Current Status and Future Development of Coal Thermal Power Plant in Indonesia.

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Indonesia


PROVINCES OF INDONESIA
1. Aceh
2. North Sumatra
3. Riau
4. Riau Islands
5. West Sumatra
6. Jambi
7. Bengkulu
8. South Sumatra
9. Bangka-Belitung
10. Lampung
11. West Kalimantan
12. Central Kalimantan
13. South Kalimantan
14. East Kalimantan
15. Banten
16. Jakarta
17. West Java
18. Central Java
19. Yogyakarta
20. East Java
21. Bali
22. West Nusa Tenggara
23. East Nusa Tenggara
24. West Sulawesi
25. South Sulawesi
26. Central Sulawesi
27. South East Sulawesi
28. Gorontalo
29. North Sulawesi
30. Maluku
31. North Maluku
32. West Papua
33. Papua
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INDONESIA
National capital
Provincial capital
Town, village
International boundary
Provincial boundary
Area : Land 1,9 M km2, territorial : 5,2 M km2
Population : 247 million; Growth : 1 %
GDP : 900 Billion USD; growth : 6.2 %

PLN is Major Integrated Electric Utility Company in Indonesia

Sole owner of transmission and distribution assets with control over majority of generation assets in Indonesia

Generation

- Owner of 38 GW Power Plant
- Controls over 85% of national generation capacity
- Main purchaser of electricity from Independent Power Producers (IPPs)

Transmission

- Sole responsibility for power transmission in Indonesia
- Transmission lines with 38 thousands kmc and 72 GVA of power transformer capacity

