A Just and Affordable Transition Towards a Net Zero Indonesia in Electricity Sector

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CONTENTS

I ELECTRICITY POLICY

5 K OF ELECTRICITY

In the electricity sector, Government of Indonesia defined our policy in a term called “5K of Electricity”.

1

SUFFICIENCY

Implementation of National Electricity Demand and Planning

2

RELIABILITY

Utilization of technology (sensors) in power plants for efficiency

3

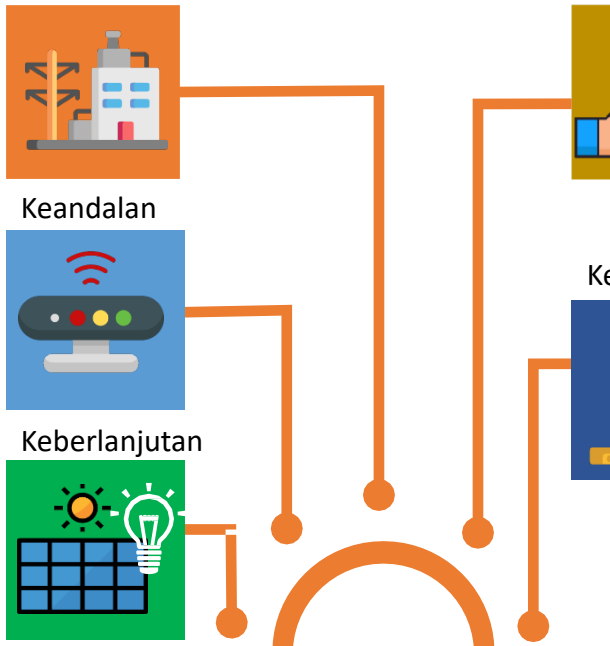
SUSTAINABILITY

Use of EBT / Installation of PLTS in Power Plants

Kecukupan

Keandalan

Keberlanjutan



Keterjangkauan

4

AFFORDABILITY

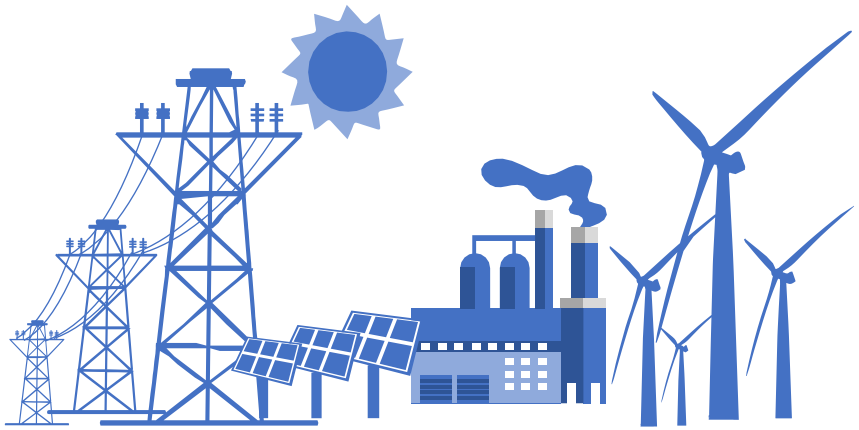
Striving for competitive electricity prices, so that community rates are affordable

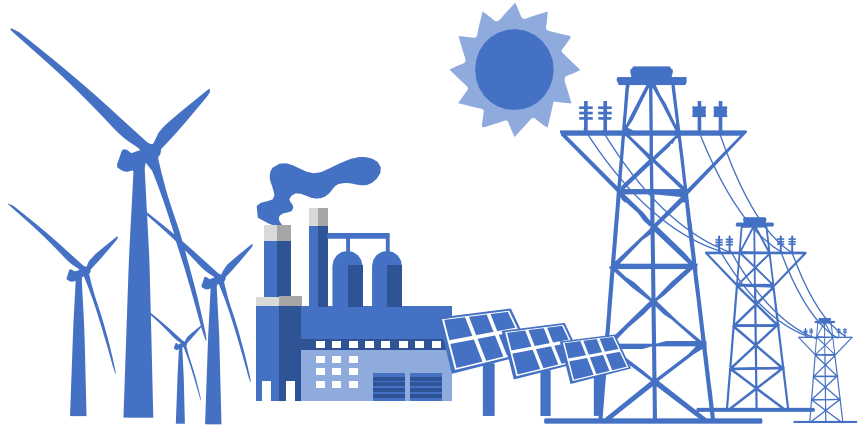
Keadilan

5

EQUALITY

Equitable access to electricity is manifested in an increase in the electrification ratio for household





POLICY DIRECTION FOR ELECTRICITY SUPPLY DEVELOPMENT

GUARANTEE THE AVAILABILITY OF ELECTRICITY

SUFFICIENT | GOOD QUALITY | AFFORDABLE PRICE

GENERATION

- **Minimum share of RE 23% by 2025.**
- Diesel generation is only for emergency and temporary power supplies such as crisis areas.
- GTPP/CC/GE/CCGE platform.
- CFPP uses Clean Coal Technology (CCT).
- Utilization of local primary energy sources.
- The use of nuclear energy is in line with National Energy Policy (KEN).

TRANSMISSION

- Dispatching electricity to business and industrial centers (Special Economic Zones, Tourism and Industrial Zones).
- HVDC transmission for long distance power evacuation (point to point / inter-island).

SUBSTATION

- At least 1 substation for each district/city.
- The addition transformer of the substation if the load capacity of transformer has reached about 70%.
- Development of Gas Insulated Switchgear (GIS) for limited land.
- Reducing losses and rehabilitation of old network.

