DIRECTORATE GENERAL OF NEW RENEWABLE ENERGY AND ENERGY CONSERVATION
MINISTRY OF ENERGY AND MINERAL RESOURCES
THE REPUBLIC OF INDONESIA

INDONESIAN NRE DEVELOPMENT AND INVESTMENT OPPORTUNITY

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On

The 3rd International Investment Forum to Attract Japanese Investment into Indonesia's Renewable Energy Sector

March 3, 2023

INDONESIA'S COMMITMENT TO ACHIEVE SDG7

The Ministry of Energy and Mineral Resources participates in actualizing the SDG7 through GHG reduction

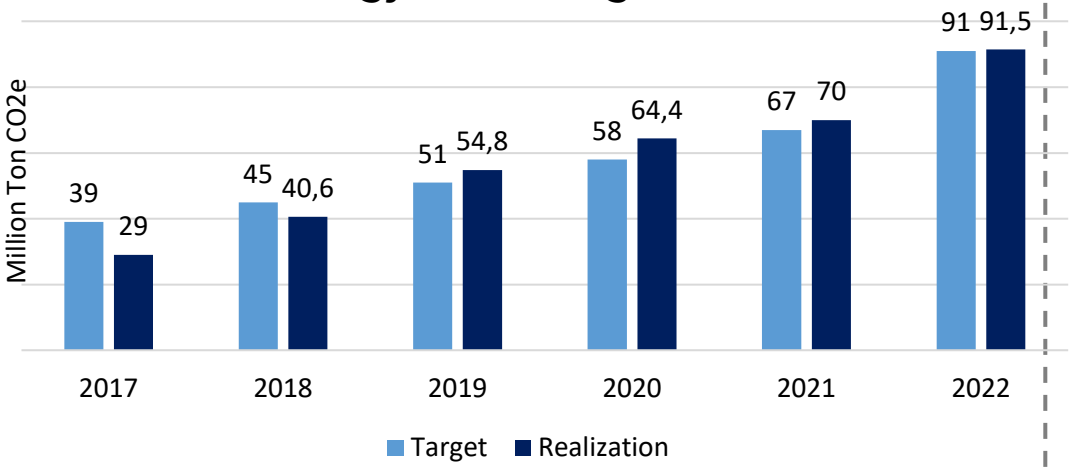
EMISSION REDUCTION TARGET

Enhanced NDC 2030

No	Sector	2010 GHG Emission(Million Ton CO_2e)	GHG Emision by 2030			Reduction	
			BaU	CM1	CM2	CM1	CM2
1.	**Energy**	**453,2**	**1.669**	**1.311**	**1.223**	**358**	**446**
2.	Waste	88	296	256	253	40	45,3
3.	IPPU	36	70	63	61	7	9
4.	Agriculture	111	120	110	108	10	12
5.	FOLU	647	714	217	-15	500	729
	TOTAL	**1.334**	**2.869**	**1.953**	**1.632**	**915**	**1.240**

Note: *CM: Counter Measure;* CM1: *self effort*; CM2: *international assistance*; IPPU: *industrial processes and production use*

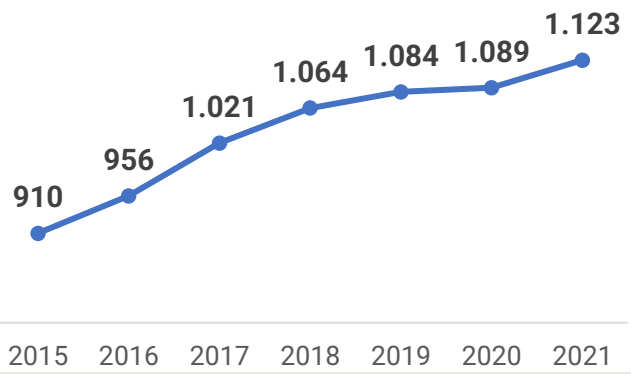
Realization of Energy Sector Mitigation Actions



NRE POTENTIAL, UTILIZATION AND ELECTRICITY CONSUMTION

ENERGY	POTENTIAL (GW)	UTILIZATION (MW)
SOLAR	3,295	270
HYDRO	95	6,689
BIOENERGY	57	3,087
WIND	155	154
GEOTHERMAL	24	2,343
TIDAL	60	0
TOTAL	**3,686**	**12,543**

ELECTRICITY CONSUMPTION



Indonesia has **abundant**, **various**, and **spreading** NRE resource.
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.

