



PLN

How PLN could Adapt to Energy Transition

DIVISI ENERGI BARU DAN TERBARUKAN
PT PLN (PERSERO) KANTOR PUSAT





PLN

Important Issues

1. Reduce Global Emission
2. Limited Resources of Fossil Fuel
3. Fossil Fuel for Generation



Utilizing New Technology:

- Huge Capacity of Steam Power Plant → Nuclear Power Plant
- Fossil for Power Plant Operation → Bxx or CPO
- Natural Gas → Synthetic Gas ?



PLN

Preparation of First Nuclear Power Plant

- 1. PLN involved in Feasibility Study for Bangka Nuclear Power Plant → Ready for other Area**
- 2. PLN welcome if appointed as Owner of Nuclear Power Plant**
- 3. PLN also ready as off-taker**



PLN

Implementation of Bxx, CPO and Biomass

1. **Bxx** → B20 and B30 already implemented by PLN (Diesel)
2. **CPO** → already testing CPO for Diesel/Gas Machine.
3. **Co-Firing Testing** → Jeranjang Steam Power Plant

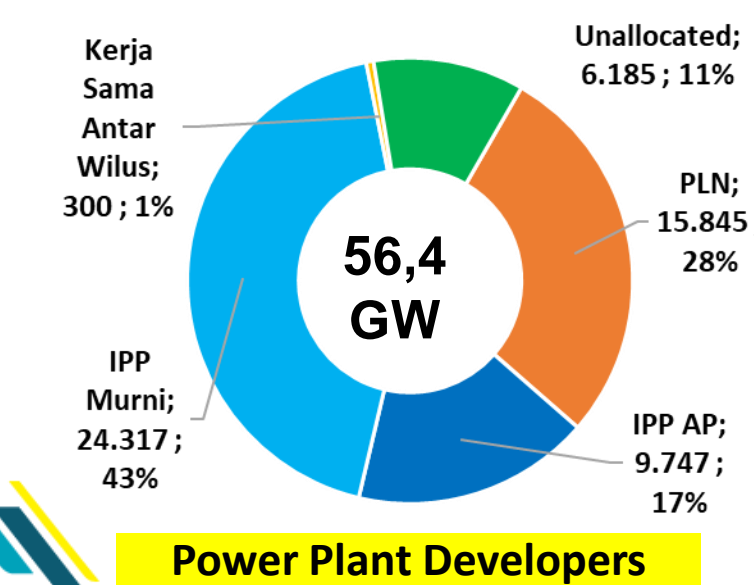
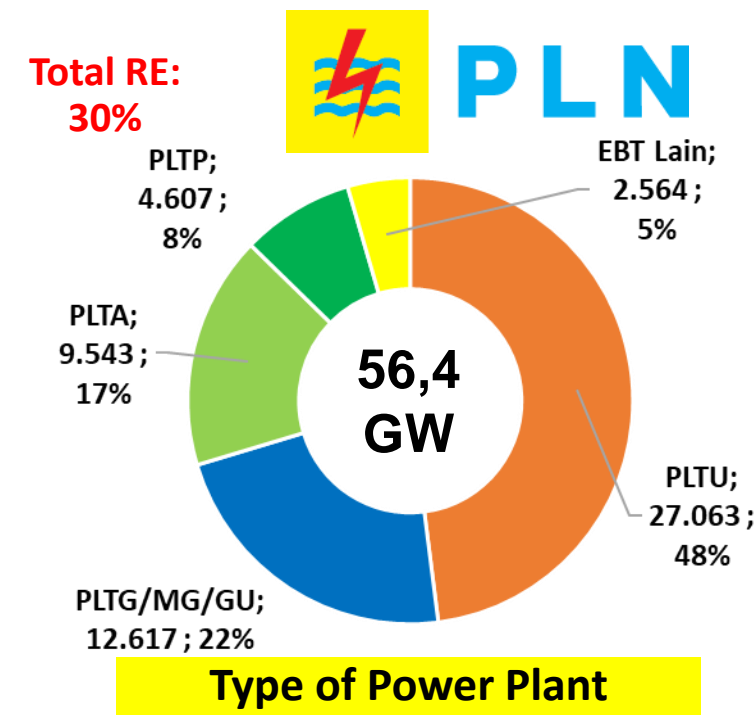
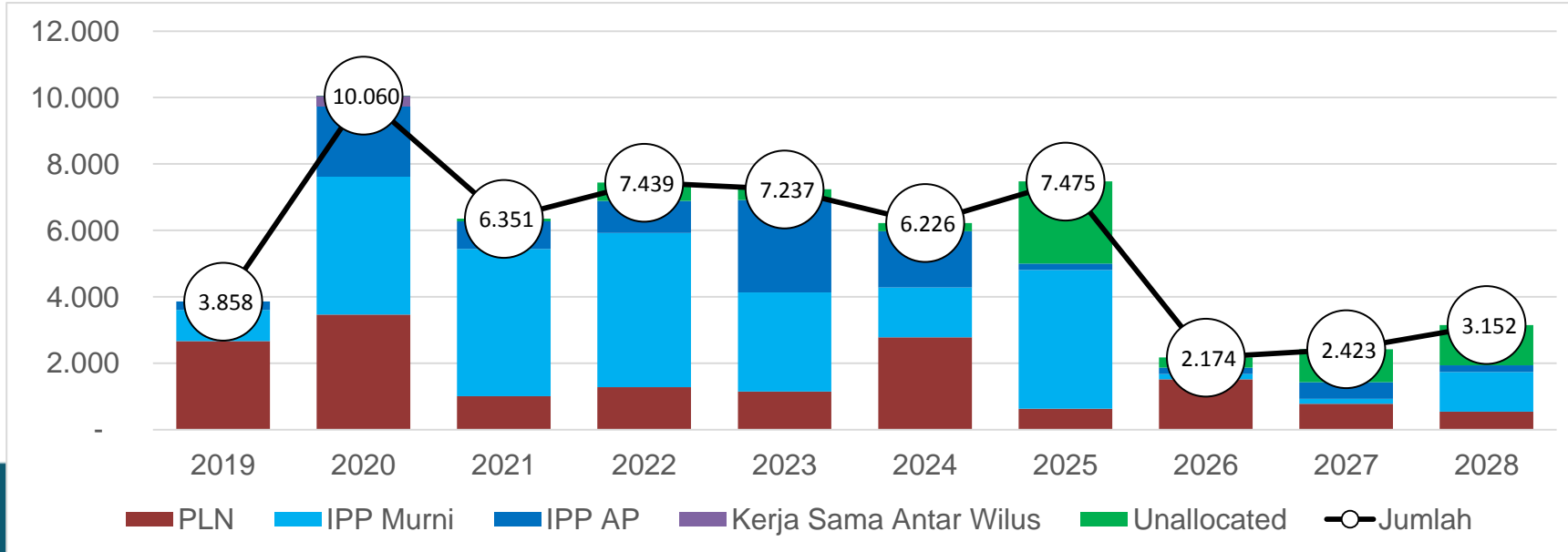
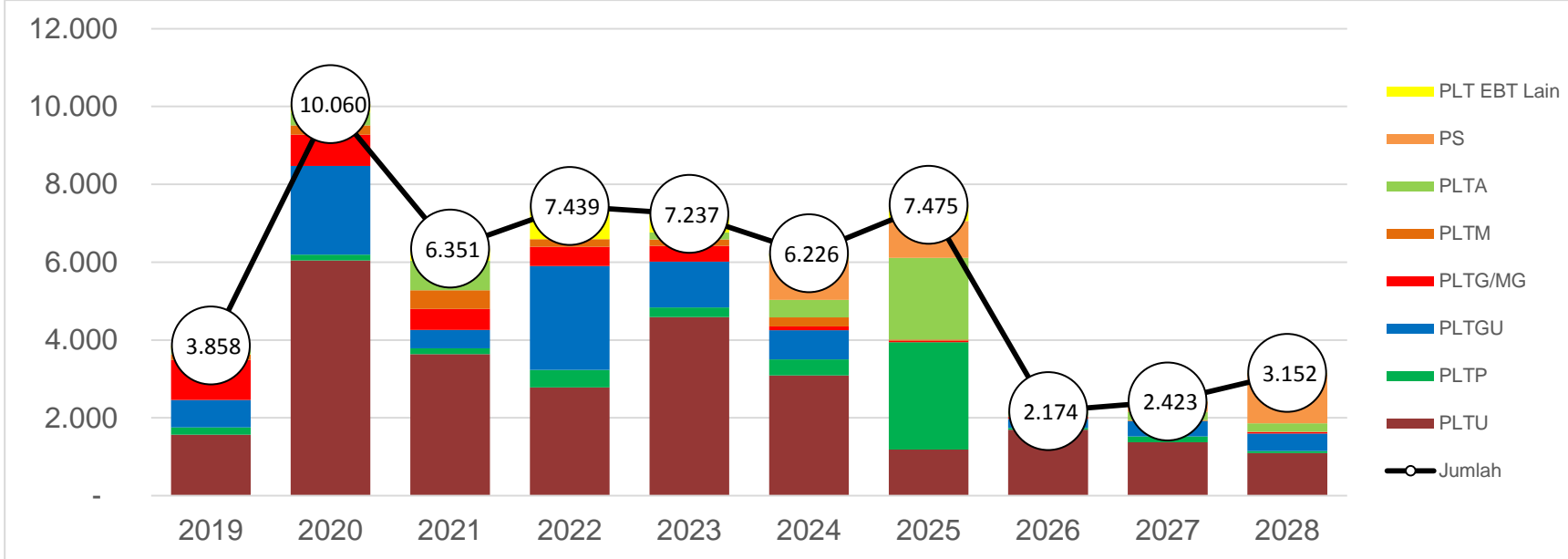


P L N

Distributed Generation

- 1. Distributed Generation can be encourage to supply electricity On-Grid and Isolated**
- 2. Bioenergy can be used as Fuel for Distributed Generation**