RURAL ELECTRICITY AND SMART GRID

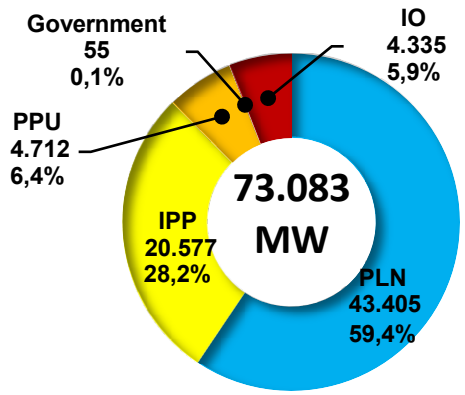
- Expansion of access to electricity in remote and scattered areas.
- In 2020 smart grids is began to be implemented in Java-Bali.

Source: National Electricity Master Plan 2019 - 2038

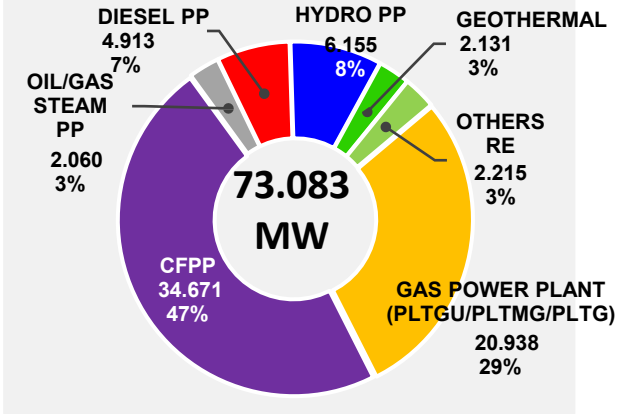
STATUS OF NATIONAL ELECTRICITY (STATUS OF MEI 2021)

INSTALLED CAPACITY OF NATIONAL POWER GENERATION

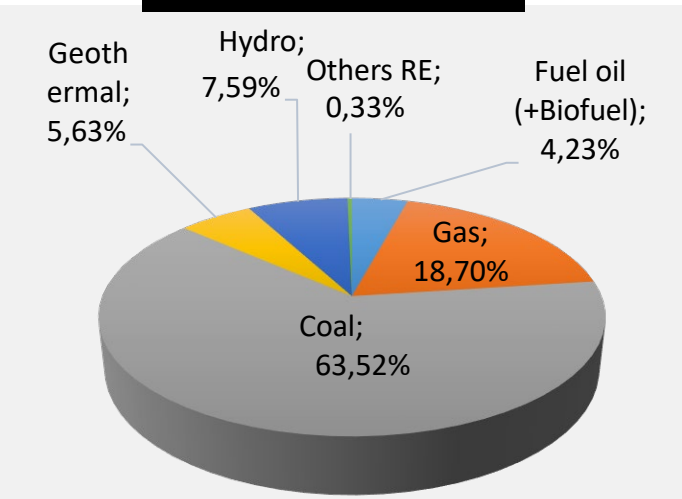
Based on owner



Based on type



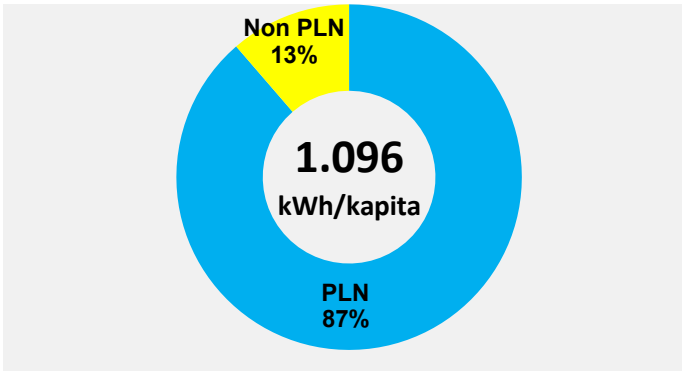
ENERGY MIX OF PLN'S POWER GENERATION



TRANSMISSION AND DISTRIBUTION

Transmission	**61.666 kms**
Substation	**150.928 MVA**
Distribution	**1.012.751 kms**
Distribution Substation	**62.292.065 MVA**

