



# RE Deployment Strategies to Lower Generation Cost in Isolated Grids

**PT PLN (Persero) – New and Renewable Energy Division**

**Renewable Energy Opportunities for Remote Indonesian**

**Mulia Hotel, Jakarta, October 1<sup>th</sup>, 2014**



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# INTRODUCTION : PLN AS STATE OWNED WITH THE SUBSIDIARIES

Ministry of State Owned Enterprises (MSOE)

Ministry of Energy and Mineral Resources (MEMR)

Ministry of Finance (MoF)

National Development Planning Agency (BAPPENAS)

Oversight

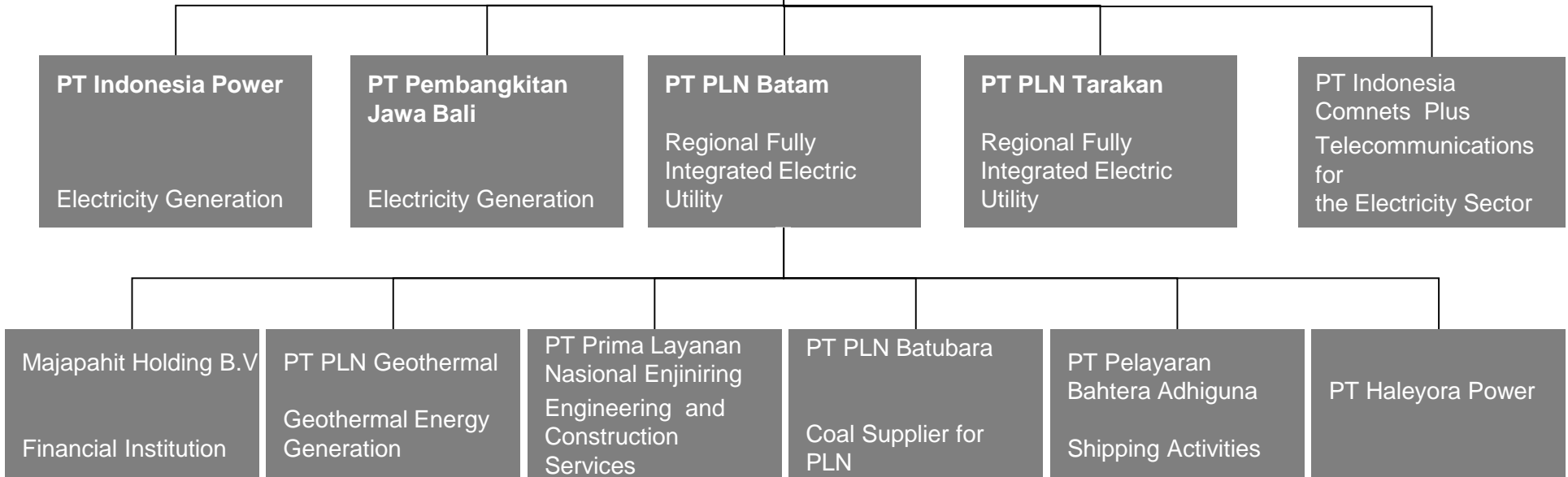


100% Owned by GoI

PT PLN (Persero)

consists of :

- 8 Directorates
- 37 Divisions level
- 36 Business Unit
- 6 Unit of Support





PLN is the wholly state-owned power utility company, the largest and the only fully-integrated power utility company in Indonesia.

## PLN Business Segments:

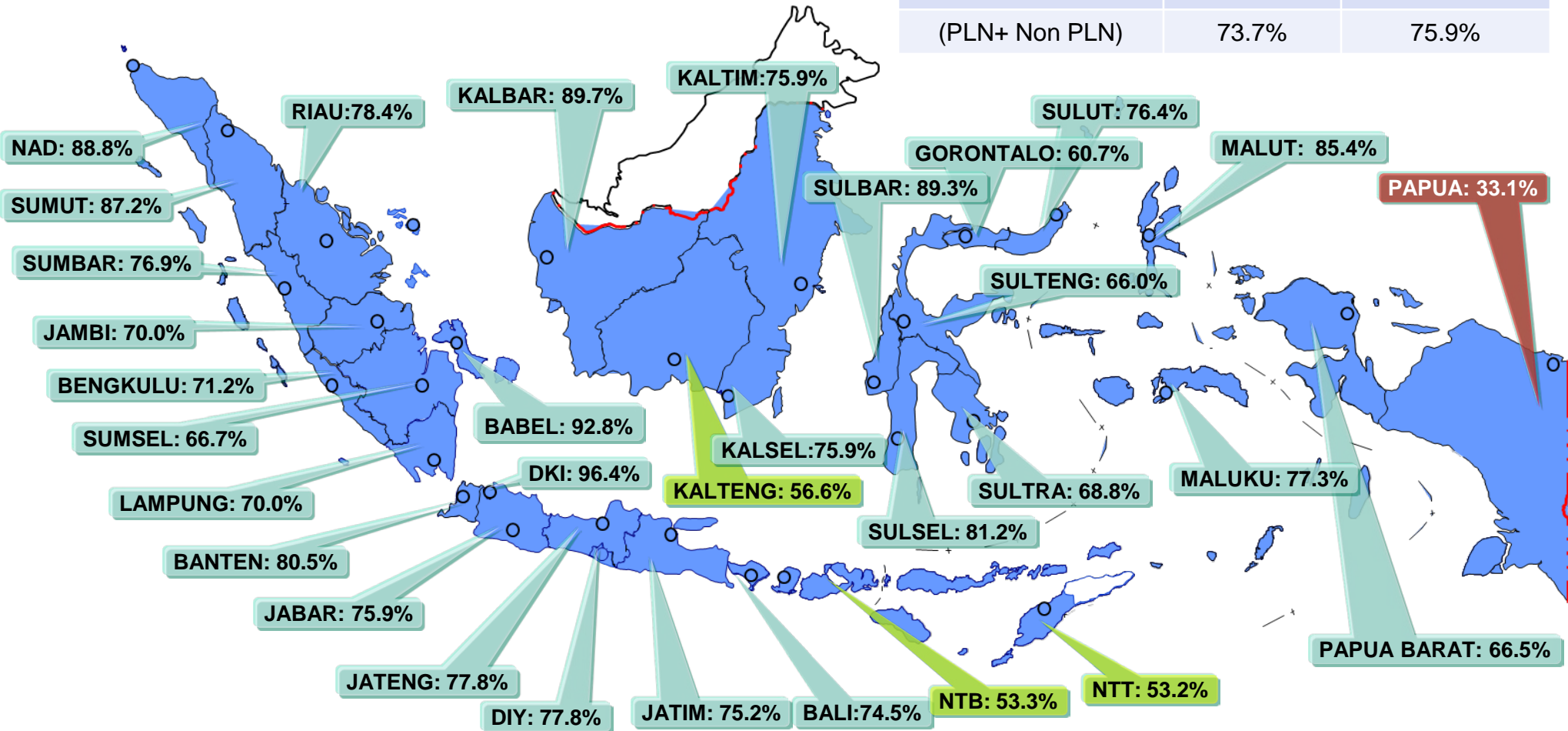
- Controls over 85% of installed generating capacity Indonesia's
- Main purchaser of electricity from Independent Power Producers (IPPs)
- Sole provider of power transmission in Indonesia
- Sole distributor of electricity to end customers in Indonesia <sup>(1)</sup>
- Serving more than 50 million customers