ENERGY TRANSITION ROADMAP TOWARDS CARBON NEUTRAL

1) **Timeline of strategic actions 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 realize NZE in 2060 or sooner.**

2021 - 2025

2025: Emision Reduction 231.2 Mio ton CO_2e

Supply:
- NRE Development in accordance with RUPTL PT PLN (Persero) 2021-2030
- Utilization of Rooftop PV
- Waste to energy development acceleration
- Development of small-scale biomass PP
- Cofiring for existing CFPP

Demand:
- Induction cooker used by 8.1 million HH
- 300 thousand electric cars and 1.3 million electric motorcycles
- Gas network for 5.2 million HH
- Dimethyl ether to become substitute of LPG for HH
- Mandatory biodiesel 30% by 2025

2026 - 2030

Supply :
- NRE Development in accordance with RUPTL PT PLN (Persero) 2021-2030
- Pump storage from 2025

Demand:
- Induction cooker used by 18.1 million HH
- 2 million electric cars and 13 million electric motorcycles
- Gas network for 10.2 million HH
- Biofuels in the industrial and transportation sectors reach 40%
- Energy Management and MEPS for 11 equipment

2030: Emision Reduction 327.9 Mio ton CO_2e

2031- 2035

2035: Emision Reduction 388 Mio ton CO_2e

Supply:
- Green Hydrogen development starting 2031
- Massive Battery Energy Storage System (BESS) in 2034
- Installed capacity geothermal PP reach 11 GW in 2035

Demand:
- Induction cooker used by 28.2 million HH
- 9.3 million electric cars and 51 million electric motorcycles
- Gas network for 15.2 million HH
- Biofuel use is maintained at 40%
- Expansion of application of Energy Management & MEPS

2036 - 2040

Supply:
- Nuclear utilization for power generation starts from 2039
- The development of Variable Renewable Energy (VRE), especially solar PV, is more massive, followed by wind turbine PP on both onshore and offshore starting 2037.

Demand:
- Induction cooker used by 37.9 million HH
- 23 million electric cars and 101 million electric motorcycles
- Gas network for 20.2 million HH
- Biofuel use is maintained at 40%
- CCS for cement and steel industries from 2036
- Low carbon for shipping

2040: Emision Reduction 629.4 Mio ton CO_2e

2041- 2050

2050: Emision Reduction 1,043.8 Mio ton CO_2e

Supply :
- Green hydrogen to replace natural gas for high temperature heating processes starting from 2041
- Primary energy utilization from NRE is higher than the fossil

Demand:
- Induction cooker used by 46.6 million HH
- 50.2 million electric cars and 163 million electric motorcycles
- Gas network for 22.7 million HH
- Biofuel use is maintained at 40%

2051 - 2060

Supply :
- Zero emissions from power sector and 129 million tons of carbon emission remains in the industrial and transportation sectors
- All electricity is generated by NRE

Demand:
- Induction cooker used by 54.3 million HH
- 65 million electric cars and 175 million electric motorcycles
- Gas network for 22.7 million HH
- Utilization of CCS in industry up to 13 million ton CO_2
- Projected demand for electricity consumption is 1,942 TWh or equal to 5,862 kWh/capita

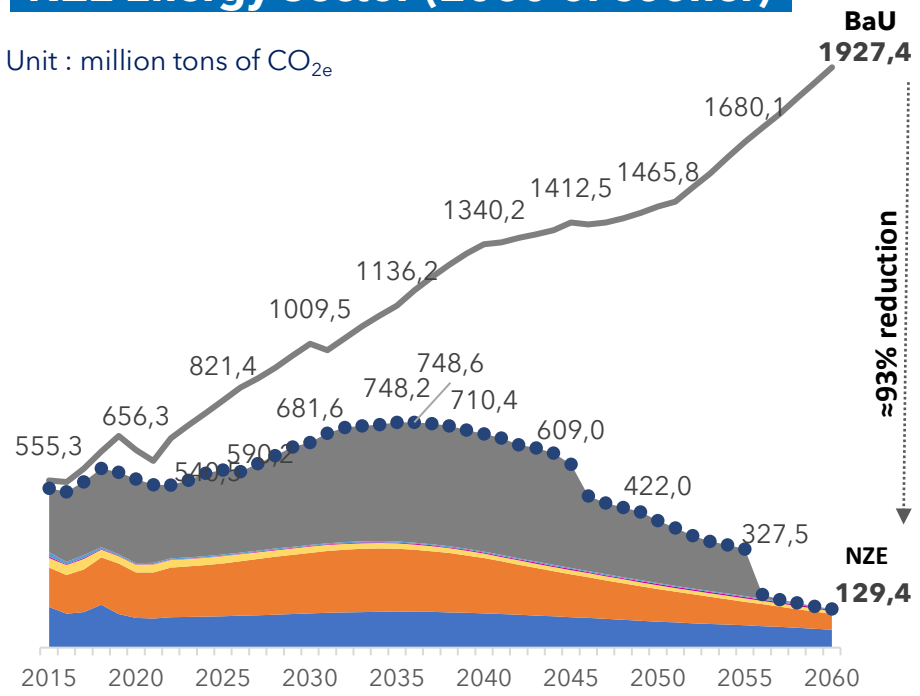
2060: Emision Reduction 1,798 Mio ton CO_2e

Innovative low emission technologies such as CCS/CCUS can be applied under certain conditions to existing fossil power plants to accelerate emission reductions in the transition towards cleaner and greener energy

*) CFPP on PLN dan Non-PLN Business Area: Maximum 30 years and IPP 25-30 years (based on PPA)