Power Plant Development Plan

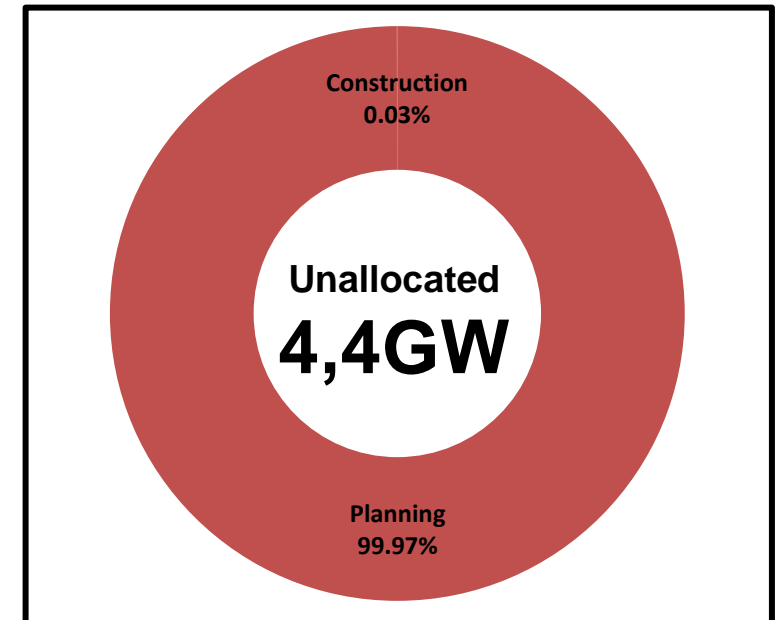
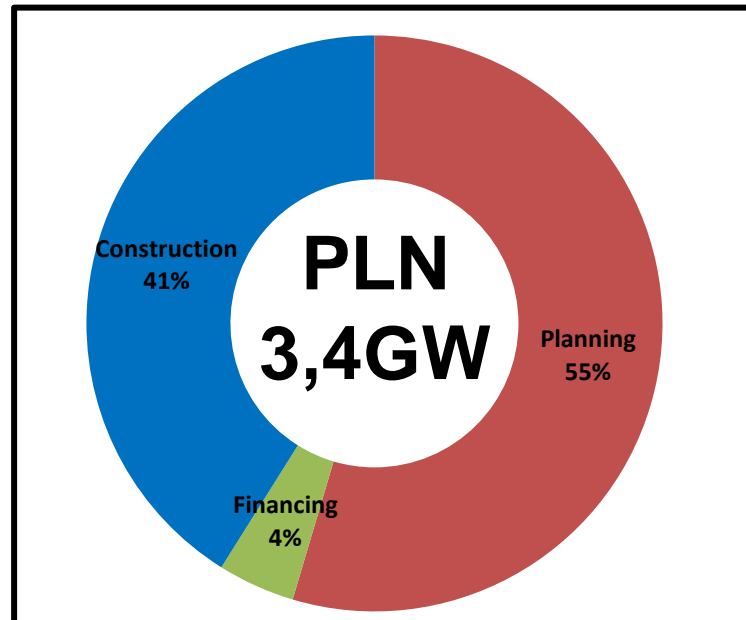
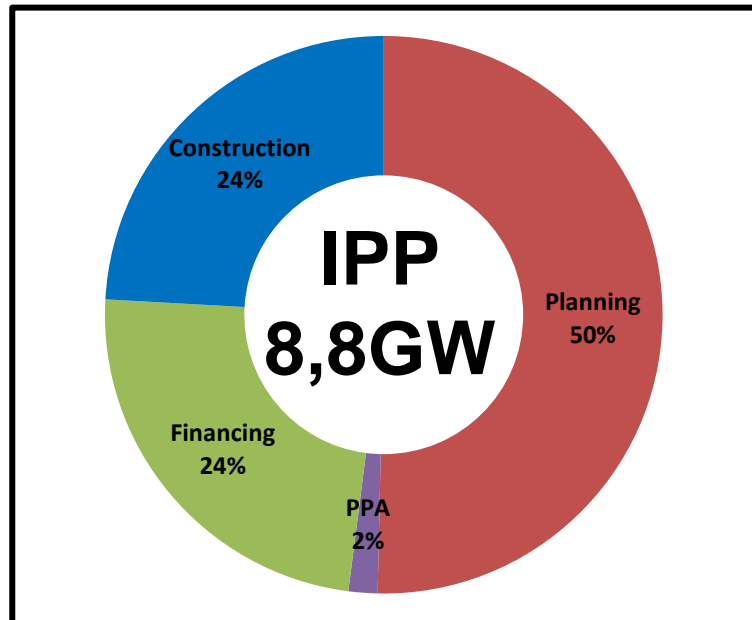


Status and Ownership of NRE Power Plant

RUPTL 2019-2028



No	Power Plant	IPP	PLN	Unallocated	Total
1	Planning	4,453	1,888	4,461	10,802
2	PPA	149			149
3	Financing	2,109	150		2,259
4	Construction	2,133	1,421	1	3,555
Total		8843	3460	4462	16,765



Summary



PLN

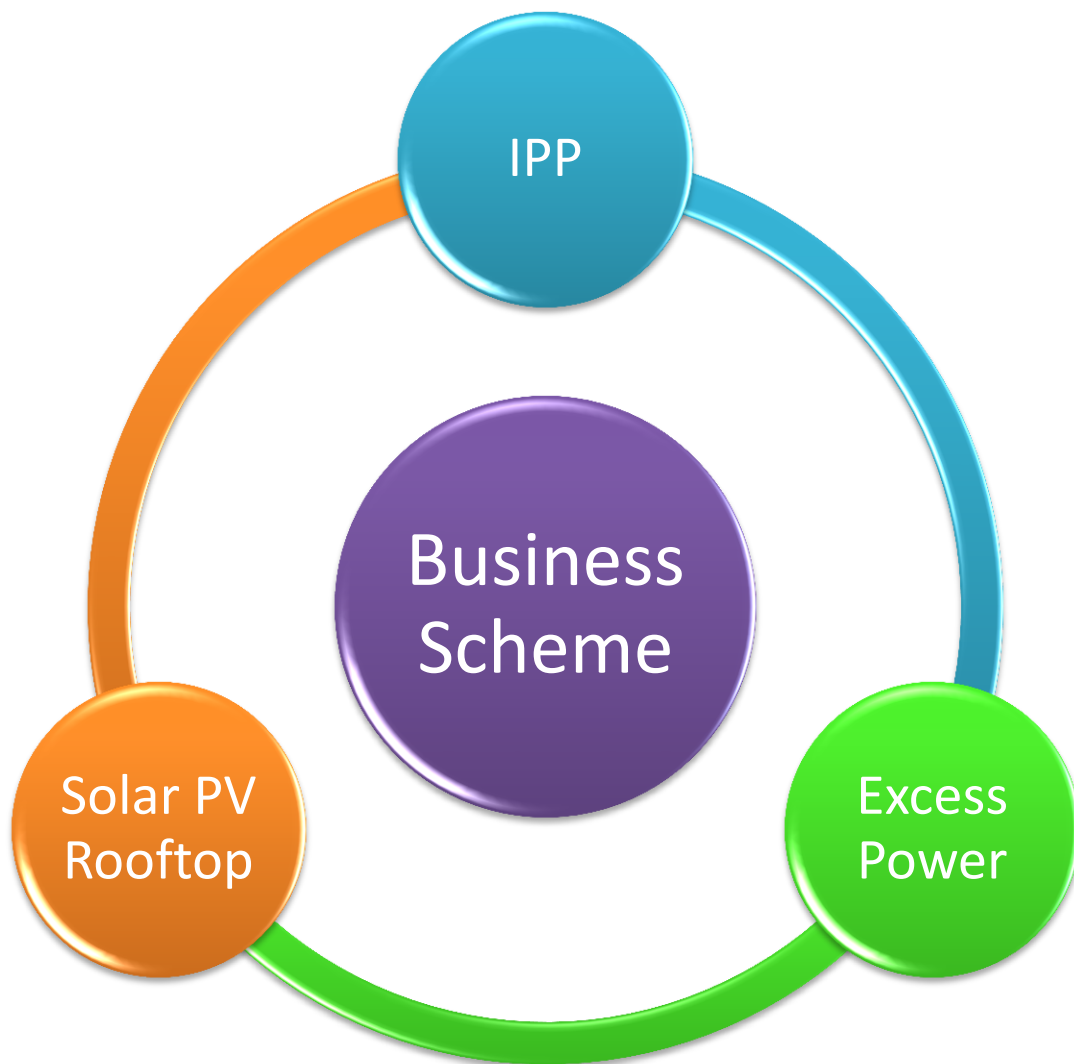
The transition of energy will be next challenge of PLN in circumstance of electricity secure.

TERIMA KASIH





Current Policies



IPP

- MEMR Decree No. 50/ 2017
- PPA start from 20 years up to 30 years



Excess Power

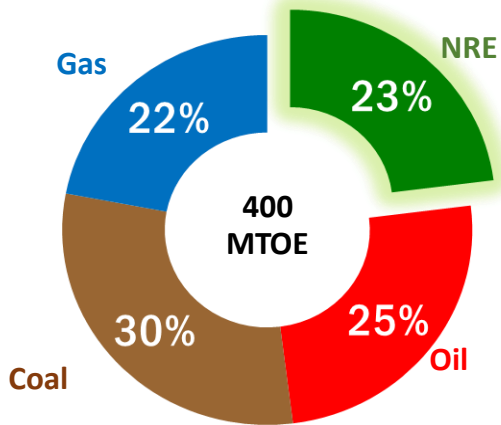
- MEMR Decree No. 19/ 2017
- PPA up to 2 years



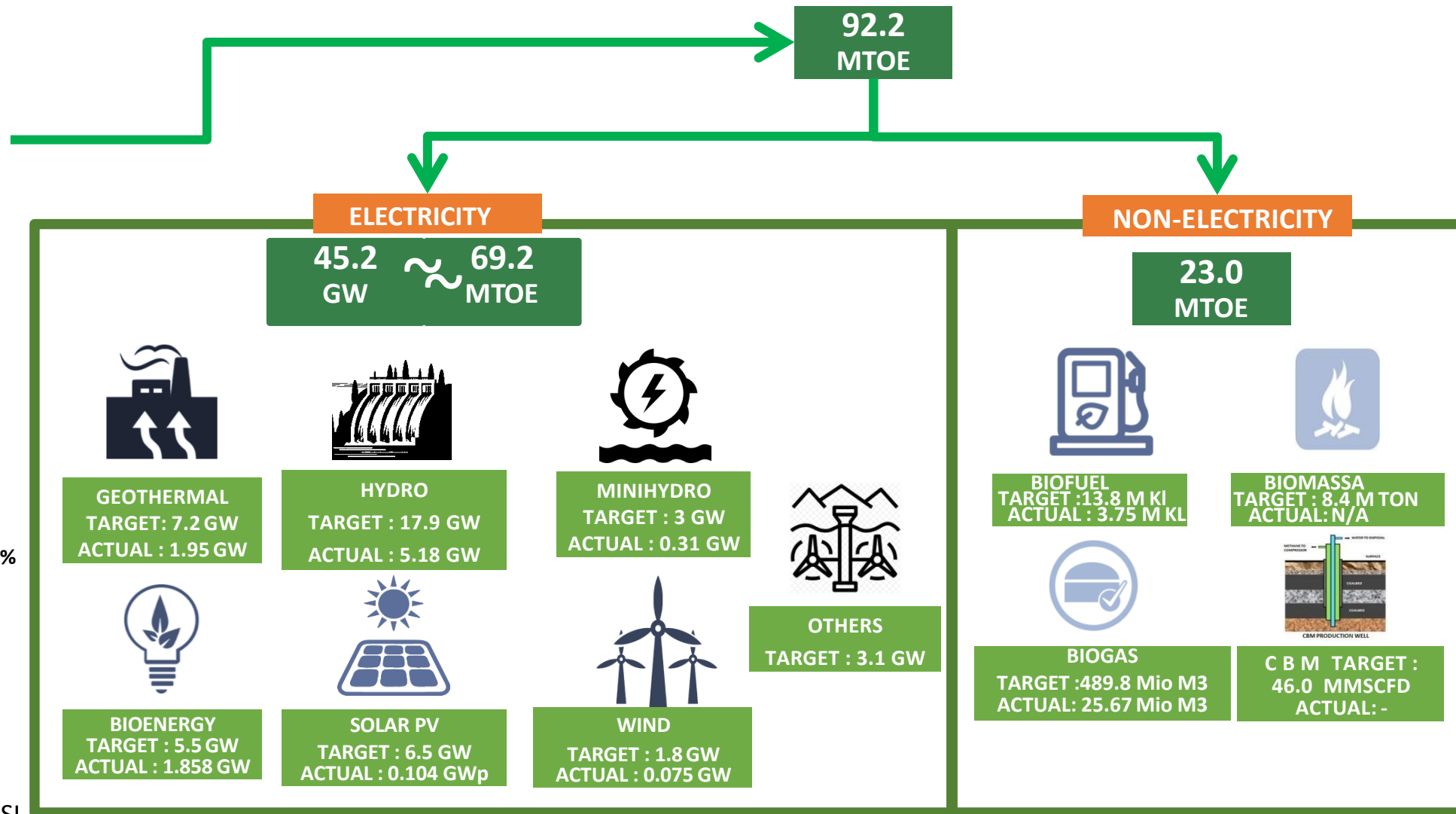
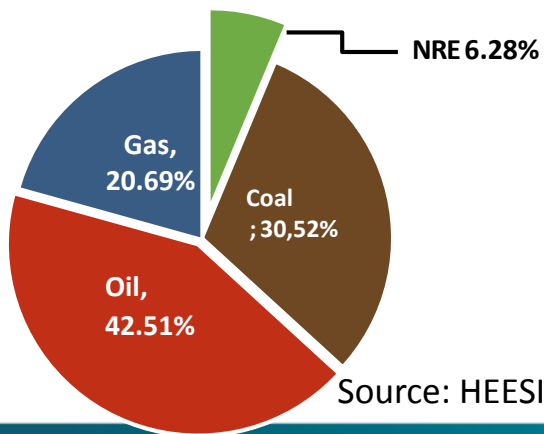
Solar PV Rooftop

