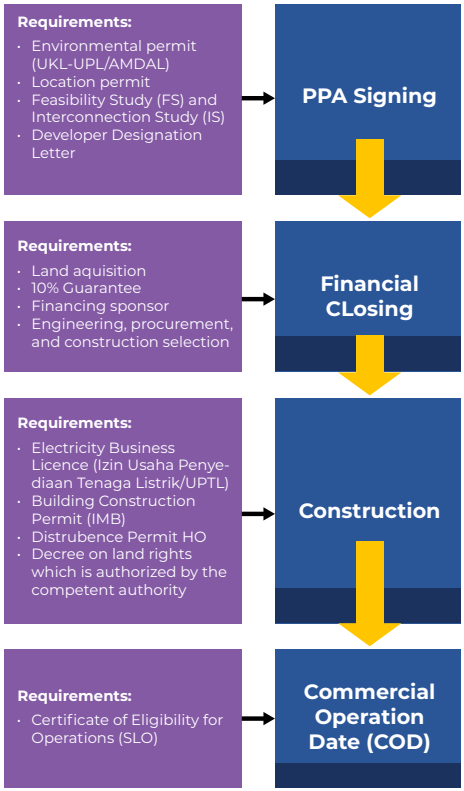
INVESTMENT

Two years after the PPA signing, 27 PPAs have not reached Financial Closing due to bankability issues



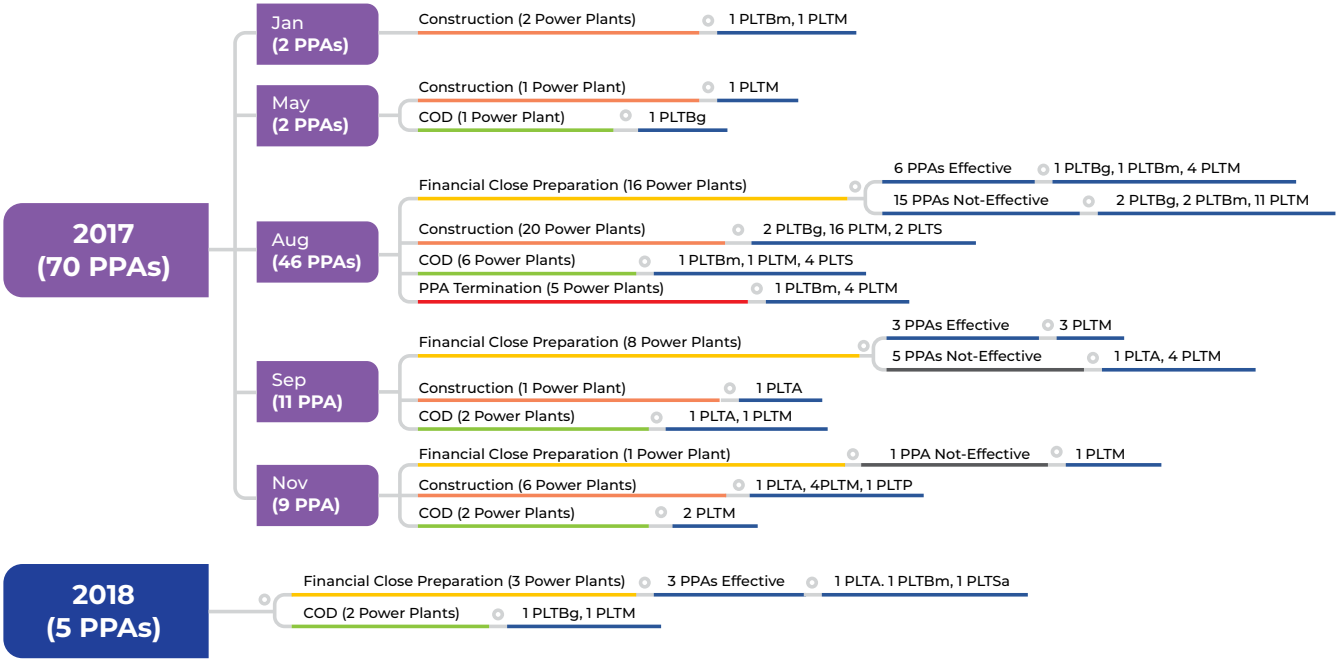
- Out of 75 PPAs signed between 2017-2018, 27 PPAs have not reached financial close (FC) and five projects have been terminated as of October 2019. The FC deadlines have been delayed three times without further notification of final deadline.
- From the 27 PPAs, 19 are mini/micro hydro projects which owned by small-scale IPPs. For mini/micro hydro projects, their main barriers to getting finance is the risk sharing and tariffs regulated in Regulation No. 10/2017 and Regulation No. 50/2017, which lower the bankability of projects.
- While the regulations seem to hamper funding access, some IPPs managed to get finance from lenders through the use of a creditworthy project sponsor which a small-scale IPP usually does not have. The IPPs, therefore, ask the government to improve current regulatory framework and/or act as a project sponsor in small-scale renewable projects.

Business Process



INVESTMENT

The majority of PPAs that have not met financial closing are mini-hydro projects (PLTM)

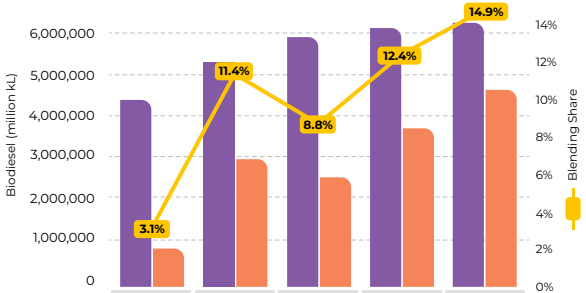


Escalating in 2019, domestic biodiesel consumption was lower than mandatory target

- By October 2019, the domestic biodiesel consumption reached 4.6 million kL, outstripping the total consumption in 2018 at 3.8 million kL.
- While biodiesel consumption increased significantly, the blending target proves difficult to meet. By October, biodiesel comprised only 14.9% of total diesel consumption, or 74% of the blending target. We predict, at maximum, the consumption will reach 5.6 - 5.8 million kL (with 0.5 - 0.6 million kL per month) by the end of 2019 or 90% of the target.
- Some challenges to biodiesel program are feedstock (competing use of CPO with other purposes), CPO price stability, and limited infrastructure (such as transportation vessels) while biodiesel producers are concentrated in the west Indonesia (MEMR, 2019).
- Indonesia saved USD 0.9 billion and USD 1.89 billion of foreign exchange reserves in 2017 and 2018 respectively through the reduction of fossil fuel imports enabled by the biodiesel program. In 2019, the savings were projected to increase to USD 3.31 billion with 6.19 million kL of biodiesel domestic consumption (MEMR, 2019).

Biodiesel Blending Target and Realization (million kL)

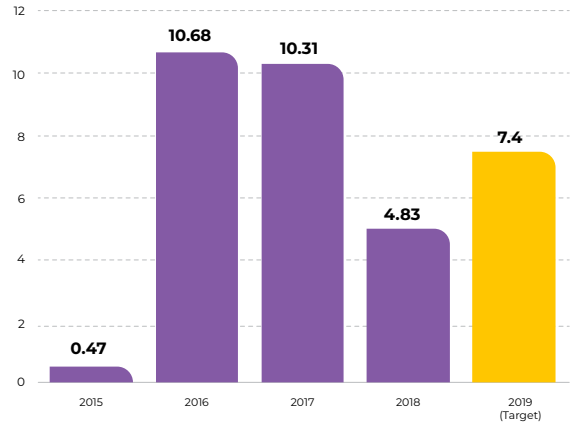
Source: Laporan Kunjungan Kerja Komisi XI DPR 2018, SPKS (2019)



Palm Oil Fund: much needed by the biodiesel program, disputed by EU

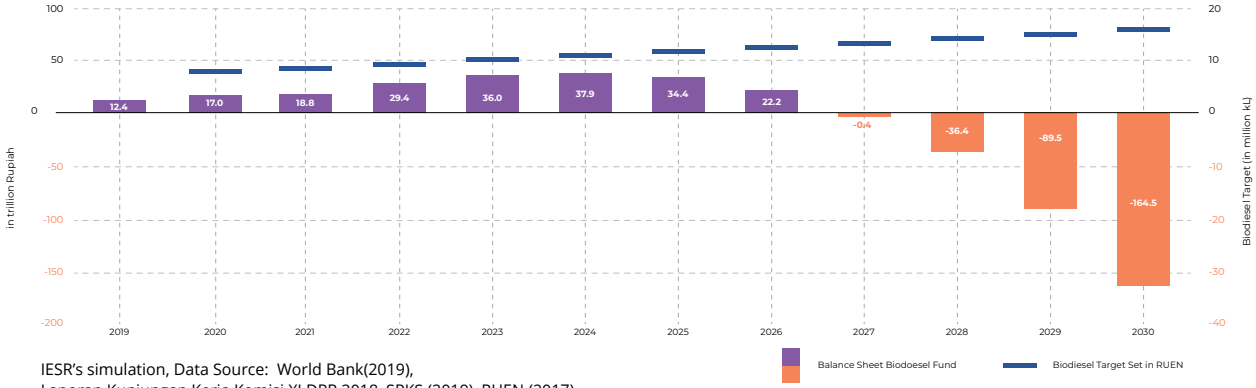
Distributed Palm Oil Fund for Biofuel (Trillion Rupiah)

Source: Laporan Kunjungan Kerja Komisi XI DPR 2018, SPKS (2019)