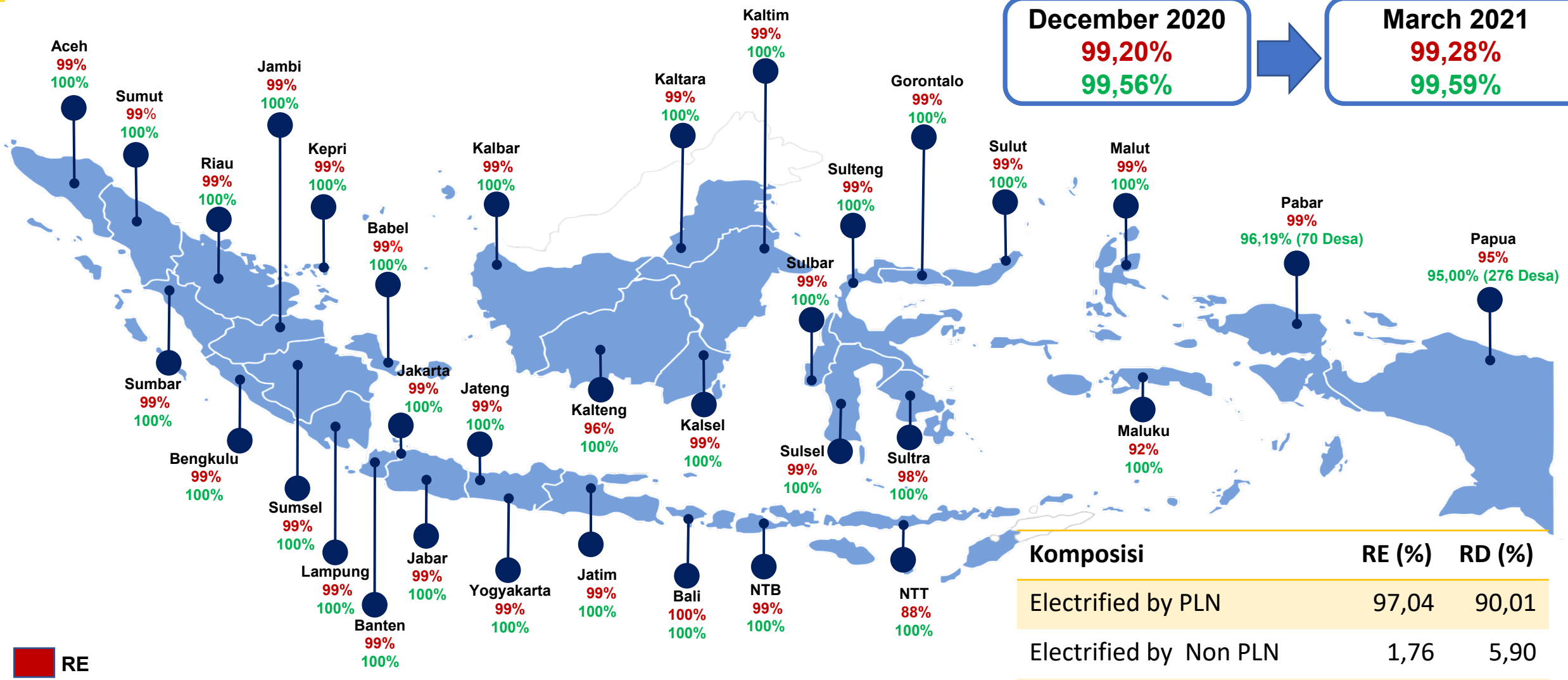
NATIONAL ELECTRICITY CONSUMPTION



- IPP: *Independent Power Producer*
- PPU (Private Power Utility) is a holder of a business area other than PLN
- IO non BBM is the holder of an Operating Permit with a generator that uses fuel other than BBM

HOUSEHOLD (RE) AND RURAL AREAS (RD) ELECTRIFICATION RATIO

December 2020	March 2021
99,20%	99,28%
99,56%	99,59%



Household not yet electrified : 542.124 RT
Villages not yet electrified : 346 villages

Komposisi	RE (%)	RD (%)
Electrified by PLN	97,04	90,01
Electrified by Non PLN	1,76	5,90
Electrified by LTSHE	0,48	3,68
Not yet electrified	0,72	0,41

CHALLENGES IN THE ELECTRICITY UTILITY SECTOR

- Energy Transition Plan And Roadmap Implementation To Achieve Net Zero Emission 2060
- High Penetration & Integration Of Variable Renewable Energy
- Grid Modernization Through Smart Grid Implementation & Distributed Energy Resource Implementation
- Market Development & Investment In The Renewable Energy, Grid Modernization And Electric Mobility Transformation Through Electric Vehicle
- Subsidy Realocation

II

CLIMATE CHANGE COMMITMENT

INDONESIAN GOVERNMENT COMMITMENT

UNFCCC – COP 21, December 2015

Leaders Summit on Climate, 22 April 2021

National Commitments

- The Mandat of Law No 16/2016 on Ratification of Paris *Agreement* : Reducing GHG emissions by 29% (self-effort) or 41% (with international assistance) by 2030 according to NDC
- The energy sector reduces GHG emissions by 314 - 398 million tons of CO_2 by 2030, through the development of renewable energy, the application of energy conservation, clean energy technology, fuel switching and post-mining reclamation

National Commitment

- Implement concrete actions on climate change through a moratorium on forest and peat land conservation to reduce forest fires by 82%
- Encouraging green development through the development of a Green Industrial Park covering an area of 12.500 hectares in North Kalimantan
- Unlock investment in the energy transition through **the development of biofuels, lithium battery industry, and electric vehicles**