- MEMR Decree No. 49/ 2018
- Net Metering, Ratio 1 : 0.65

PRIMARY ENERGY MIX @ 2025



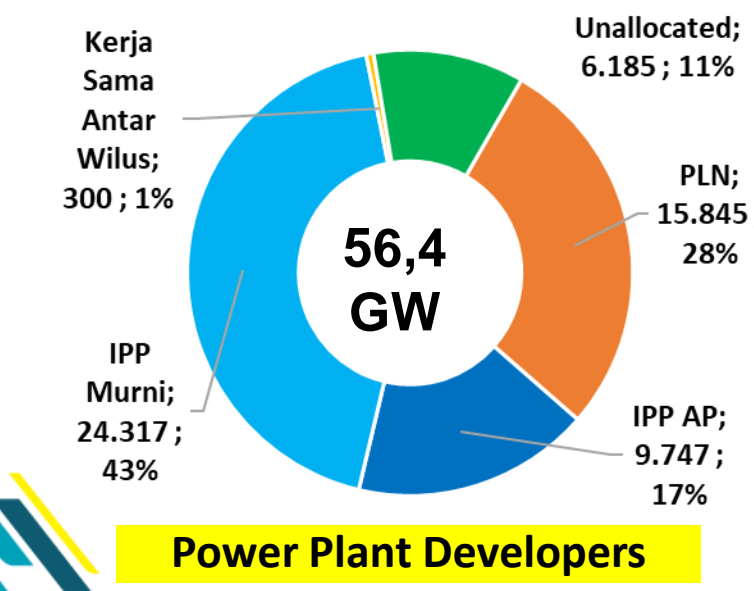
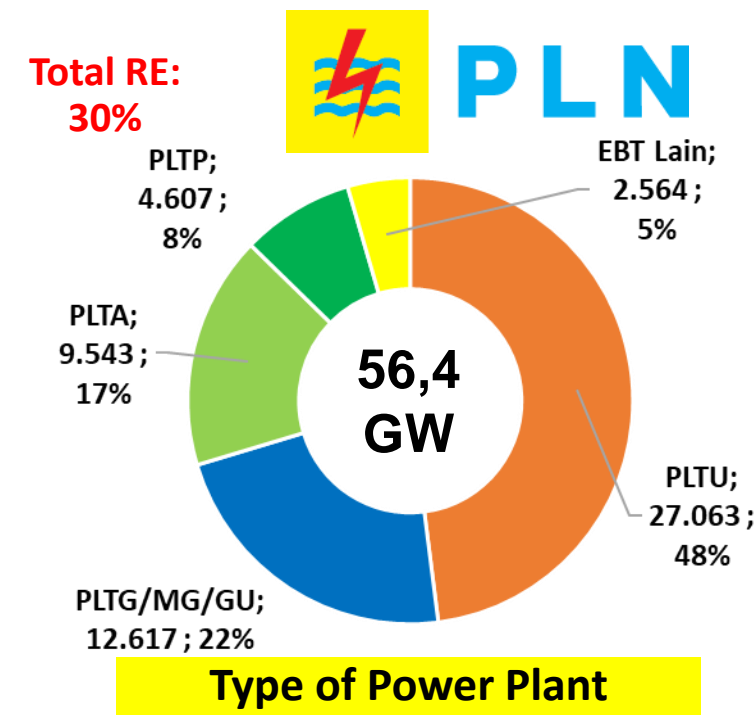
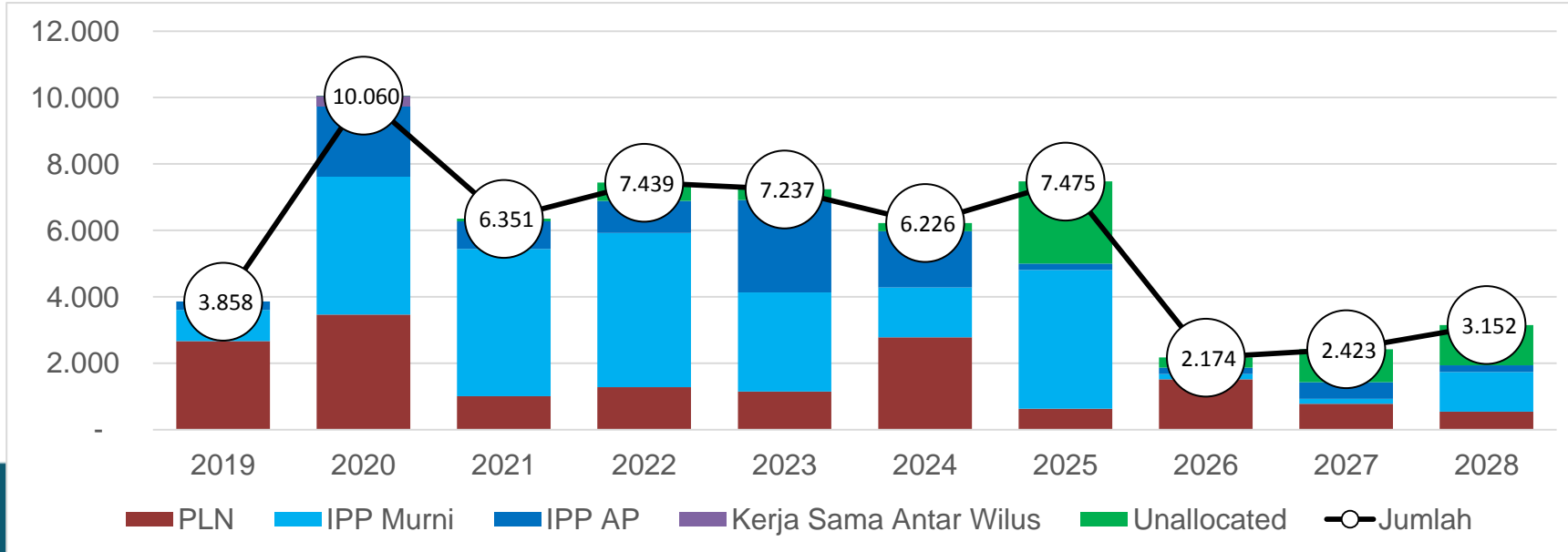
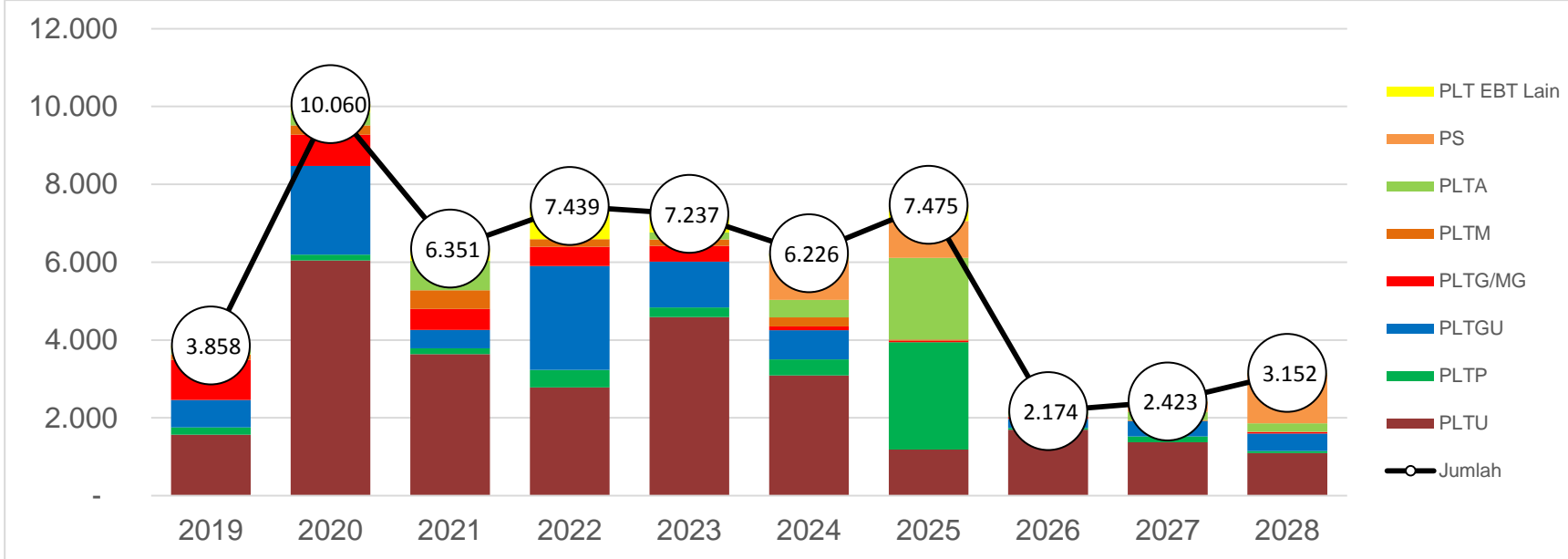
PRIMARY ENERGY MIX @ 2017