NET ZERO EMISSION IN ACCORDANCE WITH NRE DEVELOPMENT

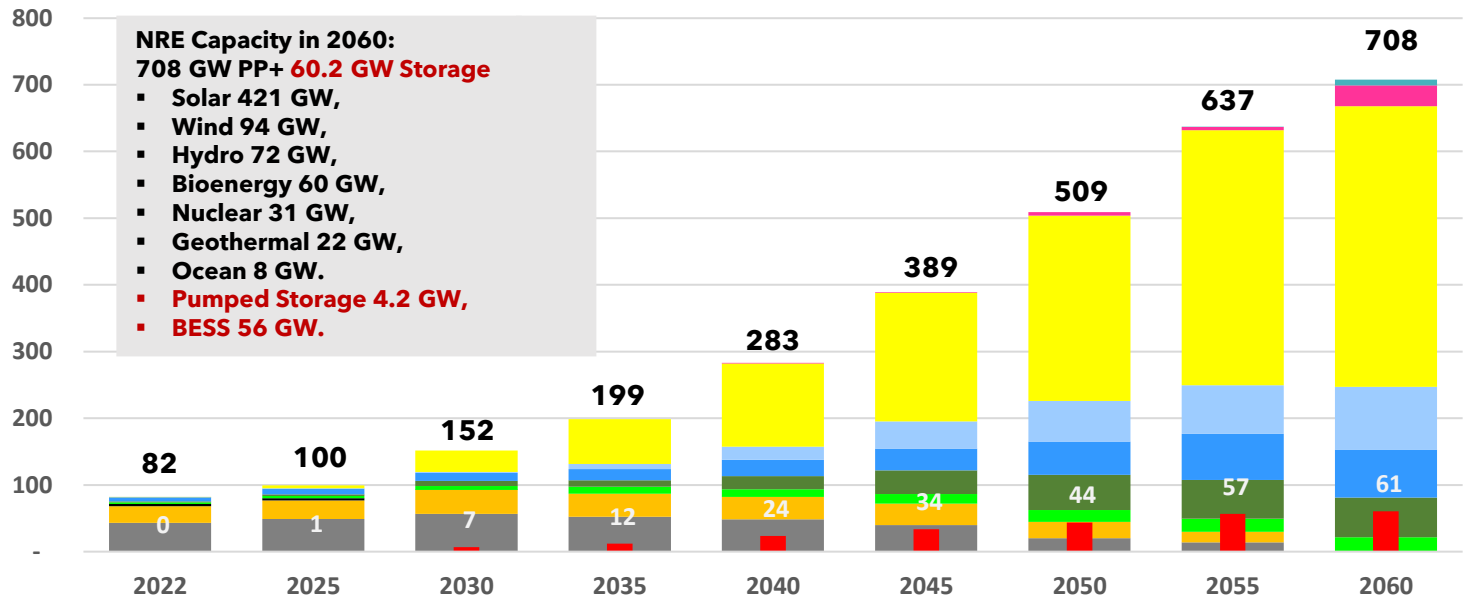
NZE Energy Sector (2060 or sooner)



Implementation Strategies:

1. NRE development acceleration, particularly Solar PV and Wind PP.
2. Gradual retirement of coal-fired PP.
3. More efficient technology utilization.
4. Encouraging the use of electric vehicle and electric stoves.
5. The implementation of Smart Grid to overcome intermittency of VRE (Variable Renewable Energy).

NZE Power Plant Development Roadmap



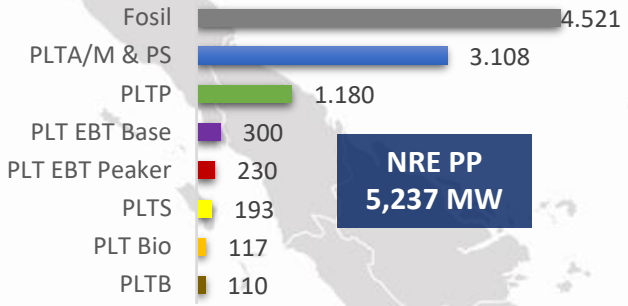
EMISSION REDUCTION STRATEGY FOR INDUSTRY SUB-SECTOR

1. **Fuel Switching:** reduction of coal and use of NRE;
2. **Energy efficiency:** equipment with a potential to reduce energy consumption by 50-60%;
3. **Electrification Strategy:** in industries that use low-temperature processes such as: Food & beverage, textiles and leather, electronic devices, assuming 55% electrification by 2060;
4. **Hydrogen as Gas Substitute:** Green hydrogen for transportation sector starting from 2031 and to replace fossil natural gas for high temperature heating processes starting from 2041;
5. **Biomass substitution:** replaces fossil fuels for high-temperature heating processes, especially in the cement industry, but is also applied in smaller amounts in other sub-sectors;
6. **Carbon Capture & Storage (CCS):** for the cement and steel sector starting from 2036. All use of coal and gas in these sectors has the opportunity to be reduced through CCS. Potential The reduction of CCS by 13 million tons of CO2