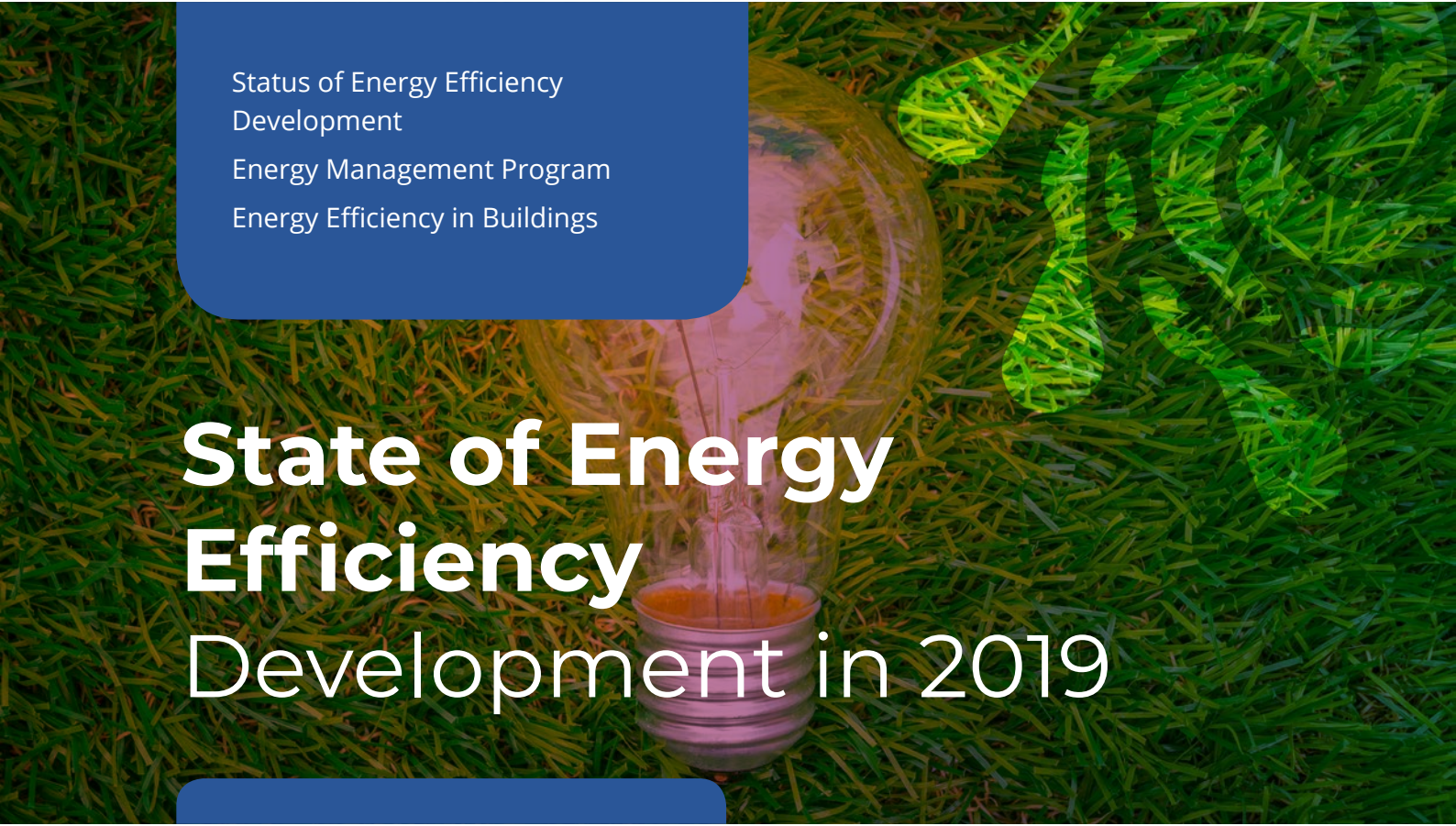
- A significant increase in domestic consumption in 2019 has been mainly enabled by the provision of biodiesel incentives from Palm Oil Fund for the non-public (non-PSO) transport sector since September 2018. The fund is obtained from export levy of CPO and its derivative products.
- The biodiesel program has been dependent on CPO Fund to cover the price gap between the biodiesel and diesel prices. From 2015 to 2018, the government had spent 26.29 trillion rupiah or 56% of the total 47.29 trillion rupiah collected from CPO export levy. While no export levy was collected since March 2019 due to low CPO prices (BPDPKS, 2019), BPDPKS targeted to disburse IDR 7.4 trillion of CPO fund in 2019.
- The use of CPO fund to incentivize the biodiesel program has been deemed by EU as unfair subsidies for the Indonesian biodiesel exporters. To encounter this, on December 9, 2019, the EU officially imposed duties set at 8-18% on imports of Indonesian biodiesel. This five-year regulation may further encourage the government to increase the use of biodiesel domestically.

The risk of Palm Oil Fund deficit in 2027 will become a major setback for meeting RUEN's biodiesel target



IESR's simulation, Data Source: World Bank(2019),
Laporan Kunjungan Kerja Komisi XI DPR 2018, SPKS (2019), RUEN (2017)

- While in RUEN the government intends to increase the biodiesel consumption in the following years, the questions remain on the availability and sustainability of PO fund used to subsidize domestic consumption. With CPO price is projected to increase to 900 US$/MT (World Bank, 2019) in 2030, the potential Palm Oil fund collected from 2020 to 2030 will be IDR 258.63 trillion. The fund would be only sufficient to support the mandatory blending program up to up to 2026.
- Based on our calculation, the government would face a shortage of IDR 0.4 trillion in 2027. The scenarios were made with assumptions that the distribution costs make up for 30% of retail diesel prices, all fund will be used for biodiesel program, and the CPO prices will be always higher than USD 570/ton which is the lower limit of Palm Oil fund collection. The results shown, therefore, might be rather conservative, meaning that the deficits could come in earlier years than indicated in this simulation.



Status of Energy Efficiency Development

Energy Management Program

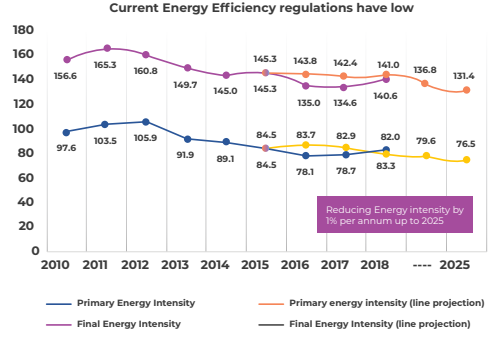
Energy Efficiency in Buildings

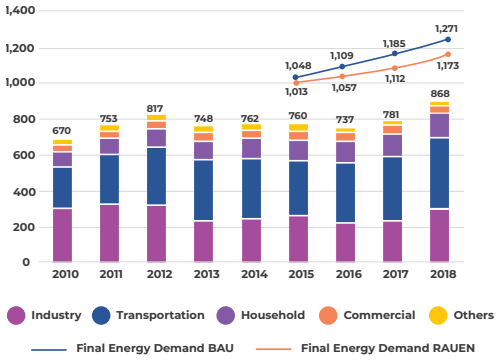
State of Energy Efficiency Development in 2019

STATUS

The transportation sector has been the biggest contributor to the final energy demand since 2013

- By using the energy intensity in 2015 as a basis, 1% annual reduction as mandated by RUEN means, that by 2025, the primary and final energy intensity is 131.4 and 76.5 BOE/billion rupiah respectively. Looking at the trend between 2016-2018, Indonesia energy intensity must start declining from 2018 onwards if this target to be achieved.
- Final energy consumption for industry and household increased more than 40% from 2013 to 2018, surpassed transportation sector that only grew at 15%. However, during this period, transportation sector still dominated final energy consumption due to the steadily big consumption of fuel (40% is for truck consumption) (OECD, 2019).
- Improvements in energy efficiency since 2000 prevented additional 9% of energy use in 2017, with most contribution came from industry and services and limited from transportation, due to the existing policy, Government Regulation 70/2009, has not tackled the fuel efficiency standards for passengers car and truck (IEA, 2018).
- The Government Regulation No. 70/2009 on energy conservation imposes a mandatory energy conservation for energy user with an annual energy consumption exceeding 6,000 TOE that must be reported to the government through online platform called Pelaporan Online Manajemen Energi (POME).



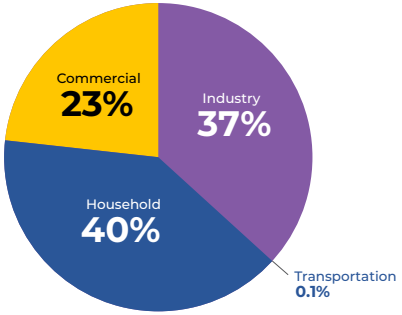


STATUS

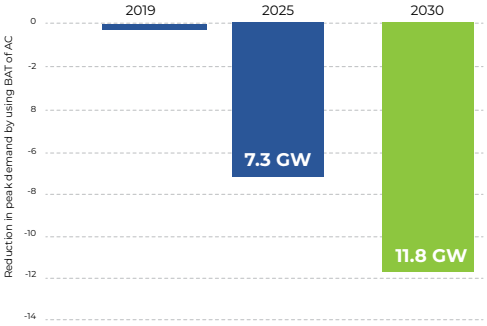
Unless utilizing the best available technologies (BAT), Air Conditioners (AC) will contribute significantly to peak load

- Almost 40% of Indonesia's total electricity consumption in 2018 is in the residential sector at 62.7 million BOE or 106.5 TWh.
- Most of this residential's demand caused by use home appliances, with air conditioner (AC) unit energy consumption being the highest at 1,661 kWh/year (BAU's technology) or at 729 kWh/year (best available technologies) (LBNL, 2019).
- Due to the rapid adoption of room ACs, in 2030, ACs usage could contribute 21 GW or 27.2% of peak demand at 77.3 GW (LBNL, 2019).
- Utilization of best available technologies will contribute significantly in reducing this peak demand from ACs, with 7.3 GW and 11.8 GW savings in peak load could be achieved in 2025 and 2030 respectively (LBNL, 2019).
- Increasing existing Minimum Energy Performance Standard (MEPS) for AC will ensure that only efficient ACs are sold in the market - hence reduce the usage of non-energy efficient ACs. Coupled with the projected increase of ACs adoption in the future, significant amount of GW could be saved.

*BAT refers to the most efficient AC that is available on the market



Source: Handbook of Energy Economic and Statistics of Indonesia 2018 (processed)



Source: LBNL (2019)

STATUS

Energy labeling and standard are available but lower than the international best practices

- Indonesia imposes both MEPS and energy labeling for AC and only labeling for Compact Fluorescent Light (CFL). The other ten appliances such as refrigerators, washing machines, and television which were targeted to have energy efficiency standards by the end of 2019 failed to obtain the necessary standards.
- The MEMR Reg. No. 57/2017 adopted ISO 5151 that uses the energy efficiency ratio (EER) to measure energy efficiency of AC. This standard is less stringent than ISO 16358-1 that uses Cooling Seasonal Performance Factor (CSPF) to determine the efficiency standard. The country, however, intends to update the current standards following the ASEAN Mutual Recognition Agreements (MRA) for electrical and electronic equipment in 2018 (ICED, 2019).
- The energy labeling for CFL is regulated under the MEMR Reg. No. 18/2014. The regulation provides a four-star rating system for CFL based on its correlated color temperature (CCT) (<4400 K and ≥4400 K). The four-star rating system applied in Indonesia is less common used in other countries (e.g. ENERGY STAR is imposing a minimum efficacy on every power range of CFL that has to be complied by manufacturers).
- Indonesian annual energy saving potential from AC could reach 51.7 TWh in 2030 if best available technologies in AC were adopted (ASEAN SHINE, 2015). Additionally, lighting will also provide annual energy savings of 9.2TWh in 2030 if higher labeled lamps are used (H.Batih and C. Sorapipatana, 2016).

AC MEPS and Labelling

Star	Indonesia[a]	Malaysia[b]	Thailand[b]	Vietnam[b]	Taiwan[b]
1	8.53	10.57	13.47	10.57	13.3
2	9.01	11.08	14.5	11.6	15.01
3	9.96	15.69	15.18	12.28	16.71
4	10.41	16.03	16.21	12.79	18.42
5		18.42	17.06	14.33	20.13

a) EER non-inverter
b) CSPF calculated as of ISO 16358-1 for Inverter and Non-Inverter Unit
Source: Importance of using CSPF, Ari D. Pasek (ITB), 2019

Indonesia CFL MEPS and Star Ratings for 2700k-4400k (lumen/Watt)

Power (Watt)	1 Star	2 Star	3 Star	4 Star
<8	<34	>34	>44	>54
>8-15	<38	>38	>48	>58
>15-25	<42	>42	>52	>62
>25-60	<46	>46	>56	>66

Lack of stimulus, energy-intensive industries are indifferent to energy management self-reporting

Through the Government Regulation No. 70/2009 on energy conservation, large energy consumers with energy consumption larger or equal to 6000 TOE are required to perform energy management by appointing an energy manager, establishing and implementing an energy conservation program, conducting regular energy audits, and reporting annually the implementation of the program to the government to an online system called Energy Management Online Reporting System (POME).

By 2018, there were 306 large energy consumers/energy-intensive industries identified to be subject to the energy management programs.

Out of 306, only 40% or 123 large energy consumers reported their energy management programs. A large majority of companies who failed to report their energy management programs were coming from the iron and steel, textile, power generating, oil and gas, and pulp and paper industries.