(1) PLN is also the provider of electricity of last resort, in that if PLN is not supplying a particular area and there are no regional-owned companies, private enterprises or cooperatives that elect to supply electricity in that area, the Government is obligated to instruct SOEs (which includes PLN) to supply electricity to the area.

# ELECTRICITY STATUS: ELECTRIFICATION RATIO (2012)



Electrification Ratio	Target	Realization
PLN	71.2%	73.1%
(PLN+ Non PLN)	73.7%	75.9%





- ❑ Large interconnection grids : Java-Bali System and Sumatra Grid System with 500 kV T/L
- ❑ Interconnection sub system grid : Kalimantan and Sulawesi Grid System with 150 kV T/L
- ❑ The rest are small system and isolated system and mostly is small islands with 70 kV T/L or 20 kV D/L
- ❑ Most grid system are under development



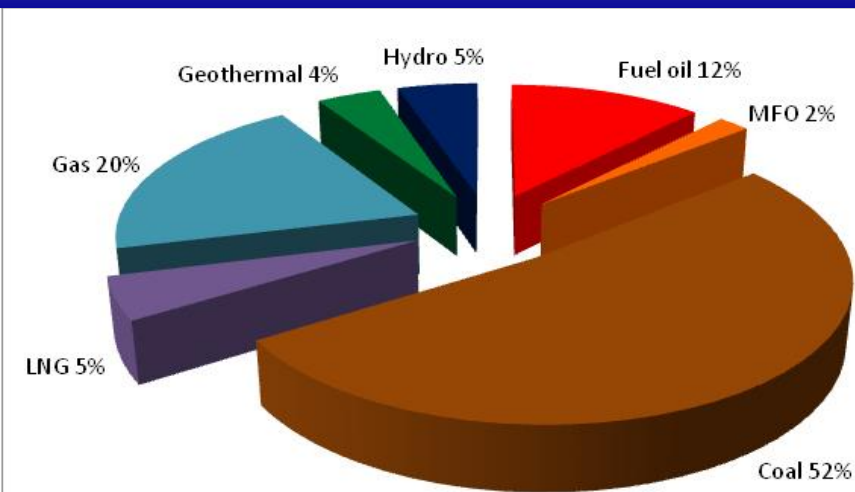
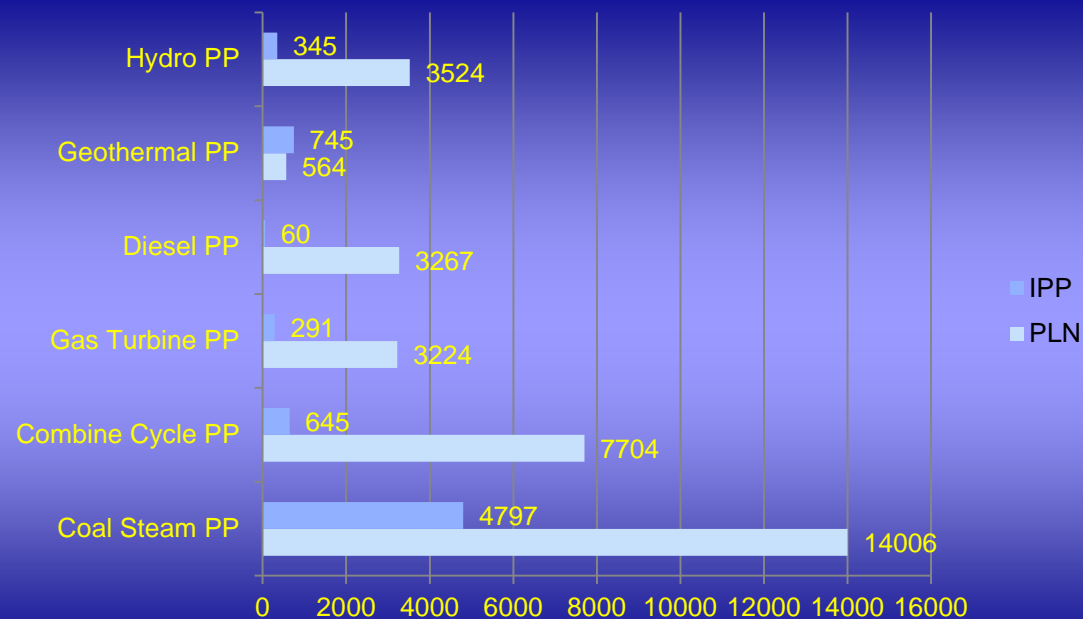
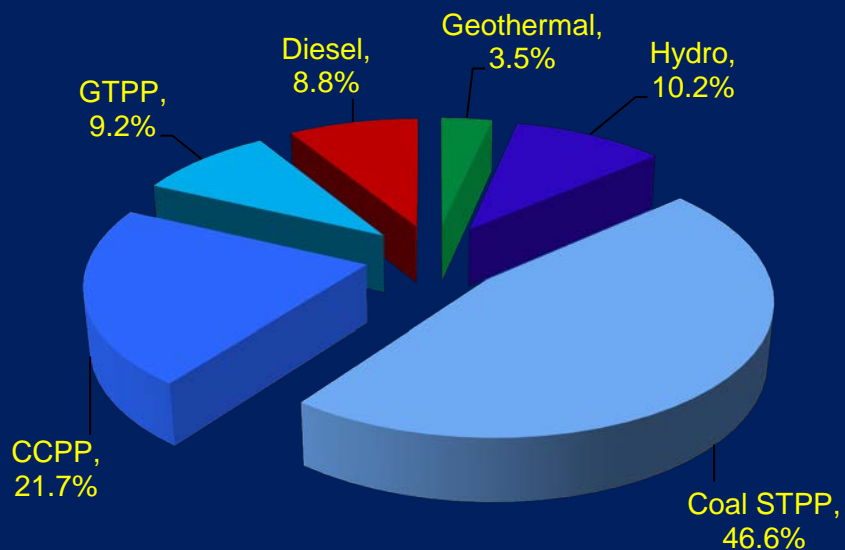