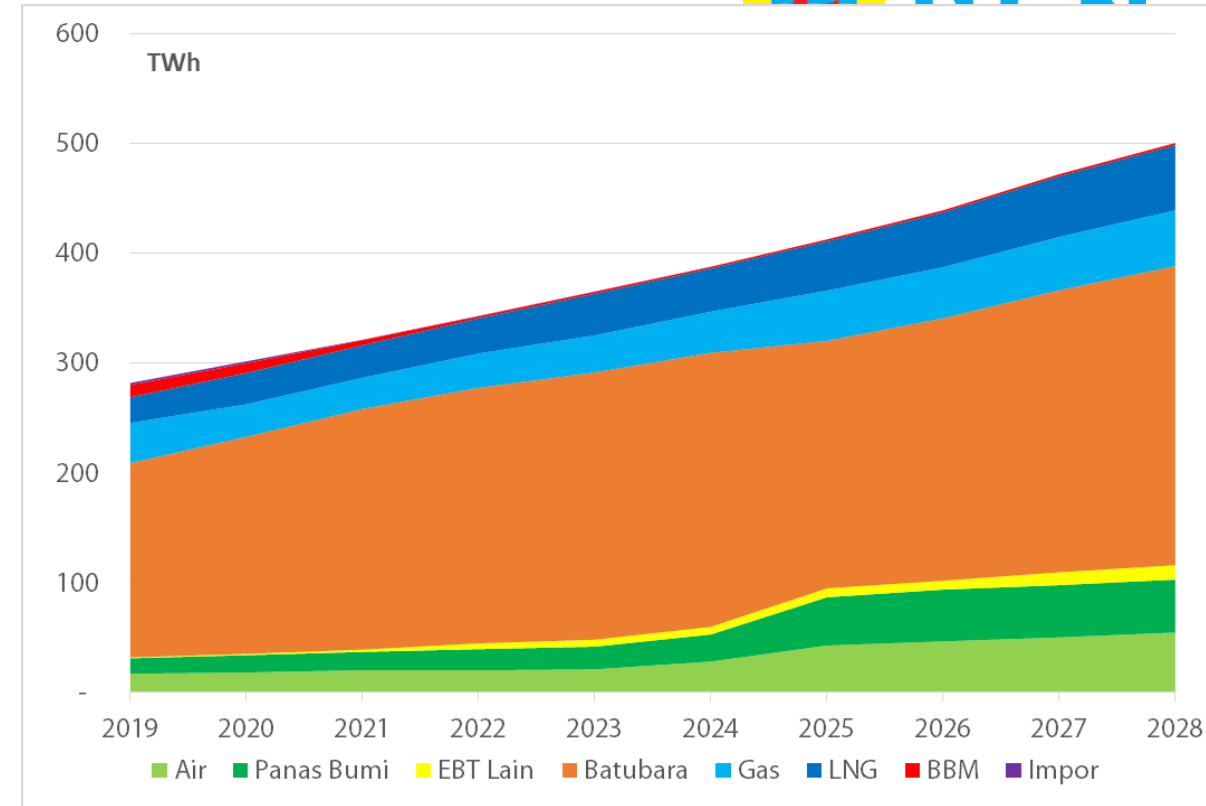
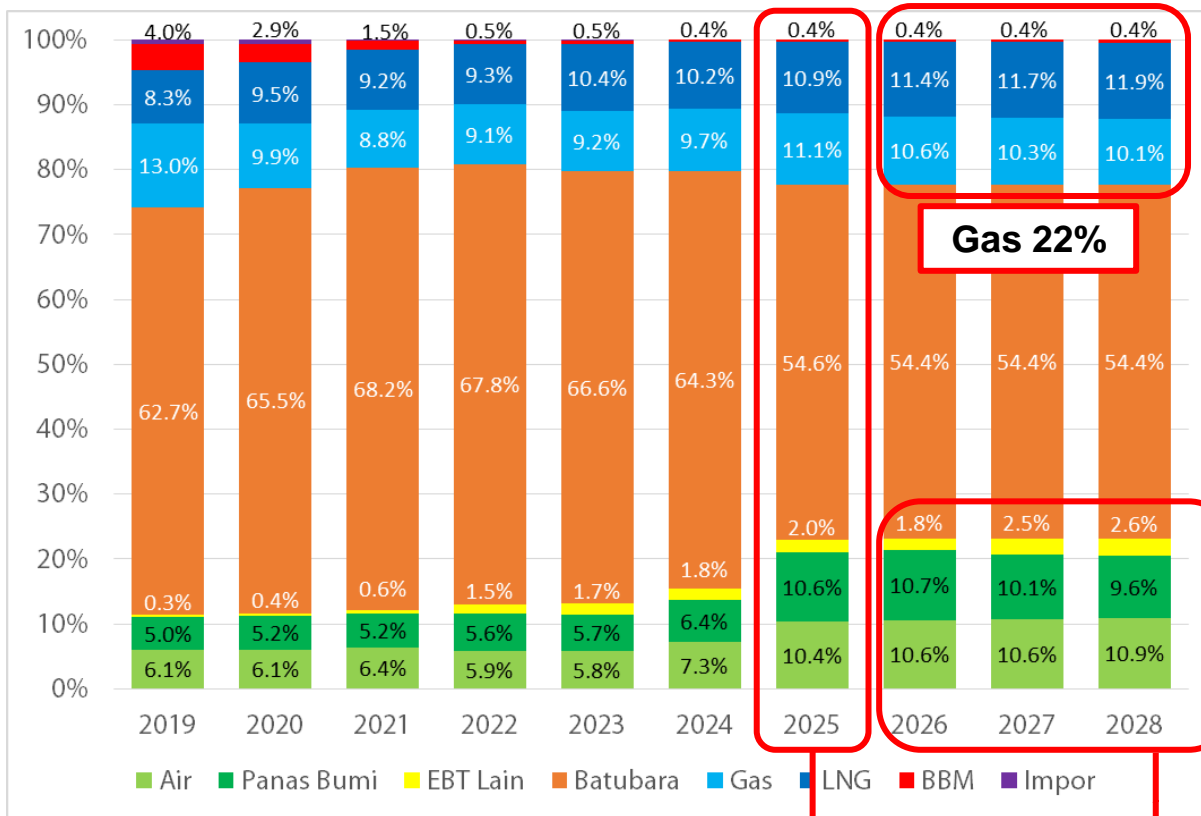


Summary RUPTL 2019-2029

Power Plant Development Plan



Energy Mix Projection



Type	RUPTL 2018-2027	RUPTL 2019-2028
NRE	23,0%	23,0%
Gas	22,2%	22,0%
Coal	54,4%	54,6%
Oil	0,4%	0,4%
Total	100%	100%

2025 Energy Mix Target

EBT 23,2%

- To maintain the RE mix of 23.2% in 2026-2028, it is necessary to add rooftop solar PV about 3,200 MW (equivalent to 1.6 million rooftop PV customers @ 2 kW).
- The target can be achieved with community participation and Government support in developing RE, especially rooftop PV, whose prices are expected to decline further in the future.

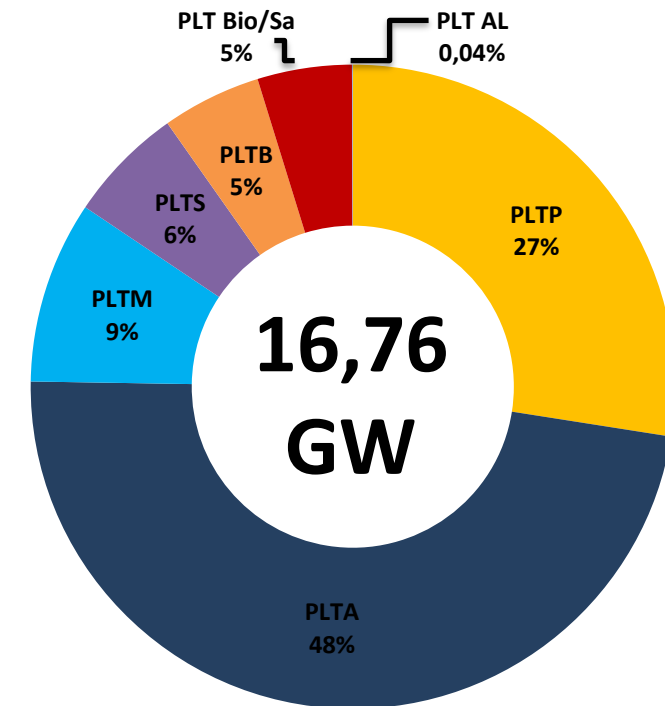
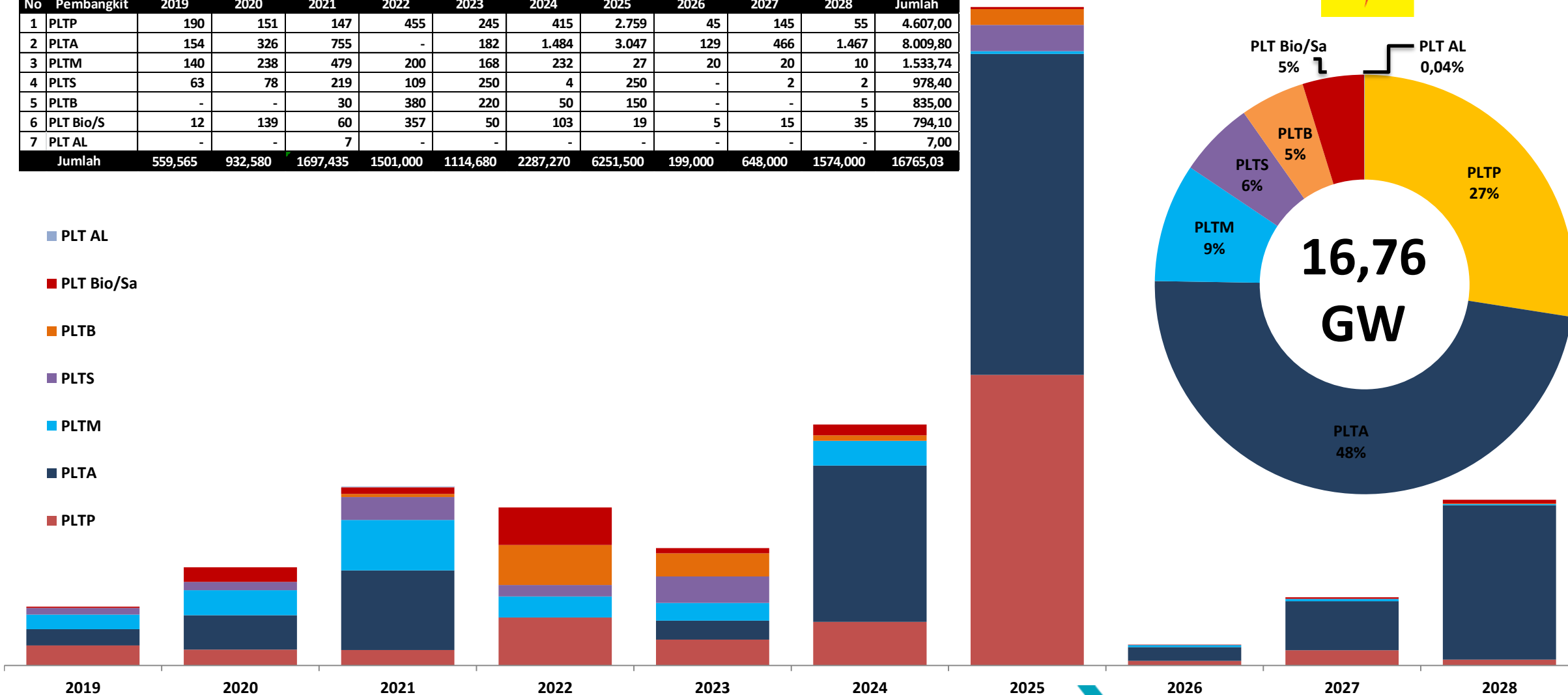
NRE Additional Power plant

