DIRECTORATE GENERAL OF NEW, RENEWABLE ENERGY AND ENERGY CONSERVATION
MINISTRY OF ENERGY AND MINERAL RESOURCES

KEYNOTE SPEECH

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at
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Economics towards Net Zero Emission: Challenges and Opportunities on Technology Innovation and Financing

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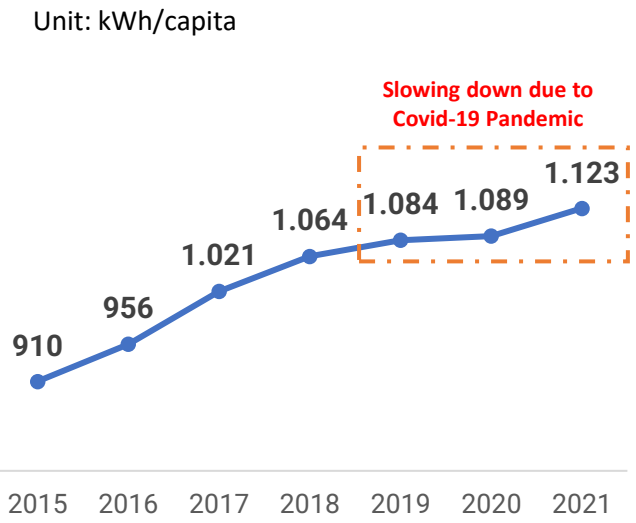
INDONESIA'S NRE POTENTIAL, ELECTRICITY CONSUMPTION & NRE MIX

The increasing electricity consumption should be in line with increased NRE utilization

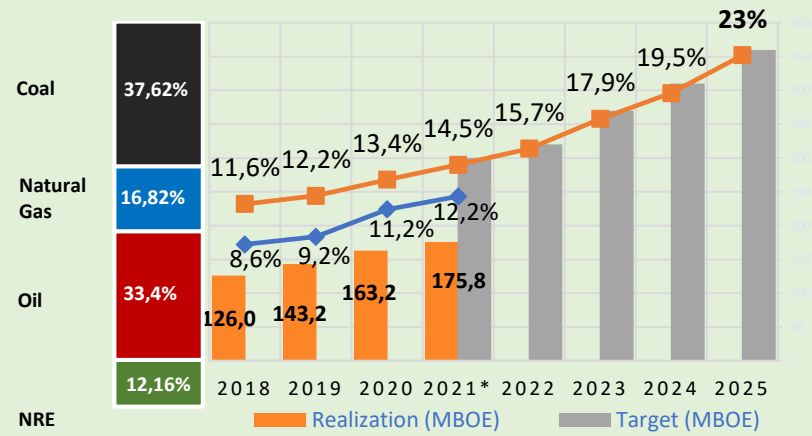
NRE POTENTIAL

ENERGY	POTENTIAL (GW)	UTILIZATION*) (MW)
SOLAR	3,295	217
HYDRO	95	6.648
BIOENERGY	57	2,284
WIND	155	154
GEOTHERMAL	24	2,293
TIDAL	60	0
TOTAL	3,686	11,597

ELECTRICITY CONSUMPTION



NRE MIX 2021



Indonesia has **abundant**, **various**, and **spreading** NRE resource, Currently**, only 0.3% of the total potential has been utilized. The potential of new renewable energy is distributed as follows:**

- **Hydro** potential spreads all over Indonesia's areas, particularly in North Kalimantan, NAD, North Sumatra and Papua.
- **Solar** potential spreads all over Indonesia's areas, particularly in East Nusa Tenggara, West Kalimantan and Riau which has higher radiation.
- **Wind** potential (>6 m/s) is particularly located in East Nusa Tenggara, South Kalimantan, West Java, NAD and Papua.
- **Ocean** energy potential spreads all over Indonesia's areas, particularly in Maluku, East Nusa Tenggara, West Nusa Tenggara and Bali.
- **Geothermal** potential spreads in ring of fire areas, including Sumatra, Java, Bali, Nusa Tenggara, Sulawesi, and Maluku.

