



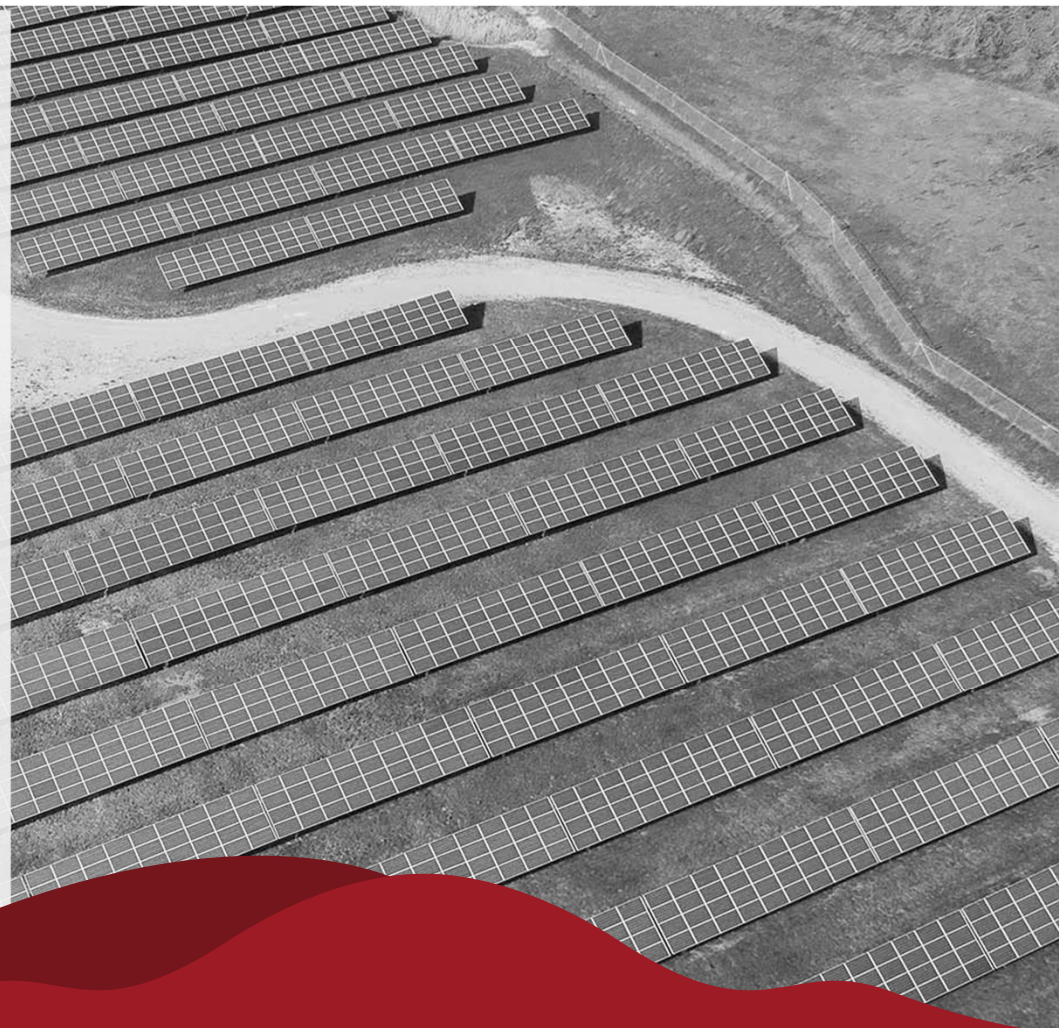
KEMENTERIAN ENERGI DAN SUMBER DAYA MINERAL  
REPUBLIK INDONESIA

# GOVERNMENT'S ROLE IN MAINTAINING ENERGY AFFORDABILITY AND SECURITY

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Tokyo | 26 April 2023

*#TransisiEnergi*



# GOVERNMENT PROGRESS TO ACHIEVE SDGs

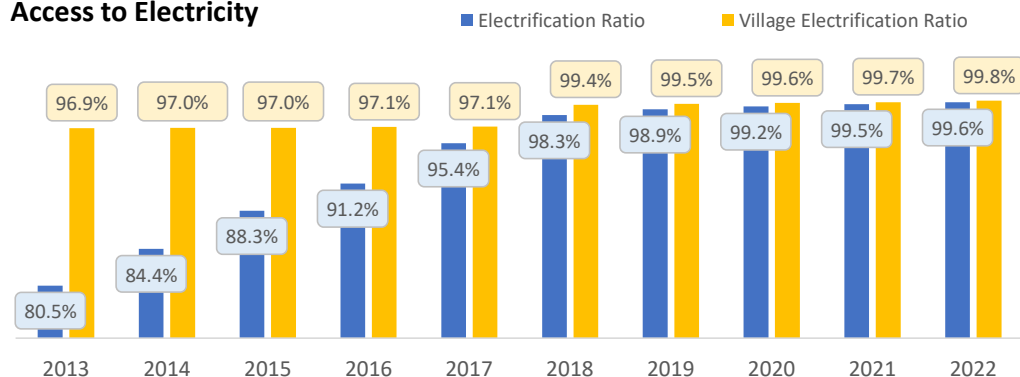
7 AFFORDABLE AND CLEAN ENERGY



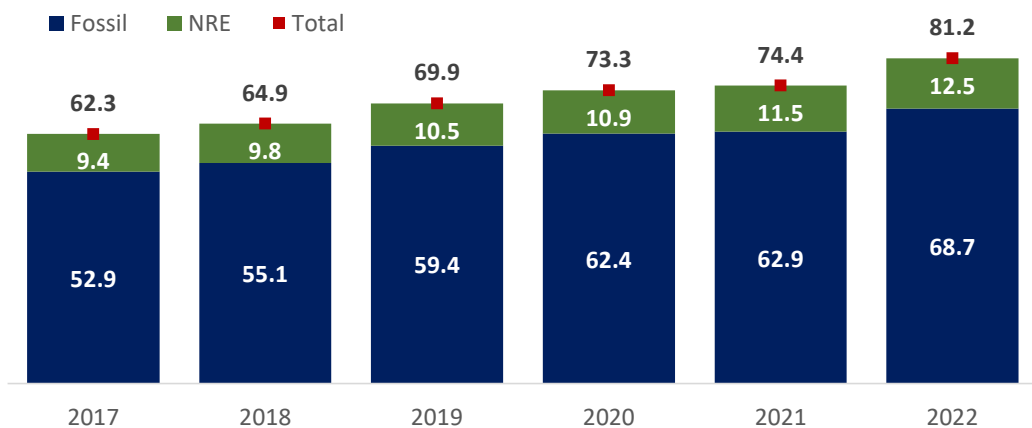
## Clean and Affordable Energy

- Ensuring access to affordable energy
- Increased share of renewable energy
- Improved energy efficiency

### Access to Electricity



### Power Plant Installed Capacity 2022 | GW



13 CLIMATE ACTION

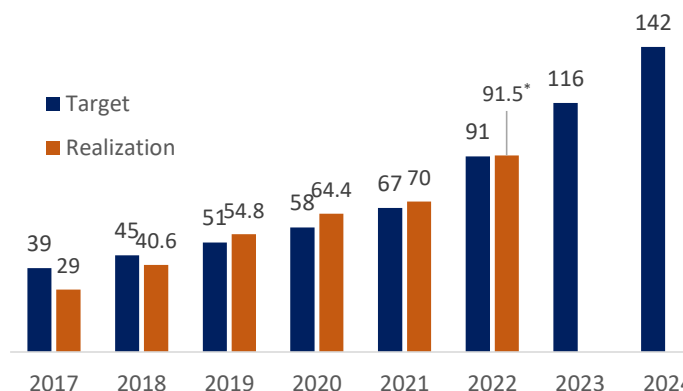


## Climate Change and Disaster Mitigation

- Strengthen resilience and adaptation capacity to climate-related hazards and natural disasters
- Integrate climate change anticipation measures into policies, strategies & planning