Some of major barriers to the implementation of energy management reporting are no tangible benefits seen by the industries to reporting their programs and no real penalties or retributions imposed on entities that fail to submit their reports.

Green Building Codes: huge potential of cost savings, the codes are only adopted in a small number of cities

- Efforts to push for energy efficient buildings were first initiated by Jakarta through Governor Reg. No. 38/2012 on Green Building Code which focuses on large commercial and residential buildings for new and existing buildings. This was later followed by the Minister of Public Works and Public Housing (PUPR) Reg. No. 2/2015 on national guidance for green buildings which marked the first green building code at the national level.
- To date, there are three cities (Jakarta, Bandung, and Semarang) that have local green building codes while other three cities (Surabaya, Manado and Makassar) are still preparing their codes. By 2018, there were 339 new buildings in Jakarta certified as green buildings with cost saving may reach USD 90 million (ICED, 2019).
- The main barriers to the adoption of green buildings in Indonesia are the high investment costs, lack of funding scheme for the energy efficient building projects, and relatively low awareness of cost saving potential brought by a green concept.

Regulatory Updates

Policy and Regulatory Framework

REGULATION

Presidential Regulation No. 55/2019: A new start for EV, a wait for implementing regulations

The regulation was issued in August 2019. The document delineates several key points in accelerating battery electric vehicle development in Indonesia. It gives notion of support to all related stakeholders via several methods (mainly fiscal and non-fiscal incentives), it shows concerns to protect local industry in entering the era of EV with steep local content requirement (increasing gradually until 2026 onward), it can also be seen that government is trying to build local EV and EV component industry by mentioning aid in R&D for electric vehicle main components, including battery, and it also assigns PLN to develop the charging infrastructure needed. However, this regulation is deemed lacking in several aspects as outlined below.

Unclear justification for EV adoption in Indonesia

The regulation does not provide sufficient reasonings regarding electric vehicles introduction in Indonesia (e.g. oil consumption saving, carbon emissions saving, etc). Since there is no specific goal to benchmark against, it is difficult to parameterize the progress of EV development

Ambiguous terminology on battery electric vehicle

In the first chapter of the document, it describes the definition of battery electric vehicle: a vehicle moved by electric motor, which gets its electric power from the battery or outside source. Therefore, while the term “battery electric vehicle” is widely accepted as fully electric, the explanation provided above could include hybrid electric vehicles as well.

Dedicated roadmap for EV is missing

It can be inferred from the document that government bases the roadmap of EV development to national vehicle industry development roadmap. However, national vehicle industry roadmap itself is insufficient in providing detailed guidance and direction. Hence, it begs the question of where to start and how to nurture local EV manufacturing capability

Derivative regulations are imminent

The regulation outlines several fiscal and non-fiscal incentives to be given to OEMs, R&D departments, end users, charging infrastructure developers, and other entities related to EV development. However, following regulations are necessary to provide more details regarding incentives, such as the amount given, timeframe, etc and the charging infrastructure, like charging tariff and others

REGULATION

MEMR Regulation No. 13 and 16/2019: Better terms for rooftop solar PV

Aug 2018

MEMR Reg. No. 49/2018

Regulates the use of rooftop solar PV. Stipulates general requirements and procedures for the installation of rooftop PV by PLN Consumers.

Sep 2019

MEMR Reg. No. 13/2019

Amends the requirements to obtain Operation Licence subject to prevailing regulation (MEMR 12/2019). Renewables user <500 kVA are also declared to have fulfilled their Worthy to Operate (SLO) licensing.

Oct 2019

MEMR Reg. No. 16/2019

Amends capacity charge for industrial sector from 40 hours to 5 hours and removes emergency energy charge.

- The MEMR Reg. No. 13/2019 shows support for small scale (< 500 kWp) rooftop PV users as they will no longer need to obtain Operating License (Izin Operasi/IO) and Operational Feasibility Certificate (Sertifikat Laik Operasi/SLO). This will ease administration process and extra costs.
- The MEMR Reg. No. 16/2019 will allow industrial consumers to generate and use their own solar energy with significantly less cost because the capacity charge is reduced from 40 hours to only 5 hours per month and the emergency charge is no longer applied.
- The expected implications from these amendments are increased number of commercial and industrial consumers, particularly multinational and national companies, which already have targets to use renewable energy for the operation of their facilities. These are positive signals towards solar development, however, the revision still do not address the price cap compensation of the export of excess electricity of 1:0.65 using net metering which is seen as a significant barrier to solar development and utilization in households due to the longer payback period of the investment.

REGULATION

MEMR Regulation No. 50/2017: Persistent challenge for renewable energy investment

Aug 2017

MEMR Reg. No.50/2017

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

Dec 2018

MEMR Reg. No.53/2018

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

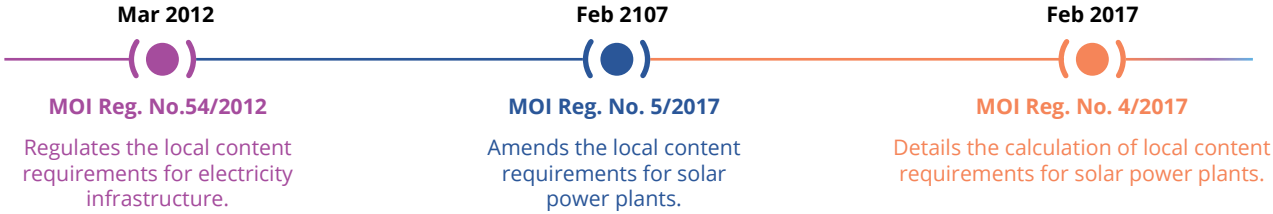
2020?

Presidential Reg. No.../2020 ?

- MEMR Reg. No. 50/2017 amendment MEMR Reg No. 53/2018 did not tackle renewables' bankability issues as the renewables tariff, BOOT scheme, procurement process, and local content requirements. The investors believe that the key issues that block renewable energy investment remain unchanged and increase level of difficulty to reach financial close for projects. This regulation has caused some the delay of some biddings by PLN, as well as cold response of investor in recent tender for geothermal field carried out by MEMR.
- To attract renewables investment MEMR has tasked to look deeper into hampering clauses in MEMR Reg. 50/2017 and have started drafting recommendation for its amendment and suggested upgrading the regulation to a Presidential Regulation since third quarter of 2019. Just before the change of cabinet in October 2019, the discussion of the draft regulation has reached office of Vice President.
- The proposed Presidential Regulation is likely to introduce back the Feed-in Tariff (FiT) policy, considering reasonable financial return and tariff staging (decrease over time) for renewable energy power plants.

REGULATION

MOI Regulation No. 5/2017: High local content requirements thwart solar PV development



- The MOI Reg. No. 5/2017 specifically sets out the minimum local content of solar modules at 40% in 2017 before increasing to 50% in January 2018 and 60% in January 2019. These requirements are higher than what has been laid out in the previous regulation at 30.14% for Solar Home System modules and 25.63% for Communal Solar System modules. However, considering feedback from stakeholders, MEMR keeps the local content requirements (LCRs) at 40% until further notification.
- The high LCRs for solar modules are deemed as one of main barriers to rapid deployment of solar PV in Indonesia since local modules are more expensive than imported modules from China; with imported module prices range from USD 0.25 - 0.37/Wp compared to local modules at USD 0.47/Wp on average (IESR, 2019).
- In addition, in some cases, the use of local modules would also lower the bankability of solar projects as lenders regard local modules less durable than the imported ones (IEEFA, 2019). With this regulation, IPPs are faced with dilemma as they are required to use more expensive modules while at the same time they are only offered low tariffs.

“

In terms of policy and regulations, there were some improvements in 2019 that need to be appreciated. However, some challenges remained, **questioning the commitment of the government to accelerating renewable energy development in Indonesia.**”

Pamela Simamora, Research Coordinator, IESR

Development Status

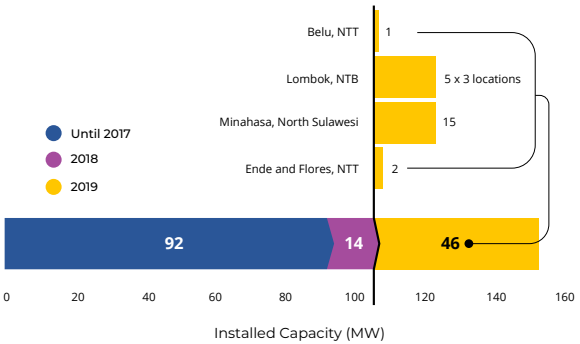
Rooftop Solar PV

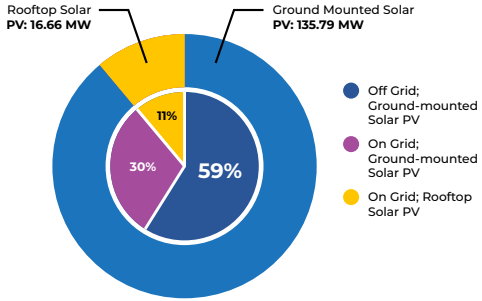
Utility Scale Solar

Roadmap

Special Report: **Solar Electricity**

STATUS



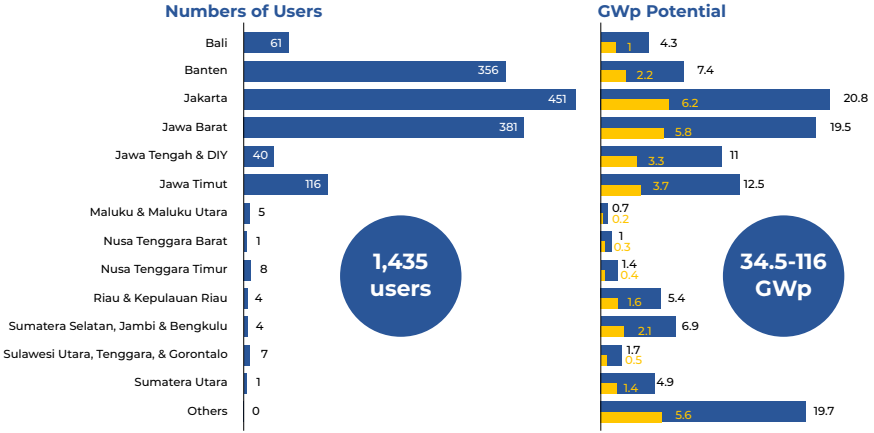


Slow progress in solar PV development, six years left to meet the ambitious solar target in 2025

- By November 2019, 152 MW of solar PV had been installed. Although 2019 scored a higher growth of solar energy (tripled the addition in 2018), with 44% increment year-on-year, it is still far from RUEN target at 550 MW by the end of 2019. The progress in 2019 mainly came from utility-scale solar power plants.
- Out of 46 MW additional capacity in 2019, 33 MW were from ground mounted on-grid utility-scale solar PV (IPP projects). The latest project, PLTS Likupang (15 MW) in Minahasa which was commissioned in September 2019, is now the biggest solar power plant in Indonesia.
- Around 89% of total installed solar capacity is ground-mounted, 59% is off-grid ground mounted (mostly used for rural electrification), while the other 30% is on-grid utility scale.
- With current installed capacity and only 908 MW of solar PV are in the RUPTL 2019-2028 pipeline (lower than RUPTL 2018 - 2027 target at 1,047 MW), the government needs to develop at least 1,000 MW of solar PV per year from 2020 to 2025 to achieve the 6500 MW RUEN target by the end of 2025. To realize the target, the government should support the use of distributed solar PV (rooftop and off grid) in the country.