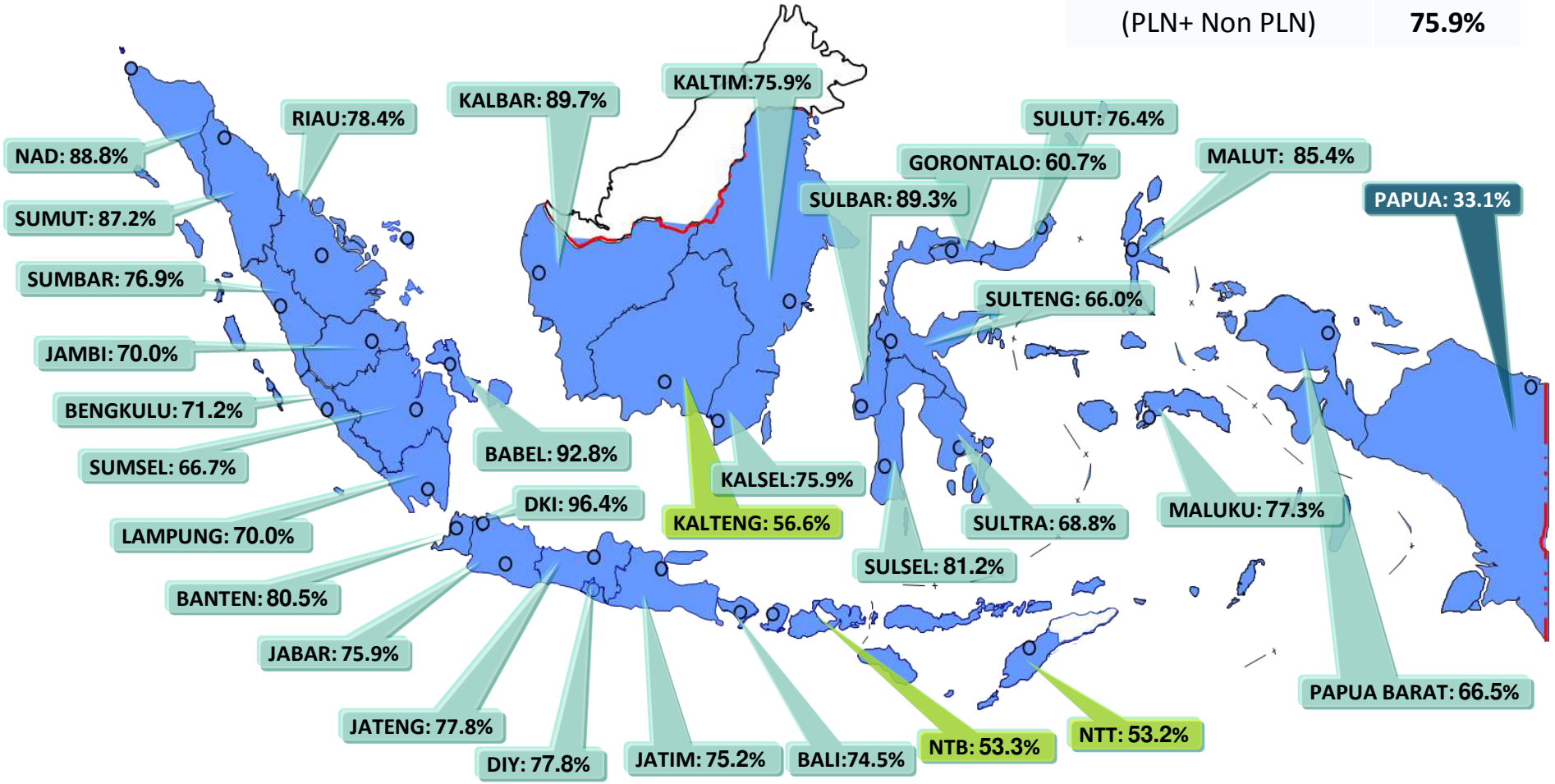
Distribution

- Sole distributor of electricity to end customers in Indonesia
- Distribution lines of 740 thousands kmc and 39 GVA of transformer capacity, serving around 50 Millions customers, 10 million PrePaid Meters.

Electrification Ratio [2012]

More than 60 million Indonesian people had no access to electricity

Electrification Ratio	2012
PLN	**73.1%**
(PLN+ Non PLN)	**75.9%**



PLN has an extensive generation portfolio with total installed capacity of approximately 36,612 MW across Indonesia

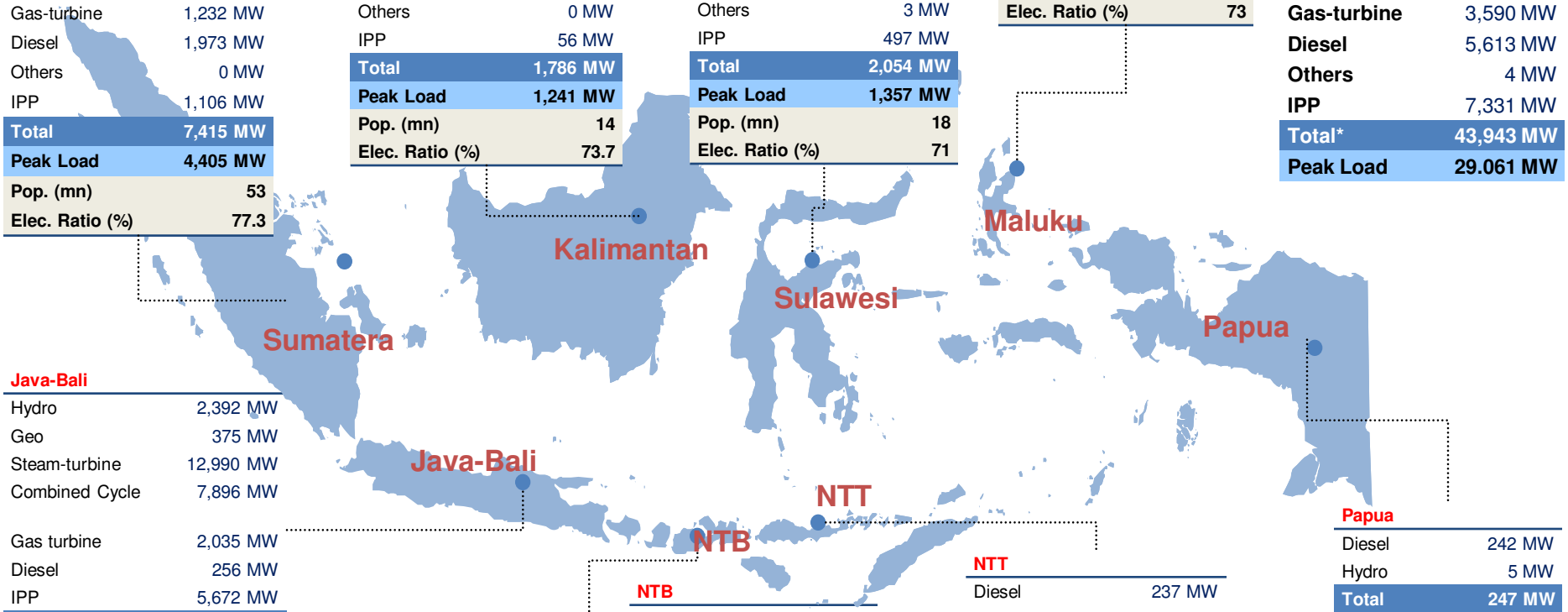
Sumatera	
Hydro	864 MW
Geothermal	110 MW
Steam-turbine	1,272 MW
Combined Cycle	858 MW
Gas-turbine	1,232 MW
Diesel	1,973 MW
Others	0 MW
IPP	1,106 MW
Total	**7,415 MW**
Peak Load	**4,405 MW**
Pop. (mn)	**53**
Elec. Ratio (%)	**77.3**