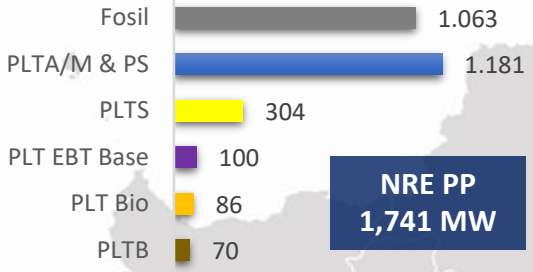
GREEN RUPTL PT PLN (PERSERO) 2021 – 2030

NRE additional capacity is targeted to reach 20.9 GW, with more than 20% (4.68 GW) coming from SOLAR PV

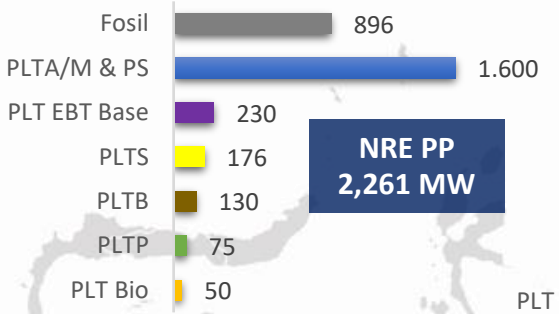
SUMATERA



KALIMANTAN



SULAWESI



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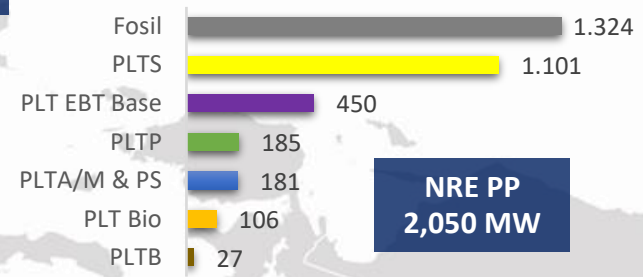
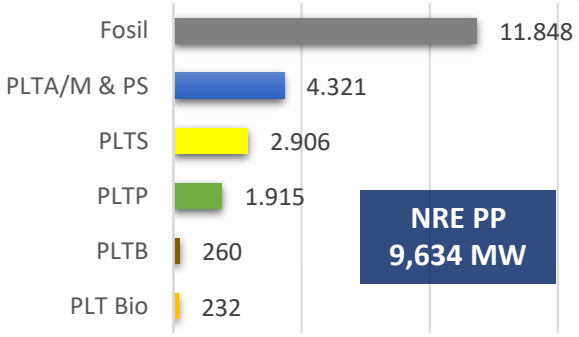


JAWA MADURA BALI



No	PP	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
1	Geothermal (PLTP)	136	108	190	141	870	290	123	450	240	808	3,355
2	Large Hydro (PLTA)	400	53	132	87	2,478	327	456	1,611	1,778	1,950	9,272
3	Mini Hydro (PLTM)	144	154	277	289	189	43	-	2	13	6	1,118
4	Solar PV (PLTS)	60	287	1,308	624	1,631	127	148	165	172	157	4,680
5	Wind Turbine (PLTB)	-	2	33	337	155	70	-	-	-	-	597
6	Bioenergy (PLT Bio)	12	43	88	191	221	20	-	15	-	-	590
7	NRE PP - Base	-	-	-	-	-	100	265	215	280	150	1,010
8	NRE PP - Peaker	-	-	-	-	-	-	-	-	-	300	300
Total		752	648	2,028	1,670	5,544	978	991	2,458	2,484	3,370	20,923

POLICY AND REGULATION UPDATES TO SUPPORT INDONESIA'S ENERGY TRANSITION

EXISTING

Presidential Regulation No. 112/2022
Presidential Regulation for the acceleration of Renewable Energy Development for electricity supply

MEMR Reg. No. 26/2022
Procedures for Implementing Carbon Economic Value in the Power Generation Subsector

Coordinating Minister for Economic Affairs Regulation No. 21/2022
List Of National Strategic Projects

Presidential Reg. No. 98/2021
Presidential Regulation concerning Implementation of Carbon Economic Values for Achieving Nationally Determined Contribution Targets and Control of Greenhouse Gas Emissions in National Development

MEMR Reg. No. 26/2021
Minister of EMR Regulation on Solar PV Rooftop

UNDER DISCUSSION

Law on New Energy and Renewable Energy

Updated of National Energy Policy and General Energy Plan

Presidential Regulation concerning Nuclear Energy Program Implementation Organization (NEPIO)

Minister of EMR Regulation and other Supporting Regulations for Presidential Regulation No. 112/2022

Ministerial Decrees and other Supporting Regulations as a way forward to the Minister of Energy and Mineral Resources Regulation No. 26/2021

Revision of MEMR Reg. No. 26/2021
Minister of EMR Regulation on Solar PV Rooftop

PRES. DECREE 112/2022: ACCELERATION OF RENEWABLE ENERGY DEVELOPMENT FOR ELECTRICITY PROVISION

Provides framework for RE based electricity provision:

- ✓ Renewable Energy Development is carried out based on the RUPTL, which takes into account the target of the renewable energy mix, supply-demand balance, and the economic value of power plants.
- ✓ Price and procurement mechanism for RE PP
- ✓ Utilization of domestic product

PRICE:

Highest Benchmark Price (HPT) for 2-stage staging without escalation with location factors applies to stage 1, for each type of renewables:

Type	Stage 1 (cUSD/kWh)	Stage 2 (cUSD/kWh)
Geothermal	7.65 – 9.76 x F	6.5 – 8.30
Large Hydro	6.74 – 11.23 x n x F	4.21 – 7.02
Excess Power Hydro	5.80 x 0.7	
Solar	6.95 – 11.47 x n x F	4.17 – 6.88
Wind	9.54 – 11.22 x n x F	5.73 – 6.73
Biogas	7.44 – 10.18 x n x F	4.46 – 6.11 x n
Biomass	9.29 – 11.55 x n x F	7.43 – 9.24 x n

n: Technical factor (0.7 – 1.0) F: Location factor (1 – 1.5)

Deal Price (requires MEMR approval): Peaker Hydro; Biofuel PP; Ocean PP

- Transactions in rupiah with the JISDOR exchange rate
- The deal price requires MEMR approval

PROCUREMENT MECHANISM:

- **Direct Appointment for:**
  - Hydro (Lakes, by assignment)
  - Geothermal (by assignment)
  - Expansion of Geothermal; Large Hydro, Solar, Wind, Biomass, Biogas;
  - Excess Power Geothermal; Large Hydro, Solar, Wind, Biomass, Biogas
- **Direct Selection**:
  Hydro, Solar, Wind, Biomass, Biogas, Biofuel, Ocean
- **Duration:** 180 business days
- ***BOOT*** through *B to B.*
- **Contract period**:
  - 30 years: Hydro, Geothermal, Wind
  - Max. 30 years: Solar
  - 25 years: Biomass
  - 20 years: Biogas

Presidential Decree 112/2022 also mandates the Government c.q. The MEMR to prepare a roadmap to accelerate the retirement of the CFPP's operational life and limit the development of new CFPPs, except for those CFPPs that have been listed in the RUPTL and which are integrated with industry.

NRE LAW DRAFT FOR THE ENERGY TRANSITION

> "As a comprehensive regulation to create a sustainable and fair climate for NRE development"

NRE LAW DRAFT REGULATES THE FOLLOWING

1. **ENERGY TRANSITION AND ROADMAP**
2. NRE SOURCES
3. NUCLEAR
4. BUSINESS PERMITS
5. RESEARCH & DEVELOPMENT
6. NRE PRICE
7. INCENTIVES
8. NRE FUND
9. LOCAL CONTENT (TKDN)
10. AUTHORITIES
11. GUIDANCE & SUPERVISION
12. PUBLIC PARTICIPATION
13. ENERGY CONSERVATION

PV ROOFTOP REGULATION

Incentive for public participation in NRE development

Ministerial Regulation of PV Rooftop (Permen ESDM No. 26/2021)

1. Provisions for export of electricity to 100% (originally 65%) and extension of nullification to 6 months (originally 3 months)
2. The application-based service mechanism and services are shorter, from 15 days to 5 days
3. PV Rooftop customers and IUPTL holders can trade carbon
4. Expansion of not only PLN customers but customers in non-PLN Business Areas (originally only PLN customers)
5. The existence of a PV Rooftop System Complaint Center to receive and follow up on complaints on the implementation of PV Rooftops (originally not available)

Solar PV Rooftop (10 kWp) at Pondok Pesantren Sunan Drajat, Lamongan

On Progress :

1. Preparation of PV Rooftop applications for Non-PLN Business Areas, reporting and Complaints center
2. Finalize the MEMR decree regarding Assignment to PLN to build service applications, reporting and integration with SCADA
3. Finalize the MEMR decree regarding Complaint center
4. Launching of Funding Incentives for PV Rooftop in cooperation with UNDP, with grant of Rp. 23.6 Billion on 10 February 2022. Target 5 MWp for 1,296 customers, with Micro, Small, and Medium Enterprises as main priority.

Roadmap for PV Rooftop as PSN Program

No.	Customer Sector	Solar PV Rooftop Development(kWp)				
		2021	2022	2023	2024	2025
1	Social	166	2,073	4,146	8,291	16,652
2	Household	15,188	189,854	379,709	759,418	1,524,213
3	Commercial	7,257	90,709	181,418	362,836	728,679
4	Industry	13,017	162,714	325,428	650,855	1,303,103
5	Government	372	4,650	9,300	18,600	37,353
	TOTAL (kWp)	**36,000**	**450,000**	**900,000**	**1,800,000**	**3,610,000**

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

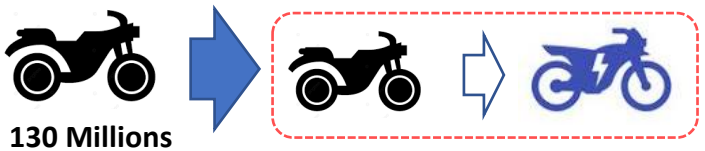
Additional Capacity until 2030 : **300 MW**
GHG Emission Reduction : **2.01 million tons CO2e**
Investment Required : **0.28 Billion USD**

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

ELECTRIC MOTORCYCLE CONVERSION PROGRAMME

MEMR Minister Directive on October 7th, 2021

"MEMR is the catalyst for creating a Supply-Demand ecosystem that supports converted electric motorcycles, especially for small and medium scaled workshops in achieving national targets"



130 Millions
Year 2019

Catalyst

Scale up 6,000,000

Scale up 1,000,000

Scale up 100,000

Scale Up 10,000

Prototype 1,000

Pilot Project
100 units

As the converter kit patent holder, the quality assurer, and provider technical assistant for conversion workshops.