RUPTL 2019-2028



No	Pembangkit	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Jumlah
1	PLTP	190	151	147	455	245	415	2.759	45	145	55	4.607,00
2	PLTA	154	326	755	-	182	1.484	3.047	129	466	1.467	8.009,80
3	PLTM	140	238	479	200	168	232	27	20	20	10	1.533,74
4	PLTS	63	78	219	109	250	4	250	-	2	2	978,40
5	PLTB	-	-	30	380	220	50	150	-	-	5	835,00
6	PLT Bio/S	12	139	60	357	50	103	19	5	15	35	794,10
7	PLT AL	-	-	7	-	-	-	-	-	-	-	7,00
Jumlah		559,565	932,580	1697,435	1501,000	1114,680	2287,270	6251,500	199,000	648,000	1574,000	16765,03

- PLT AL
- PLT Bio/Sa
- PLTB
- PLTS
- PLTM
- PLTA
- PLTP

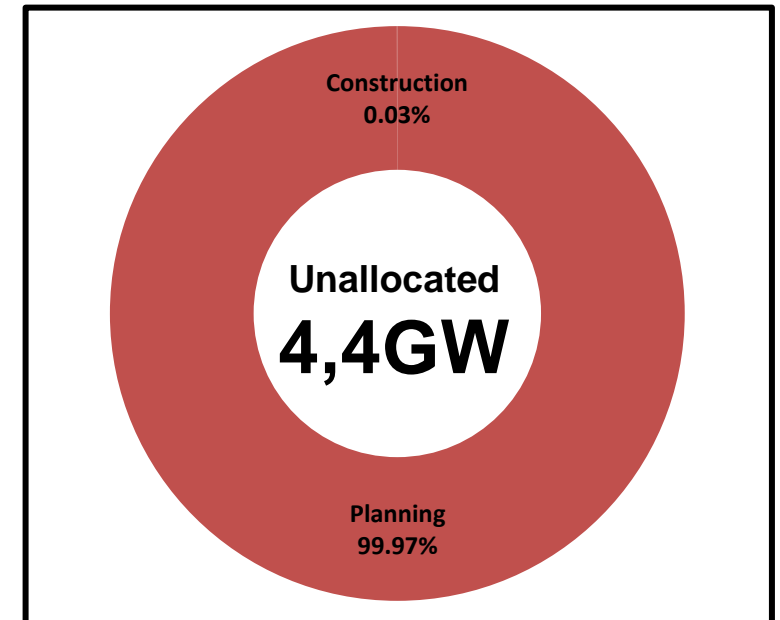
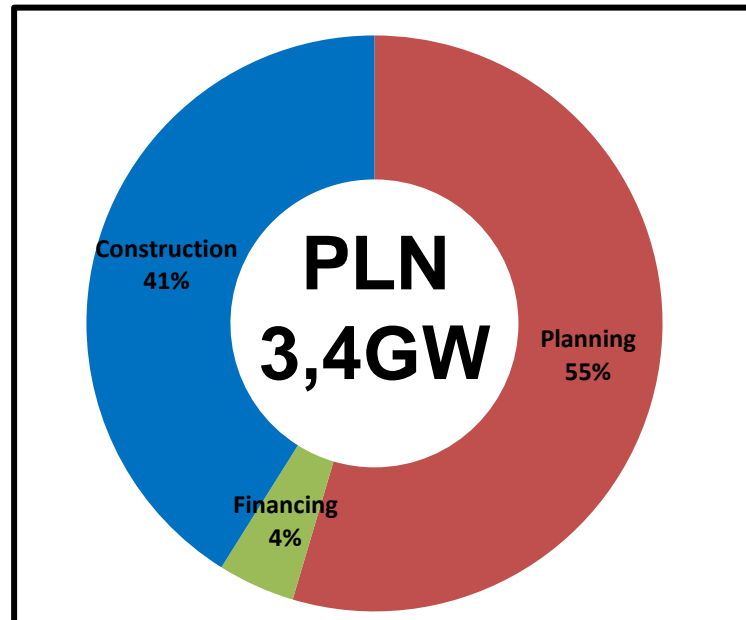
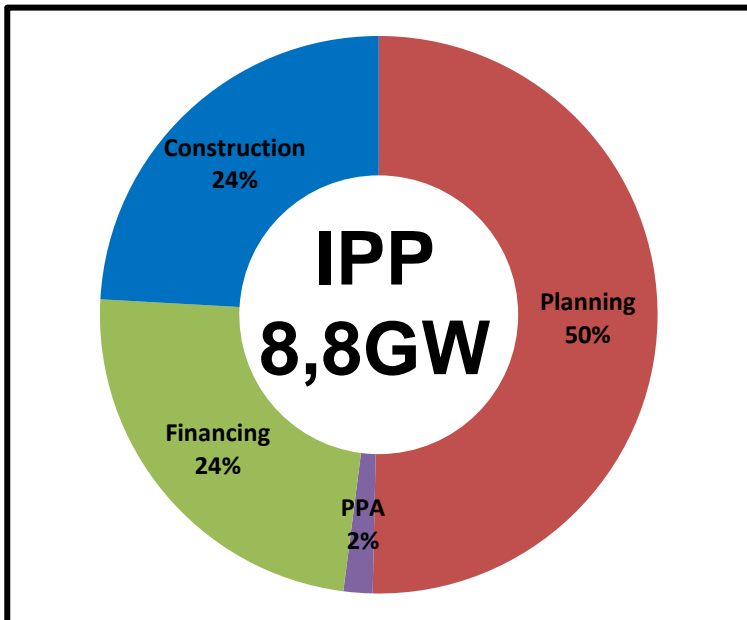


Status and Ownership of NRE Power Plant

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VRE Grid Integration Requirements

1. Weather Forecast

Integration of weather sensor and forecast of VRE power plant with control centre

2. Intermittent Anticipation (Buffering)

Installation of AGC, operational of high ramping rate power plant, and installation of battery energy storage system

3. Inertia Resources

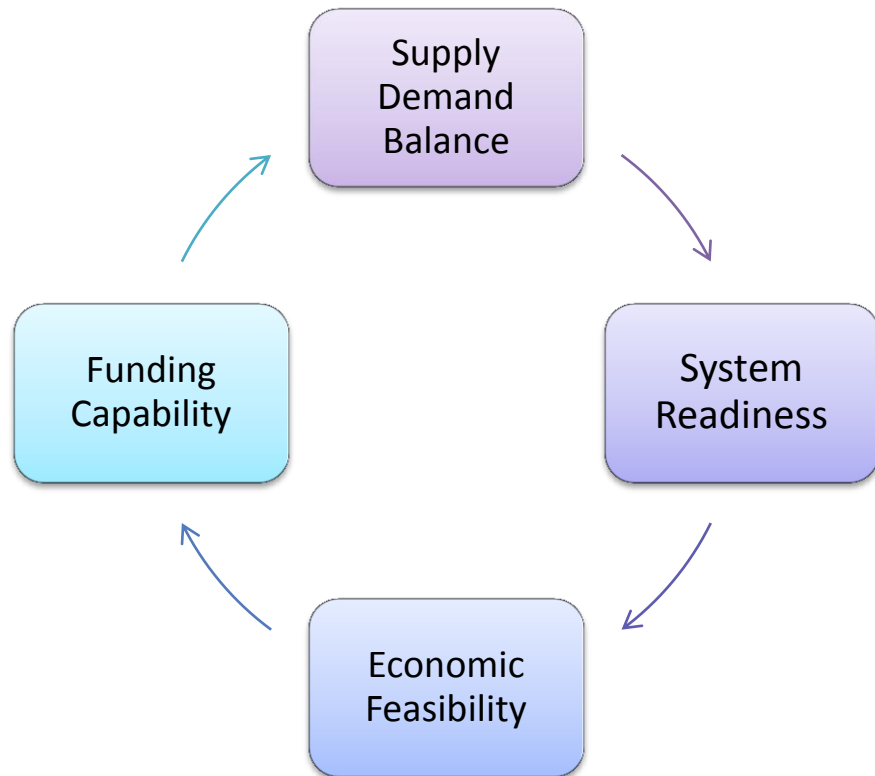
Maintain conventional power plant only for inertia, virtual inertia feature from inverter and introduction of scattered synchronous condenser

4. Technical Minimum Loading

Minimum TML establishment for base load power plant both technically and contractually and gas contract

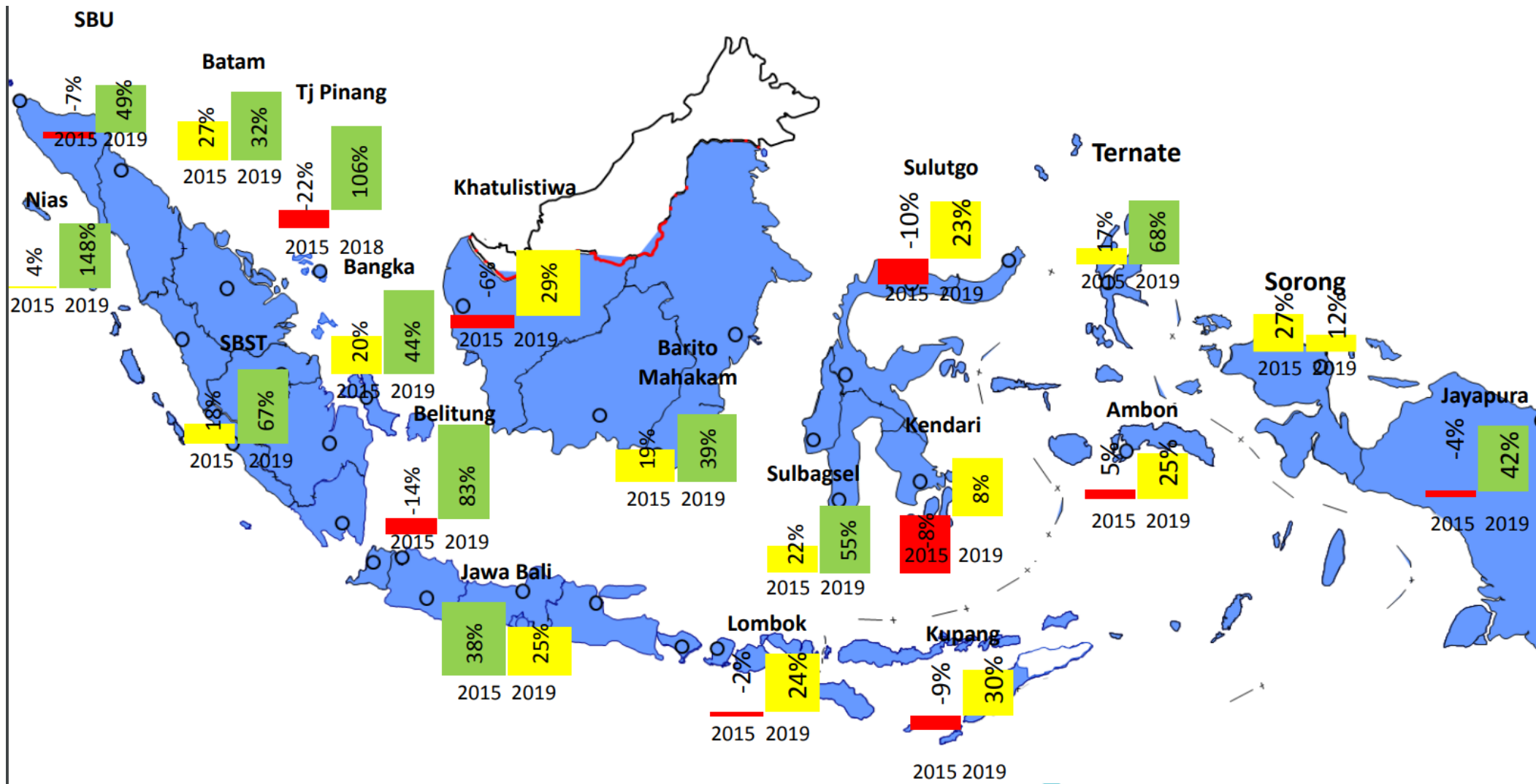
5. Inverter Features

LVRT, LFRT, Reactive Power Support, and Half Active Power Support





System Condition





THANK YOU



Listrik untuk Kehidupan yang Lebih Baik

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CONSTITUTION NO. 30/ 2007 ABOUT ENERGY

A horizontal green bar with a white circle on the left side, connected by a red line to the bar above.