Kalimantan	
Hydro	32 MW
Steam-turbine	130 MW
Combined Cycle	60 MW
Gas-turbine	200 MW
Diesel	1,308 MW
Others	0 MW
IPP	56 MW
Total	**1,786 MW**
Peak Load	**1,241 MW**
Pop. (mn)	**14**
Elec. Ratio (%)	**73.7**

Sulawesi	
Hydro	219 MW
Geothermal	60 MW
Steam-turbine	137 MW
Gas-turbine	123 MW
Diesel	1,015 MW
Others	3 MW
IPP	497 MW
Total	**2,054 MW**
Peak Load	**1,357 MW**
Pop. (mn)	**18**
Elec. Ratio (%)	**71**

Maluku	
Diesel	279 MW
Others	0 MW
Total	**279 MW**
Peak Load	**136 MW**
Pop. (mn)	**2.8**
Elec. Ratio (%)	**73**

Total Indonesia	
Hydro	3,514 MW
Geothermal	548 MW
Steam-turbine	14,529 MW
Combined Cycle	8,814 MW
Gas-turbine	3,590 MW
Diesel	5,613 MW
Others	4 MW
IPP	7,331 MW
Total*	**43,943 MW**
Peak Load	**29.061 MW**



Java-Bali	
Hydro	2,392 MW
Geo	375 MW
Steam-turbine	12,990 MW
Combined Cycle	7,896 MW
Gas turbine	2,035 MW
Diesel	256 MW
IPP	5,672 MW
Total	**31,616 MW**
Peak Load	**21,370 MW**
Pop. (mn)	**145**
Elec. Ratio (%)	**78.4**