Year 2025

Year 2025

139 Mil.

Motorbike (fossil fuel)

5 Mil.

New Electric Motor Bike

6 Mil.

Electric Motor Bike (conversion)

Total **150 Mil.**

Benefits:

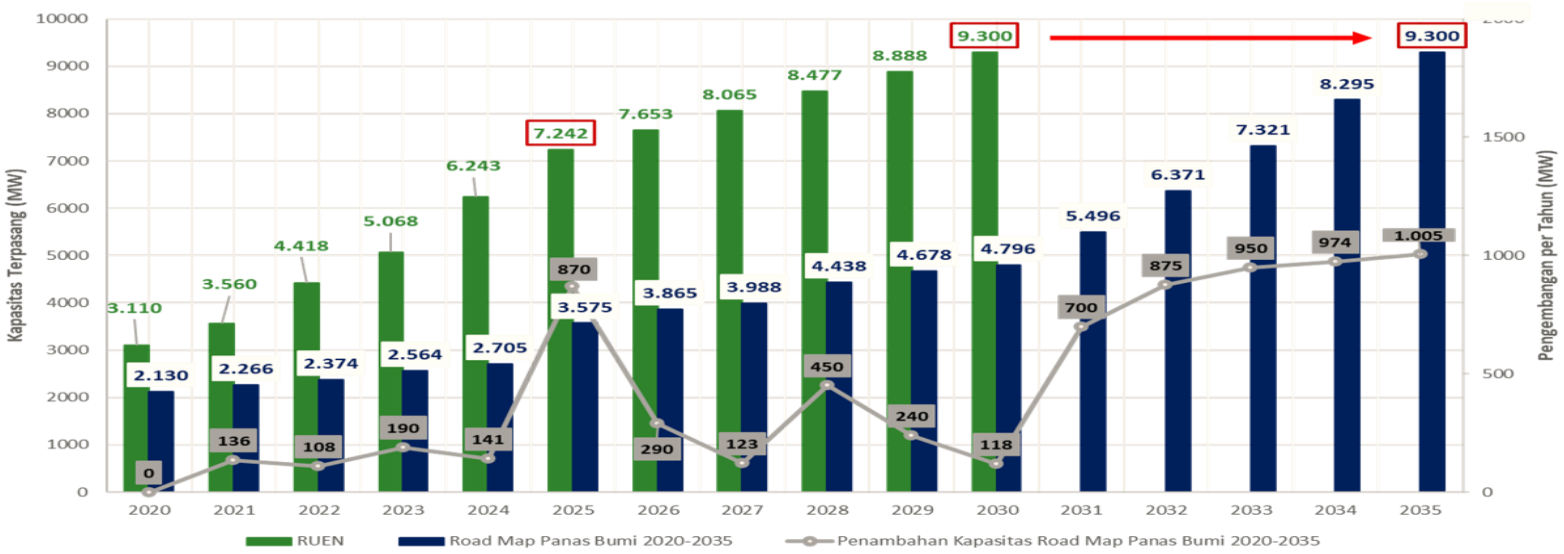
- Fuel savings = 1 litre/day/unit x 6 mil. = 12.8 mil. barrel/yr
- CO_2 reduction = 1.9 kg/day/unit x 6 mil. = 3.87 mil. tons/yr
- Electricity cons. = 1.2 kWh/day/unit x 6 mil. =2.4 TWh/yr

Multiplier effect for the economy IDR 12-15 mil./unit.
For 6 millions unit, the effect will reach IDR 72 - 90 trillion (in 5 years)

GEOTHERMAL DEVELOPMENT

Increasing Geothermal Capacity through the synergy of government, SOEs, De-risking, and Technology Optimization

Geothermal PP Development Plan



Geothermal Acceleration Programs:

1. **Government Drilling**
2. **Utilization of PISP (Geothermal Sector Infrastructure Financing)** and **GREM (Geothermal Resource Risk Mitigation)** funds to finance geothermal development**.**
3. **SOE synergy** in geothermal development**.**
4. **Optimization of resources** in geothermal working area (WKP) with expansion development, including Binary Salak 15 MW, Dieng 10 MW, etc.

Offering Working Area and Preliminary Survey and Exploratory Assignment (PSEA) Area of Geothermal. Geothermal Areas Offering Plan 2022 – 2024 :

- 5 Working Areas with the total capacity of 316 Mwe;
- 3 Preliminary and Exploration Survey Assignment Area, with total capacity of 101 MWe

Government Drilling

NAGE (KAB. NGADA, NTT)

- MEMR c.q. DG NREEC and the Geological Agency has been jointly conducting geothermal exploration drilling in 20 geothermal working area up to 2024 for the 683 MW development plan.
- MEMR also collaborates with the Ministry of Finance c.q. PT SMI for 2 geothermal working are with a 60 MW development plan.