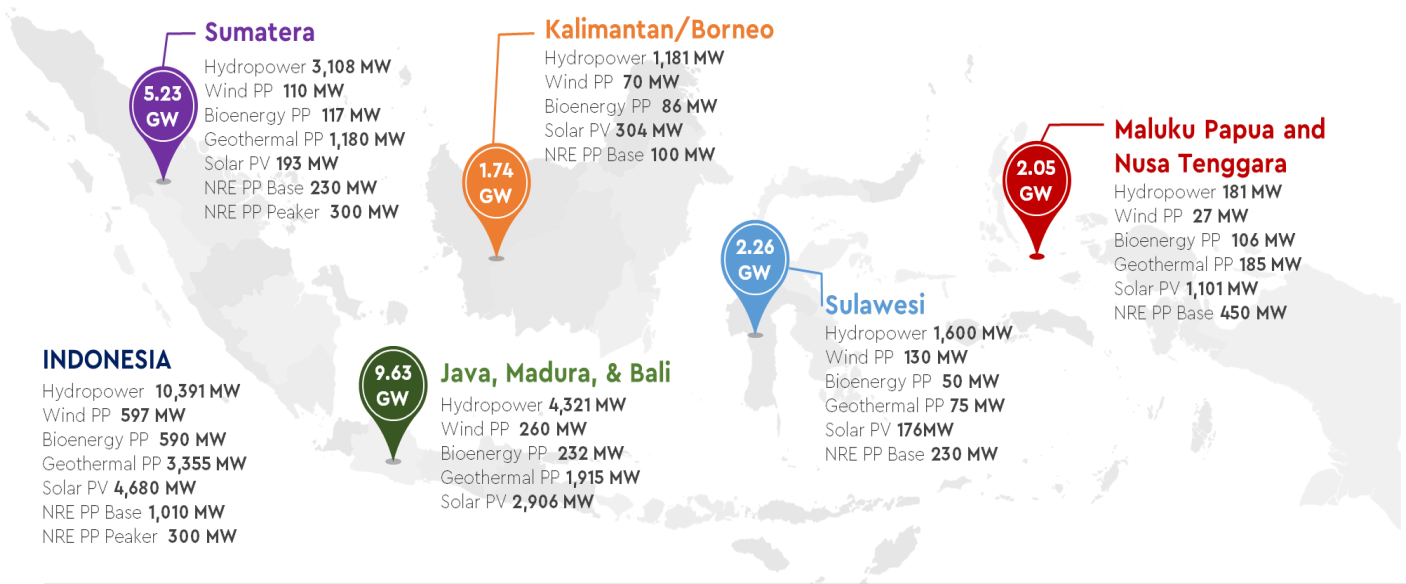
Acceleration Measures:

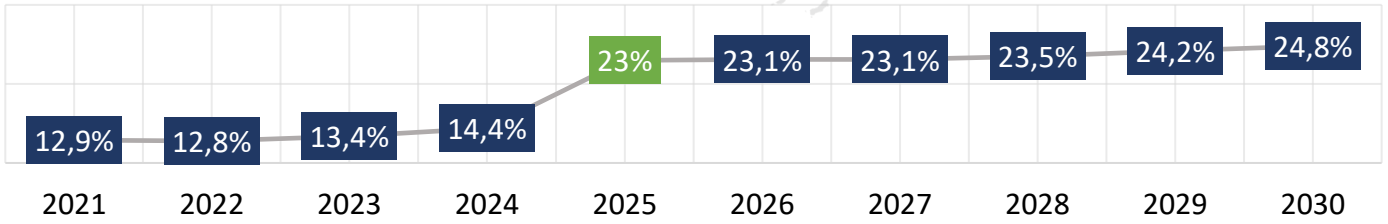
1. Completion of Pres. Reg. Draft on NRE Tariff
2. Implementation of Solar PV Rooftop
3. Mandatory Biofuel Utilization
4. Fiscal and Non-fiscal Incentives for NRE Projects
5. Ease of doing business
6. Stimulating demand towards electricity, namely electric vehicle, electric stove

NRE PP DEVELOPMENT PLAN 2021-2030 (RUPTL PT PLN (Persero)