# STATUS OF POWER GENERATION : RE PENETRATION



( RE share limited by 9 % , mainly from Hydro and Geothermal PP )

Power plant composition (35.617 MW in 2012)



Generation Share (2013)

- ❑ Power Plant Capacity : Renewable Power plant is 14 %
- ❑ Generation (2013): Share of renewable energy is 9 % only
- ❑ Almost all from hydro and geothermal, the other renewables share is less than 1%

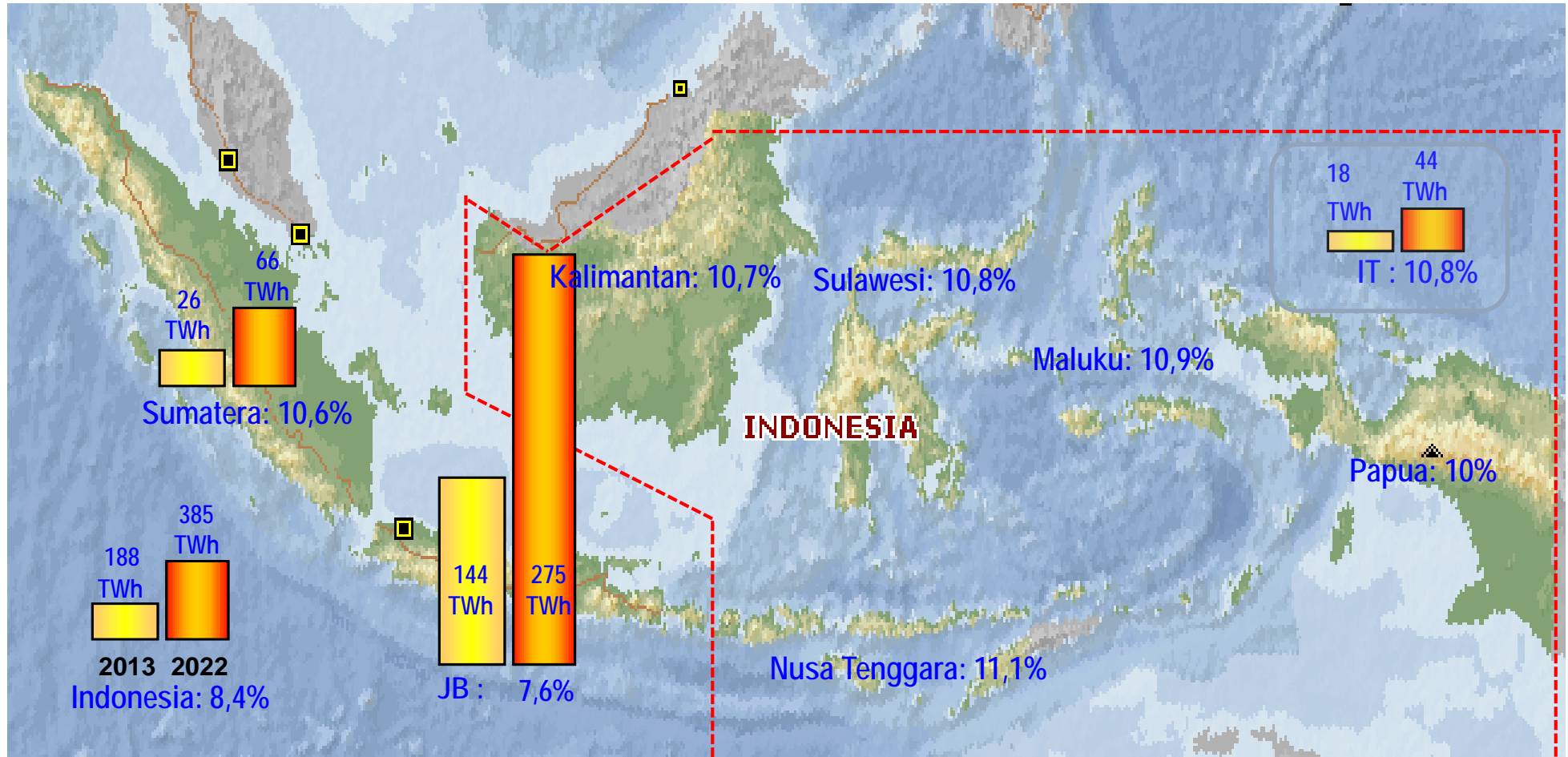


- Archipelago countries with a high electricity national demand growth, especially eastern part, and thousands islands without access electricity.
- A high potential of varies energy resources (hydro, geothermal, biomass , solar, sea and wind) but has not been optimally taped mainly for electricity.
- Generated power in the remote areas mostly by diesel power plant, means expensive and susceptible fuel supply
- Trend of cost reduction and efficiency improvement on RE technologies
- Policy and target decision to increase the role of renewable energy
- Incentives from the government throug FIT for small RE plant