Activity Scopes

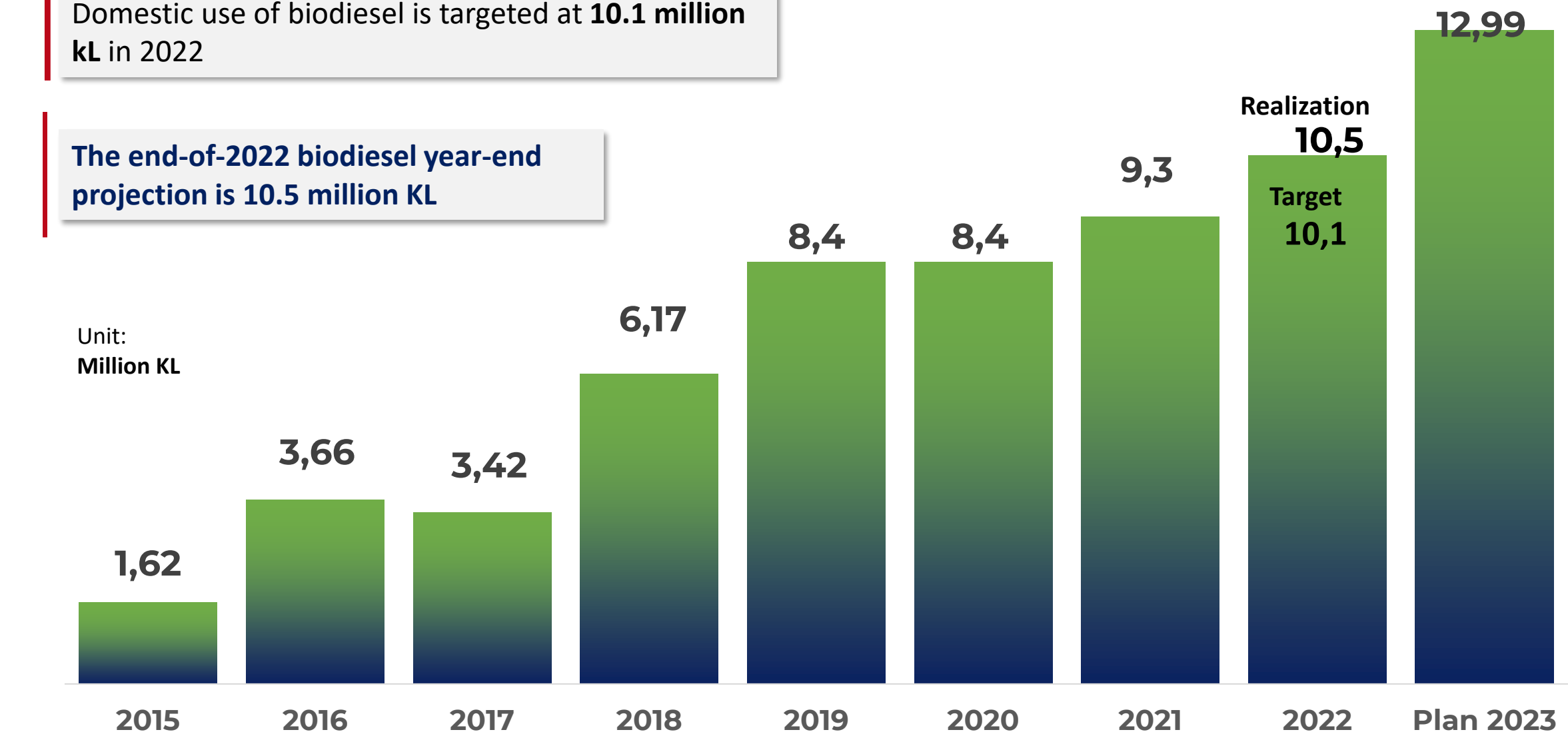
- **A** Geoscience Data Addition (3G).
- **B** LiDAR Survey
- **C** Geoscience Data Integration
- **D** Evaluation Support on Data Acquisition as well as Targeting

BIODIESEL MANDATORY B30 → B35

Reducing imports and saving foreign exchange through the B30 Program USD 8.34 Billion or IDR 122.65 Trillion