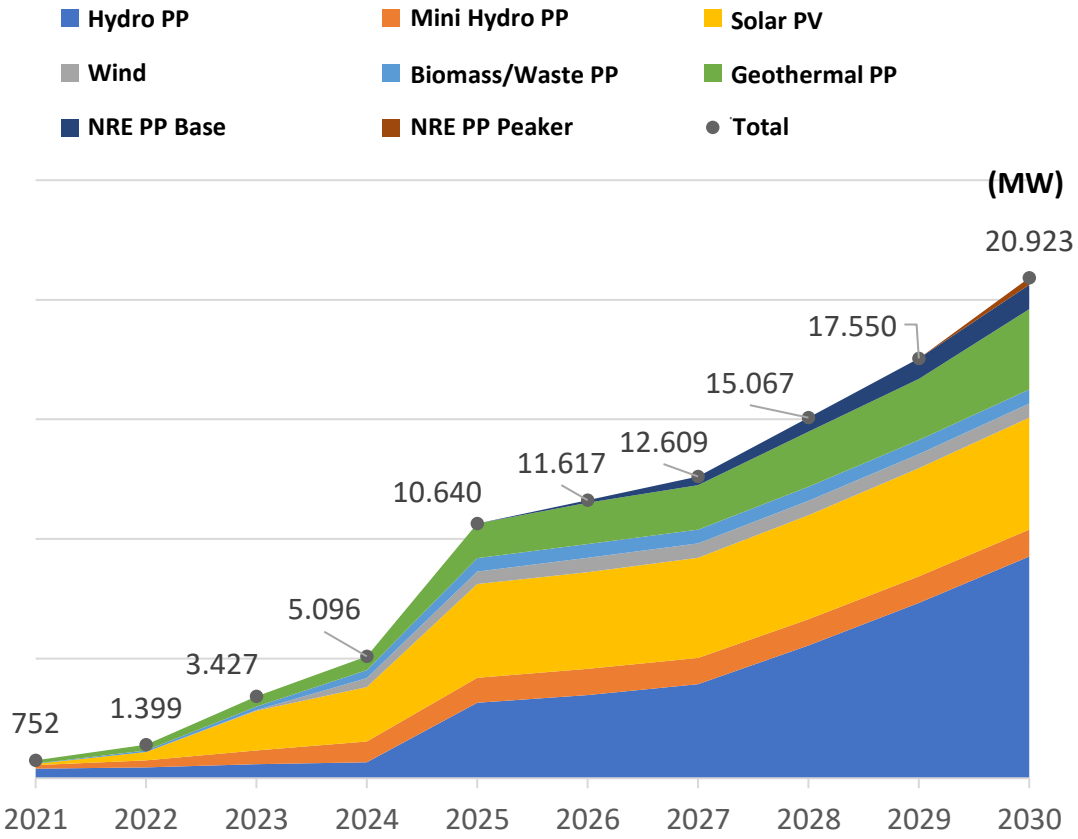
NRE project acceleration efforts

Distribution based on RUPTL 2021-2030





Additional NRE PP in RUPTL 2021-2030



- NRE additional capacity is targeted to reach 20.9 GW (51.6% of the power plant in RUPTL 2021-2030) to fulfill NRE target for 23% in 2025 and NDC emission reduction target in 2030.
- Total required invesment is 55.2 billion USD and the emission reduction potential will amount to 89 million tons CO_2e.
- Private sectors have an important role in supporting the NRE development. Based on RUPTL 2021-2030, >50% of NRE PP will be developed by private sector.

OPPORTUNITIES FOR INVESTMENTS IN NRE BASED ON RUPTL PLN 2021 - 2030

Encouraging economic growth and employment

01

SOLAR PV ROOFTOP

Additional Capacity until 2025: **3.61 GW**
GHG Emission Reduction : **5.4 million tons CO2e**
Investment Required : **3 Billion USD**

Investment opportunity through:

- Installing Solar PV Rooftop on Buildings and Houses
- Installing Solar PV Rooftop in Industries

02

LARGE SCALE SOLAR PP

Additional Capacity until 2030 : **4.68 GW**
GHG Emission Reduction : **6.97 million tons CO2e**
Investment Required : **3.2 Billion USD**

Investment opportunity through:
Offer on Solar PP Quota from PT PLN (Persero)

03

HYDRO PP

Additional Capacity until 2030 : **104 GW**
GHG Emission Reduction : **46.46 million tons CO2e**
Investment Required : **25.63 Billion USD**

Investment opportunity through:
Development of Large Scale, Mini, Micro Hydro and *Pump storage*

04

NRE PP - BASE

Additional Capacity until 2030 : **1.01 GW**
GHG Emission Reduction : **4.51 million tons CO2e**
Investment Required : **5.49 Billion USD**