# ELECTRICITY DEMAND PROJECTION (2013-2022)

Average annual growth by 8.4%



Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Demand (TWh)	189	208	227	246	266	286	308	332	358	387
Elektrifikasi ratio (%)	79.6	82.6	85.9	88.9	91.9	93.7	95.3	96.8	97.4	97.8



Government and Regulation	<ul style="list-style-type: none"><li>• To create a harmonic coordination among government institution for permits, land acquisition, land use, national productivity, integrated planning, etc.</li><li>• To provide strong, applicable and synchronous policies and regulation.</li><li>• To reduce the number, complexity and duration process of permits</li></ul>	Key stake holder : ministries (MEMR, forestry, MoF) government agencies, local government
Technical	<ul style="list-style-type: none"><li>• To maintain natural resources</li><li>• To optimise interconnection small RE to the isolated grid</li><li>• To have the knowledge and expertise in solar PV technology, biomass technology and wind technology</li><li>• To manage the system stability due to intermittent and high fluctuation of solar PV and wind power</li><li>• To provide a sufficient infrastructure</li><li>• To manage the miss match between available resource and electricity demand</li></ul>	Key stake holder : Government agencies, PLN, developer, academic

# THE CHALLENGES AND STAKEHOLDERS (2/2)



Financial	<ul style="list-style-type: none"><li>• To obtain tariff, which is a commercially viable for developer and acceptable for the off taker</li><li>• To provide incentive, subsidy including cheap funding</li><li>• To provide an appropriate cost and risk allocation based on available data</li><li>• To prioritize the lower risk and lower cost RE source such as hydro and biomass (solar tends to decrease)</li></ul>	Key stake holder : ministries (MEMR, MoF), government agencies (PIP), lender, banks, PLN
Capacity	<ul style="list-style-type: none"><li>• To increase the national capacity on both skilled /expertise human resources and institution (consultant, contractor and also IPP developer)</li><li>• To increase the role of national capacity in RE development</li><li>• To increase the participation small and local capacity for appropriate portion of development</li></ul>	Key stake holder : universities, consultant, contractor, manufactures, PLN
Social and environmental	<ul style="list-style-type: none"><li>• To manage the difference interest between environment sustainability and energy security</li><li>• To provide benefit for local community to increase economic growth and capacity building</li><li>• To manage the local interest to become supporting factor of the development</li></ul>	Key stake holder : ministries (MEMR, MoF), government agencies (PIP), lender, banks



No	RE Type /technology	Unit	Years										Total
			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
1	Small Hydro	MW	33	42	96	149	237	192	186	156	190	200	1481
2	Solar PV	MWp*)	6	104	75	54	36	60	75	75	75	75	635
3	Wind	MW	0	0	50	20	20	20	30	40	50	50	280
4	Biomass	MW	48	10	15	20	30	40	50	50	50	50	363
5	Ocean	MW	0	0	1	0	1	3	3	5	5	10	28
6	Bio-fuel	kilo liter	15	400	400	500	500	600	600	600	600	600	4815

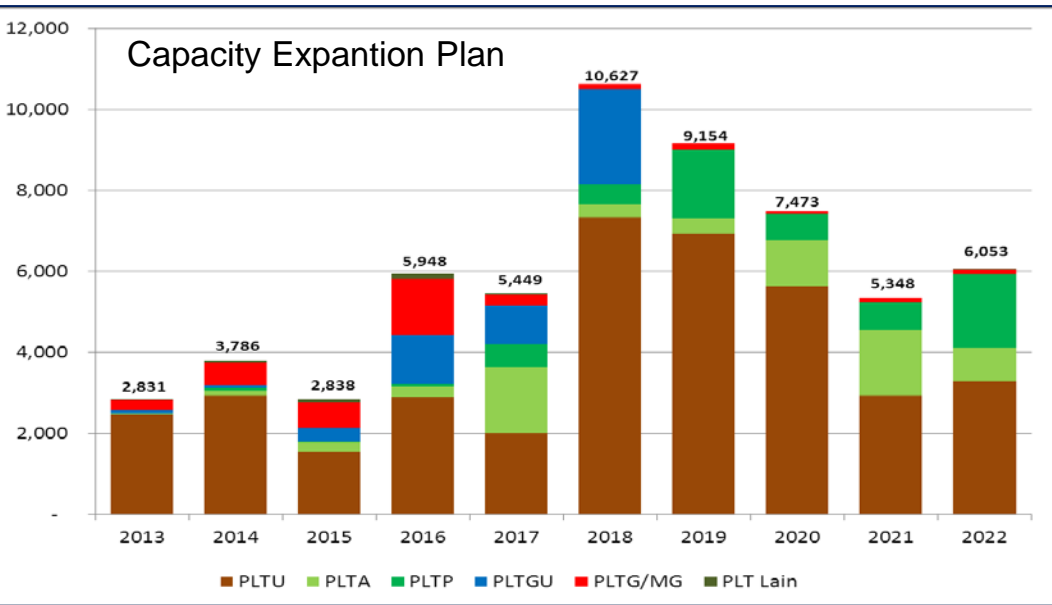
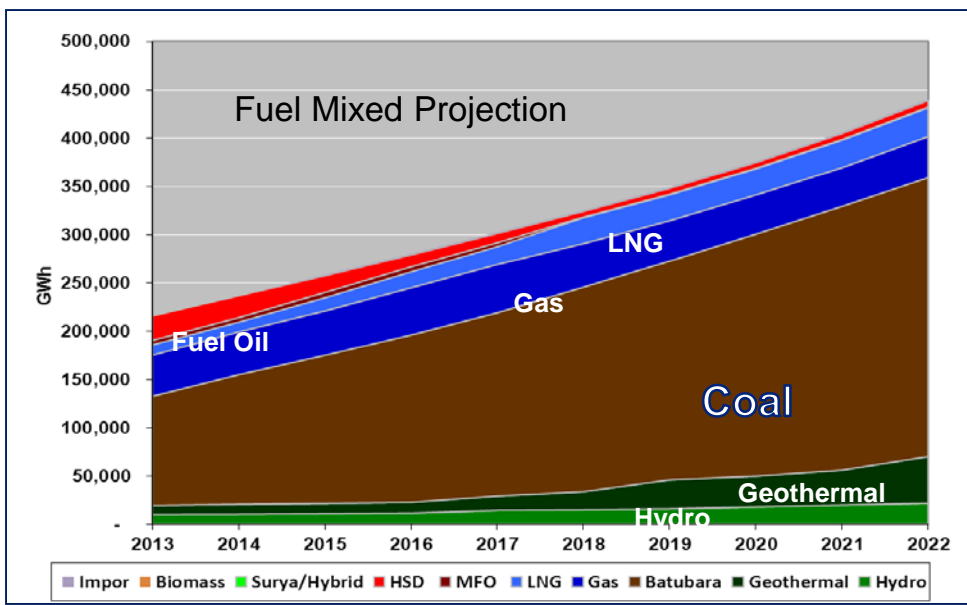
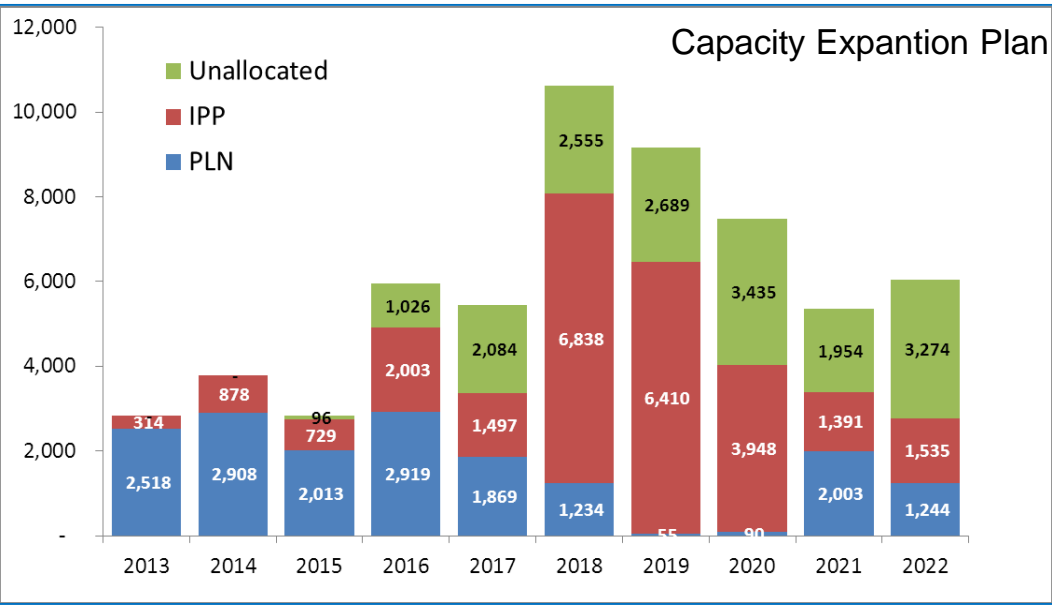
## Notes :