### Enhanced NDC 2030

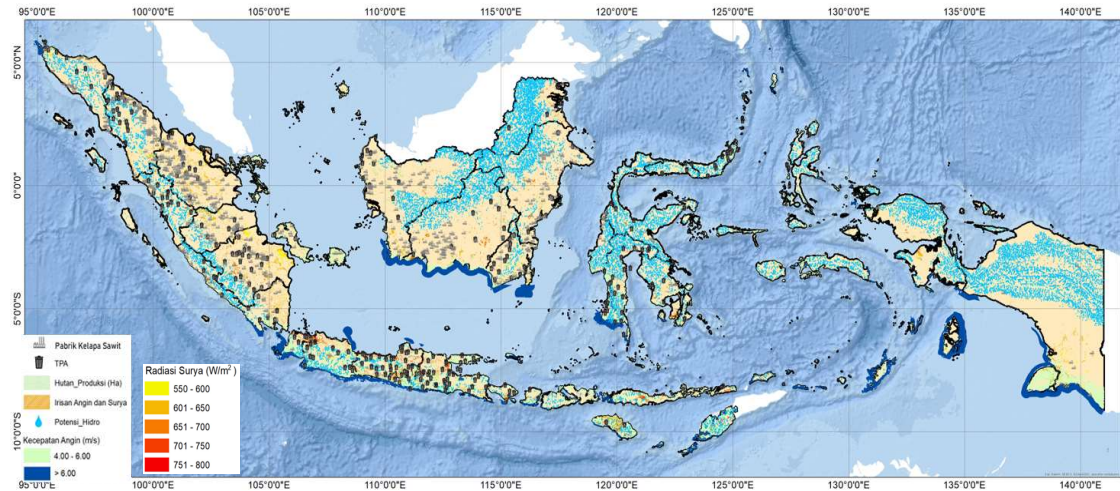
No	Sector	2010 GHG Emission (Million Ton CO <sub>2</sub> e)	GHG Emission by 2030			Reduction	
			BaU	CM1	CM2	CM1	CM2
1.	Energy	453.2	1,669	1,311	1,223	358	446
2.	Waste	88	296	256	253	40	45.3
3.	IPPU	36	70	63	61	7	9
4.	Agriculture	111	120	110	108	10	12
5.	FOLU	647	714	217	-15	500	729
<b>TOTAL</b>		<b>1,334</b>	<b>2,869</b>	<b>1,953</b>	<b>1,632</b>	<b>915</b>	<b>1,240</b>



- By 2022, the energy sector will be able to reduce GHG emissions by 91.5 million tonnes of CO<sub>2</sub>e.
- Energy efficiency contributed for 22% of the realization or equal to 20.5 million tonnes of CO<sub>2</sub>e

# INDONESIA'S NRE POTENTIAL

Indonesia has large, widespread and diverse NRE potential to support national energy security and achieve NRE mix targets



**“ 0.3% of the total potential has been utilized so that the opportunity for NRE development is very open, especially supported by environmental issues, climate change, and increased electricity consumption per capita. ”**

## NRE POTENTIAL AND UTILIZATION

ENERGY	POTENTIAL (GW)	UTILIZATION (GW)
SOLAR	3,295	0.27
HYDRO	95	6.69
BIOENERGY	57	3.09
WIND	155	0.15
GEOTHERMAL	24	2.36
OCEAN	60	0
<b>TOTAL</b>	<b>3,686</b>	<b>12.56</b>

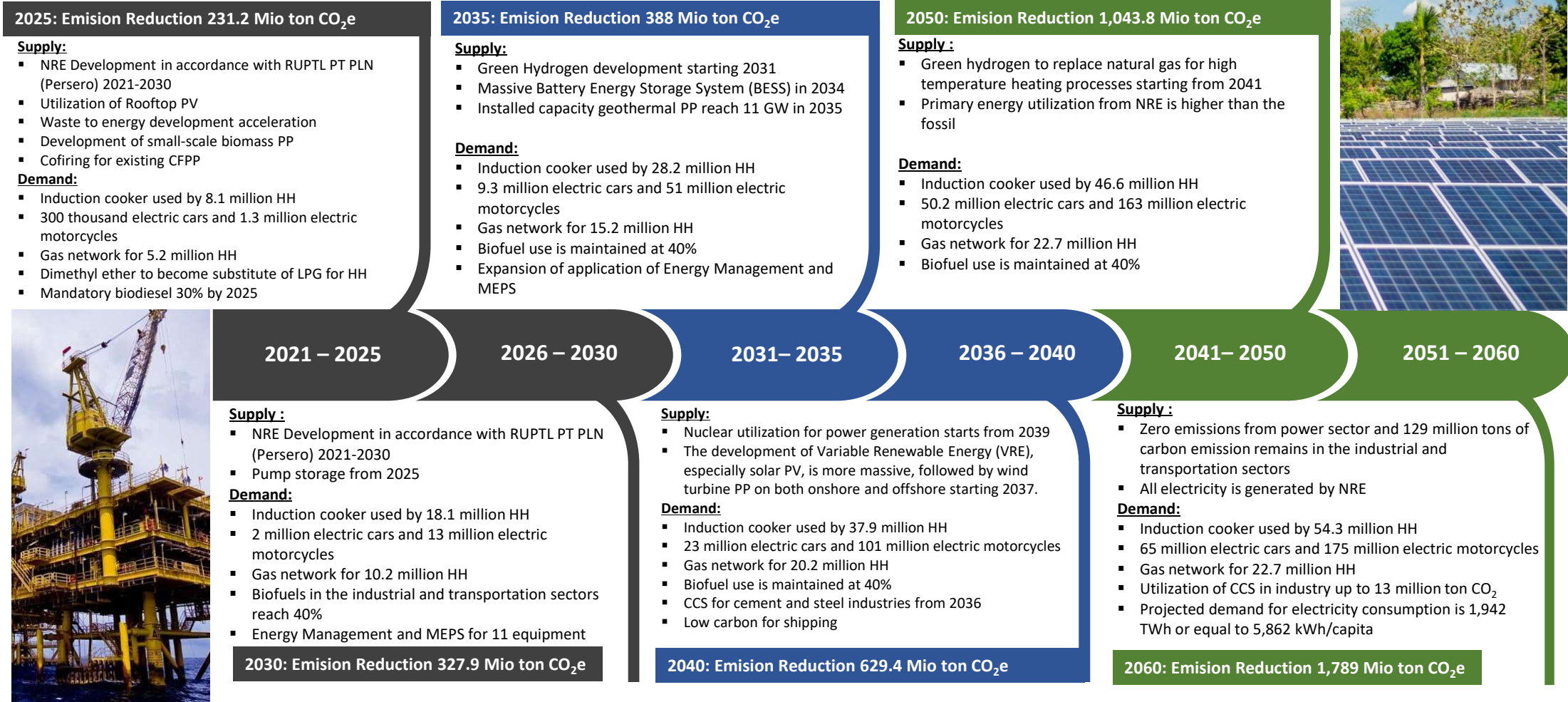
Note:  
Nuclear Potential: Uranium 89,483 tonnes - Thorium 143,234 tonnes

- Hydro potential is spread throughout Indonesia, especially in North Kalimantan, NAD, West Sumatra, North Sumatra, and Papua
- Solar potential is spread throughout Indonesia, especially in NTT, West Kalimantan and Riau which have higher radiation
- Wind potential (> 6 m/s) is mainly found in NTT, South Kalimantan, West Java, South Sulawesi, NAD and Papua
- Ocean Energy potential is spread throughout Indonesia, especially Maluku, NTT, NTB and Bali
- Geothermal potential is spread in the ring of fire area, 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.