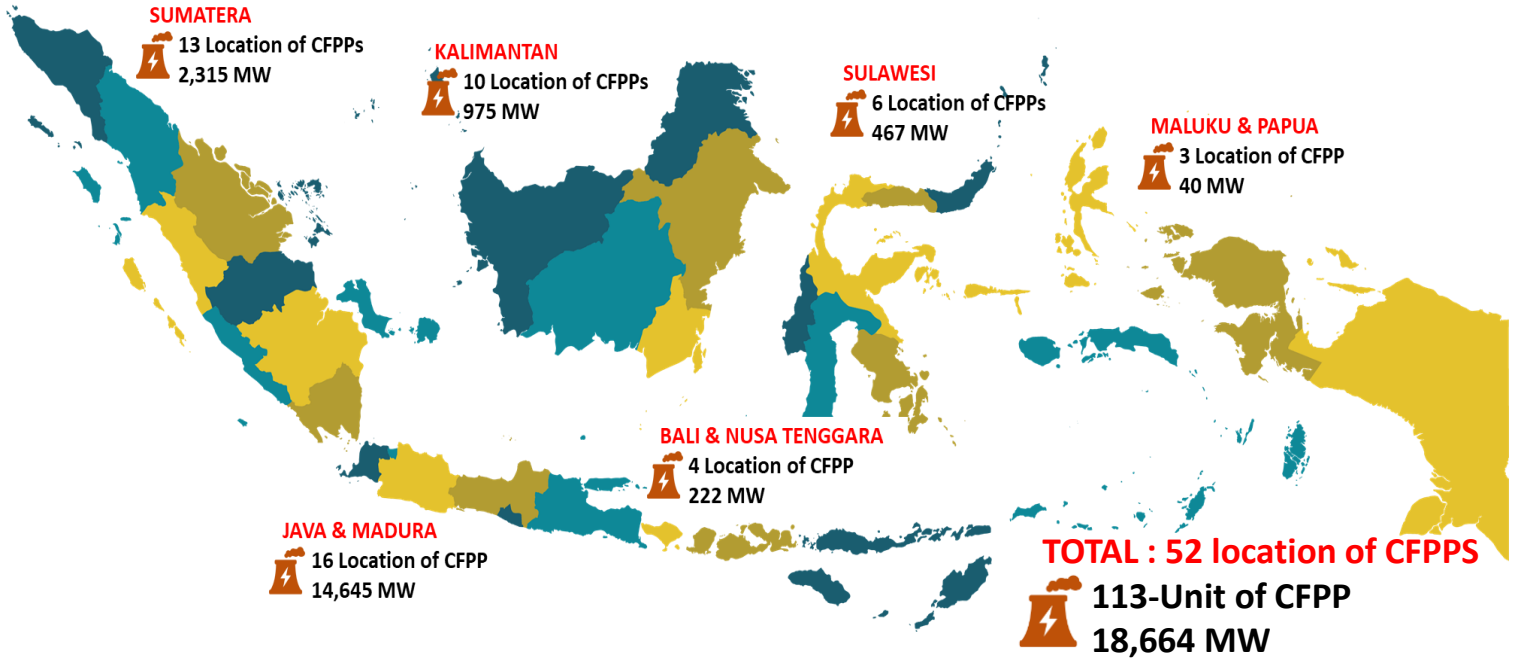
Domestic use of biodiesel is targeted at **10.1 million kL** in 2022

The end-of-2022 biodiesel year-end projection is 10.5 million KL



BIOMASS & RDF AS COFIRING FUELS IN EXISTING CFPP

- Biomass pellet and waste-based RDF are used to partially reduce the use of coal as non-renewable source through a co-firing program at the existing Coal-fired Power Plant (CFPP).
- PLN conducted cofiring trials using various biomass sources, including sawdust, woodchips, Palm Kernel Sells and waste based – RDF with a blending rate of 5 – 15%.
- Biomass co-firing in existing CFPPs is intended to increase renewable energy mix, meet the economics of electricity supply, and "greening" the CFPP in a relatively faster time.
- MEMR is finalizing a ministerial regulation on The Implementation of Cofiring on the Existing CFPPs.



Target 2022

Implementation	Decarbonization	Biomass	Green Energy
35 Location	0,334 mio Ton CO2	0,45 mio Ton	340 GWh

Current *Co-firing* CFPP (Until June 2022)

Implementation	Decarbonization	Biomass	Green Energy
32 Location	0,263 mio Ton CO2	0,255 mio Ton	265 GWh

CHALLENGES & ENABLING FACTORS TO ACHIEVE NZE

Efforts towards NZE requires synergy by all stakeholders both in energy supply and demand sectors

CHALLENGES

Financial

Implementing clean technology requires a large investment cost

Technology

Some implementation of clean technology are currently still in the stage of pilot project

Awareness

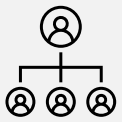
Lack of awareness and knowledge to implement energy management.

Industry Process

Industrial processes that require high temperatures still require fossil fuels

Standard and Label

It needs regulations such as MEPS and labeling for industrial equipment (motors, boilers, chillers, etc.)



Coordination

Cross-sectoral coordination involving multiple stakeholders

ENABLING FACTORS

	Supply	*Demand*
Supporting policies	• *Feedstock* • *Carbon Pricing* • *Phase Down*/Coal-fired PP retirement • *Power Wheeling*	• Energy Management • Minimum Energy Performance Standard • *Labelling*
Infrastructure	• *Super Grid* • *Power Wheeling*	• Charging station (SPKLU) • City Gas infrastructure • Induction stoves
Financial Support	• Fiscal and non-fiscal incentives • Grant/Loan • Funding/financing	• Fiscal and non-fiscal incentives • Grant/Loan • Funding/financing
R&D dan Technology	• CCS/CCUS	• Efficiency • CCS/CCUS

THANK YOU

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