GOVERNMENT REGULATION NO. 79/ 2014 ABOUT NATIONAL ENERGY POLICY

A horizontal purple bar with a white circle on the left side, connected by a red line to the bar above.

PRECIDENTIAL DECREE NO. 22/ 2017 ABOUT NATIONAL ENERGY GENERAL PLAN

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MEMR DECREE NO. 50/ 2017 j.o. NO. 53/ 2018 ABOUT UTILIZATION OF NEW AND RENEWABLE ENERGY SOURCES FOR ELECTRICITY SUPPLY

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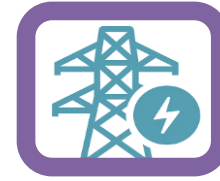
MEMR DECREE NO. 39K/20/MEM/2019 ABOUT RATIFICATION OF PT PLN (PERSERO) ELECTRICITY SUPPLY BUSINESS PLAN (RUPTL) YEAR 2019 TO 2028



Electricity Demand Growth

6.42 %

RUPTL 2018-2027 : 6.9 %



Transmission Lines Development

57,293 kms

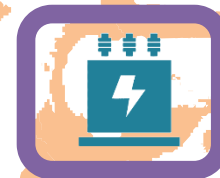
RUPTL 2018-2027 : 63,855 kms



Power Plant Capacity Development

56,395 MW

RUPTL 2018-2027 : 56,024 MW



Substation Development

124,341 MVA

RUPTL 2018-2027 : 151,424 MVA



Energy Mix in 2025

Renewable **23.0 %**

Gas **22.0 %**

Coal **54.6 %**

Oil **0.4 %**

RUPTL 2018-2027:	
Renewable	23.0%
Gas	22.2%
Coal	54.4%
Oil	0.4%



Distribution Network Development

472,795 kms

RUPTL 2018-2027 : 526,391 kms



Total Customers Addition

16.9 million

RUPTL 2018-2027 : 25.5 million

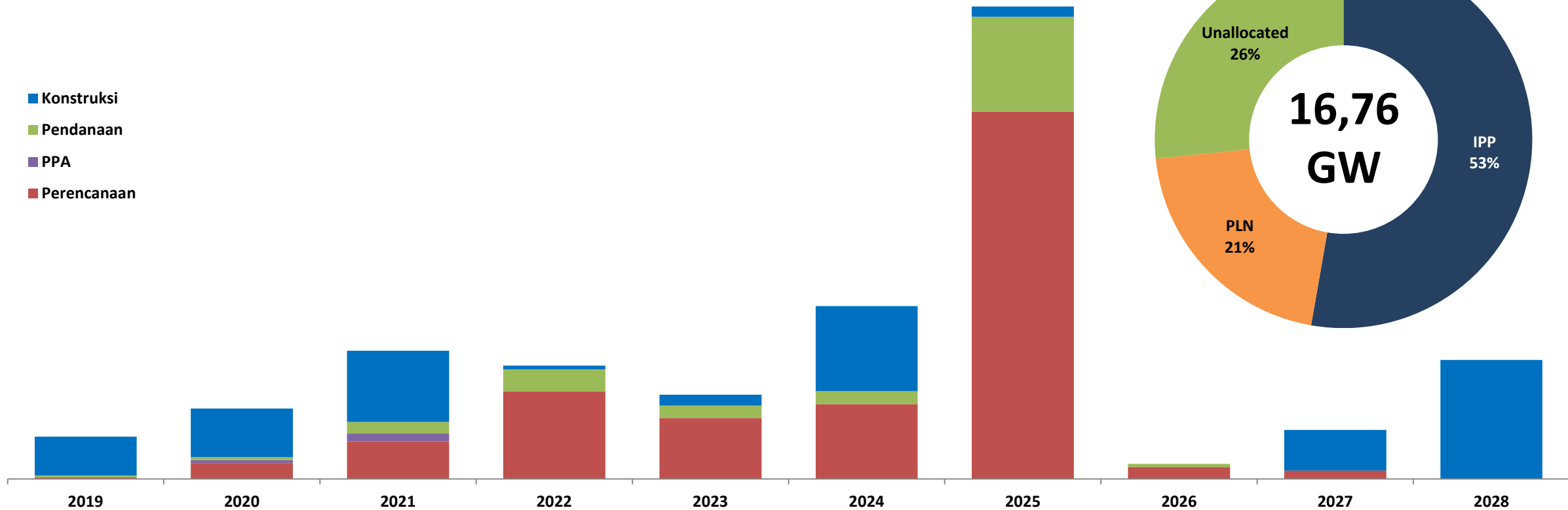
Status NRE Additional Power plant

RUPTL 2019-2028

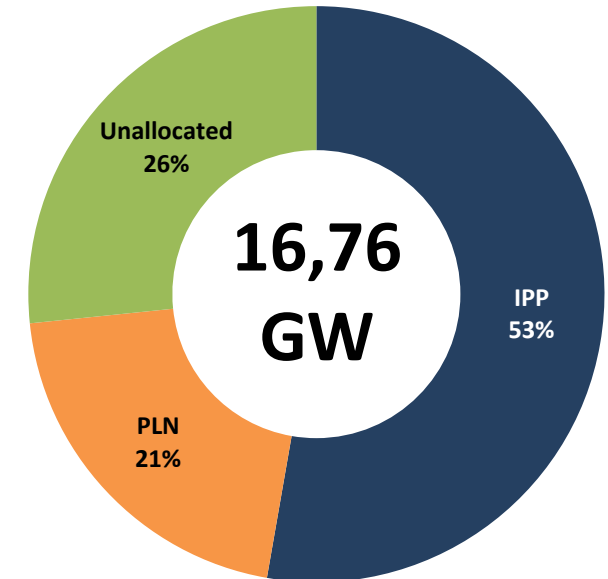


No	Power Plant	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Ttal
1	Planning	18	209	494	1,155	806	990	4,858	159	538	1,574	10,801.895
2	PPA	3	39	107								148.520
3	Financing	23	41	154	296	165	170	1,260	40	110		2,259.460
4	Construction	515	644	942	50	143	1,127	134				3,555.155
Total		559.565	932.580	1697.435	1501.000	1114.680	2287.270	6251.500	199.000	110.000	1574.000	16765.030

- Konstruksi
- Pendanaan
- PPA
- Perencanaan



OWNER COMPOSITION

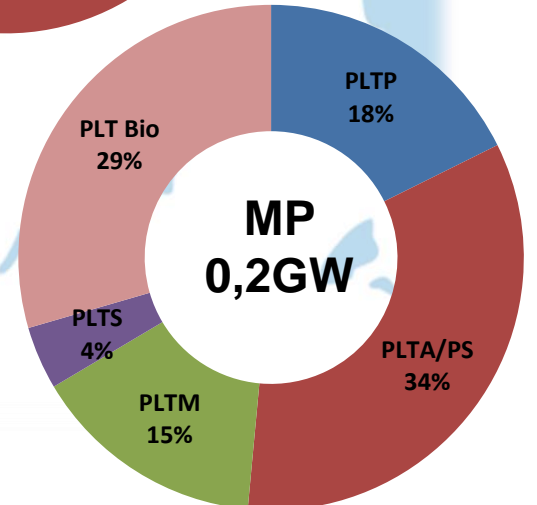
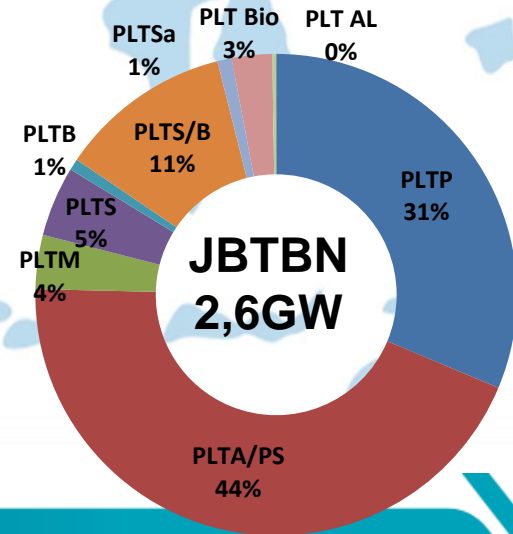
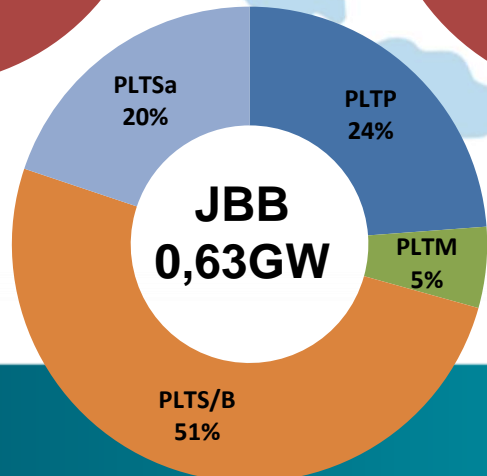
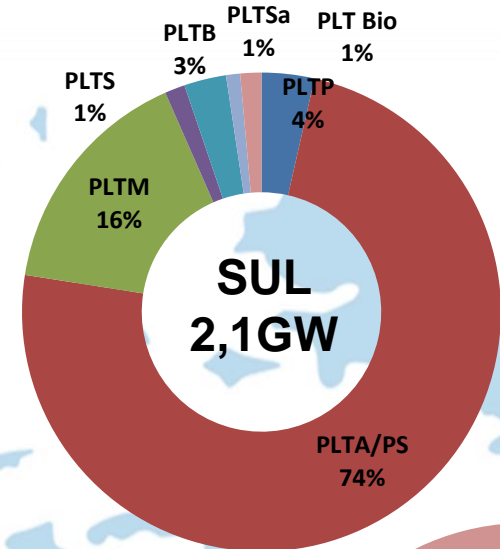
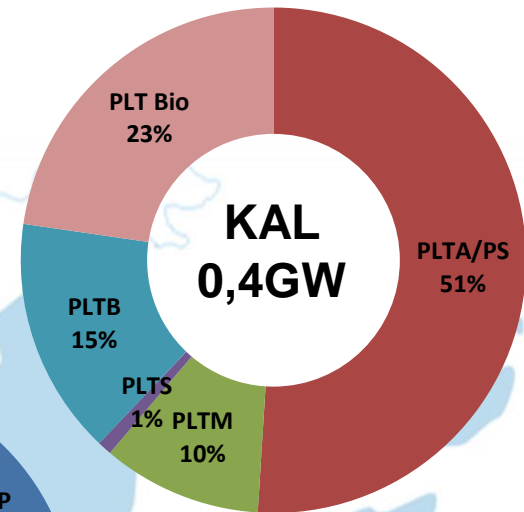
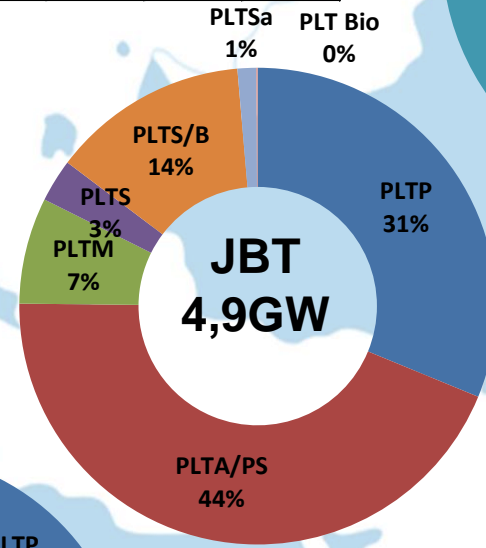
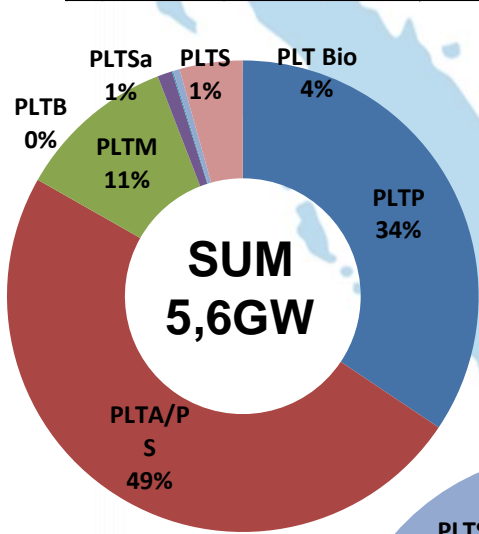