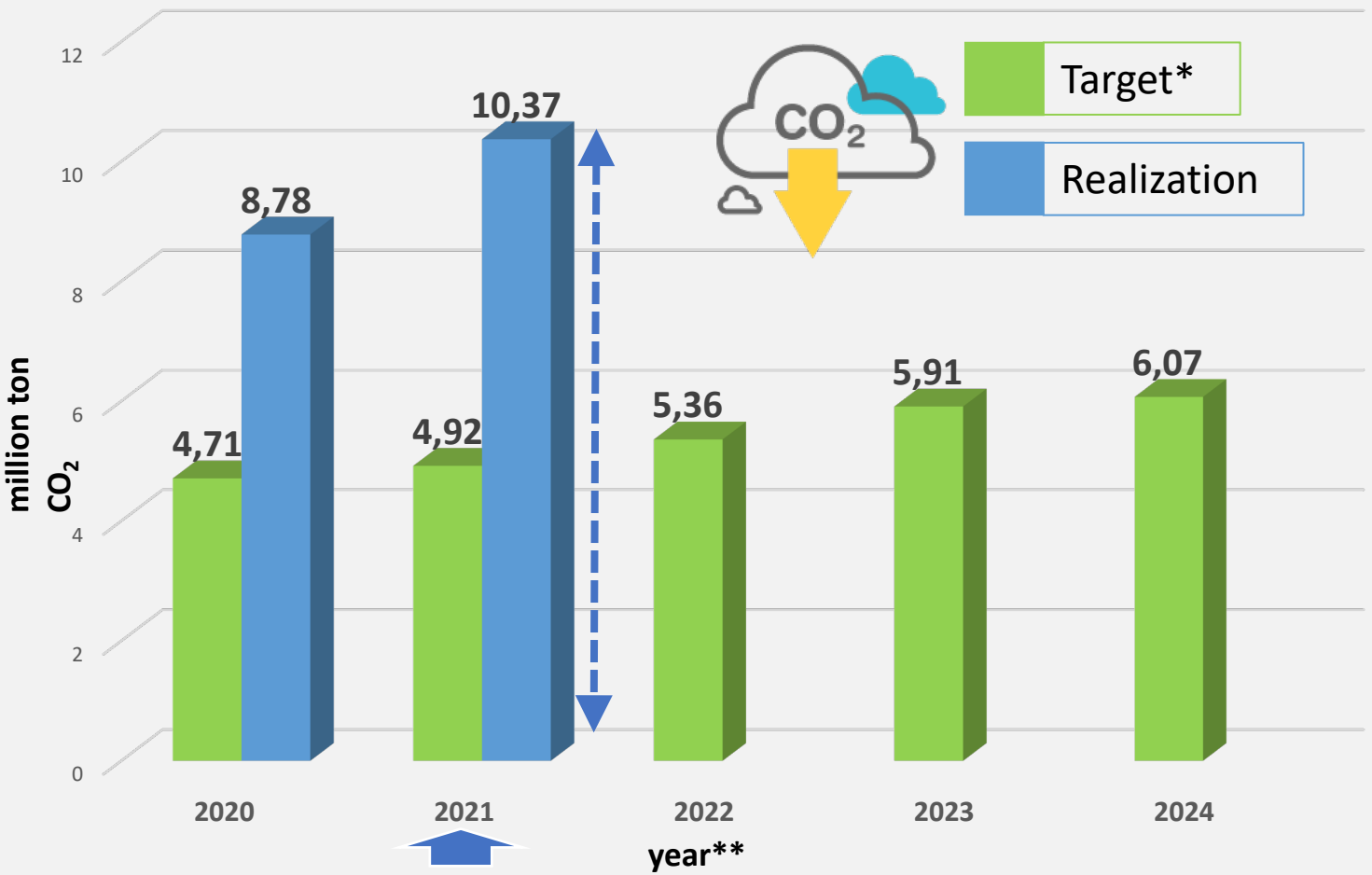
Indonesia's Nationally Determined Contribution (NDC) Target

No	Sector	GHG Emission 2010 (Million Ton CO_2e)	GHG Emission in 2030 (Million Ton CO_2e)			Reduction (Million Ton CO_2e)	
			BaU	CM1	CM2	CM1	CM2
1	Energy	453.2	1,669	1,335	1,271	314	398
2	Waste	88	296	285	270	11	26
3	IPPU	36	69.6	66.85	66.35	2.75	3.25
4	Agriculture	110.5	119.66	110.39	115.86	9	4
5	Forest	647	714	217	64	497	650
	Total	**1,334**	**2,869**	**2,034**	**1,787**	**834**	**1,081**

Mitigation	Target of reduction (Million Ton CO_2e)
Renewable energy	170.42
Energy efficiency	96.33
Clean power	31.80
Fuel switching	10.02
Post mining reclamation	5.46
Total	**314.03**

Scenario Notes:
CM1: self effort
CM2: Had international assistance
CM: Counter Measure

CO_2 EMISSION REDUCTION IN ELECTRICITY SECTOR 2021



GHG Mitigation in 2021

Clean Coal Technology in Coal Power Plant	3.368.736,64 tonCO_2
Newly Constructed Gas Power Plant	5.943.814,93 tonCO_2
Conversion from *Single Cycle* to *Combined Cycle*	49.125,36 tonCO_2
Hydro Power Plant	32.929,08 tonCO_2
Mini/Micro Hydro Power Plant	874.711,67 tonCO_2
Solar Power Plant	106.703,94 tonCO_2

Notes

*** Mitigation target for GHG emission reduction based on the Strategic Planning of the Directorate General of Electricity 2020-2024**

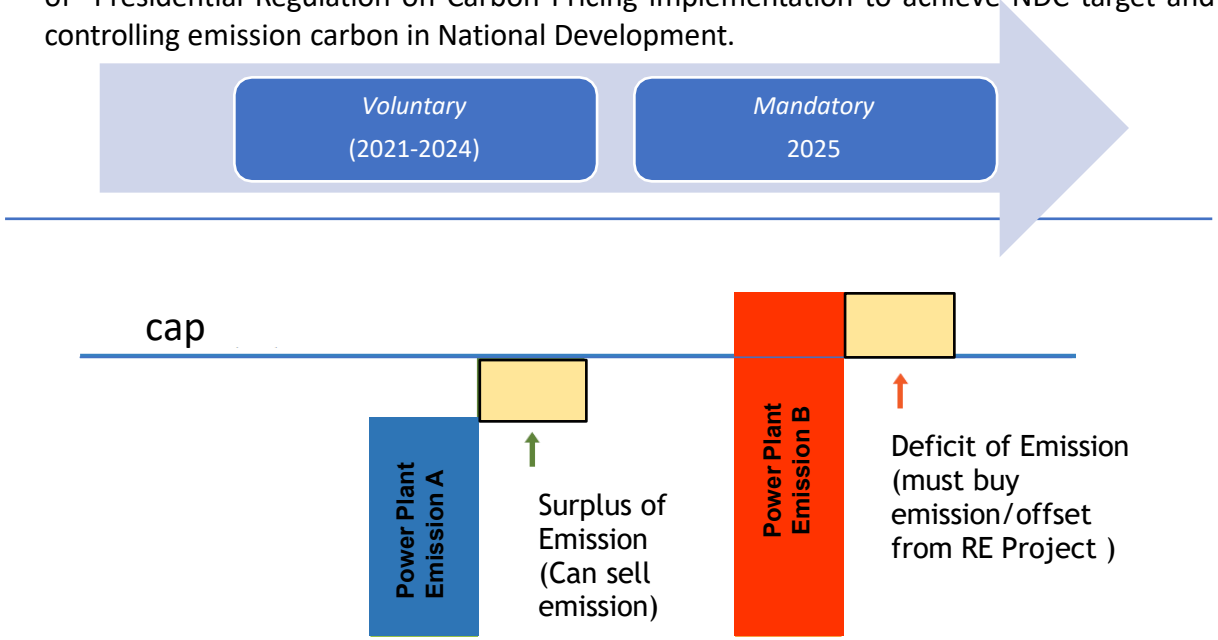
****GHG mitigation realization is calculated for the previous one year**