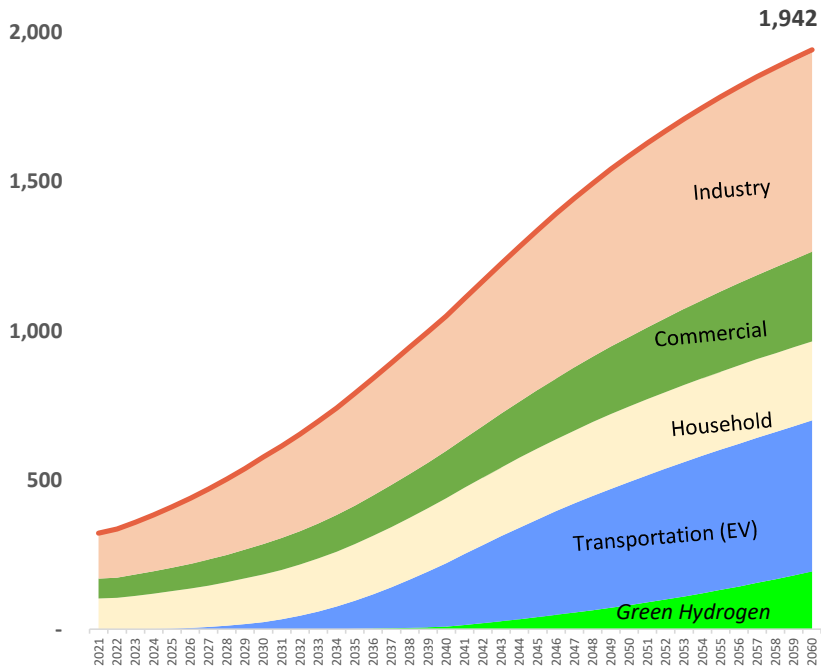


Innovative low emission technologies such as CCS/CCUS can be applied under certain conditions to existing fossil power plants to accelerate emission reductions in the transition towards cleaner and greener energy

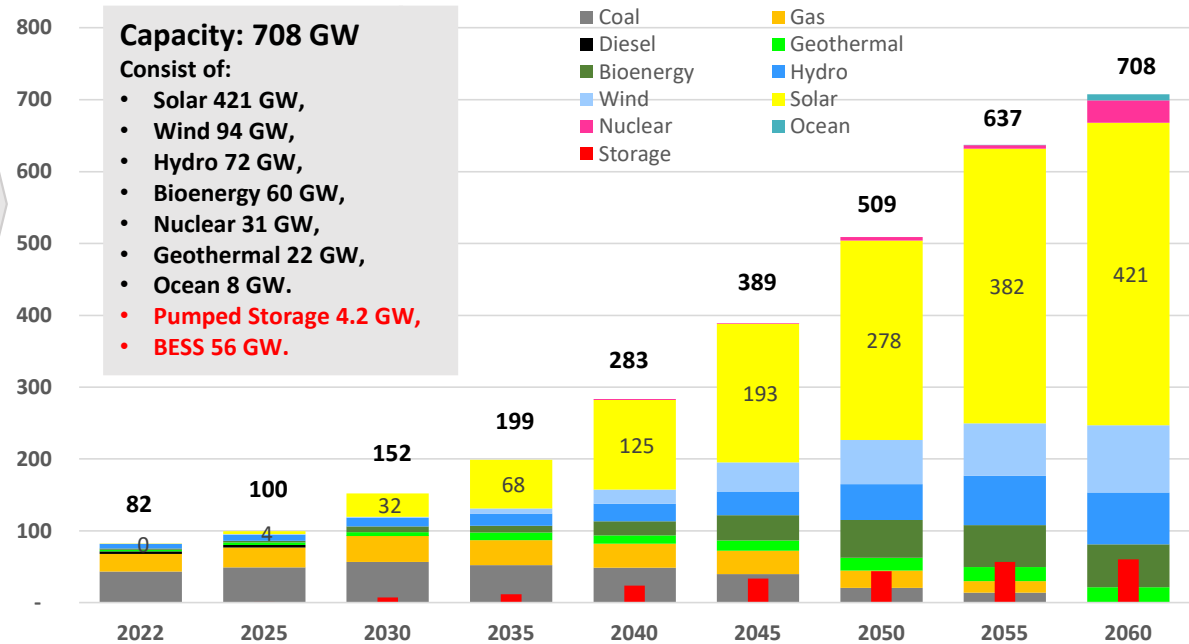
\*) PLTU pada Wilus PLN dan Non-PLN: Maksimal 30 tahun dan IPP 25-30 tahun (sesuai PPA)  
[www.esdm.go.id](http://www.esdm.go.id)

# ELECTRICITY SUPPLY PLAN

Electricity Demand by Sector | TWh



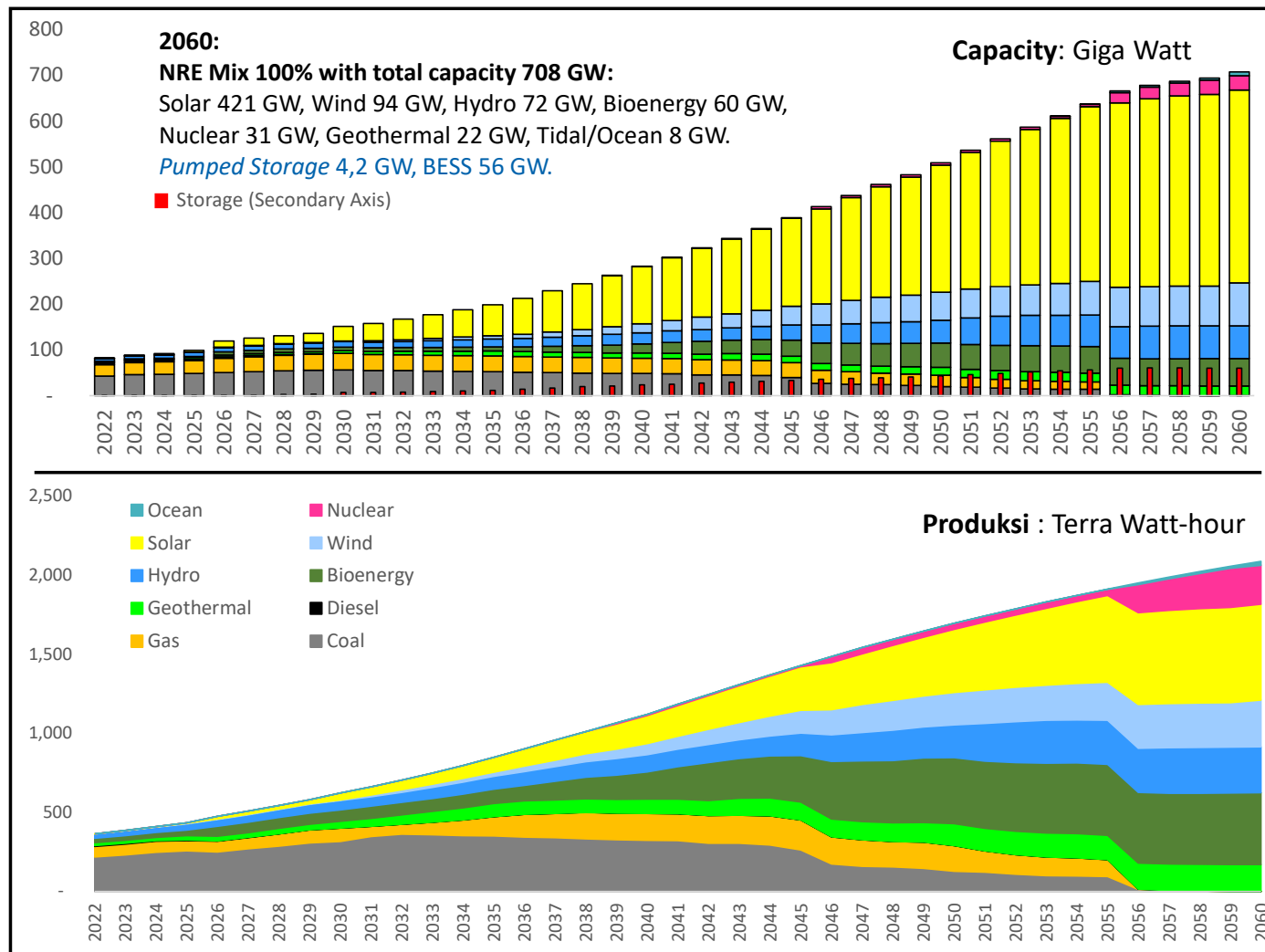
Power Plant Capacity | GW



Electricity Demand in 2060 will reach 1,942 TWh, dominated by industry and transportation sector. All electricity demand around 708 GW supplied by 96% renewable energy-based power plant and 4% of Nuclear. The total capacity of various renewable energy is 77% of total renewable energy capacity equipped by storage technology such as Hydro pumped storage and BESS.