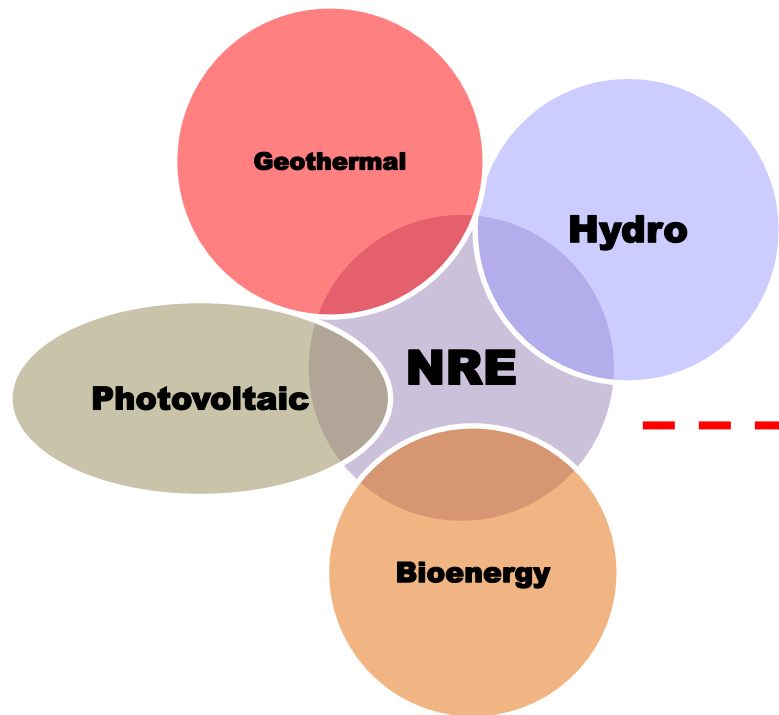
NRE Additional Power plant Per Regional

RUPIL 2019-2028



No	Power Plant	SUM	JBB	JBT	JBTBN	KAL	SUL	MP	Total
1	PLTP	1,960	150	1,555	820		75	47	4,607
2	PLTA/PS	2782		2,190	1,154	235	1,559	90	8,010
3	PLTM	621	35	359	95	47	336	40	1,534
4	PLTS	58		145	123	4	29	11	370
5	PLTB	5			20	70	60		155
6	PLTS/B		320	665	304				1,289
7	PLTSa	26	125	63	25		20		259
8	PLT Bio	247		5	71	105	30	79	536
9	PLT AL				7				7
Total		5698.33	629.70	4982.31	2618.86	460.87	2108.82	266.15	16765.03





- Optimization of NRE development especially for the biggest potential energy: Geothermal, Hydro, Bioenergy, & Solar
- Optimization of local NRE to increase the electrification ratio in Eastern Indonesia
- Hybrid system for the existing diesel power plant
- Smart grid development to increase the NRE penetration in the system
- Biofuel utilization for the existing diesel generation
- Consider the utilization of tidal energy and wind generation in the Eastern Indonesia
- Excess power option for Bioenergy Development (PLTBm & PLTBg) related to BOOT scheme
- Encourage the PV Rooftop Development to support energy mix (23% in 2025)

Sumatera

	2014	2015	2016	2017	2018	May-19
PLTD	2.665	2.597	2.391	2.578	1.456	1.454
PLTU	2.266	3.498	3.881	3.832	3.886	4.346
PLTG/GU/MG	2.404	2.471	2.732	3.012	4.084	4.057
PLTP	112	110	165	570	550	550
PLTS	1	1	1	1	3	3
PLTA	1.068	1.073	1.148	1.289	1.350	1.350
PLTBM & PLTB	13	29	30	99	119	115
	8.529	9.778	10.348	11.381	11.448	11.875

Kalimantan

	2014	2015	2016	2017	2018	May-19
PLTD	1.385	1.389	1.382	1.379	1.207	1.150
PLTU	593	616	925	927	1.125	1.263
PLTG/GU/MG	344	378	569	686	763	796
PLTP	0	0	0	0	0	0
PLTS	1	1	2	2	1	1
PLTA	33	35	264	124	124	124
PLTBM & PLTB	13	15	21	23	33	35
	2.367	2.433	3.163	3.142	3.254	3.370

Sulawesi

	2014	2015	2016	2017	2018	May-19
PLTD	1.502	1.454	1.506	909	782	879
PLTU	573	577	580	849	1.069	1.219
PLTG/GU/MG	378	438	713	607	716	596
PLTP	86	96	136	120	120	120
PLTS	5	5	12	5	4	19
PLTA	458	547	719	694	694	694
PLTBM & PLTB	0	1	1	1	71	131
	3.002	3.117	3.667	3.184	3.456	3.658

TOTAL INDONESIA

	2014	2015	2016	2017	2018	May-19
PLTD	6.619	6.390	6.268	6.487	4.757	5.032
PLTU	23.939	25.200	27.308	27.499	28.273	29.029
PLTG/GU/MG	13.502	13.579	14.727	14.715	17.662	17.549
PLTP	1.340	1.348	1.443	2.197	1.924	1.924
PLTS	9	9	20	21	25	43
PLTA	4.156	4.289	4.831	4.860	4.938	4.994
PLTBM & PLTB	27	45	67	147	243	301
	49.591	50.859	54.664	55.926	57.822	58.873

Jawa Bali Nusra

	2014	2015	2016	2017	2018	May-19
PLTD	505	315	340	864	663	881
PLTU	20.507	20.507	21.899	21.839	22.143	22.152
PLTG/GU/MG	10.350	10.292	10.663	10.290	11.877	11.878
PLTP	1.142	1.142	1.142	1.507	1.254	1.254
PLTS	0	0	1	11	10	12
PLTA	2.590	2.604	2.668	2.722	2.739	2.795
PLTBM & PLTB	1	1	16	24	20	20
	35.095	34.862	36.728	37.256	38.707	38.992

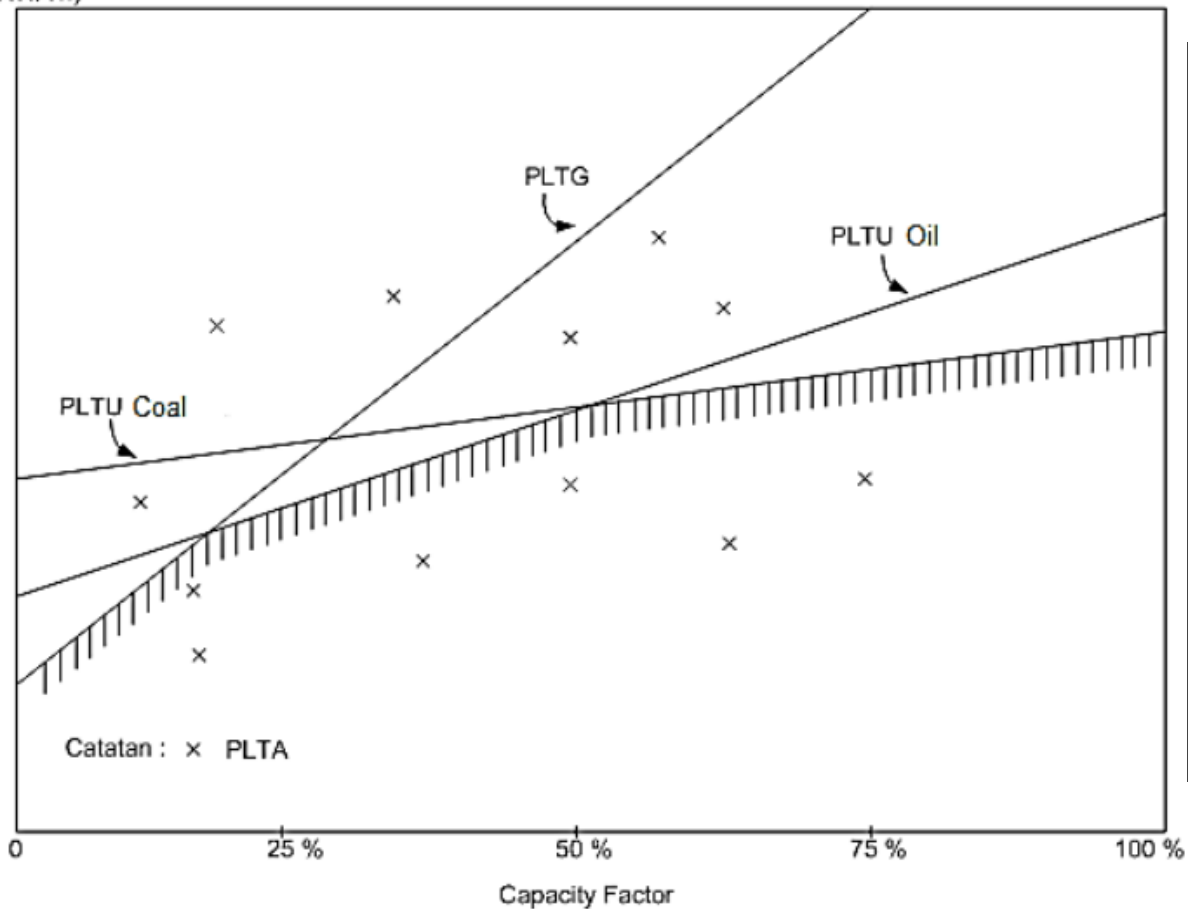
Maluku dan Papua

	2014	2015	2016	2017	2018	May-19
PLTD	562	636	648	756	649	667
PLTU	0	2	24	52	50	50
PLTG/GU/MG	27	0	51	119	222	222
PLTP	0	0	0	0	0	0
PLTS	2	2	4	3	6	6
PLTA	6	30	32	32	31	31
PLTBM & PLTB	0	0	0	0	0	0
	597	669	759	963	958	977