- The small scale RE power plants (up to 10 MW) is not necessarily put in the RUPTL
- Solar PV target up to 2015 is 1<sup>st</sup> Phase of 1000 islands program and PV to be developed by IPP. Plan for following years is indication only.
- Small hydro still dominates but solar PV and biomass are very promising

# PLN's 10 YEARS ELECTRICITY DEVELOPMENT PLAN (RUPTL 2013 – 2022)



( Share of RE will increase from 9 % to 19 % by 2022 )



- ❑ Total 60 GW additional capacity in the period of (2013 – 2022) consisting of:
  - ❑ Coal fired : 38 GW
  - ❑ Hydro : 6.5 GW
  - ❑ Geothermal : 6.0 GW
  - ❑ Combined cycle : 5.0 GW
  - ❑ Gas Turbine/Engine : 3.7 GW
  - ❑ Other : 0.3 GW
- ❑ Coal will be more dominant and geothermal is expected to increase significantly (from 4% to 11%)





## Summary IPP Mini hydro development

Status: August 2014

Status	IPP		Cumulative Number	Cumulative Capacity (kW)
	Number	Capacity (kW)		
In operation	47	111,935	47	111,935
Under consruction	45	240,888	92	352,823
Financing arrangement	43	232,448	135	585,271
PPA preparation	90	425,316	225	1,010,587
Proposal	85	381,340	310	1,391,927
<b>Grand Total</b>	<b>310</b>	<b>1,391,927</b>		



# SOLAR PV DEVELOPED BY PLN (2012)

**INDONESIA**  
-Average Solar Irradiation between 4 – 6 kW/m<sup>2</sup> . Most higher radiation is in Eastern of Indonesia  
- Estimating, the radiation can generate energy about 3.7 kWh/day.