Mitigation Actions

Emission Reduction

EMISSION TRADING SYSTEM (ETS) TRIAL IN ELECTRICITY SECTOR

According to article 52 Government Regulation No. 46/2017 on Economic Instrument of Environment, emission trading must be implemented maximum in Nov, 2024. For preparing the mandatory ETS beyond 2024, starting this year Directorate General of Electricity conducting ETS trial (voluntary scheme). ETS trial will be accordance with draft of Presidential Regulation on Carbon Pricing implementation to achieve NDC target and controlling emission carbon in National Development.



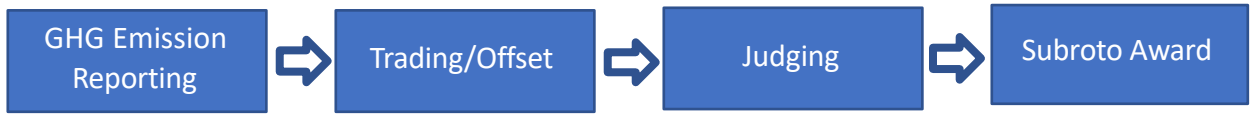
Emission Trading System trial on power plants will be implemented through Cap & Trade and Offset

Cap The upper limit of GHG emissions allowed set by the Government

Trade Activities for selling and buying the allowances to meet the GHG emissions allowed

Offset Reductions in GHG emissions in one place that can be used to compensate for emissions elsewhere

ETS trial (voluntary scheme) is conducting through Subroto Award in Efficiency Energy in C Category, with scheme as follows:



Objectives of ETS trial are:

- Increasing GHG emission reduction to achieve NDC target
- Implementing of cap emission in CFPP
- Strengthening Measurement, Reporting and Verification in Inventory GHG emission
- Raising awareness in implementation of carbon pricing, especially in cap and trade, and offset

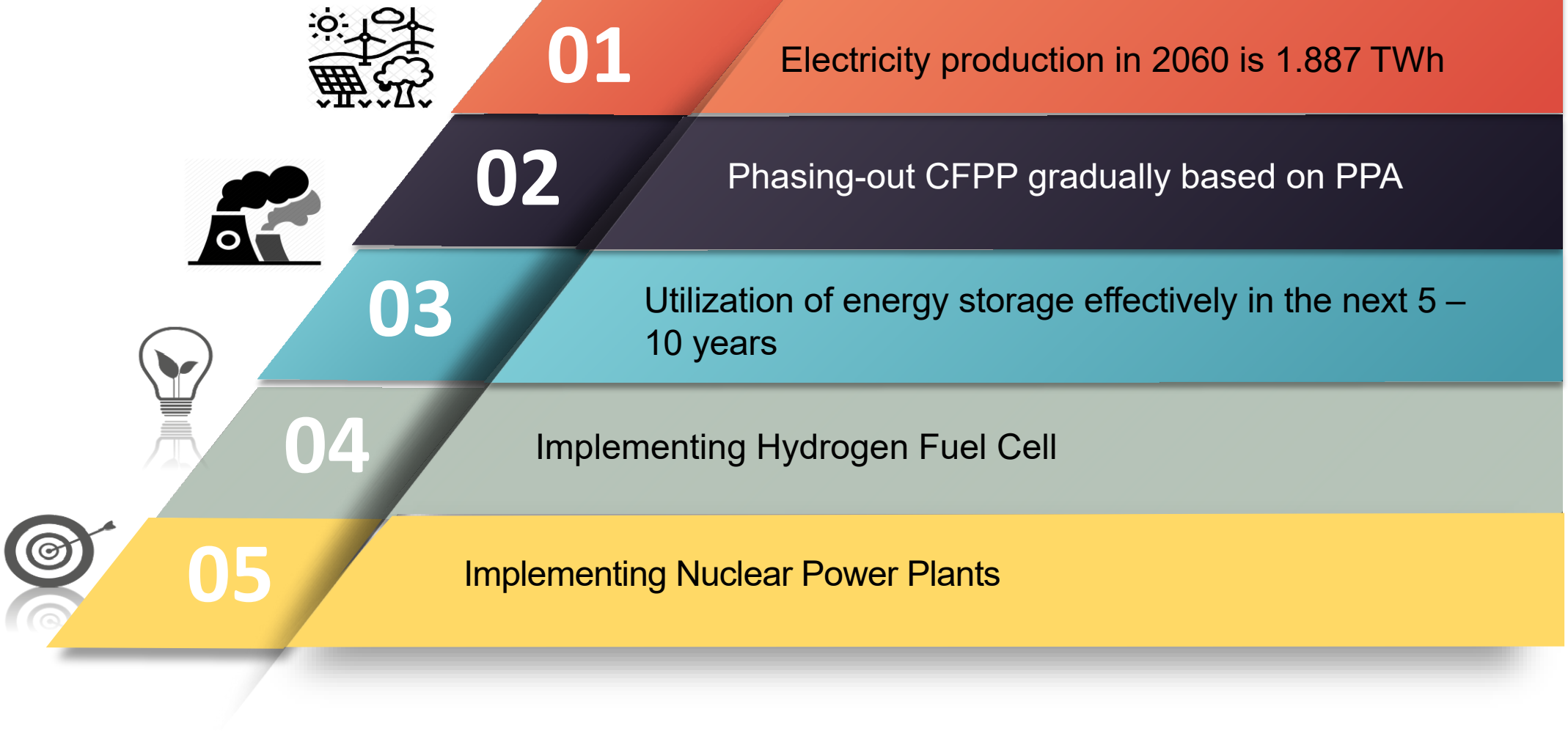
GHG emission cap in Coal Fired Power Plant (CFPP)