Investment opportunity through:
NRE PP which can fulfill baseload generation needs, i.e. Geothermal PP

05

GEOTHERMAL PP

Additional Capacity until 2030 : **3.35 GW**
GHG Emission Reduction : **22.4 million tons CO2e**
Investment Required : **17,.35 Billion USD**

Investment opportunity through:

- Offer on Working Area dan Geothermal PSPE Area
- Implementation of geothermal supporting industries and services

06

BIOENERGY PP

Additional Capacity until 2030 : **590 MW**
GHG Emission Reduction : **4.61 million tons CO2e**
Investment Required : **2.2 Billion USD**

Investment opportunity through:
Development of Biomass, Biogas, and Waste PP

07

WIND PP

Additional Capacity until 2030 : **597 MW**
GHG Emission Reduction : **2.22 million tons CO2e**
Investment Required : **1.03 Billion USD**

Investment opportunity through:
Development of Wind PP by through offers from PT PLN (Persero)

08

NRE PP - PEAKER

Additional Capacity until 2030 : **300 MW**
GHG Emission Reduction : **2.01 million tons CO2e**
Investment Required : **0.28 Billion USD**

Investment opportunity through:
Utilization of NRE PP – Peaker quota listed on the electricity balance i.e. *Battery Energy Storage System (BESS)*

ENERGY TRANSITION ROADMAP TOWARD CARBON NEUTRAL

1) Timeline of strategic achievements to achieve net zero emission in the energy sector
2) This Roadmap will be a form of joint commitment between the government and stakeholders to achieve NZE 2060

2021 – 2025

2025: Emission Reduction 198 Mill ton CO_2

Supply:
- Implementation of 3.6 GW solar roof top
- Construction of NRE Plant capacity 10.6 GW
- Gasification gas generator 1.7 GW
- Take out 8.8 GW PLTU at RUPTL
- Convert Gasoil Plant to NRE
- Gas and Steam Power Plant 0.8 GW as a replacement for Steam Power Plant

Demand:
- Decreasing LPG imports by using Induction stove for 8.2 mill HH.
- Electric vehicles 400K cars and 1.7Mill motorcycles
- Gas network for 5.2 million homes.
- CNG Car 100k
- Application of Energy Management and MEPS

2026 – 2030

NDC TARGET ACHIEVED

Supply:

Construction of NRE Plant capacity 10.3 GW to replace coal power plant

Demand:
- Decreasing LPG imports by using Induction stove for 18.2 mill HH.
- Electric vehicles 2Mill cars and 13Mill motorcycles
- Gas network for 10million homes.
- CNG Car 300k
- DME usage to subtitute LPG for 20,4Mill HH
- Application of Energy Management and MEPS

2030: Emission Reduction 314 Mill ton CO_2

2031– 2035

2035: Emission Reduction 475 Mill ton CO_2

Supply:
- No additional Fosil Power Plant
- No Gasoil Power Plant
- Retirement Coal Power Plant 6 GW*)
- NRE Plant: Solar PV 99 GW, Hydro 3,1 GW, Bioenergy 3,1 GW dan Geothermal 5,6 GW
- Hydrogen 328 MW
- Battery use 7 GW

Demand:
- Induction Stove for 28,2 Mill HH.
- EV 5,7Mill Car and 46,3Mill motorcycles
- Gas network untuk 15,3Mill homes.
- CNG Car 800K

2036 – 2040

Supply:
- Retirement Coal power plant 3 GW*)
- NRE Construction: solar PV 68,5 GW, Wind power plant 9,4 GW, Hydro 3,7 GW, Bioenergy 7,8 GW, and geothermal 1 GW
- Hydrogen use 332 MW
- Battery use 46 GW

Demand:
- Induction Stove for 38,2 Mill HH.
- EV 12,3 Mill Car and 105Mill motorcycles
- Gas network untuk 20,3Mill homes.
- CNG Car 2Mill

2040: Emission Reduction 796 Mill ton CO_2

2041– 2050

2050: Emission Reduction 956 Mill ton CO_2

Supply:
- Retirement Coal Power Plant 31 GW*)
- NRE Plant : Solar PV 180,2 GW, Wind power plant 17,5 GW, Hydro 13,7 GW, Bioenergy 23 GW, Geothermal 3 GW, Ocean Current 1,3 GW and Nuclear 5 GW
- Hydrogen 9 GW
- Battery use 151 GW