# POWER GENERATION CAPACITY TOWARD ZERO EMISSION BEFORE 2060

Optimize the utilization of renewable energy development in power generation



**Scenario:** To achieve NZE in the energy sector where emissions for the generating sector must be 0 by 2060, the scenario chosen is the *Zero Emission (ZE) scenario*.

**Coal/Gas:** Additional Coal PP is only for projects that are already under contract and construction. IPP's Coal PP retired after the PPA ended. Combined Cycle PP retired after the age of 30 (remaining < 1 GW, PLTU: 2057, PLTGU: 2056).

**RE:** Additional generation after 2030 only from NRE. Starting in 2030 the development of Variable Renewable Energy (VRE) in the form of PLTS is increasingly massive, followed by PLTB both on shore and offshore starting in 2037.

**Geothermal:** The development is gradually maximized to 22 GW, through the development of the Advance Geothermal System and the development of other unconventional geothermal systems.

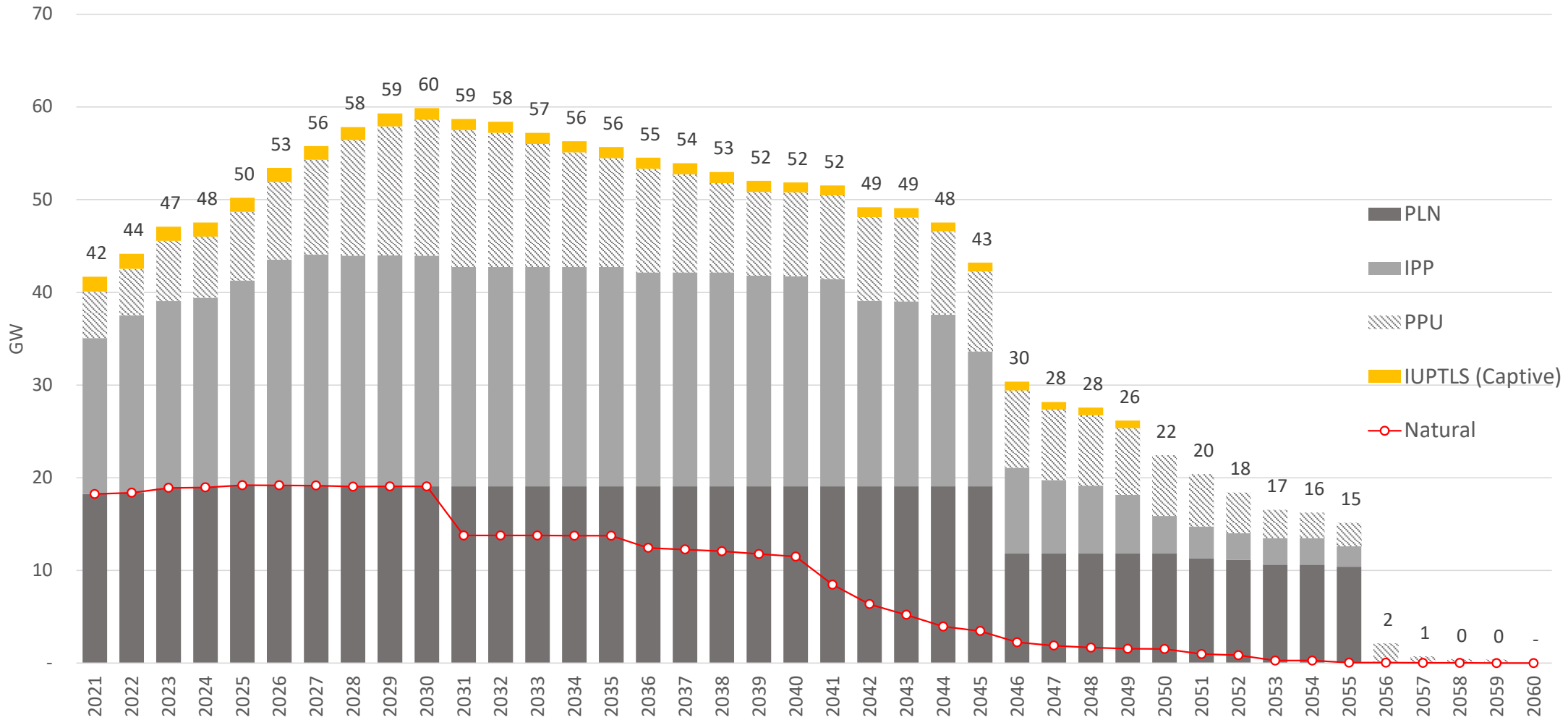
**Hydro:** will be optimized and transferred to the load centers in other islands. The other utilization is to create system balance in the increasing share of VRE.

**Nuclear:** will be commercial in 2039 to increase power system reliability. The capacity will be increased up to 31 GW in 2060.

**STORAGE:** Pump storage starting in 2025, Battery Energy Storage System (BESS) will start to be massively developed in 2034. While Hydrogen produced from RE (Green Hydrogen) based electricity starting in 2031 where its use is intended for the non-generating sector.

# COAL FIRED POWER PLANT RETIREMENT SCENARIO

Retirement of PLN's takes into account asset revaluation with an extension of the lifetime of the generator by 30-40 years since 2016



# EARLY RETIREMENT OF COAL FIRED POWER PLANT (CFPP)

Source: draft analysis of CFPP early retirement of Java-Sumatera System (only for discussion)

## EARLY RETIREMENT UP TO 2030

No.	Nama Pembangkit	Provinsi	DMN (MW)	Tahun Pensiun Natural	Tahun Pensiun Dini	Kumulatif Penurunan Emisi s.d. 2030 (MtonCO2)
1.	PLTU SURALAYA #3,4,5	Banten	1318.2	2055	2028	27.1
2.	PLTU SURALAYA #8	Banten	590	2045	2029	10.7
3.	PLTU PAITON #09	Jatim	615	2045	2029	10.4
4.	PLTU ADIPALA	Jawa Tengah	615	2045	2030	5.4
5.	PLTU IPP Paiton #5,6	Jawa Timur	1220	2031	2030	9.0
6.	PLTU BUKIT ASAM #01,02,03	Sumsel	157.5	2055	2029	0.6
7.	PLTU OMBILIN #01	Sumbar	90	2055	2029	1.1
8.	PLTU LABUHAN ANGIN #01, 02	Sumut	140	2055	2029	0.6
9.	PLTU NAGAN RAYA #01	Aceh	80	2045	2029	1.5

Apart from the retired CFPP, there is an additional 1.32 GW from the Jawa-3 CFPP which was not built. So that the total CFPP in the PLN system that is retired is 6.1 GW, with investment USD5,1 Billion and emission reduction 66,3 Million ton CO2.

## CASE STUDY PELABUHAN RATU AND PACITAN

No.	Nama Pembangkit	Provinsi	DMN (MW)	Tahun Pensiun Natural <sup>1</sup>	Tahun Pensiun Dini	Biaya Pensiun Dini (MUSD)
1.	PLTU PELABUHAN RATU (3x350)	Jawa Barat	3x323	2045	2037	830*
2.	PLTU PACITAN (2x315)	Jawa Timur	2x280	2045	2037	542*

\*)Menggunakan kurs USD/IDR 15.300, berdasarkan bookvalue per November 2022



- To achieve the emission reduction target in the power generation sector so as to reach a peak emission in 2030 of 290 MtonCO2, one of the strategies is cofiring biomass for other CFPPs with an average of 10%.
- For small CFPP units under 100 MW, referring to empirical data from IUPTLS (captive power) cofiring of more than 10% can be carried out. For example, the CFPP owned by Kutai Refinery Nusantara (capacity 50 MW cofiring 40% from feedstock from remaining palm oil) and the Toba Pulp Lestari Paper Factory (capacity 81.8 MW cofiring 100%) provided that it is close to the location of the biomass feedstock.



# JUST ENERGY TRANSITION PARTNERSHIP (JETP)



support the energy transition of the electricity sector in Indonesia which is ambitious and fair to keep global temperature rise below 1.5°C

## TARGET

- Peaking in the electricity sector's emissions is projected to occur in 2030, faster than the initial projection;
- The maximum emission from the electricity sector is 290 million tons of CO2 in 2030, lower than the baseline value of 357 million tons of CO2;
- Set a target to achieve net zero emissions in the electricity sector by 2050, 10 years faster than the initial projection;
- Accelerate the use of renewable energy so that by 2030 it is hoped that at least 34% of electricity generation will come from renewable energy.