ROOFTOP SOLAR

Slight increase in rooftop solar PV deployment despite huge potential in the residential market



Updates

The number of rooftop solar PV owners has increased fourfold from 351 in 2017 to 1435 owners in 2019, accounting for 16.66 MW of total solar PV capacity in 2019. With almost 90% of owners are from the residential sector (2-4 MW of total installed capacity), the sector has become a major market for rooftop solar PV in the last two years.

Opportunities

A study by IESR shows that the potential market of residential rooftop solar PV (households ≥ 1,300 VA) in Indonesia ranges from 34.5 - 116.3 GWp. Even with the lowest range, it will generate 48.6 TWh or 20% of total electricity demand in Indonesia in 2019 (245 TWh).

Jakarta and East Java are among top five of residential solar PV markets. According to IESR's market survey, 13% of households in Greater Jakarta and 19% in Surabaya are interested in investing in rooftop solar PV.

Challenges

With the upfront costs of IDR 15-20 million/kWp, 80% of IESR's market survey respondents expected a less than 7 year payback period. This expectation is hard to meet since current net metering scheme (1:0.65) offers a longer payback period of 11-12 years, compared to 7-8 years under the previous 1:1 scheme. The net kWh credit can only be accumulated up to 3 months, shorter than the annual restart imposed in the previous scheme. Moreover, delays in the installation of export import meters are still happening in some areas.

Despite existing challenges, sustainable visions and improved regulation drive the increased use of solar energy in businesses and industries

	Opportunities	Challenges
Regulation	A decrease in capacity charge from 40 to 5 hours (MEMR Reg. 16/2019) will encourage industries in using rooftop PV. With industrial rooftop PV capacity normally ranges from hundreds of kWp to MWp, industries can contribute significantly to solar deployment in Indonesia.	MEMR Reg. 13/2019 has simplified the requirements for IO and SLO, but there are cases where regional PLN offices slow down the permit approval process. MEMR, PLN HQ, and regional PLNs need to coordinate more effectively to ease the permit process.
Energy Efficiency	Businesses and industries (B&I) with 24/7 operations usually cap the rooftop solar PV capacity at its (daylight) base load to ensure that all electricity generated can be absorbed as a form of energy efficiency measure. Since no electricity is exported to the grid, current net metering scheme (1:0.65) is not always an issue for B&I sector.	The case is different, however, for the B&I with weekday-only loads. The use of rooftop solar PV as an energy efficiency program is ineffective and the return on investment is relatively low due to the 1:0.65 scheme.
Payment Option	Other than the upfront payment scheme, several solar developers also offer a long term leasing scheme (15-25 years) which allows their B&I customers to pay the electricity generated (IDR/kWh). With this scheme, the developers are incentivize to ensure that their systems are working well to obtain profits.	For developers, the economies of scale will only be achieved with medium to large-scale projects (minimum of 1 MW). Meanwhile, the financial institutions are only keen to contribute if developers apply for project bundling (minimum of 20 MW).
Sustainability vs Insurance	Some companies use solar PV for sustainable and "green" branding purposes. Globally, over 200 companies have committed to using 100% renewables (RE100). By November 2019, there were three multinational companies in Indonesia pledged to use renewables and started to use rooftop solar PV in their facilities.	Some B&I customers are concerned about how rooftop solar PV will increase risks to their buildings and affect their asset insurance. Developers/EPC must comply with structural criteria of rooftop solar PV and in some cases need to ensure that solar panels are included in buildings insurance.

Ministries and State Owned Enterprises (SOEs) are joining the bandwagon

Eco Pesantren by Ministry of Energy and Mineral Resources

To further promote rooftop solar PV use, in 2019, the Ministry of Energy and Mineral Resources (MEMR) launched its *eco-pesantren* program, aiming to install 1.6 MW of rooftop solar PV on 99 *pesantren* (Islamic boarding schools) in Aceh, Central Java, West Java, and East Java (the program also installs biogas systems and replaces lamps with LED).

Solar *Puskesmas* by Ministry of Health

The Ministry of Health plans to have a special allocation fund (DAK) in 2020 to install rooftop solar PV on *puskesmas* (government's grassroot health facility units). Rooftop solar PV is expected to provide power to those with no energy access, and reduce cost and reliance on inefficient diesel generators, which commonly used at rural *puskesmas*.

PVROOF and dam for solar PV by Ministry of Public Works and Public Housing

Since 2017, the R&D Agency of Ministry of Public Works and Public Housing (MPWPH) has been developing PVROOF (a form of solar PV roof tiles). Learned from its pilot project, improvements are needed in its rooftop design and layout adjustment. The ministry installed 304 kWp of solar PV on Jatibarang dam in 2017 and planned to optimize the utilization of their dam asset with ground-mounted or floating solar PV (MPWPH, 2019). However, this will need regulatory changes as water body of the dam can only be used for three purposes: flood control, irrigation, and tourism.

SOEs Synergy

By December 2019, Len Industri has installed 139 solar PV systems on 139 Pertamina gas stations, accounting for 1.3 MWp of total capacity. In August 2019, Len Industri, Pertamina, and PLN agreed to form a joint venture to work with all 144 SOEs and achieve 1.4 GWp of solar installed capacity by 2025, an initiative called as SOEs Synergy. This synergy shows SOEs commitment to renewables development in Indonesia.

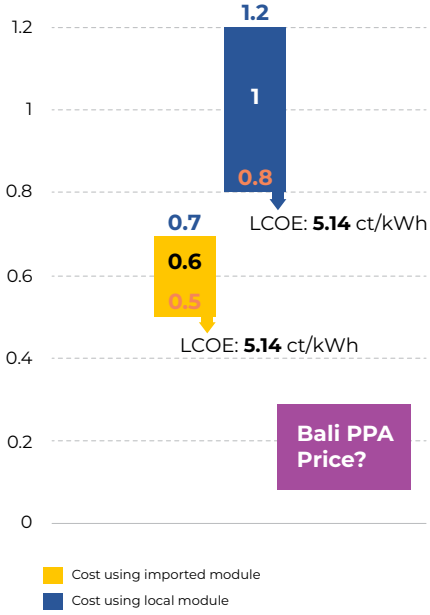
Local governments to take the lead in rooftop solar PV adoption

		Realization (in 2019)	Target (in 2020)
JAKARTA	In response to public outcry over Jakarta's status as the most polluted city in the world, the governor of Jakarta issued the Governor Instruction No. 66/2019 which mandates the use of rooftop solar PV on public schools, sport facilities, and medical facility from 2019-2022.	• **<10 government buildings (>50 kWp each)** • **80 schools**	• **<20 government buildings (10-50 kWp each)** • **234 schools**
CENTRAL JAVA	Central Java was the first province to finalize the Provincial Energy Plan (RUED) in 2018. The RUED mandates all SKPD (Local Government Agencies) and encourage commercial and industrial complexes to install rooftop solar PV. In September 2019, the government of Central Java declared its intention to be the first solar province in Indonesia.	• **3 government buildings (30-35 kWp each)** • **80 kWp in industrial complexes**	• **17 government (SKPD) buildings**
BALI	With Governor Reg. No 45/2019, Bali becomes the first province that has a local regulation on clean energy. Some of its mandatory clauses are rooftop PV use at minimum 20% of government buildings and buildings with area >500 m2. The regulation also stipulates land and building tax (PBB) reduction and ease of financing as incentives for solar PV. More details, however, are expected to be issued shortly.	• **1 government building (158 kWp)** • **2 schools**	

A technical study by IESR shows that the total solar capacity in those three provinces (government/public buildings) can achieve 44.5 MWp. With high amount of energy consumption during daylight, the solar PV can reduce electricity bills significantly. As RUEN mandates rooftop solar use at minimum 30% of government and public buildings, the government should act as an early adopter which will then drive the installation costs down and open a larger market for rooftop solar PV in Indonesia.

Caution should be taken for the declining costs of the recent utility-scale solar project

- Since February 2019, PLN has been conducting a tendering process for 2x25 MW solar power plants in Bali, where only preselected developers (so called direct selection) were invited to submit their proposals. This project is currently in the Feasibility Study phase and targeted to have financial close by the end of 2020 and COD by the end of 2022. Once finished, it would be the first solar power project complying with MEMR Reg. 50/2017.
- As cost of generation (BPP) in Bali is 6.91 USD ct/kWh or lower than the national BPP at USD 7.86 ct/kWh, the PPA price will be based on the IPP-PLN negotiation. PLN, which expected a tariff at around USD 6 ct/kWh, has been offered a low tariff at USD 5.14 ct/kWh for this project. Based on IESR LCOE calculator, the low tariff can only be attained if the project uses imported modules (total cost at 60 USD ct/Wp). The number will double to 10.67 ct/kWh with the use of local modules (total cost at 1 USD/Wp).
- Less attractive tariffs, BOOT scheme, unbalanced risk allocation, and module price (local content requirements) still affect the bankability of solar projects. However, with a significant project scale, access to reputable sponsors, and high daily power output at 4.3 kWh/kWp, the developers are quite optimistic to run this project.
- The availability of a land which has good solar irradiation, is affordable and close to PLN's substation will help lower generation prices. Ideally, the land cost is included in the development cost (10% of project cost) and should be less than USD 5 ct/kWp.



Barriers to utility-scale solar PV development

Local Content Requirements

- The regulation on local content requirements (LCRs) for solar modules which increases the LCRs from 40.68% (2017) to 60% (2019) was issued without careful consideration of current local manufacturing capacity (<500 MW/year) and performance quality. On average, local content of solar modules can only reach 42% and an upgrade in glass components (as the most doable improvement) will only improve the local content to 56%.
- To increase the LCRs to >60%, local manufacturers need to enter the upstream industry on cell printing which requires increased production volumes. This might be feasible considering that currently, the annual local module production is only 20-30 MW or 4-6% of total manufacturing capacity. The EPC/developers, however, still prefer imported tier 1 or 2 solar modules due to their guaranteed quality and cheaper prices (around 40% lower). This situation shows a mismatch between LCRs, local manufacturing capacity, and market demand.
- The use of local modules also hampers developers to obtain financing from international lenders as most of local manufacturers do not have international licenses or tier 1 labels required to acquire funding.
- The weighted local content calculation imposed in Indonesia, e.g., 7.5% weight for blue cell printing and 8% weight for PV junction box production, is not aligned with the international standard. The 100% weight for combiner boxes, cables, and services is also difficult to fulfill due to low quality of local products (BPPT, 2019).

Land Acquisition

- While the land acquisition for power plants has been regulated under the land procurement law, in some cases, securing available, unoccupied, non-customary land is difficult to carry out (a considerable land size is needed, 1 MW=1 ha in average). Three other important factors determining good location are high solar irradiation (high yield), reasonable price, and proximity to PLN substation.