Demand:
- Induction Stove for 48,2 Mill HH.
- EV 38,2 Mill Car and 205Mill motorcycles
- Gas network untuk 23,4Mill homes.
- CNG Car 2,8Mill

2051 – 2060

Supply:
- Retirement Coal power plant 8 GW*)
- Retirement Gas and Steam Power Plant 8 GW
- NRE Construction : Solar PV 8,2 GW, Wind power plant 11,6 GW, Hydro 37,9 GW, Bioenergy 2,1 GW, geothermal 3 GW, Ocean Current 12,1 GW and Nuclear 30 GW
- Hydrogen use 52 GW
- Battery use 140 GW

Demand:
- Induction stove for 58Mill HH.
- EV 69,6Mill Car and 229Mill motorcycles
- Gas Network 23,9Mill HH.

2060: Emission Reduction 1.526 Mill ton CO_2

Innovative low emission technology such as CCS/CCUS technology in some extent could be implemented in existing fossil power generation to accelerate the emission reduction while transitioning to a cleaner and greener energy

*) Coal Power Plant & Power Private Utility (PPU) maximum 30 years and IPP 25-30 years (as in PPA)

INDONESIA'S STRATEGY TOWARDS *NET ZERO EMISSION*

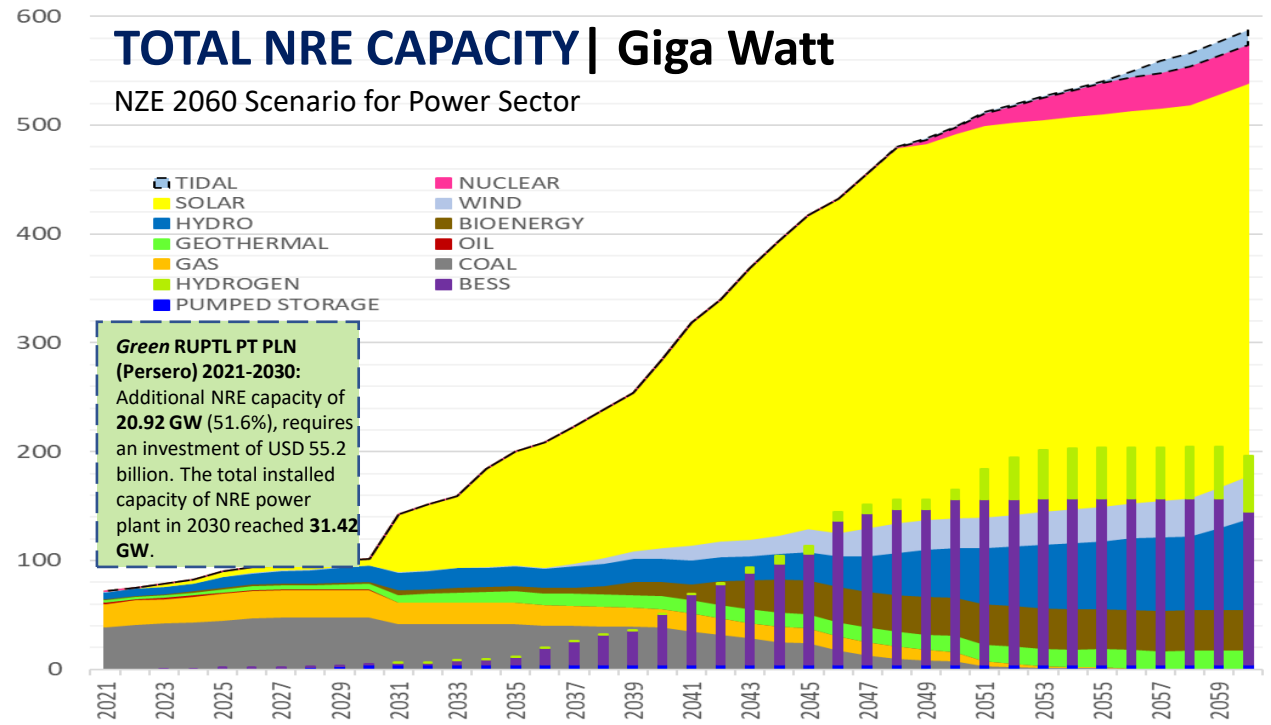
2060: All electricity will be generated by NRE PP, focus on VRE Development.