CHAIR CO-CHAIR



President Joko Widodo together with United States President Joe Biden and leaders of the International Partners Group (IPG) countries launched JETP international agreement during the G20 Summit series of events in Bali.

FUNDING 20 billion USD

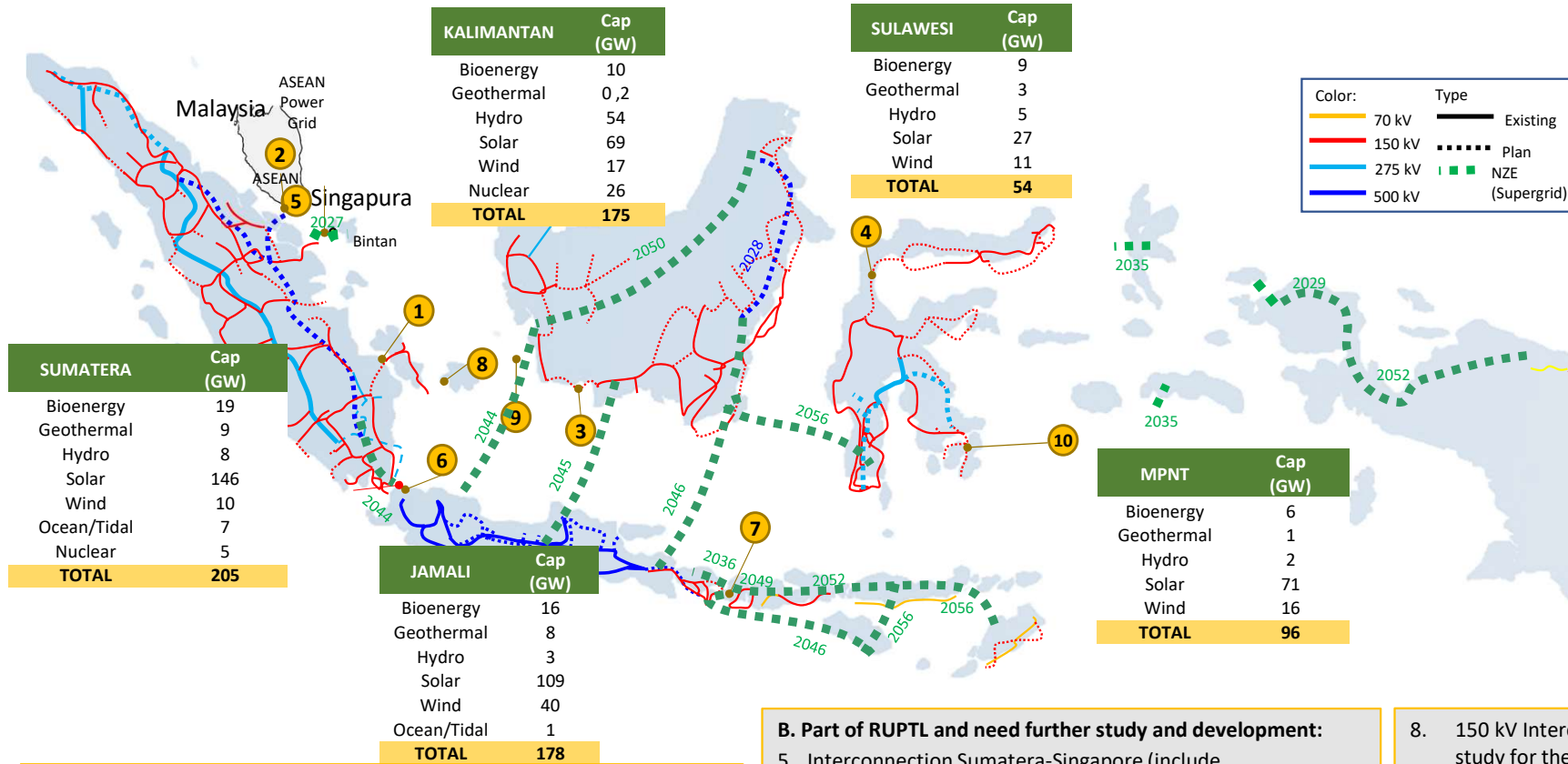
Fund mobilization will be carried out through the Indonesia Country Platform as a financing mechanism for the early retirement of Coal PP and the construction of renewable energy generators with PT Sarana Multi Infrastructure (PT SMI) as the manager who will partner with the Glasgow Financial Alliance for Net Zero (GFANZ).

MEMR is preparing a Roadmap for Early Retirement for Coal Power Plants in accordance with the mandate of Presidential Regulation Number 112 of 2022 concerning Acceleration of Renewable Energy Development for the Provision of Electricity.

JETP uses the Net Zero Emission roadmap supported by the International Energy Agency (IEA) and it is hoped that the IEA can provide further technical assistance.

# SUPER GRID AND RE SHARING RESOURCES

Super grid is a key factor to achieve Zero Emission in the power generation sector



National	Cap @ 2060 (GW)
Bioenergy	60
Geothermal	22
Hydro	72
Solar	421
Wind	94
Ocean/Tidal	8
Nuclear	31
<b>TOTAL</b>	<b>708</b>

The invested interconnection will be decreased if REBID is implemented.

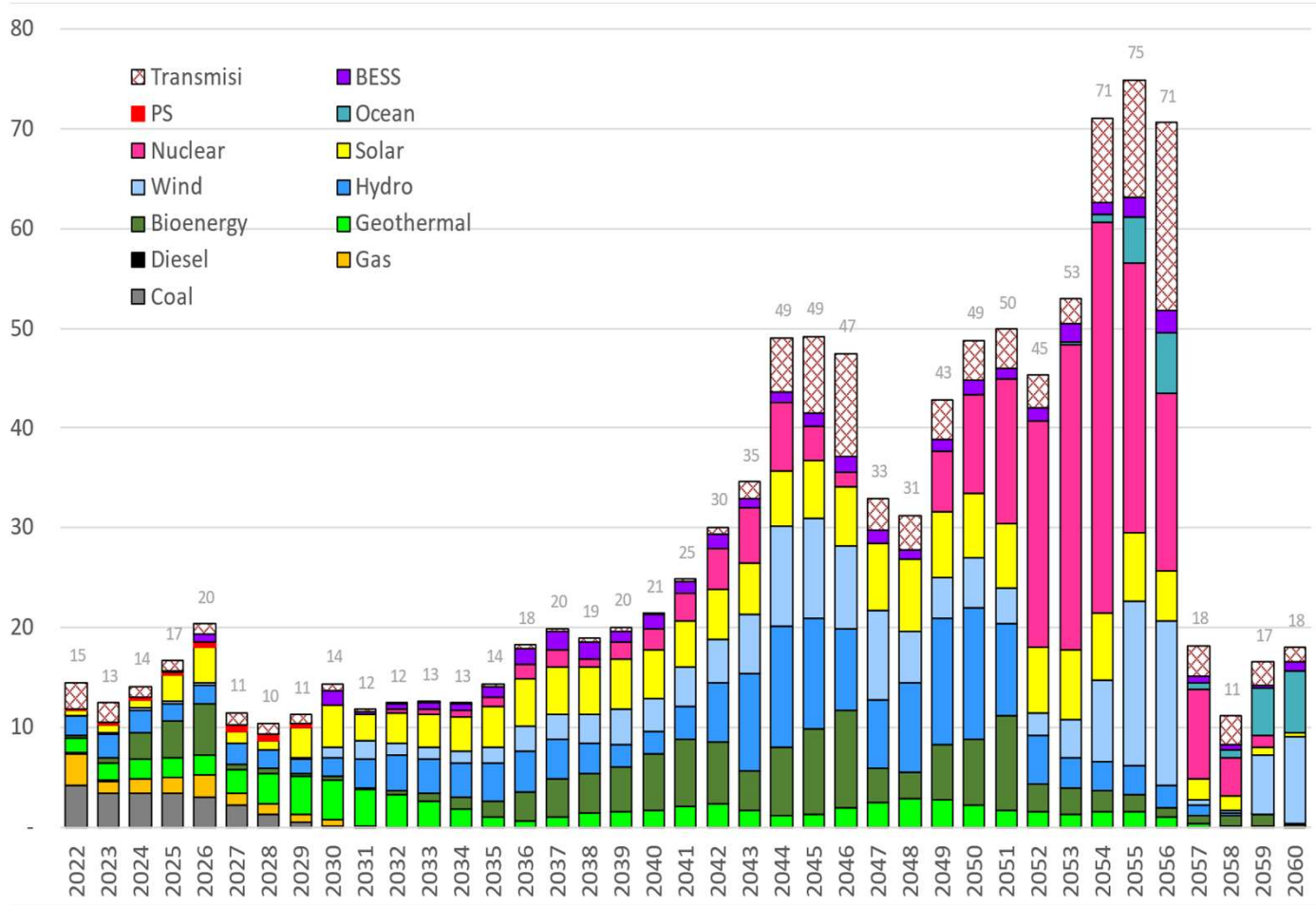
- A. Listed in RUPTL:**
- 150 kV Interconnection Sumatera-Bangka (2022);
  - 500 kV Interconnection Sumatera-Malaysia (2030), Supporting ASEAN Power Grid;
  - 150 kV Interconnection Kalimantan (2023);
  - 150 kV Interconnection Northern and Southern Part of Sulawesi (Tambu-Bangkir COD 2024).