OPTIMUM HYDRO-THERMAL GENERATION MIX

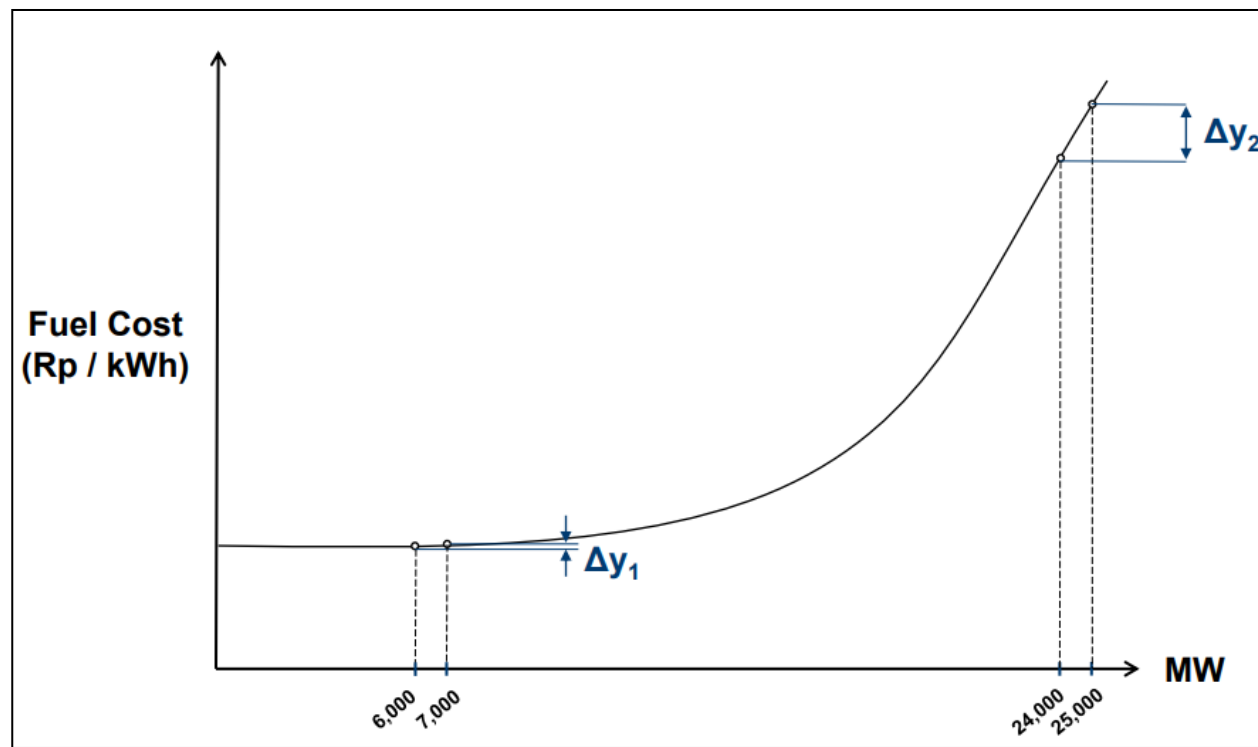
STATIC OPTIMIZATION

Annual Cost
(Rp/KW/Th)



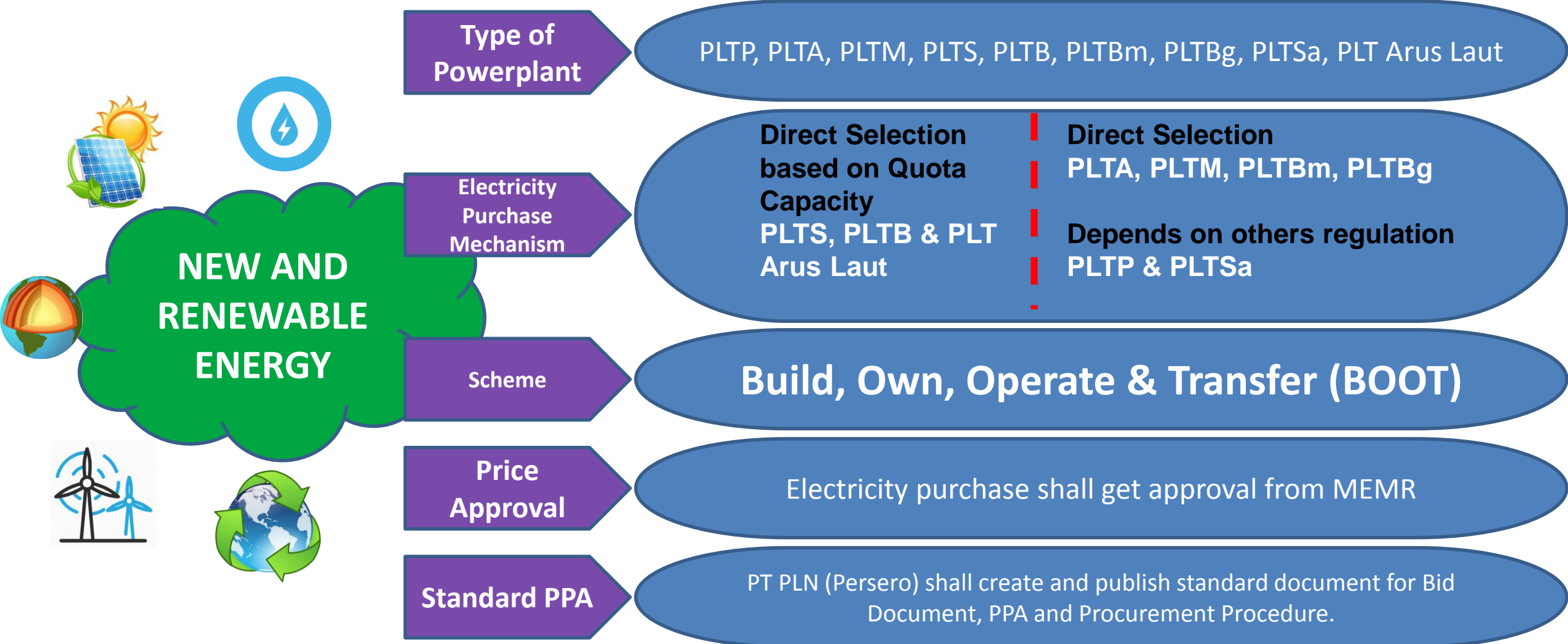
THE ECONOMY OF A PUMP STORAGE HEPP

HYPOTHETICAL ALTERNATE FUEL COST



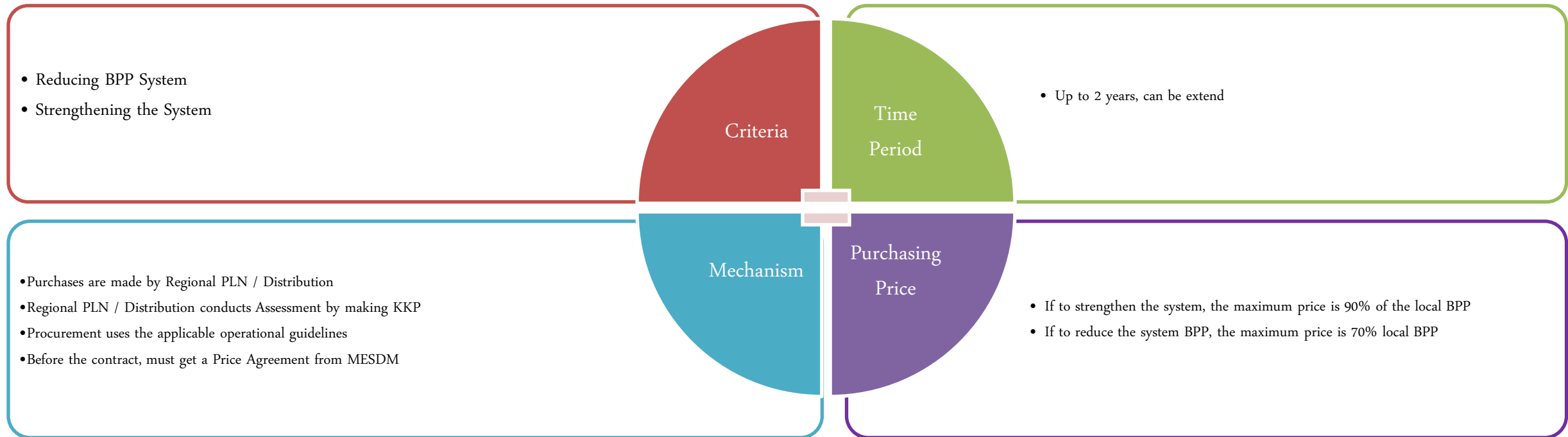


Scheme of Business Development



Reference :

- MEMR Decree No. 19/ 2017 about Pemanfaatan Batubara untuk Pembangkit Listrik dan Pembelian Kelebihan Tenaga Listrik (Excess Power)
- PLN Director Decree No. 0005/ 2018 about Guidelines for Purchasing Excess Power by PT PLN (Persero)





1. The value of energy from Solar PV Rooftop that are exported to PLN which is rated at 65% of what is measured in kWh meters of export-import (exim)
2. Solar PV Rooftop capacity is maximum 100% of the customer's contract power
3. In the event that the amount of electricity released is greater than that issued in the current month, the excess (balance) will be accumulated and calculated for the next bill and will be reset to zero at the end of each quarter
4. For Industrial Customers who install Solar PV Rooftop on grid with the PLN network will be subject to emergency capacity and energy costs in accordance with the laws and regulations (Parallel Operation)
5. Minimum Account Provisions remain valid.
6. Solar PV Rooftop customers are postpaid customers
7. Solar PV Rooftop system must have SLO. Up to 25kWp has become part of SLO TR. Can be used above 25 kWp, there must be a new SLO.