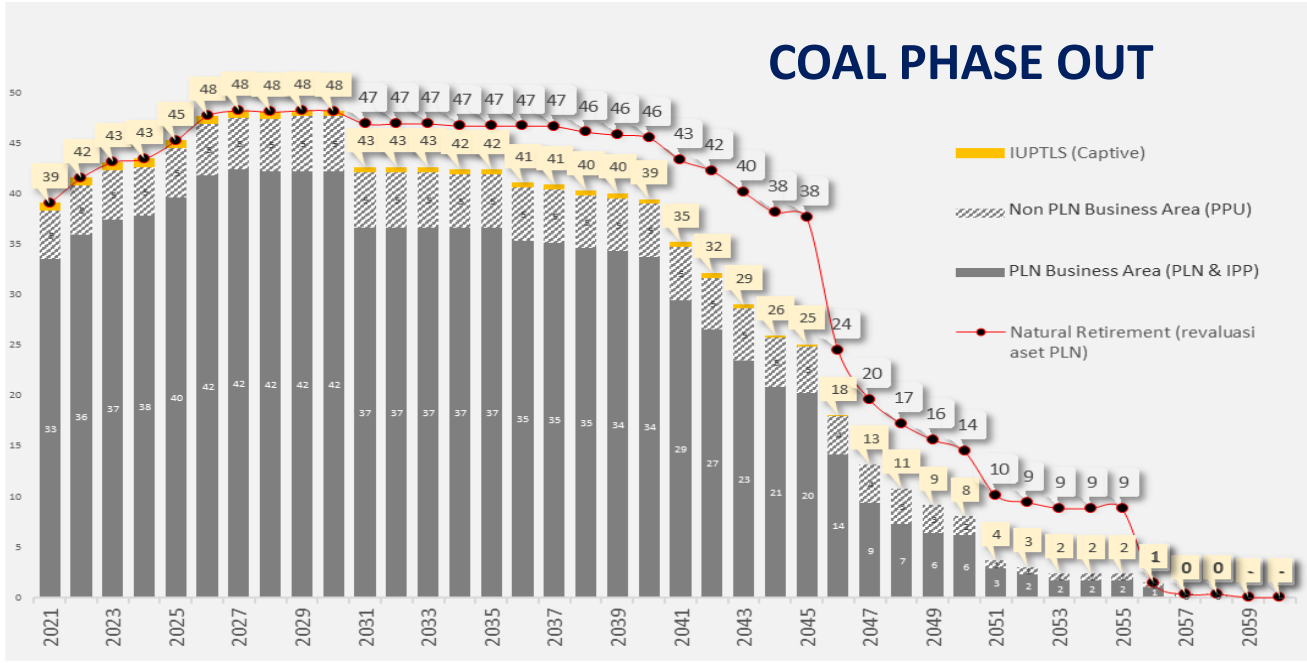
NRE capacity 587 GW: Solar 361 GW, Hydro 83 GW, Wind 39 GW, Nuclear 35 GW, Biomass/Bioenergy 37 GW, Geothermal 18 GW, Tidal/Ocean 13.4 GW, Pumped Storage 4.2 GW, BESS 140 GW, Hydrogen 52 GW.

- Pump storage enters the system in 2025, Battery Energy Storage System (BESS) to be massively utilized in 2031. Hydrogen is utilized gradually starting in 2031, and massively in 2051.
- Nuclear PP will enter the system in 2049 to maintain system reliability, by 2060, it will need up to 35 GW.

Coal Phase Out

- CFPP capacity includes existing and on-going CFPP in all business areas, both PLN and non-PLN.
- **The increase in CFPP capacity** up to 2026 **only comes from on-going projects.**
- Maximum age of PLN CFPP 30 years and IPP 25-30 years (according to PPA).
- In the phase out scheme, there is a **financial impact for PLN of around USD 38 billion**, based on the revaluation of PLN's assets at the end of 2015 the age of the CFPP PLN which was operating at that time was extended by 30-40 years, so that the **natural retirement is in 2046-2056**.
- It needs regulation and legal rule (Gov. Reg or Presidential Reg), so that the implementation of phasing out can be done by business entities and could be sustainable.