- B. Part of RUPTL and need further study and development:**
5. Interconnection Sumatera-Singapore (include Interconnection Sumatera-Bintan), supporting ASEAN Power Grid;
  6. 500 kV Interconnection Sumatera-Jawa;
  7. 150 kV Interconnection Bali-Lombok (require further study for Interconnection Jawa-Nusa Tenggara);

8. 150 kV Interconnection Bangka-Belitung (require further study for the Interconnection of Sumatera-Kalimantan);
9. Interconnection Belitung-Kalimantan (require further study for the Supergrid Nusantara program);
10. 150 kV Interconnection Baubau-Sulbagsel (require further study for the Bau-Bau Sulbagsel Interconnection System Reliability).

# POWER PLANT & TRANSMISSION INVESTMENT

Billion USD



\* Fossil investment is only for projects that have been committed and will be phased out before 2060

TYPE OF GENERATOR / STORAGE	INVESTMENT NEEDS (MILLION USD)	CAPACITY @ 2060 (GW)
HYDRO	168,568	72
NUCLEAR	216,210	31
SOLAR	159,879	421
BESS	37,218	56
WIND	156,393	94
GEO THERMAL	71,270	22
OCEAN/TIDAL	24,205	8
BIO	122,347	60
PUMP STORAGE	2,989	4.2
COAL	21,693	-*
GAS	13,614	-*
OIL	207	-*
<b>TOTAL</b>	<b>994,593</b>	<b>768</b>

## Investment Needs:

- **Generation: USD 994.6 billion**
- **Transmission: USD 113.4 billion**
- **Total: 1,108 billion USD or 28.5 billion USD/year**

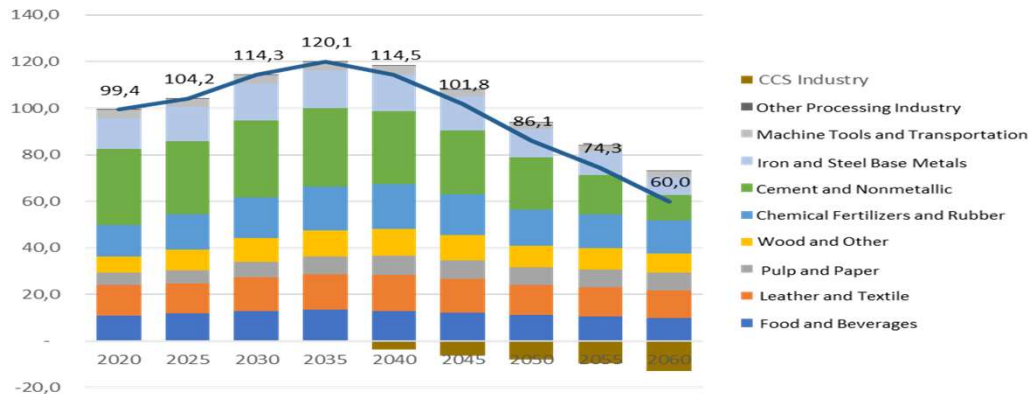


# INDUSTRY & TRANSPORTATION STRATEGIC STEPS

## INDUSTRY SECTOR

- Fuel Switching:** increasing electricity share;
- Energy efficiency:** for equipment, reduce energy consumption about 50-60%;
- Electrification strategy:** industries that use low-temperature processes such as food & beverages, textiles and leather, electronic devices about 55% coming from electricity;
- Hydrogen as a gas substitution:** Green hydrogen to replace natural gas for high-temperature heating processes in the industry starting from 2041;
- Biomass substitution** replaces fossil fuels for high-temperature heating processes, especially in the cement industry, but is also applied in other subsectors with smaller amounts;
- Carbon Capture & Storage (CCS)** for the cement, chemical and steel industry starting 2036. The emissions by using coal and gas can be reduced through the application of CCS technology with the potential reduction of 13 million tons of CO<sub>2</sub>.