Power Plant	Installed Capacity (MW)	*Cap* (ton CO_2/MWh)
CFPP	X > 400	0,918
CFPP	100 ≤ X ≤ 400	1,013
Mine Mouth CFPP	100 ≤ X ≤ 400	1,094

- CFPP capacities distribution according to the MEMR Regulation No 9/2020 on the Efficiency of the Electricity Supply of PT PLN (Persero).
- The cap value based on the 2019 weighted average GHG emission intensity in each CFPP groups and considering the emission quota status.

III ENERGY TRANSITION TOWARD NET ZERO EMISSION

NET ZERO EMISSION PARAMETER



ENERGY TRANSITION TOWARDS NET ZERO EMISSION

Fossil Fuel

Availability, Accessibility, Affordability, Sustainability & Competitiveness

Renewable Energy

Fossil Fuel + Clean Technology (CCT, CCUS) + Net Sink

Green Energy

NRE Acceleration:

- **Primary Energy Substitution (Biofuels, Cofiring, RDF/SRF)**
- **Fossil Energy Conversion.**
- **Additional Capacity of NRE Power Plant, focus on Solar PV.**
  - **Hydro** (incl. pumped storage)
  - **Wind** (on-shore and off-shore)
  - **Biomass & Waste**
  - **Geothermal** (Gov't Drilling, small-scale)
  - **Ocean Energy**
- **Non-Electricity / Non-Biofuels (Briquette, Biogas, CBG).**

+

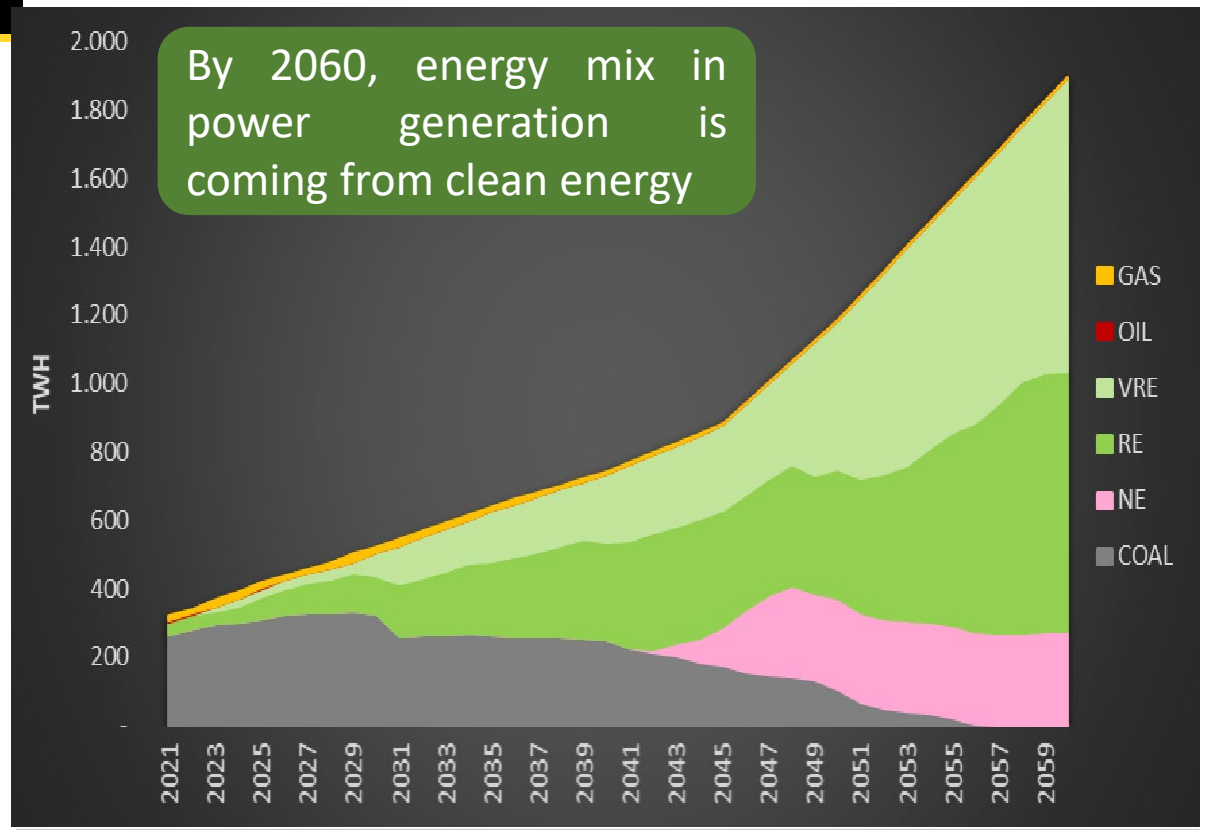
- **Electric Vehicle**
- **Nuclear** (incl. SMR's)
- **Battery**
- **Hydrogen**

+

Smart Energy, Smart Grid, Energy Conservation

- Energy Independence
- Energy Security
- Sustainable Development
- Low Carbon & Climate Resilience