**RIAU&KEPRI**  
Location: TAREMPA  
ANAMBAS Island  
Capacity: 200 kWp  
Status : Operation

**RIAU&KEPRI**  
Location: MORO.  
KARIMUN Island  
Capacity: 200 kWp  
Status : Operation

**WEST SUMATERA**  
Location: SIMALEPET  
SIPORA Island  
Capacity: 40 kWp  
Status : Operation

**WEST SUMATERA**  
Location: TUA PEJAT  
SIPORA Island  
Capacity: 150 kWp  
Status : Operation

**EAST KALIMANTAN**  
Location: SEBATIK  
SEBATIK Island  
Capacity : 300 kWp  
Status : Operation

**EAST KALIMANTAN**  
Location: BUNYU  
BUNYU Island  
Capacity : 150 kWp  
Status : Construction

**WEST NUSA TENGGARA**  
Location : GILI TRAWANGAN  
Capacity : 200 kWp  
Status : Operation on Feb 2011

**EAST KALIMANTAN**  
Location: DERAWAN Island  
Capacity : 170 kWp + Battery  
Status : Operation on March 2011

**NORTH MALUKU**  
Location : MOROTAI Island  
Capacity : 600 kWp  
Status: Operation on April 2012

**SOUTH SULAWESI**  
Location: TOMIA Island  
Capacity : 75 kWp  
Status : Operation on May 2011

**NORTH SULAWESI**  
Location: MIANGAS Island  
Capacity : 30 kWp  
Status : Operation on Oct 2011

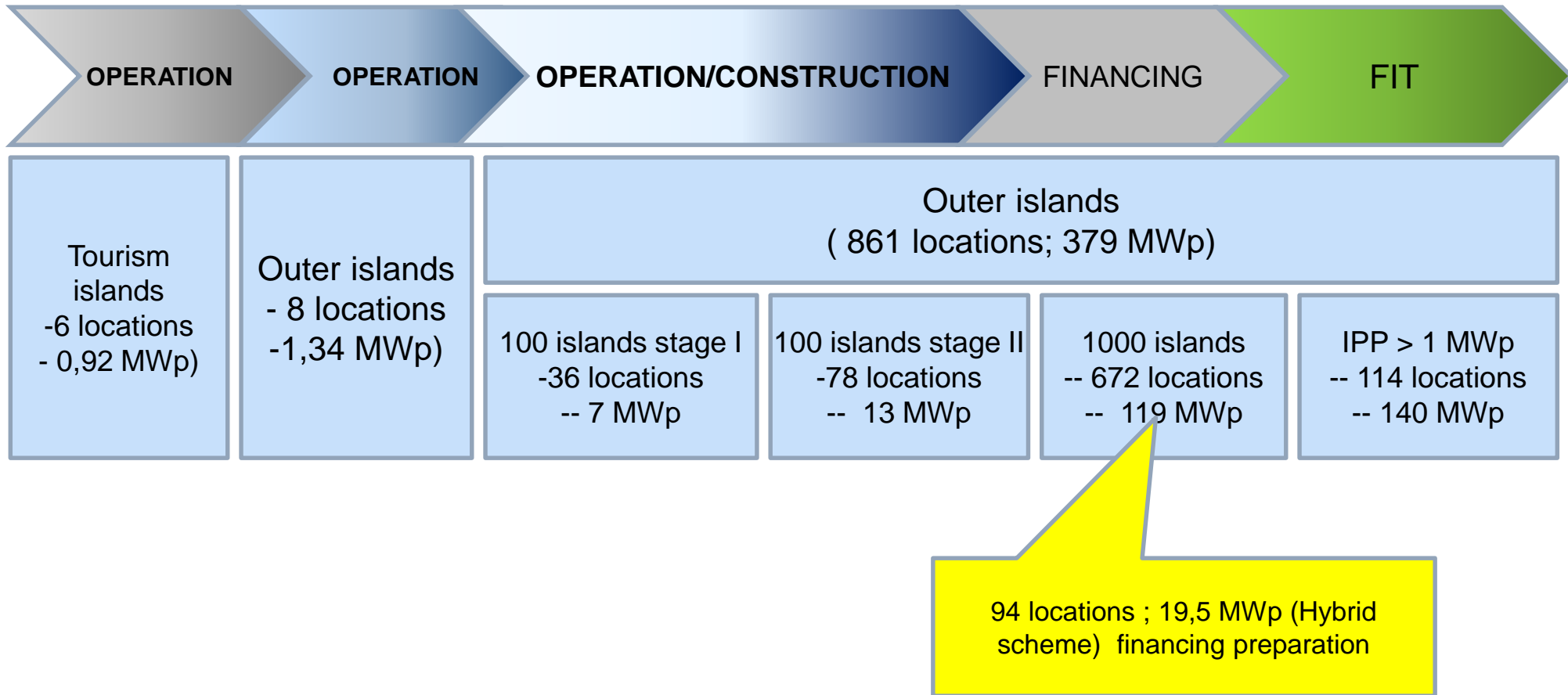
**NORTH SULAWESI**  
Location : MARAMPIT Island  
Capacity : 50 kWp  
Status : Final Construction