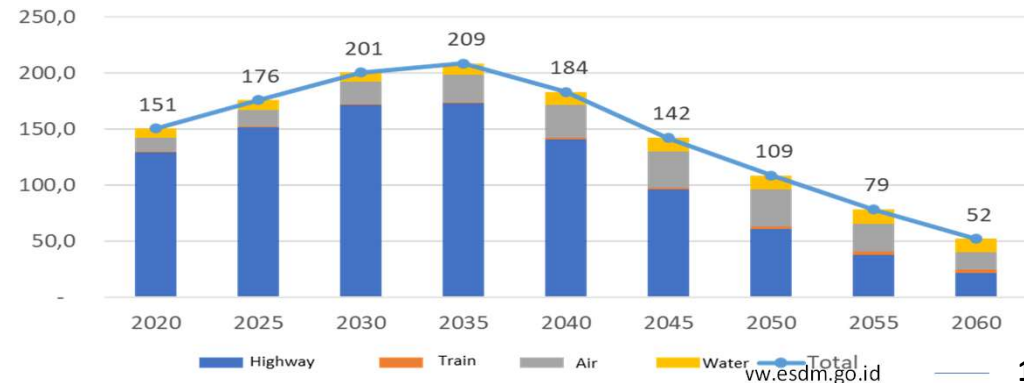
Unit | Million Ton CO<sub>2</sub>



## TRANSPORTATION SECTOR

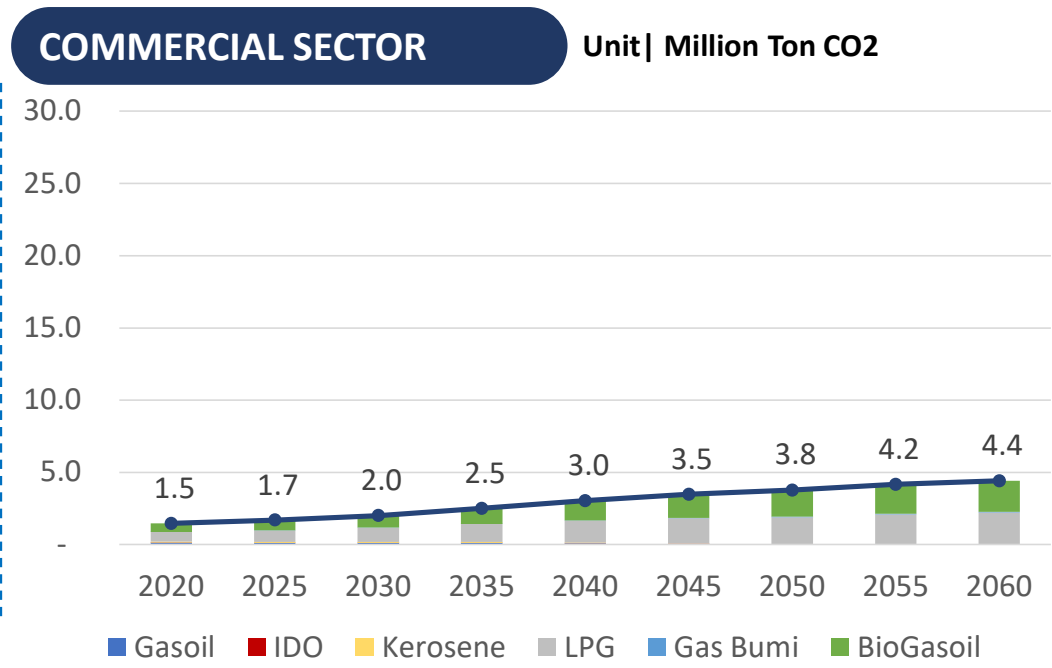
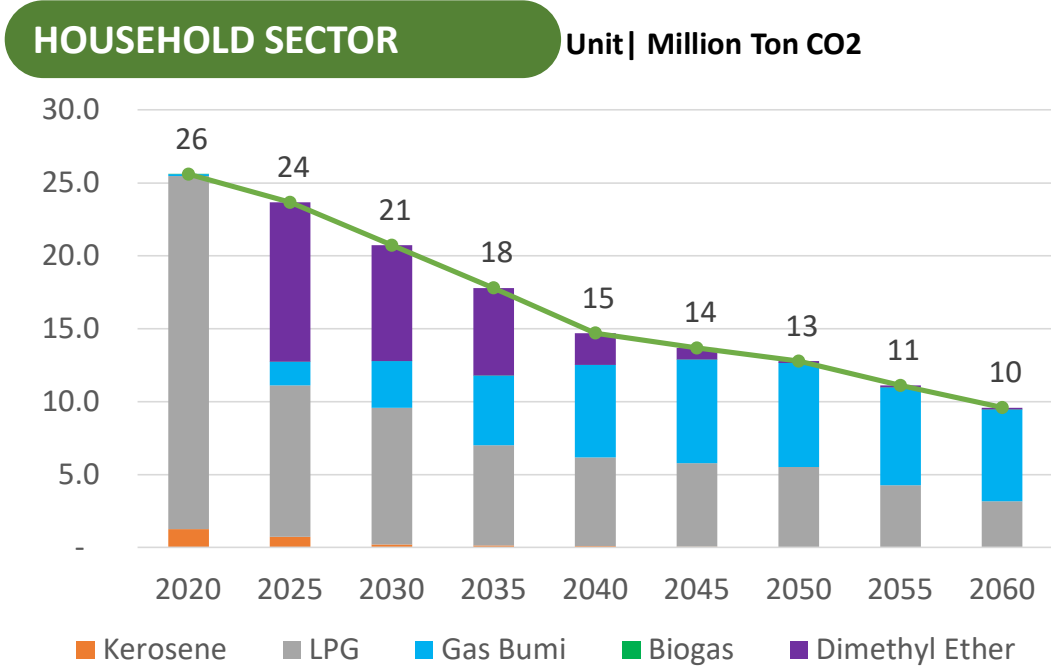
- Stop Importing fuel** (other than Avtur) by 2030;
- Biofuel utilization** is projected to reach 40%;
- The penetration of electric vehicles** by accelerating sales penetration 100% for 2wheelers by 2035 and 4wheelers by 2040;
- The use of hydrogen for trucks.** Sales penetration hydrogen trucks is 5% by 2040 and 20% by 2060;
- Eco-fuels (Eco-friendly fuels/low-carbon fuels for aviation)** started in 2040 and will reach 45% by 2060;
- Low-carbon fuels for shipping** begin in 2036 with a mixture of e-ammonia, hydrogen and biofuels;
- E-fuel** (derived from biosyngas and green hydrogen) for vehicles.
- Electrification** at ports or electric vessels for shorter distances and/or hybrid vessels.
- Energy efficiency in transportation technology** is projected to be 20-25% by 2060.

Unit | Million Ton CO<sub>2</sub>





# HOUSEHOLD & COMMERCIAL STRATEGIC STEPS



1. Stop importing LPG;
  2. Penetration on the use of Electric / Induction Stoves;
  3. Gas Network/ City gas; and
  4. Energy efficiency programs include optimizing energy management and using high energy efficient appliances (in example of air conditioning and other equipment)
- Note:

- There is a gradual phase-in potential of MEPS (AC), the stocks will reach the Best Available Technology (BAT) by 2060, estimated to be 40% from the current level;
- The equipment is assuming MEPS that leads to an average unit consumption at the current BAT level by 2060, estimated to be at 60% of the current level; and
- The Other sector is not specifically discussed in the modelling but is summed up with the Household and Commercial sector of around 3.3 million tons of CO2-e.

# INDONESIA'S DECARBONIZATION PROGRAM



## Policy instruments under Law/Government/ Presidential/Ministerial Regulations:

- Ratification of Paris Agreement. Enhanced NDC has been submitted
- Renewable energy priority in example geothermal and Solar rooftop PV
- Renewable Energy Tariff
- Energy conservation
- Carbon Cap and Trade in Power Generation.



## Developing 20.9 GW Renewable Energy Power Plants up to 2030

(Based on PLN Electricity Supply Business Plan)



## No More Coal Fired Power Plant development (starting 2030)



## Implementing the Conversion of Diesel Power Plant

- Gas power plant: 47 locations (3,220 MW)
- Renewable energy: 2,130 locations (500 MW)



## Implementing Biomass Cofiring in CFPP (113 existing Coal Fired Power Plants - 19 GW)



## Providing Geothermal Drilling Fund (in 9 Geothermal Working Areas - 295 MWp)

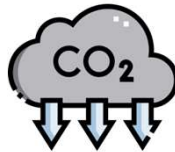


## Implementing Biofuel Mandatory B35 (Starting February 2023 - 13 KL)



## Accelerating Electric Vehicles Program

- Electric car: 2 million in 2030
- Electric motor bike: 13 million in 2030



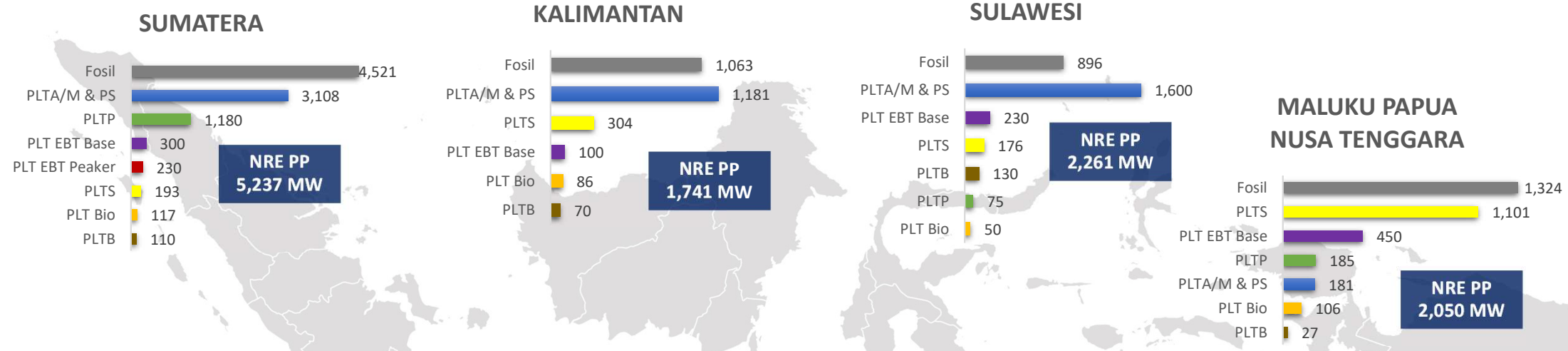
## Developing CCS/CCUS Technology (16 Projects in oil and gas sector)



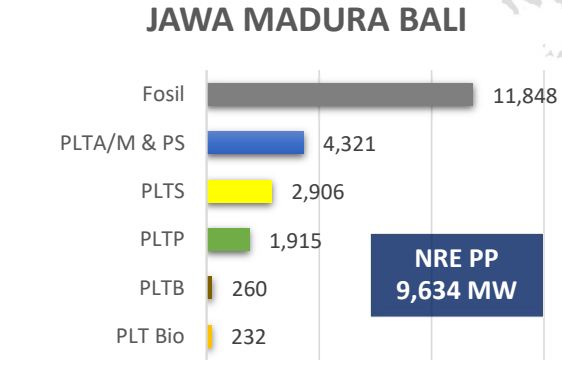
## Expanding of Minimum Energy Performance Standards and Mandatory of Energy Management

# NRE PP DEVELOPMENT PLAN YEAR 2021-2030 - GREEN RUPTL

- NRE additional capacity is targeted to reach 20,9 GW (51,6% of the power plant in RUPTL 2021-2030).
- NRE development has been carried out in accordance with the systems' electricity balance.