Barriers to utility-scale solar PV development

Unbalanced risk allocation	When PLN is unable to dispatch the power from power plants due to natural force majeure, PLN is relieved from its payment obligation and acquires 14 days of grace period to rectify the damage. The transfer of such risk to IPP sponsors would prevent IPPs from securing funding, as lenders require stable and regular payments from IPPs. There shall also be a maximum limit of grace period per year and per concession time (HHP and PWC, 2019).
Unattractive tariff and BOOT scheme	Current tariff is capped at 85% of local generation cost (BPP) when BPP is established based on average generation costs from existing power plants dominated by coal-based power plants. This unlevel playing field creates unattractive tariffs for renewables and when combines with BOOT (build own operate transfer) scheme, the cost of asset transfer cannot be covered (IESR, 2019).
Unfair equity IRR on project termination	When PPA is terminated due to force majeure (natural or caused by PLN), the payment for IPP sponsors is based on 7.5% equity IRR in IDR. Meanwhile the appropriate equity IRR is usually at 15% in IDR or 12% in USD (HHP and LPEM UI, 2019).
Poor payment scheme	Current take or pay scheme is limited up to the payback period, not the concession period, albeit IPPs have no other off-takers beside PLN (HHP, 2019).
High interest rate	Average interest rates offered by local banks for renewables developers range from 10% to 12%. Renewables project are perceived as risky by local banks due to regulatory uncertainty.
Procurement transparency	Developers find the procurement process and timeline can be unpredictable. In some cases, project allocation (between SOEs and IPPs), technical specification, commercial structure, or even the availability of the project tender could be changed in the middle of project.

Lessons learned from the latest commissioned IPP-owned solar projects: Likupang and Lombok

Module Price

With aforementioned challenges in solar IPP projects, several developers explore many ways to secure a project. Two of the latest commissioned solar IPP projects were a 30 MW (42 MWp) bundling project: a 15 MW (21 MWp) solar power plant in Likupang Timur, North Sulawesi and 3 solar power plants with each capacity of 5 MW (7 MWp) in Lombok, NTT. These projects secured 10 USD ct/kWh tariff or lower than 85% of local BPPs (13.46 USD ct/kWh in North Sulawesi and 14.35 USD ct/kWh in Bali). **The low generation costs are mostly caused by affordable module prices (without LCRs), suitable project locations, and considerable project sizes.** It is worth noting that these projects had secured PPA before the issuance of MOI Reg. 5/2017 on LCRs. Since the regulation was released in the middle of project construction, discussion and negotiation between developers and PLN resulted in agreeable terms.

Project Location

Project location matters, both locations had relatively high solar irradiation, with an average of 4.2 kWh/kWp. Sufficient land areas were also available for both projects, so land acquisition was not a major issue. Construction cost, including land cost, was 20% of total project cost. With considerable project size, the developers acquired loan up to USD 40,170,000 (in aggregate) from the development bank with a competitive interest rate. After 3-5 months of operation, no major technical issues were detected in all locations.

Project Size

It is also important to note that with the size of solar power plant in Likupang, PLN required longer adjustment period (1-2 months) to adapt their system to solar energy penetration.

Achieving 6.5 GW is possible, given various projects and initiatives are fostered

Strategies would include promoting potential projects to create market and lowering costs, enacting supporting policies and regulation, identifying innovative financing schemes, and promoting domestic solar industries.

Potential Markets

1. **Current RUPTL pipeline**

   IPP projects, rural electrification

2. **APBN budget**

   Rural electrification

3. **SOEs Synergy**

   Initiated by Len Industri, PLN, and Pertamina to utilize rooftop solar PV in 10 clusters: airport, highway, station, mining, factory, gas station, office, harbor, warehouse, and plantation owned by SOEs.

4. **RUEN mandatory**

   30% on government buildings and 25% on commercial buildings and housing complex

5. **Utility-scale solar power plant**

   Minimum capacity at 100 MW and with provision of land

- By having the project list in each potential markets, progress in solar PV deployment would be easier to measure, monitor, and evaluate.
- Integrated roadmap shall prevent overlapping programs within government ministries, agencies, and SOEs.
- Huge potential of rooftop solar PV to help meet the 6.5 GW target in 2025. IESR's study shows that there is a 2 GW potential of rooftop solar pv in the residential market* and more than 300 MW potential in public and commercial buildings**.
- With an excessive project list, government can do a bulk procurement to reduce investment costs.
- Clear, transparent, and effective procurement process is required. Currently, SOEs Synergy is developing appropriate business and procurement models for solar PV.
- Standardization of system design and price, particularly for small to medium size rooftop solar PV, is needed to quicken the procurement system; but should only be applied in the initial procurement process before the market is maturing.
- Sustainability, O&M issues can be addressed by establishing renewable energy service companies (RESCO).

* in Jakarta and Surabaya
** in Jakarta, Surabaya, Bali, North Sumatra, and Central Java

Enabling policy and ecosystem to achieve the 6.5 GWp solar target

Supporting Policies

- Amendment of tariff and procurement models
- Provision of public land (renting mechanism with Indonesia Agriculture SOE (PTPN) or Indonesia Asset Management Agency (LMAN))
- Fiscal incentives

Supportive policies and regulations will address various risks and other barriers associated with the project, creating a conducive environment for solar investments in Indonesia. Fiscal incentives and land availability will reduce risks and lower financing costs. If combined with appropriate procurement and PPA models will improve project bankability.

Financing Scheme

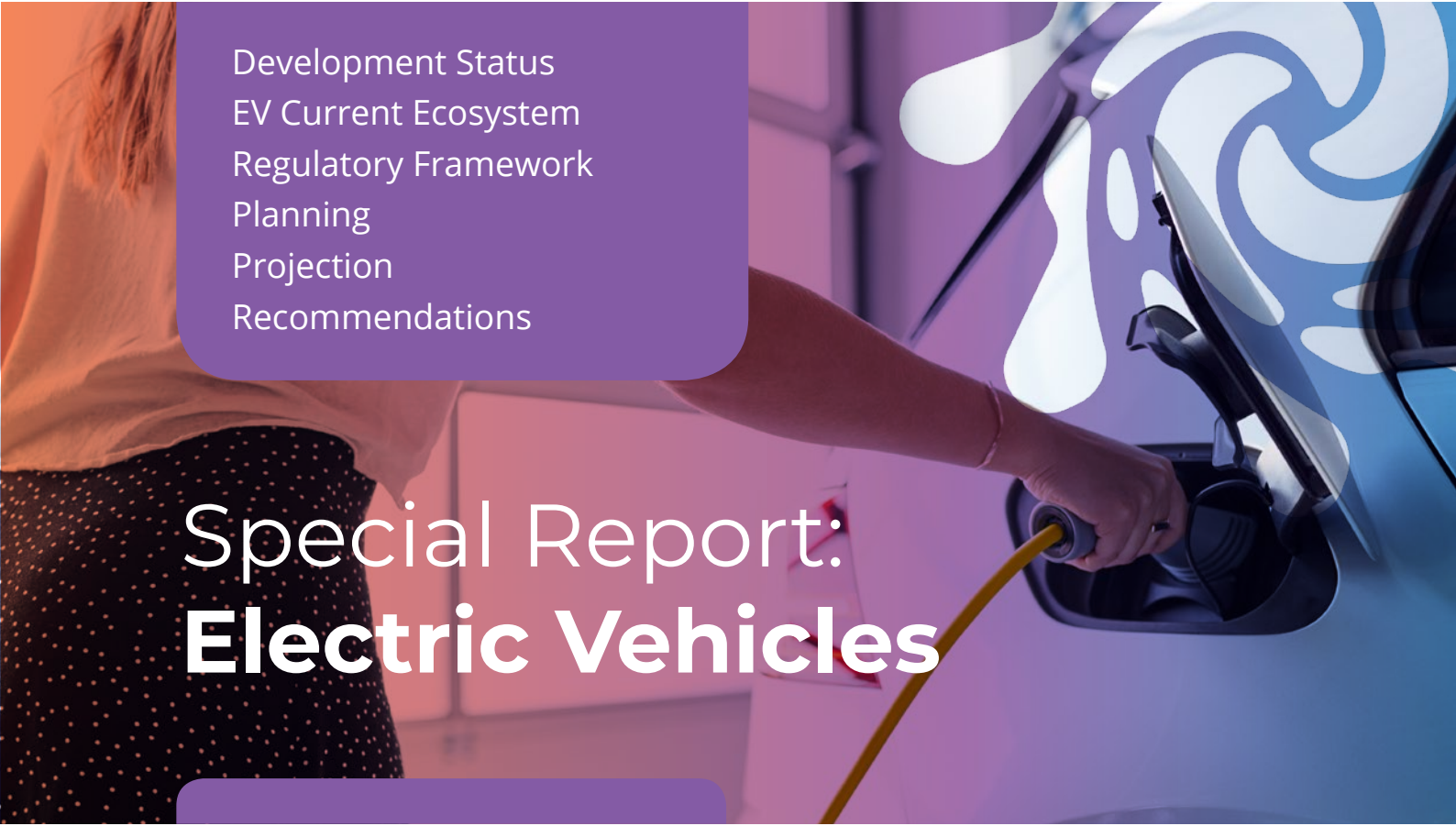
- Collaboration with development banks
- Environmental Fund Management Agency (BPDLH) that manages the Environmental Fund

Access to soft loan with low interest rates and long tenors will help bring the generation costs down. PT SMI as a national entity, with its green climate fund, could play a key role in providing the soft loan. In addition, the BPDLH which was launched in 2019 can bring in new financing instruments to the renewables projects.

Solar Manufacturing Industry

- Regulatory preparation
- Incentives to develop solar PV industry using joint venture or license schemes
- Escalation to upstream solar cell industry
- Technology standardization

Domestic manufacturing capability to produce solar components to help comply with targeted LCRs at 60% is still low. Hence, relaxation of LCRs is needed. The LCR can only be imposed on small to medium (<10 MW) projects due to smaller portion of module cost in the total project cost. The government also needs to incentivize LCR compliance. The solar module industry should not only be aimed to close the 40-60% price gap between local and imported modules, but also to attain a top tier quality.



Development Status
EV Current Ecosystem
Regulatory Framework
Planning
Projection
Recommendations

Special Report:
Electric Vehicles

STATUS

Indonesia to develop electric vehicle industry

Several electric vehicles are already operating and the number is targeted to increase by 2025 (set by the Ministry of Industry)

Mode	Number of Units (2019)	Breakdown of Units	Sales Target (2025)
	40 units	28 e-taxis 12 passenger cars	400,000 units
	3 units	3 public buses (Transjakarta)	41,000 units
	1,256 units	1,256 passenger e-motorcycles	2,000,000 units

Since early 2019, more electric vehicles, such as electric taxis, buses, and motorcycles are introduced. Not long after, the President signed Presidential Regulation No. 55/2019, the first "umbrella" regulation for battery electric vehicles development in Indonesia. This kicks off the electric vehicles era.