**NORTH SULAWESI**  
Location : BUNAKEN Island  
Capacity : 335 kWp + Battery  
Status : Operation on Feb. 2011

**PAPUA**  
Location: SAONEK  
RAJA AMPAT Islands  
Capacity : 40 kWp  
Status : Operation on Dec. 2010

**MALUKU**  
Location: BANDA NAIRA  
Capacity : 100 kWp  
Status : Operation on Dec. 2010

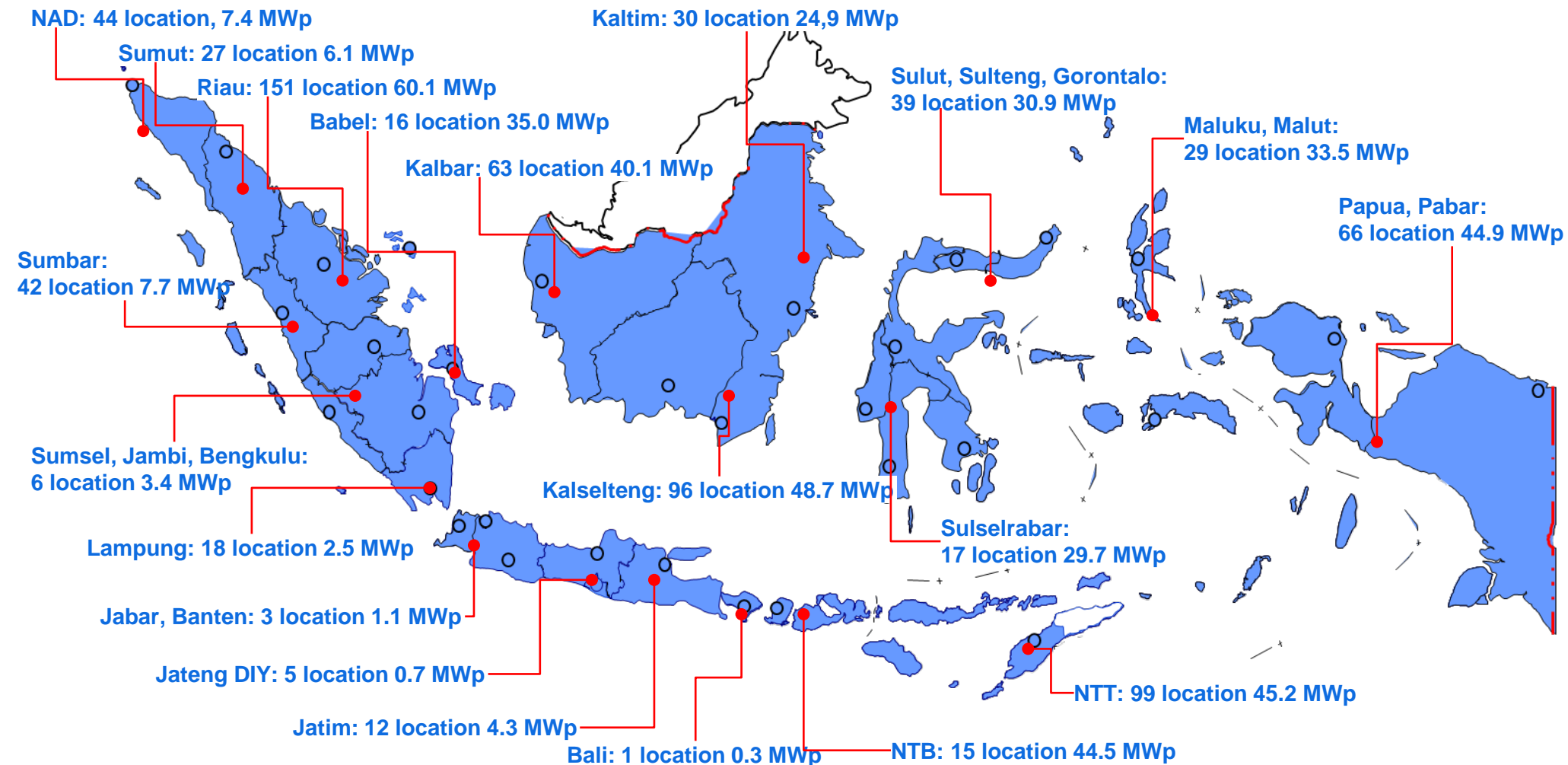
**EAST NUSATENGGARA**  
Location: LEMBATA  
Capacity : 200 kWp  
Status : Operation on Sept 2011