NET ZERO EMISSION SCENARIO IN POWER PLANT

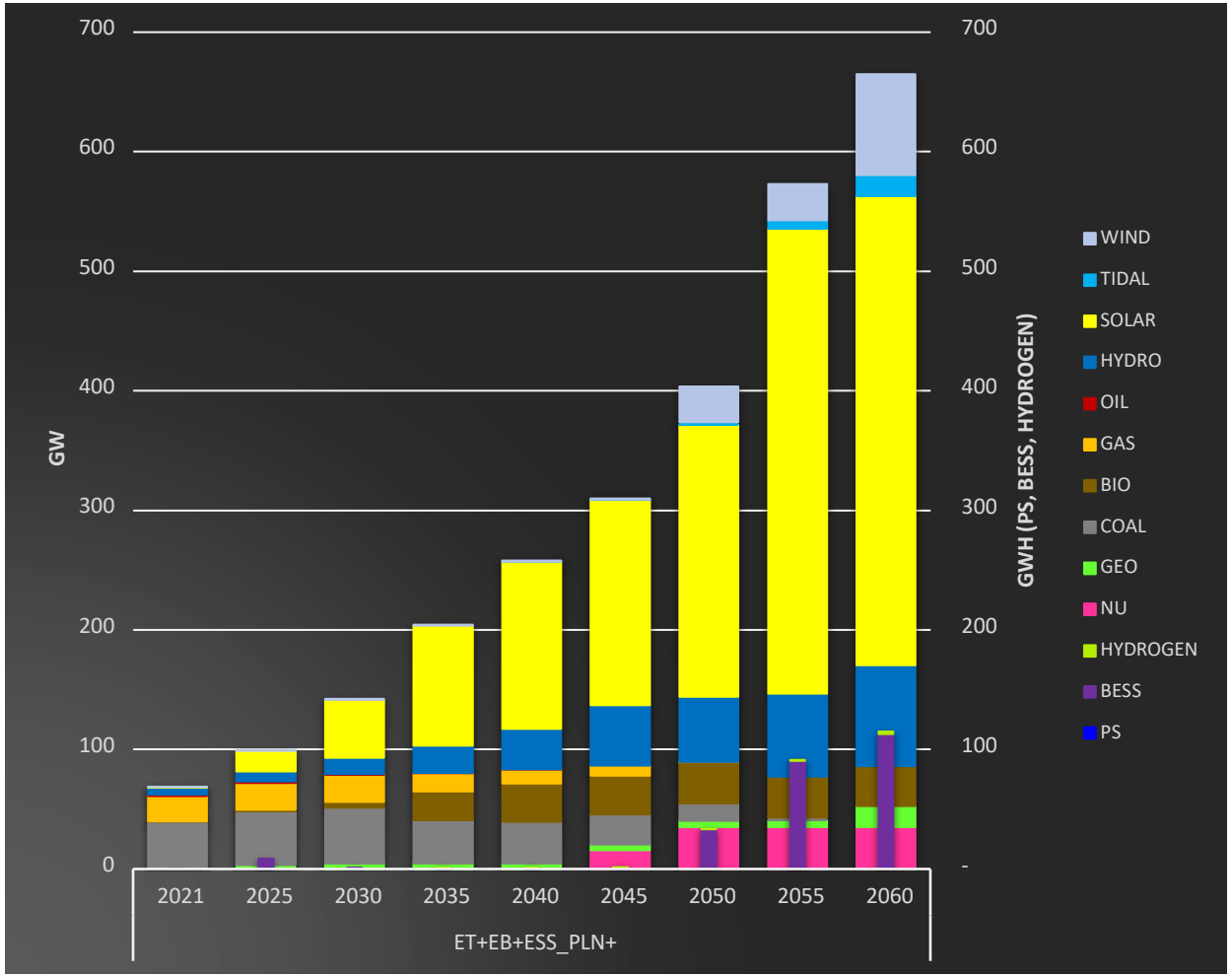


	COAL	NE	RE	VRE	GAS	OIL
2021	83%	0%	11%	0%	4%	1%
2025	75%	0%	15%	6%	4%	0%
2030	62%	0%	22%	14%	2%	0%
2035	41%	0%	34%	23%	2%	0%
2040	34%	0%	39%	27%	1%	0%
2045	20%	13%	38%	28%	0%	0%
2050	9%	22%	32%	37%	0%	0%
2055	1%	17%	37%	44%	0%	0%
2060	0%	14%	40%	45%	0%	0%

1. Electricity production in 2060 will be 1,887 TWh
2. By now, electricity production is 300 TWh and 120 TWh in addition from 35 GW program, so there will be 1,380 TWh electricity production from Renewable Energy
3. There is no additional Coal Fired Power Plant development plan except currently under contract or construction (as seen on chart, CFPP will be decreased – gray color)
4. No additional fossil fuel power plant after 2030 and significantly decreasing by 2040 following the PPA period is over
5. CFPP and Combined Cycle Power Plant will be retired accordingly to the operating period, where the last CFPP was retired in 2058 while the last Combined Cycle was retired in 2054, and replacing with Renewable Energy power plants
6. Number of Renewable Energy power plants will be increasing

Disclaimer: temporary simulation, it might be changed

NET ZERO EMISSION SCENARIO IN POWER PLANT



Solar power plant will dominant in power generation mix

1. In 2060, Renewable Energy supplied in electricity production around 665 GW
2. In 2060, 100% energy mix is coming from Renewable Energy with composition Solar Power Plant is 392 GW, Hydro Power Plant is 85 GW, Wind Power Plant is 84 GW, Nuclear Power Plant is 35 GW, Biomass Power Plant is 33 GW, Geothermal Power Plant is 18 GW and Tidal Power Plant is 18 GW
3. Implementing energy storage: hydrogen fuel cell is starting in 2035, pump storage and Battery Energy Storage System (BESS).
4. Nuclear Power Plant will be operating in 2045 and in addition there will be more 35 GW in 2060