Several charging stations for public charging (SPLU) and for EV (SPKLU) are already in place, more are planned

Charging Infrastructure

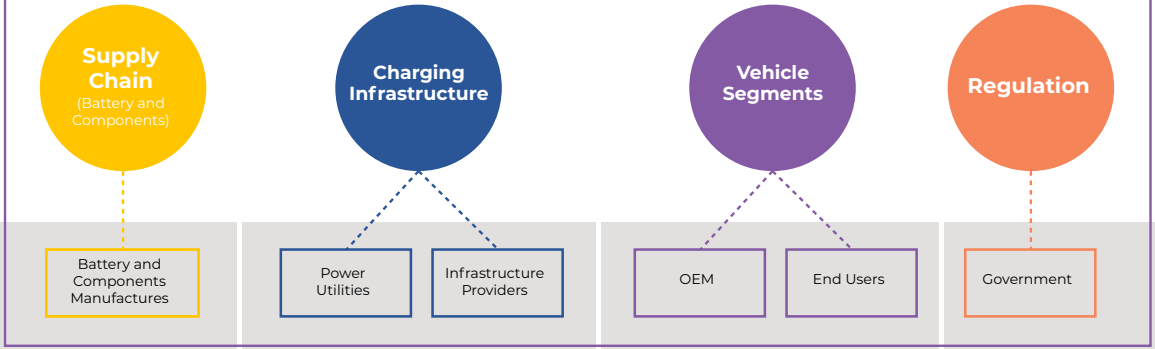
SPLU		SPKLU	
Total Units	7,000 units	**Total Units**	10 units
Power	5.5-22 kVA	**Power**	22-150 kW
Use	Street vendors, e-motorcycles, etc.	**Use**	Electric vehicles

The government has issued regulation that assigns PT PLN to develop more charging spots for EV to cope with its sales target and allows collaboration with private sector to accelerate growth

ECOSYSTEM

The existing ecosystem is unfavorable to EV penetration

Electric Vehicles Ecosystem



- Local capabilities in producing EV battery, electric powertrain and electric motor do not exist today
- Battery-grade Nickel chemicals are to be produced locally. However, there is still no commitment for downstream industry development

- A few charging points have been established, yet they are insufficient to remove consumers' range anxiety
- Roadmap for charging station infrastructure development is still missing
- Current charging station business models for public private partnership have not been finalized, discouraging private sector engagement

- High purchase price for EV as no tax exemptions and incentives (besides luxury tax) given to brand-holder agents and end users
- Consumer awareness on EVs are still low
- Two major OEMs already announced their plans to set up local EV production facility

- Derivatives of Presidential Regulation no. 55 are not yet issued, stifling engagement across stakeholders
- There is still no specific roadmap for EV development, thus distracting the overall effort

Current pace of adoption is insufficient to achieve sales targets in 2020

	2020	2025
Realization:	230 units **e-taxis**	2,000 units **e-taxis** *(still planned)*
	0.15%	0.5%
Target:	150,000 units	400,000 units

CHALLENGES

- Lack of fiscal incentives as no tax exemptions (other than luxury tax)
- Significant fee is imposed on company for electric infrastructure upgrade
- Insufficient public charging spots

	2020	2025
	1,500 units	1,000,000 units *(still planned)*
	0.19%	50%
	800,000 units	2,000,000 units

CHALLENGES

- Lack of fiscal incentives as no tax exemptions besides luxury tax avoidance
- Consumer awareness regarding electric vehicles are still fairly low

	2020	2025
	3 units	14,000 units *(still planned)*
	3%	34%
	100 units	41,000 units

CHALLENGES

- Lack of fiscal incentives as no tax exemptions beside luxury tax avoidance
- Lengthy licensing processes
- Small number of existing e-bus brand holder agents
- Small number of bus operators, thus requiring each one to procure many e-buses

Presidential Regulation No. 55/2019: Government supports for Battery Electric Vehicles (BEV), several challenges remain

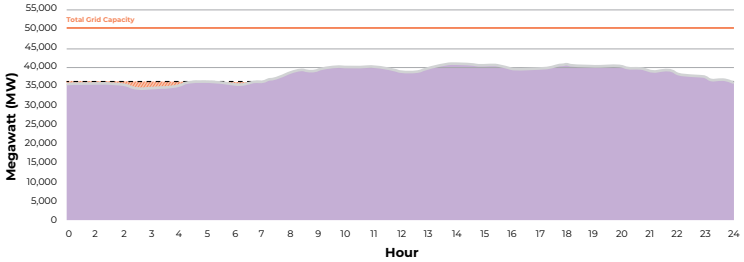
Segment	Key Messages	Assessment
1 General clause	• The regulation gives legal basis for accelerating BEV program • BEV is defined as a vehicle moved by electric motor and utilize electricity from battery within or from outside	It is unclear whether hybrid and plug-in hybrid electric vehicle fall under the same category as BEV
2 Strategic plan ahead	• Acceleration of the industry for BEV development is assessed by Coordination Team based on the roadmap for national vehicle industry development	Specific roadmap for electric vehicle development is essential to direct and manage the effort to attain certain targets
3 EV industry development	• BEV and components manufacturers are mandated to build domestic manufacturing facilities • Central and regional government, and manufacturers could synergize to conduct R&D	Market creation is crucial to attract investment, thus significant fiscal incentives are needed initially
4 Domestic component level	• Minimum domestic component level imposed on BEV industry and component industry for two- and three-wheelers starts at 40% until 80% for 2026, while for four-wheelers starts at 35% until 80% for 2030.	Collaboration with foreign components industry is advised to allow rapid information and technology transfer at the initial stage, thus boosting local industry readiness

Presidential Regulation No. 55/2019: Adequate incentives and charging facilities are key to stimulate EV penetration

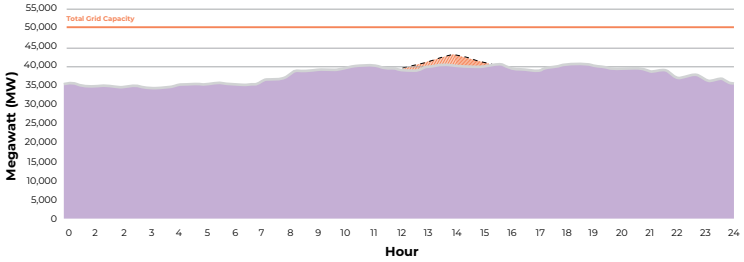
Segment	Key Messages	Assessment
5 Government incentives	• Fiscal and non-fiscal incentives would be given to stakeholders relevant to the development of EVs • Fiscal incentives will be given in the form of import duty incentives, luxury sales tax incentives, and others	At minimum, 60% of EV purchase price has to be cut to achieve sales target; non-fiscal incentives like odd-even policy exemption and free parking are also necessary
6 Charging infrastructure provision	• For starters, the provision of charging infrastructure is assigned to PT PLN; cooperation with state-owned enterprises and other business bodies are allowed within the rules of the law	There are 2 business models proposed by PLN: Partner Owned Partner Operated and Company Owned Partner Operated, yet payback period is still unattractive
7 Charging tariff	• Charging tariff for Battery Electric Vehicle is set by Minister of Energy and Mineral Resources	Tariff is set at IDR 1,650/kWh; more attractive margin is needed to appeal private investment, yet tariff also has to be favourable to consumers
8 Charging locations	• Public charging points are set at gas stations, central and regional government offices, shopping malls, and public parking spots	Roadmap for charging spots is recommended to prioritize deployment of different level of chargers (normal, fast, and ultra fast) in strategic locations

Planned grid capacity is sufficient for electric vehicles; more concern should be put on local power infrastructure

Electricity demand for 20% electric vehicles sales in 2025 (off-peak charging in Java-Bali interconnection)



Electricity demand for 20% electric vehicles sales in 2025 (peak charging in Java-Bali interconnection)

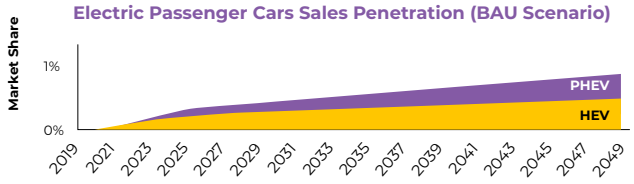


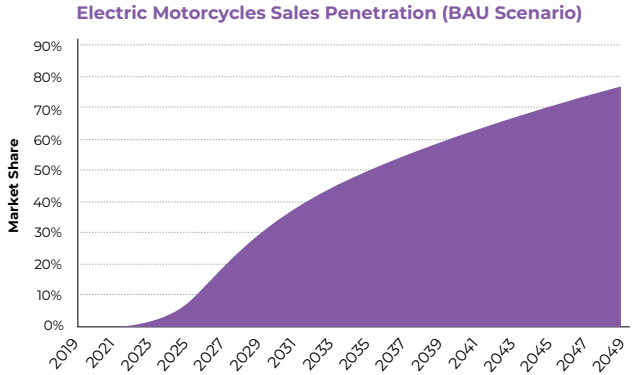
- Whether electric vehicles are charged at off-peak hours or at peak hours, even with fast chargers, the planned grid will still be able to supply the additional electricity demand coming from EV
- There is a potential of “clustering effect” of EVs. They are not distributed evenly across the country, creating clusters in several areas. These clusters could overload local electricity infrastructure when charged together, especially the feeder lines (e.g. the poles and wires) and transformers
- Careful planning on charging spots, especially fast chargers, is needed to spread the extra load optimally
- Off-peak charging has to be promoted to avoid local capacity overload. Time-varying rates or smart chargers are potential tools to be applied
- PLN and government must come to agreement to absorb the additional cost for electric infrastructure upgrade

PROJECTION

High purchase prices remain the number one barrier to achieve electric vehicles sales target

Assuming that the current tax scheme with only luxury tax exemption, development of 2,465 public charging stations by 2025 as planned by PLN, and battery price decline as forecasted by BNEF (8% per year until 2030), our model shows that the electric cars and motorcycles could only obtain 0.5% and 6% of total car and motorcycle markets in 2025 respectively. These numbers are still far off the target of 20% sales penetration for both.





For passenger cars, the government in fact intends to bring in more BEVs. However, as shown on the left, instead of BEVs, the 0.5% penetration by 2025 is attained by plug-in hybrid (PHEV) and fully hybrid vehicles (HEV). This is mainly due to vehicle purchase price of HEV that is much lower than BEV, and as battery prices decline, the benefit of fuel cost savings would attract customers to choose PHEV. BEV is simply still too costly in the absence of incentives. Government has to give significant fiscal incentives in early years to cut 60% off purchase price for BEV via tax exemptions and direct subsidy to achieve sales target.

For two wheelers, even though fiscal incentives are still a hindrance, the price parity is not as significant. With current trend, electric motorcycles are set to obtain 6% market sales penetration in 2025. More effort is needed to increase consumers awareness, build more charging stations, and provide vehicle title transfer fee exemption and removal of other taxes (VAT and vehicle tax) to cut 30% off the purchase price.

Our analysis concludes that the most influential factor overall for electric vehicles penetration is purchase price. For electric motorcycles, intangible factors like awareness, familiarity, vehicle model are also found to be the main drivers for consumers. Along with recommended fiscal incentives above, numerous public charging points have to be built to lower the range anxiety of consumers, we recommend a ratio of 1:10 (charging points to electric vehicles) to ensure growth.

PROJECTION

The road ahead: Government should first focus on two-wheelers and public transport

Electric Motorcycle

Opportunities

- Largest fleet in transportation segment with 6 times more new vehicle sales than cars
- E-motorcycle costs only .5 times more than conventional motorcycle
- Easier access to home/workplace charging with short charging duration (±3 hours to fully charge)
- Several OEMs already made investment

Electric Taxi

Opportunities

- High vehicle utilization in terms of daily distance covered; around 200 km/day for conventional taxis (5 times longer than passenger cars)
- Ease of charging infrastructure planning at taxi depots
- One major taxi operator already planned to take in more electric cars into its fleet

Electric Bus

Opportunities

- Shorter trip length compared to inter-city bus, enabling lower cost bus with smaller battery
- Route predictability since most buses run on dedicated lanes or have specific routes to follow
- Ease of charging infrastructure planning at bus depots
- Ease of control since it is owned by government

Looking at the opportunities, it is recommended for Indonesia to focus on electrifying two-wheelers first. Its lower price difference with conventional motorcycles compared to electric cars (3.5 times higher than conventional cars) along with short duration of charging at home will make it easier for public to shift into. Considering the large size of the fleet, as more electric motorcycles are introduced, Indonesia can slowly build local manufacturing expertise of batteries and other electric vehicle components. At the same time, government should also focus on incentivizing public transport operators (taxis and buses) to integrate more EVs into their armada to spread awareness to the public. Public transportation fleet serves as another entry point for EVs due to its high utilization rate, providing shorter payback period when using EVs as opposed to conventional vehicles.