# SOLAR PV DEVELOPMENT PROGRAM – 1000 ISLANDS



Roof Top PV is projected for households consumption



( RUPTL 2013 – 2022 ) : 634 MW

# BIOMASS DEVELOPMENT PLAN

*Biomass development plan up to 2020 : 447 MW (2012-2021)*

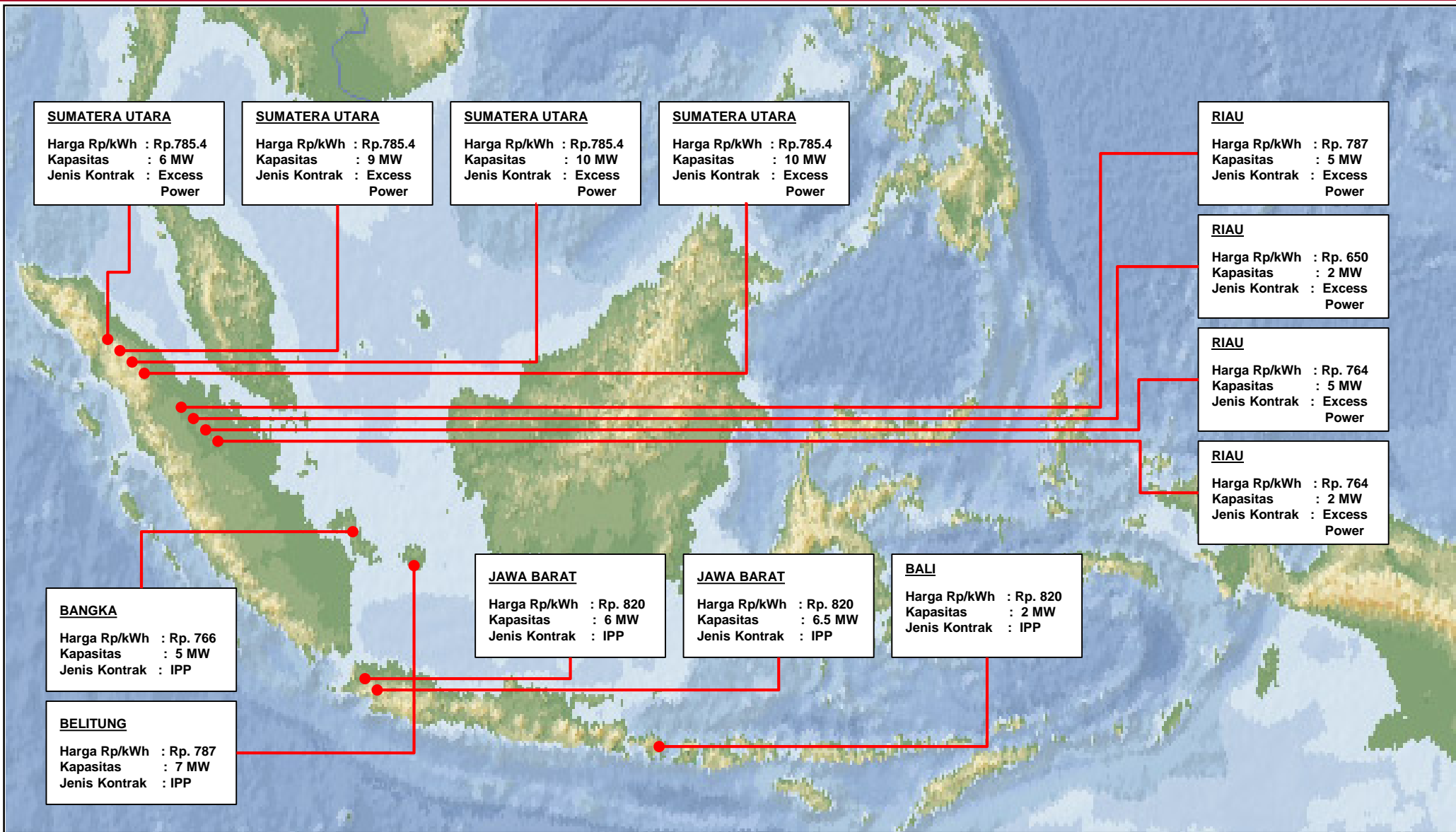


- An abundant potential of Biomass using palm oil shell, bagasse, rice husk, municipal waste and *wood chips* (Biomass potential resources 32000 MW with 445 MW under preliminary construction)
- Private participation will be encourage, either as an IPP or *Excess Power* to PLN grid. (Existing Biomass Power Plant 61 MW all IPPs)
- PLN Pilot Plants of small scale Biomass ( cap. 500 kw up to 1 MW ) using *wood chip on progress as an option to replace diesel fuel oil and reduce the fuel oil*
- The utilization of industrial forest for energy forest (estimated 2 sd 3 mill. Ha ) will replace about 3.000 MW of diesel fuel oil
- Bio-fuel (biodiesel, olein and CPO) program for converting High Speed Diesel Oil (HSD) projected about 0,5 to 1 million KL





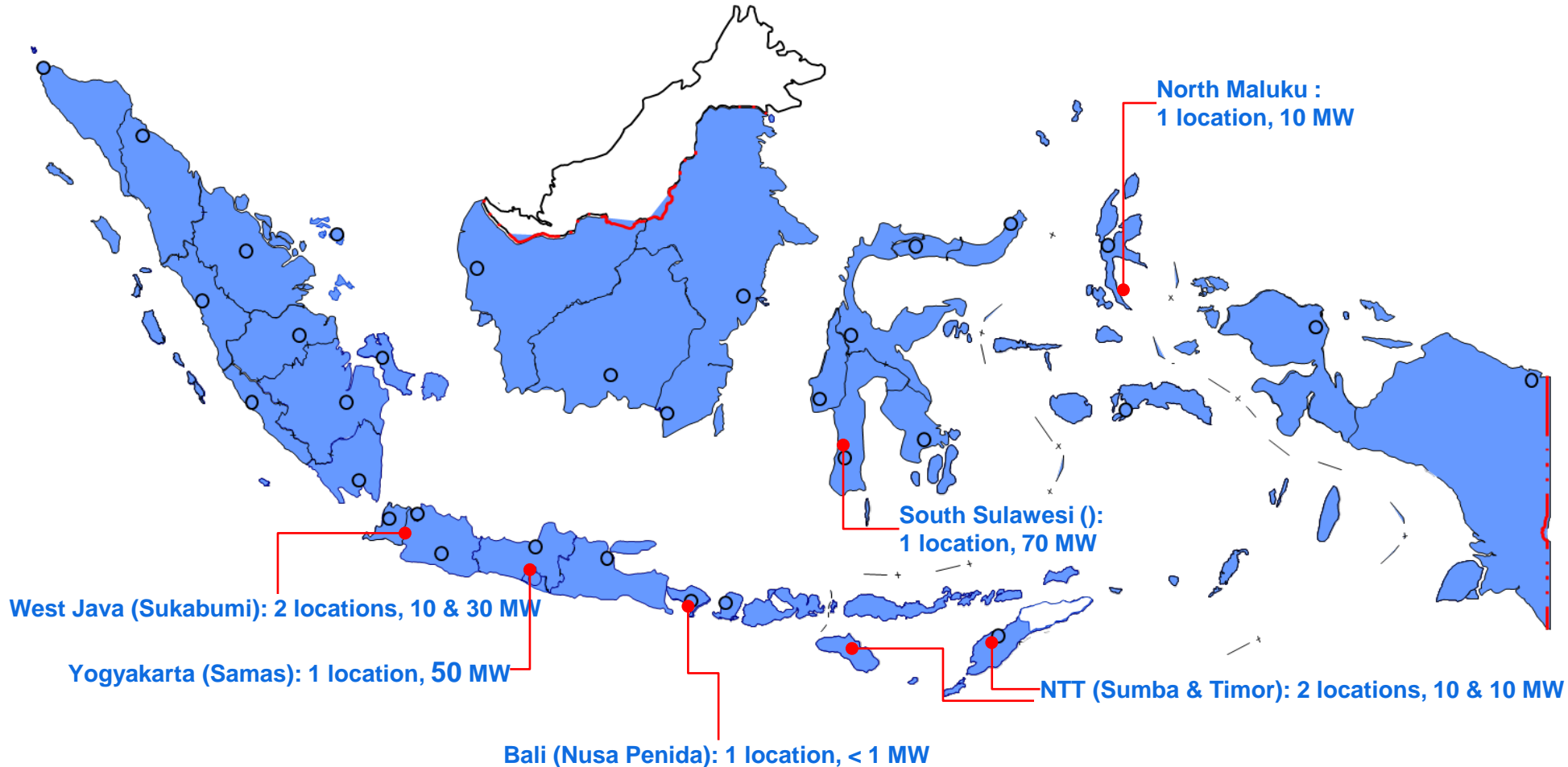
# BIOMASS POWER PLANT PROJECTS





# WIND POWER DEVELOPMENT PROGRAM

- Indonesia's wind power potential is not much because of average wind velocity is low (< 5 m/s).
- Wind Power Development Program up to 2020 : 200 MW, in study and procurement stage.





- ❑ PLN committed to support the National Policies in accelerating the utilization RE as ones solution to meet the high growth of electricity.
- ❑ The small and distributed RE, with another alternative the use of biofuel, has reduced significantly the use of highly cost of fossil fuel oil of diesel generation.
- ❑ The hybrid of solar PV and biomass power plan is promising solution following the minihydro especially for electricity in small and remotes island and other isolated grid system.
- ❑ The policy for proportionally allocation for RE as PLN Project and IPP's project (Great opportunity for private to make a PPA with PLN in IPP Schemes). Small RE generation is generally addressed to be developed by IPP.
- ❑ To encourage the IPP and also promote RE development, the pricing policies has been based on economical price with also considering insentives and subsidy..
- ❑ Bankable PPA standard considering lender concern has been implemented and also supported by a guidelines to increase the penetration of small and distributed generation into distribution grid.
- ❑ Synergy among stakeholders is key factors to provide supportive climate for RE development



*Terima kasih - Thank You*