NREEC ACCELERATION STRATEGY

Improving NRE capacity through various means in NRE development

CLUSTERS	STRATEGY	
1 LARGE-SCALE PP (Hydropower and Geothermal)	• **Renewable Energy Based Industrial Development (REBID)** • **Utilization of PUPR's Existing Dam** • **Government Drilling** • **SOE Synergy**	– REBID: Development of an NRE-based industrial area for energy provision. Potential utilization >40 GW – Utilization of 18 existing PUPR dams totaling 260.71 MW – Government drilling to minimize the risk of geothermal exploration.
2 BIOENERGY	• **Biofuel Mandatory Increase** • **Cofiring Implementation**	– Currently, B40 trials and bio-Avtur utilization planning are being carried out – Finalization of the Presidential Regulation on Cofiring Implementation is underway. Utilization potential: 8.06 million tons of biomass with a production of 10 GWh/year
3 VARIABLE RENEWABLE ENERGY (VRE)	• **Increasing the implementation of Rooftop PV** • **Floating PV Development**	– Efforts to encourage the increase of Rooftop PV are realized with the Minister of Energy and Mineral Resources Regulation 26/2021, which encourages the export-import of PV generators to be 100%. – The potential for developing PLTS Floating is 26 GW in lakes and dams spread across Indonesia. Project initiation: Cirata PV PP with a capacity of 145 Mwe in Cirata Reservoir, West Java.
4 ENERGY CONSERVATION	• **Improved implementation of SKEM** • **Electric vehicle implementation**	– Plans to add SKEM to blenders, induction cookers, LED lamp, etc. – EV roadmap: 13 million two-wheeled vehicles and 2 million four-wheeled vehicles in 2030.

CLIMATE FINANCE OPTIONS IN INDONESIA

The Ministry of Finance oversees several climate change financing and/or funding facilities, including the Green Climate Fund, BPDLH, SDG Indonesia One.

More innovations and initiatives are needed to accommodate necessary capital for NRE Development as well as decarbonization

	DOMESTIC	INTERATIONAL
PUBLIC	1 APBN / State Budget (Mitigation and Climate Change Adaptation Spending) 2 Global Green Sukuk 3 Green Sukuk Retail 4 Badan Pengelola Dana Lingkungan Hidup (BPDLH) 5 SDG Indonesia One 6 ICCTF (Bappenas) 7 Country Platform	1 Green Climate Fund 2 Global Environment Facility (MoEF) 3 Adaptation Fund 4 Multilateral Development Banks (MDBs)
NON-PUBLIC	1 Private Investments 2 Sustainable Finance 3 Philanthropy	1 Investor Bonds 2 Equity Fund 3 Pension fund 4 Philanthropy

Source: BKF

CHALLENGES & ENABLING FACTORS FOR NZE IMPLEMENTATION

CHALLENGES IN ACHIEVING NZE

1 Economy & Technology

Technological innovations and good engineering practices in the NRE and energy conservation sector encourage the safety, reliability of the electric power system and increasingly competitive prices.

2 Infrastructure

Availability of supporting infrastructure in the development of NRE and energy conservation.

3 Supply & Demand

The development NRE and energy conservation for both power generation and non electricity purposes should consider the balance of supply & demand growth.

4 Funding

High investment value, limited funding, and high development risk, etc.

5 Social Dynamics

NRE and energy conservation management and governance that focus on social aspects of people centered development.

ENABLING FACTORS

	Supply	*Demand*
Policy Support	▪ Feedstock ▪ Carbon Prices ▪ CFPP Retirement ▪ Power Wheeling	▪ Energy Management ▪ Minimum Energy Performance Standard (MEPS) & Labelling
Infra-structure	▪ Smart Grid ▪ Super Grid ▪ Power Wheeling	▪ EV and Charging Station ▪ City Gas Network ▪ Induction Stoves
Funding Support	▪ Fiscal and Non-Fiscal Incentives ▪ Grant and Loan ▪ Other Funding Facilities	▪ Fiscal and Non-Fiscal Incentives ▪ Grant and Loan ▪ Other Funding Facilities
R&D and Technology	▪ CCS/CCUS ▪ Hydrogen/Ammonia ▪ New Energy Sources	▪ Energy Efficiency ▪ Energy Conservation Innovation

Collaboration and participation from all stakeholders to accelerate energy transitions and meeting climate goals

Thank You

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