RECOMMENDATIONS

Government needs to remove cost barriers to create market and focus on building ecosystem to attract investments

	Fiscal	Non-Fiscal	Long Term
Demand-side incentives	• Provide exemptions of local (VAT) and central taxes (Transfer of Motor Vehicle Title Fee and Vehicle Tax) • Introduce direct subsidy to cut 10% of electric cars purchase price	• Provide exemptions from odd-even policy • Allow EV to use special lanes (e.g. Transjakarta bus routes) • Introduce free parking	• Focus on nurturing local manufacturing industry by protecting local battery and EV brands • Limit registration of conventional vehicles and put constraint on vehicle age • Explore tradable carbon credit for OEMs
Supply-side incentives	• Provide more funding on R&D for local battery and electrical components production • Allow import duty, import income tax, and luxury tax exemptions for imported EVs and its components	• Impose more stringent fuel economy standard, increasing annually	

Government needs to focus on building the ecosystem through several measures below to ensure successful deployment.

Charging Infrastructure

Set appropriate charging tariff and introduce direct subsidies for private sector in establishing charging points to shorten payback period

Power Sector

Plan and allocate funding to absorb cost of electric infrastructure upgrade to avoid imposing it to consumers and increasing electricity tariff

Supply Chain

Establish collaboration with foreign battery producers to set up local battery factory in order to develop local expertise

Electric Vehicle Segment

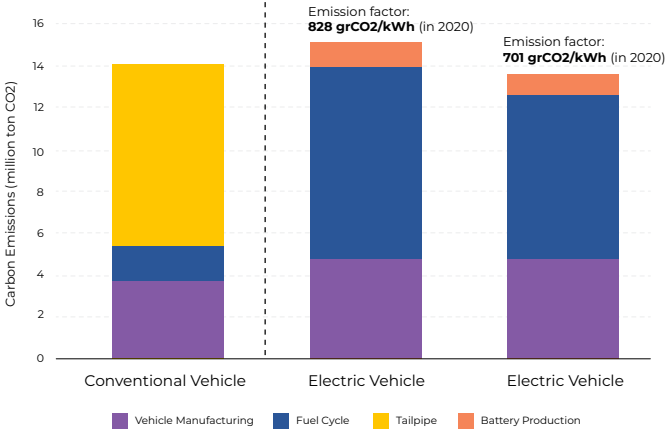
Facilitate adoption in public transport fleet and two wheelers with targeted conventional vehicle sales ban in 2035 to sustain growth

RECOMMENDATIONS

With current electricity mix, electric vehicle penetration will increase carbon emissions in Indonesia

One major concern regarding EV penetration in Indonesia is that it increases carbon emissions rather than reducing it. Using an assumption that total mileage is 150,000 km for the lifetime of each car, our estimation reveals that carbon emissions will likely to increase around 7.5% compared to using conventional vehicles if the grid emission factor stays as it is (828 gr CO2/kWh). This increase in emission is mostly related to power generation from fossil fuel sources. More emissions are coming from production of special components in electric vehicles (e.g. electric motor and controller), additional materials needed for EV body and chassis to support the battery, and the battery itself. However, if Indonesia reaches 23% renewable power mix in 2025 (grid emission factor = 701 gr CO2/kWh), electric car will show roughly 2.6% carbon emission reduction. In that scenario, the extra emissions from vehicle manufacturing process are compensated by less emissions from the electricity generation to fuel EVs.

Carbon Emission Comparison between Conventional and Electric Car in Indonesia



This finding proves that it is vital to accelerate the shift towards renewable energy mix in the grid to get the emission reduction benefits of EV. Government needs to put more aggressive effort to surpass the current 23% energy mix plan. Moreover, end-of-life stage, especially for batteries, must be planned. The use of recycled materials can also reduce emissions in the manufacturing phase by a maximum of 17%.

In the case of two wheelers, since electric motorcycle has 4.5 times better fuel economy compared to its conventional counterpart (150 MPG), it results in around 35% of carbon emission reduction on well-to-wheel basis with current grid energy mix. This benefit could be intensified with cleaner grid. In conclusion, accelerating grid energy mix improvement is imperative to acquire carbon emission savings, especially with more electric cars penetration.

“

We need more than just regulations to kick off the electric vehicle revolution in Indonesia. **Fiscal incentives** (e.g., exemptions from electric vehicle taxes and subsidies for OEMs) and **aggressive electric charging infrastructure development** (minimum 30,000 SPKLU units before 2025) are two most crucial actions to be executed from 2020 onwards to create market”

Idoan Marciano, ICEO EV Report Author

Outlook 2020

Way Forward

Clean Energy Outlook 2020

Factors shaping clean energy demand and outlook

Economic Growth

On average, the Indonesian economy has grown at 5.04% annually from 2015 to 2019. In the next five years, Bappenas projected this growth to be around 5.1% - 6.1% (moderate scenario). We predict that the energy demand will grow at a similar rate to the economic growth, following the same trend in 2018 where the Indonesian primary energy demand grew at 4.9% amid the GDP growth of 5.2%.

Investment Opportunity

- Global trend in fossil fuel divestment will bring an opportunity for renewable energy. Fossil fuel investments start to face a downturn as more financial institutions commit to stop financing fossil fuel projects and increasing their investments in clean energy projects.
- Opportunities may come from local governments which support the use of renewable energy at local levels.

Air Quality & Climate Change

MoEF reported that several provinces experienced significantly poor air qualities (e.g. Jakarta with index of 66.6 (Moderate) and Banten with index of 71.6 (Moderate)) due to emissions from the transportation sector. MoEF also reported that the GHG emissions from the power sector continue to increase (by 3% CAGR since 2010), contributing to 65.3% of national GHG emission inventory in 2017, and may grow to 77.4% by 2030 (excluding FOLU emission). The power plants and transportation currently contribute to 72.5% of GHG emissions. The electrification of transportation sector coupled with increased use of renewable power could be key to mitigate the risks of GHG emission and worsening air quality.

Factors shaping clean energy demand and outlook

Demography & Urbanization

The Indonesian Central Bureau of Statistics (BPS) estimated that the Indonesian population will reach 266.9 million in 2019 and will grow at 0.7% annually from 2020-2045. Furthermore, around 64% of this population will be urban population, which will contribute significantly to energy demand.

Policy & Regulatory Framework

Unsupportive regulations on renewables (e.g. MEMR Reg. 50/2017) were regarded as the main barrier to increase renewables installation in 2019. With the plans to replace some of the regulations, there is expectation for better investment climate in 2020.

Access to Energy

Despite the high electrification ratio claimed by the government, there are still more than 10 million households experiencing electricity poverty in Indonesia. Some challenges hindering the realization of universal energy access are geographical and economic conditions, cost and funding schemes, vertically integrated market structure, and grid planning. Renewables have the potential to address some of these challenges and smoothen the road towards universal energy access.

Project Economics

The renewable technologies are reaching their cost-effectiveness. The global weighted average costs of electricity from solar PV have declined by 77% between 2010 and 2018 due to declining prices of solar modules and balance of system. The similar trend can be seen in wind turbine. However, some barriers persist (e.g. poor risk allocation, regulatory uncertainty) and need to be addressed to ensure better economics of renewables projects.

Mediocre attractiveness of the Indonesian renewable energy sector

Parameter	Sub Parameter	Sufficient*	Insufficient*	Assessment
Macro Vitals	Economic Stability	✓		Indonesia has a stable economic growth with an average of 5.04% growth per year. The renewables sector, however, has not seen similar growth as barriers remain unaddressed. The upcoming law on renewable energy is expected to help tackle the challenges and improve the investment climate in Indonesia.
	Investment Climate		✓	
Energy Imperative	Energy Security	✓		Energy security is secured with large natural resource reserves available while the electricity supply is relatively sufficient in most populated areas in Indonesia. Despite having massive renewable energy potential, Indonesia has been heavily reliant on fossil fuels. The renewable energy deployment has actually been slowing down in the last few years. The latest RUPTL has also shown preferences for fossil power plants over renewables despite the declining renewables prices and the needs to meet RUEN target.
	Electricity Supply	✓		
	Clean Energy Uptake		✓	
Policy Enablement	Political Stability	✓		While the political condition in Indonesia has been relatively stable over the years, political will in regards to renewable energy development is still questionable. Some unsupportive policies remain in place and hamper the renewable energy development in the country.
	Support Instrument for Renewables		✓	
Project Delivery	Energy Market Access		✓	Indonesia electricity market remain single buyer model where PLN act as single-offtaker. PLN supply more than 95% of electricity and control the main grid. Indonesia has seen tremendous infrastructure development in recent years. The new infrastructure may benefit the renewables projects by helping smoothen the project delivery. However, access to market remains uncertain for renewables as financing is difficult to access and non-technical challenges still persist in the sector.
	Infrastructure	✓		
	Finance		✓	
Technology Potential	Technological Maturity		✓	Renewable energy technologies used in Indonesia are mainly imported. While the local content policy is in place to help develop local industries, the local industries have a long way to go to reach sufficient technological maturity.

*Detailed explanations of parameter grades are in Annex

Renewable energy deployment in Indonesia hangs in the balance

- The National Energy Council (DEN) should revisit RUEN target. To meet RUEN target, the additional 5 to 6 GW of renewable energy should be added annually from 2020 to 2025. Considering that the demand growth has been far lower than projected for the last five years, we expected to see an average of 5% electricity demand growth until 2028. With this growth, as much 4 GW of new power plants will need to be added annually. As some thermal power plants will come online in the upcoming years, there will be small room left for renewables to fill in. Therefore, unless the government takes an affirmative action and prioritize renewables in the future capacity additions, RUEN target is not feasible to meet.
- The trend over the last three years shows that PLN only added an average of 250 to 350 MW of renewables per annum. To meet RUEN target, PLN has to step up its role in renewables development and increase the renewable share to 70-75% of annual additional generating capacity from 2020 to 2025. In this effort, the government must improve the investment climate and bring investor confidence back in the market through the betterment of regulatory framework and planning.
- The deployment of rooftop solar PV will increase in 2020, particularly in the industrial sector where the rooftop capacity ranges from 2 to 5 MW. Considering that some large industries and SOEs have stated their commitments to using more renewable energy, we projected the additional rooftop capacity in the industrial sector to reach more than 200 MW in 2020. Meanwhile, the declining costs of small-scale rooftop solar PV, raising awareness, and more access to technology may spark an interest from middle-income households to install this technology. Another market potential is coming from provinces where local governments aim to meet the Provincial Energy Plan (RUED) target.
- Although investors started losing their faith in the Indonesian market, the majority of them will still be in the “wait and see” mode. The return of these investors next year will very much depend on policy and regulation quality. It is, therefore, vital for the government to improve current regulatory regime.