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



# REGULATION TO ACCELERATE THE ENERGY TRANSITION

## Carbon Tax & Carbon Trade (Act 7/2021 and Presidential Decree 98/2021)

- 1 A carbon tax is imposed on carbon emissions that **have a negative impact on the environment.**
- 2 The subject of the carbon tax is an **individual or entity** that purchases goods that **contain carbon and/or carries out activities that produce carbon emissions.**
- 3 The imposition of a carbon tax is carried out by considering **the carbon tax roadmap set by the Government** and/or the carbon market roadmap.
- 4 **The carbon tax rate** is set at a minimum of **IDR 30.00 per kg CO<sub>2</sub>e.**

The carbon tax will be implemented in 2022 in the CFPP with a cap & tax scheme.

### Carbon Trading Implementation

#### Scope of MEMR Regulation (Draft)

- GHG Emission Reporting Mechanism for Power Plants
- GHG Emissions Cap for Coal Fired Power Plants
- Technical Emissions Approval Mechanism for Coal Fired Power Plants
- Carbon Trade Mechanism
- Technical Emissions Approval Auction Mechanism for Power Plants

Emission Cap for CFPP is divided into 4 categories:

CFPP Type	Installed Capacity	Benchmark Intensity Cap (tonCO <sub>2e</sub> /MWh)
Non-Mine Mouth & Mine Mouth	25≤MW<100	1,30 <sup>*)</sup>
Non-Mine Mouth	> 400 MW	0,913
Non-Mine Mouth	100 ≤ MW ≤ 400	1,013
Mine Mouth	≥ 100 MW	1,091

Note: only applies to the CFPPs connected to the PLN network \*) Valid no later than 2024

Source: DG of Electricity, Update January 26, 2022

## Presidential Decree No.112/2022 on Acceleration of Renewable Energy Development for Electricity Provision

### Goal:

- **Increase investment** in the Renewable Energy sector;
- **Acceleration to reach renewable energy targets** in the national energy mix in accordance with the National Energy Policy;
- **Reducing the current trade deficit** in the energy sector;
- **Reducing greenhouse gas emissions.**

### 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
- ✓ Terms for the energy transition

## Draft of New Energy and Renewable Energy Law

*A comprehensive regulation is needed to create a sustainable and fair NRE development that benefits all levels of society*

This law was initiated by DPR RI and DPD RI and is included in the National Priority Legislation (**Prolegnas**) for 2022. Include terms for :



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# THE ROLE OF FOSSIL ENERGY IN THE ENERGY TRANSITION

## Roles

### Oil and Gas

1. Oil currently as the main energy in the transportation sector
2. Natural gas used as energy transition before 100% of NRE PP applied
3. Natural gas used as fuel for intermittent renewable energy
4. Fulfillment of domestic needs (i.e. fuel for transportation, raw materials, industry and households)

### Coal and Minerals

1. Fulfilling domestic needs (i.e. fuel for power plants, industry and households) before a cleaner alternative energy accessible.
2. Minerals such as nickel, cobalt, are the main material sources for the manufacture of batteries.

## Issues

1. Increase in oil production by 1 million bopd and natural gas by 12 bscfd by 2030.
2. Produce carbon emissions

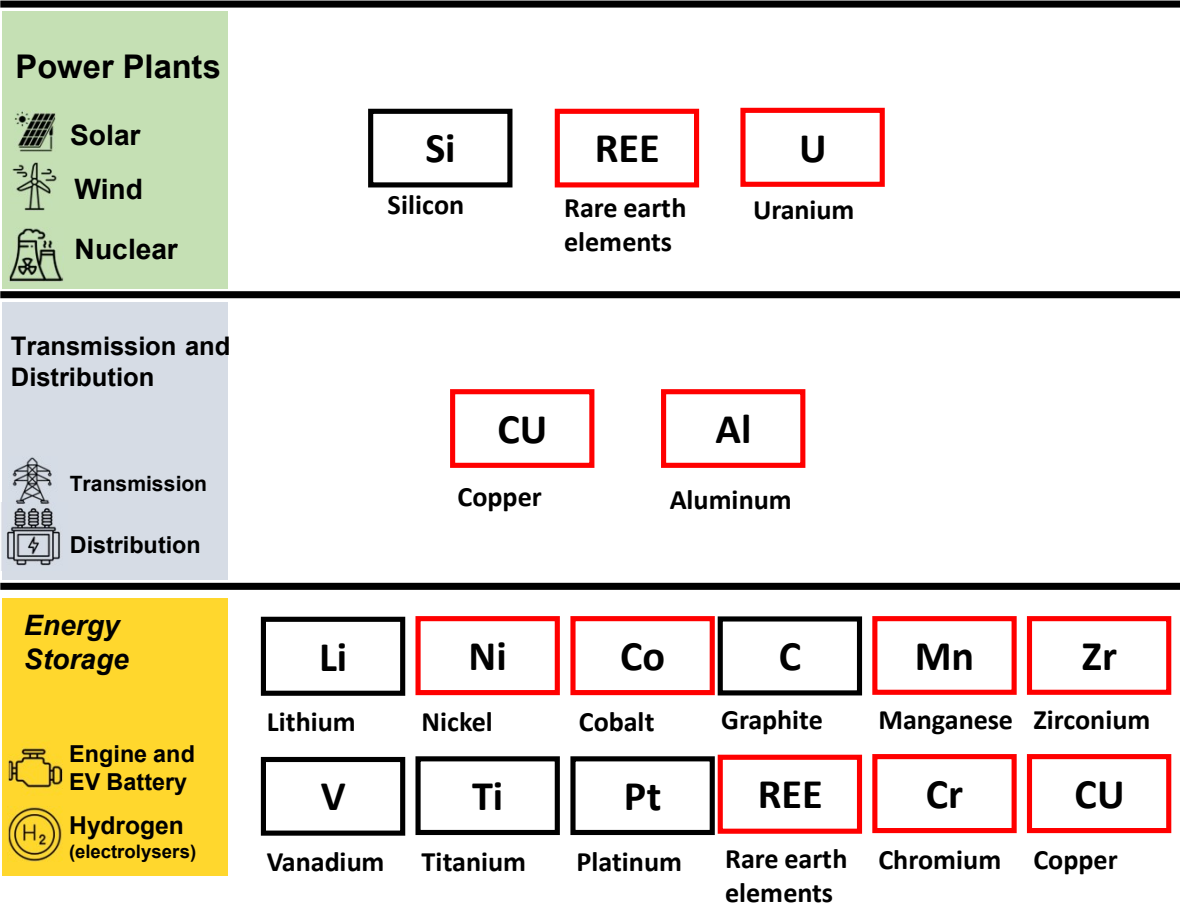
1. Carbon emissions contributors
2. Environmental issues – If not managed with good mining practices
3. Cell battery industry readiness

## Strategies

1. Increasing Reserves through:
  - Optimization of existing field production
  - Transformation of Resources to Production
  - Accelerate Chemical EOR
  - Massive exploration for big discoveries
2. Natural gas as energy transition before 100% of NRE PP applied
3. Application of CCS/CCUS

1. Reducing the use of coal as a source of energy for PP or the use of coal in Coal PP by using CCS/CCUS
2. The use of coal in households through the development of Dimethyl Ether (DME).
3. Increasing the added value of minerals through processing and refining for domestic metal mineral mining commodities.
4. Integrated battery industry development

# THE ROLE OF MINING IN SUPPORTING THE ENERGY TRANSITION



Available in Indonesia

Mining plays an important role in supporting the global clean energy transition





If the mining industry does not rapidly scale up the discovery and delivery of essential minerals, the prospects for a large-scale energy transition will be threatened.


- Challenges and Innovation :
- » Identification and *discovery*
  - » Metal extraction and Recovery
  - » *Alloying*


# Thank You

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