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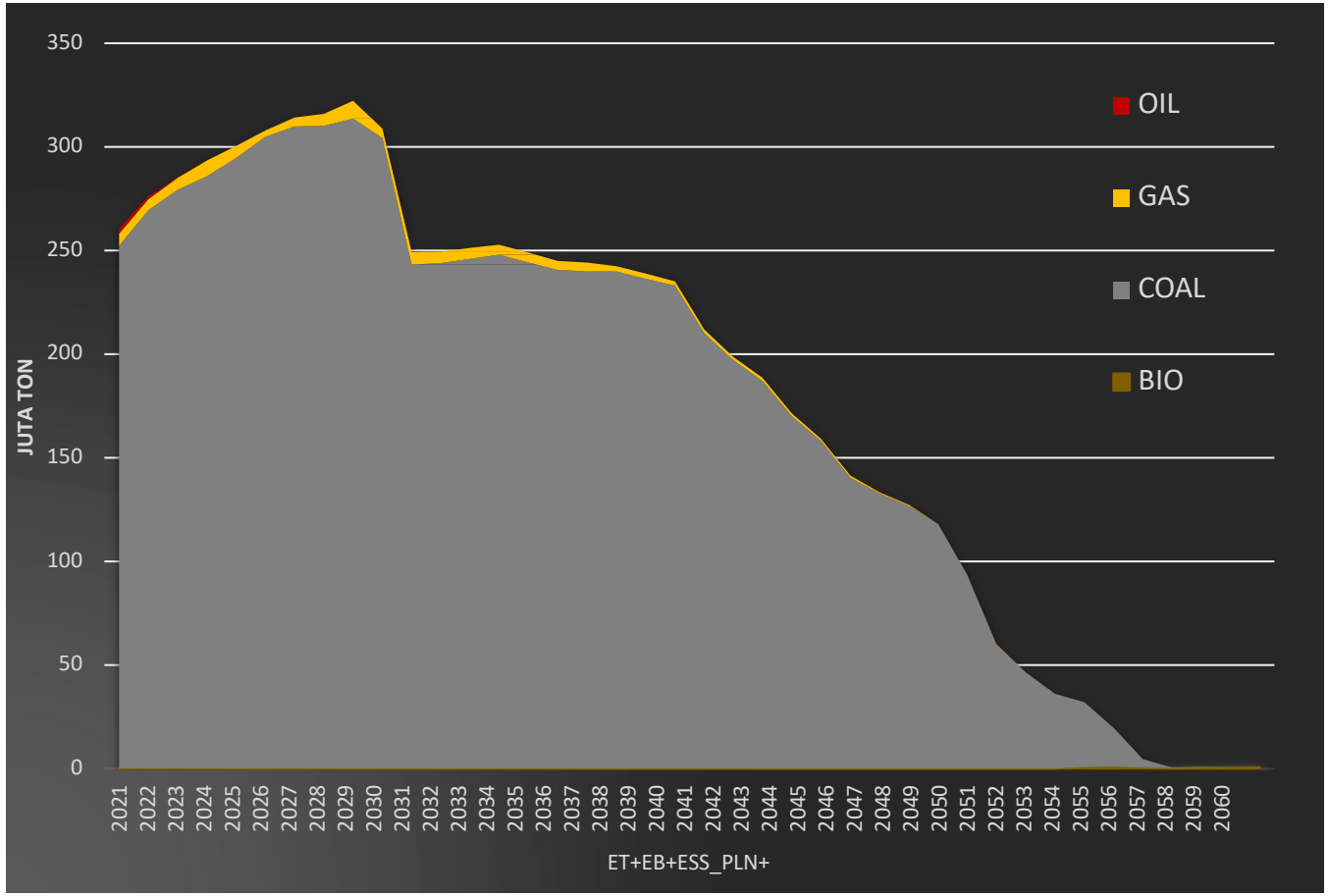
NET ZERO EMISSION SCENARIO IN POWER PLANT



1. In 2021, greenhouse gas (GHG) emission from power plants is 261 $MTCO_2e$
2. Peaking emission will occur near 2030 with GHG emission around 322 $MTCO_2e$
3. GHG emission will be decreasing in 2031, along with retirement of CFPP and Combined Cycle Power Plant and significantly decrease in 2040 due to PPA period is over.
4. In 2060, GHG emission from power plant is approaching zero

Disclaimer: temporary simulation, it might be changed

POLICY AND REGULATORY REFORM TO SUPPORT ENERGY TRANSITION

1. The Addition of Power Plants from Renewable Energy Beyond the Details of The Draft RUPTL PLN 2021-2030 can be done;
2. Developing Electricity Infrastructure : Smart Grid;
3. Revising the Grid Code;
4. Developing The Distributed Generation, Micro-grid and Distributed Storage;
5. Introducing Rooftop Solar PV for PLN's Customers to Encourage Increased of NRE (MEMR Regulation No. 49/2018 jo. No. 13/2019 jo. No. 16/2019);
6. Reviewing and Deregulate: MEMR Regulation No. 50/2017 jo. No. 53/2018 jo. No. 4/2020 (regulation related to the purchase of electricity and the benchmark price of purchasing electricity by PLN);
7. Encourage The Use of Clean Energy in The Special Tourism Area;
8. Renewable Energy-Based Economic Development (REBED) and Renewable Energy-Based Industry Development (REBID);
9. Substitution of Primary Energy for Power Generation: Co-Firing Biomass for CFPP and Conversion DEPP to NRE Power Plant; and
10. Grand National Energy Strategy.

THANK YOU

PROYEK PLTU *ON-GOING*