Improved regulations would increase investor appetite for renewable investments

- The government is currently developing a presidential regulation on renewable energy which will introduce a FiT policy back to attract investment in the sector. The regulation is set to be issued in 2020. The level of FiT imposed on the regulation may be key in determining the renewable investment climate in 2020.
- The New and Renewable Energy Bill, which is recently included in the national legislative program (Prolegnas), could provide a much needed long-term stability in the Indonesian renewable market. The law will establish some of policy supports required by renewables to take off such as the incentive schemes and/or the priority of renewables in energy mix.
- Considering that the MEMR Reg No. 16/2019 has helped lower the barriers for private sectors to invest in rooftop solar PV, we expected to see an increase in the use of the technology in the business and industrial sectors. However, the 1:0.65 scheme will still hinder the penetration in the residential sector and to a lesser extent in the industries that only operate 5 or 6 days a week.
- Biodiesel domestic consumption will increase to 9.6 million kL or around 80% of the available production capacity. Government officials suggested that the biofuel blending in diesel will be increased to 50% by the end of 2020 (B50). This cannot be realized under current biodiesel pricing scheme due to the inevitably-increased biodiesel production costs. However, if there is a change in pricing scheme, this pledge might attract investment in biofuel production, either FAME or HVO biodiesel. In that case, the availability of incentives from CPO fund has to be evaluated.
- The establishment of the Environmental Fund Management Agency (BPDLH) in late 2019 is expected to help finance the clean energy development. However, it is yet to be seen how the fund would be utilized. MEMR shall play an active role in directing how this fund supports the renewable energy projects.
- The Ministry of Industry is set to release a production roadmap of low carbon emission vehicles in 2020. This will keep the good momentum initiated by the recent presidential regulation on EV and luxury tax regulation on vehicles. However, EV will still struggle to enter the market without adequate fiscal incentives, especially the incentives to push down the EV purchase prices to compete with conventional vehicles.

Indonesia may lose some investments from businesses requiring renewables supply

- Over 200 multinational companies (at least 40 operate in Indonesia) which are members of RE100 with combined revenues of up to USD 4.5 trillion are now committed to utilizing 100% renewable energy across their global operational facilities by 2030. Some are even targeting 100% RE before 2025. Similar initiatives are on the rise for electric vehicle (EV100) and energy efficiency (EP100/Energy Productivity 100).
- Some countries have responded to the commitment call and prepared a supportive policy for renewables. Most notable example is Vietnam, which saw its solar installed capacity grew by 20-fold within a year because of the feed-in-tariff policy. Ease of purchasing renewable-based electricity may become one of deciding factors in the future investment decision. Recent regulation changes slightly improved the condition, but limited only to rooftop solar PV. If current renewables policy persists, Indonesia will lose significant investment opportunities, both in renewable energy and other sectors to the neighboring countries.
- Regulations governing the implementation of power wheeling could be an option to bring access to renewable-based electricity required by RE100 companies. While the regulatory framework exists (MEMR Regulation No. 1/2015), the charge/payment mechanism remains unclear. The MEMR, as regulator in the power sector, should determine the formula of wheeling charge and its mechanism.

Local governments are taking more actions for clean energy

- In 2019, some provincial governments, i.e. Jakarta, Bali, and Central Java, initiated clean energy campaigns and development in their own jurisdictions. Commitments from local governments, which are translated into the provincial/regional budgets, will help spur growth of small-scale renewable energy projects, most notably rooftop solar PV which is the easiest to deploy among renewables. This trend is likely to continue in 2020, with more local governments start implementing their Provincial Energy Plan (RUED).
- At least a total of 5,602 MW of additional renewables are expected to come from 12 Provincial Energy Plans or (RUED). Hydro power (3,028 MW), geothermal (1,575 MW), and solar (431 MW) are the renewable technologies that local governments mostly rely on. However issues such as planning, financing, and coordination with PLN must be taken into account to turn the potential into real projects.
- Diverse factors drive local governments to initiate clean energy initiatives. The governor of Jakarta has a concern over air pollution in the city, while the governor of Bali enacts the initiative to support the tourism sector. These local contexts may motivate other local governments to develop their own programs next year, e.g. the low air quality indexes in Banten and Bandung, or increased electricity demand in East Kalimantan as the future capital city.
- With local air pollution becomes a bigger urban issue, local (city-level) governments can play a key role in increasing the EV uptakes. Regulations on emission testing and vehicle lifetime limit adopted in Jakarta could help drive EV demand, but only if supportive policies from central government are available. The government of Jakarta has also shown its strong commitment to EV by hosting Formula-e next year.

Energy efficiency is a low hanging fruit that has yet to spark an interest

- The underlying regulation on energy efficiency, PP 70/2009, is under revision and expected to be released by next year. The updated regulation is hoped to impose the mandatory energy management system on more companies in each sector (industry, transport, and building), govern incentives and disincentives for energy efficiency activities, revitalize ESCOs, and introduce an energy efficiency (EE) auditor. Despite the good intention in improving the energy management monitoring system, the regulation may have a minimal impact on EE achievement in 2020.
- The government has planned a MEPS upgrade for AC. However, the impacts of MEPS on AC would only be felt in the next few years, signifying minimal improvement in energy efficiency in households and commercial buildings in 2020. Additionally, MEPS for other appliances remains untouched and the potential of EE from other appliances would likely be missed.
- The recent adoption of green building codes in various cities, however, indicates the growing trend in more-energy efficient buildings. This may help push the implementation of energy efficiency measures in the residential, commercial and industrial buildings.

Turn the table, seize the moment to draw investors

- Indonesia competes with its neighbouring countries in the region to attract investments in renewable energy. Countries like Vietnam, Malaysia, and Philippines attract more foreign direct investments in the last three years due to better policies and clear and consistent regulations. On the contrary, Indonesia is perceived as risky and less attractive despite its huge renewable potential. Nonetheless, investor interests are reemerging with the new leadership in the energy sector. Therefore, the new cabinet should regain trust from investors during their first months in the office by putting forward the intention and detailed action plan to accelerate renewable energy development. This effort should be followed by a plan to improve policy and regulation as well as the removal of barriers that hamper renewable energy deployment in Indonesia.
- Investors also expect that the upcoming renewable energy law can provide clarity on government support for renewables. The parliament and government must soon come into agreement on the scope and the substance of this legislation.
- As the Indonesia renewable market is still at the infant stage, the reintroduction of feed-in-tariff (FiT) is a must, at least for the next few years, to attract investors while the government prepares to implement the reverse auction scheme for utility-scale renewables projects. A clear plan and timetable has to be announced to ensure transparency and manage investor expectation. The government must then anticipate the impact of FiT on PLN's generation cost and prepare a support mechanism to ease PLN's burden. Nonetheless, tariffs alone are not sufficient to draw investments into the sector. In the upcoming regulation, a fair risk allocation between IPP and PLN must also be addressed.
- It is important to incentivize local manufacturing industries to help them compete with cheaper imported components, instead of only imposing local content requirement on project developers. For solar projects, the relaxation of local content requirements is needed in some cases, such as in small to medium (<10 MW) solar projects.
- The amendment of net-metering scheme from 1:0.65 to 1:1 is needed to increase interests in the residential and commercial sectors. Some stimulus such as special financial instruments for rooftop solar, building and land (PBB) tax reduction, and solar PV module rebates are key incentives that can help expedite the deployment of rooftop solar PV in the country.

WAY FORWARD

Develop sustainable policy and instruments to ensure the clean energy deployment

- The government needs to figure out new incentive/subsidy schemes for biodiesel, particularly if the plan to increase the biodiesel blend to 30% or 50% is to be taken seriously.
- The importance of biofuel sustainability should be taken into account. Therefore, the Presidential Instruction No. 6/2019 on the Sustainable of Palm Oil Plantation shall be implemented and integrated into biofuel production supply chain as early as possible. From time to time, the government must release data on biofuel carbon footprint.
- The government needs to have a better energy efficiency policy with a broader coverage of energy consumers required to have energy management systems. This can be done by lowering the minimum threshold of energy users that have to carry out the mandatory energy management and improving the enforcement and incentives available to drive the compliance with the regulation.
- The government needs to update the MEPS and energy labeling to cover more appliances and align them with international best practices. In particular, Indonesia needs to improve its AC efficiency and consider to utilize CSPF ratings instead of EER in conjunction with ISO-16358-1 for a better measurement of energy efficiency ratings for AC
- A special financing instrument is needed to finance small-scale renewable energy projects (1 to 5 MW) outside Java-Bali. As it will take several years until the new environmental fund (DLH) can be utilized to such cause, the government can allocate fund from the state budget (APBN) to be given to a financial institution. This fund will provide a low-interest loan to project developers in combination with other available international financing mechanisms.

Need more than just a regulation to start the EV revolution

- The government needs to set out a roadmap for low carbon transportation to bring certainty to investors on the direction of the market. It is also important to follow up the presidential regulation on electric vehicle with the needed derivative regulations, most importantly on the fiscal incentives (exemption from taxes and duties) and industrial plan.
- The government should focus on facilitating public transport operators in integrating more electric vehicles into their fleet to increase general public awareness on EV. Speeding up licensing process and providing incentives in the form of tax exemptions or direct subsidies are also essential.
- Special attention needs to be given to local EV manufacturing capability. In order to gain maximum economic benefits from EV penetration, the government has to start and nurture local EV industry by allocating more funding for the R&D of battery and other EV components, as well as collaborating with foreign battery and EV producers. The development of electric two-wheelers/motorcycles could be an initial step to build supply chain, manufacturing capability, and market penetration. The electric two wheelers are likely to take off faster than the electric cars due to its relatively competitive prices.
- In an effort to increase the electric vehicle adoption, more aggressive and detailed charging infrastructure plan needs to be devised. At a minimum, 30,000 level-2 (regular) chargers need to be built by 2025. It is especially important to develop more charging points in early years to reduce range anxiety of consumers.
- The local governments should step up and follow the initiatives taken by Jakarta, Central Java, and Bali to foster clean energy development such as the adoption of rooftop solar PV and EV in their regions. Some of incentives that can be introduced by local governments are the exemptions from odd-even policy for EV or land and building tax exemptions for rooftop solar owners.
- Greening the grid must be taken into account. More renewables supply in the grid could make EV have environmental advantage over the conventional vehicles.

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Annex

Parameter of Indonesia Clean Energy Attractiveness

Parameter	Sub Parameter	Sufficient	Insufficient
Macro Vitals	Economic Stability	Sufficient with stable growing economic growth rates	Insufficient with unstable and falling economic growth rates
	Investment Climate	Sufficient enabling conditions to foster investment	Insufficient enabling conditions and barriers to foster investment
Energy Imperative	Energy Security	Sufficient energy natural resources reserves	Insufficient a shortage of energy natural resources reserves
	Electricity Supply	Sufficient current energy supply for consumption	Insufficient of current energy supply for consumption
	Clean Energy Uptake	Sufficient Clean energy utilization with little clean energy gap	Insufficient clean energy utilization with large clean energy gap
Policy Enablement	Political Stability	Sufficient political stability with stable government	Insufficient political stability unstable government
	Support Instrument for Renewables	Sufficient regulations, policy and political will supporting renewables development	Insufficient regulations, policy and political will supporting renewables development and barriers
Project Delivery	Energy Market Access	Sufficient market access for clean energy with no barriers	Insufficient market access for clean energy with barriers
	Infrastructure	Sufficient infrastructure (electricity transmission,distribution, roadways and logistic transportation) for project delivery	Insufficient infrastructure (electricity transmission,distribution, roadways and logistic transportation) for project delivery
	Finance	Sufficient availability of many financing options with no barriers	Insufficient with limited availability of financing options with barriers
Technology Potential	Technological Maturity	Sufficient access and availability of best available technology (BAT) as in International market,easy access of project owner to the technology and mobilization of technology.Support for R&D. Ability of local production of renewable energy technology	Insufficient access and availability of best available technology (BAT) as in International market, barriers for project owner to the technology and mobilizing of the technology.Difficulties for R&D. Inability of local production of renewable technology

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