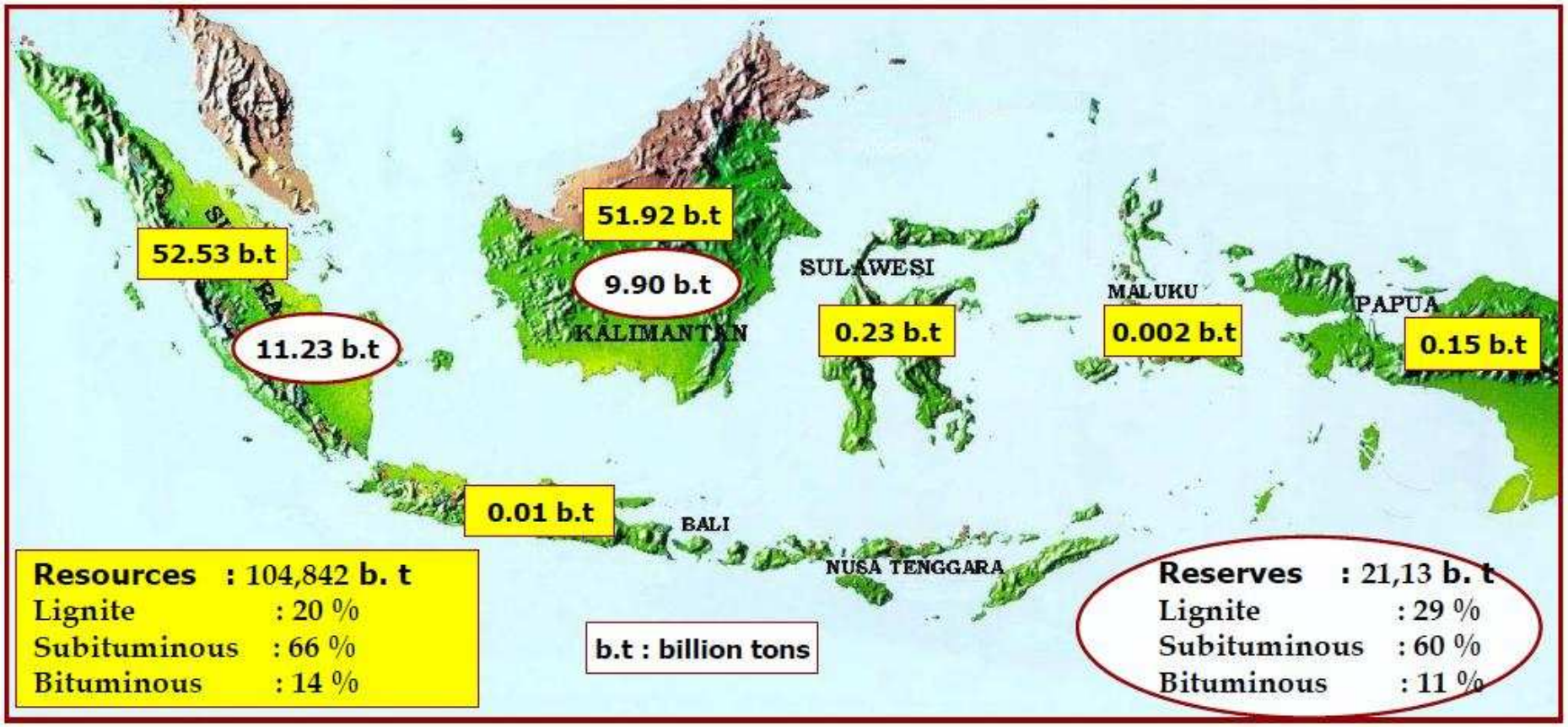
NTB	
Diesel	303 MW
Hydro	1 MW
Others	1 MW
Total	**305 MW**
Peak Load	**220 MW**
Pop. (mn)	**4.7**
Elec. Ratio (%)	**53**

NTT	
Diesel	237 MW
Geothermal	3 MW
Hydro	1 MW
Total	**241 MW**
Peak Load	**131 MW**
Pop. (mn)	**4,8**
Elec. Ratio (%)	**53**

Papua	
Diesel	242 MW
Hydro	5 MW
Total	**247 MW**
Peak Load	**200 MW**
Pop. (mn)	**3.8**
Elec. Ratio (%)	**41**

As of December 31, 2012.
* Total power generation capacity in Indonesia, of which PLN produces 36GW

Indonesia Coal Resources and Reserves

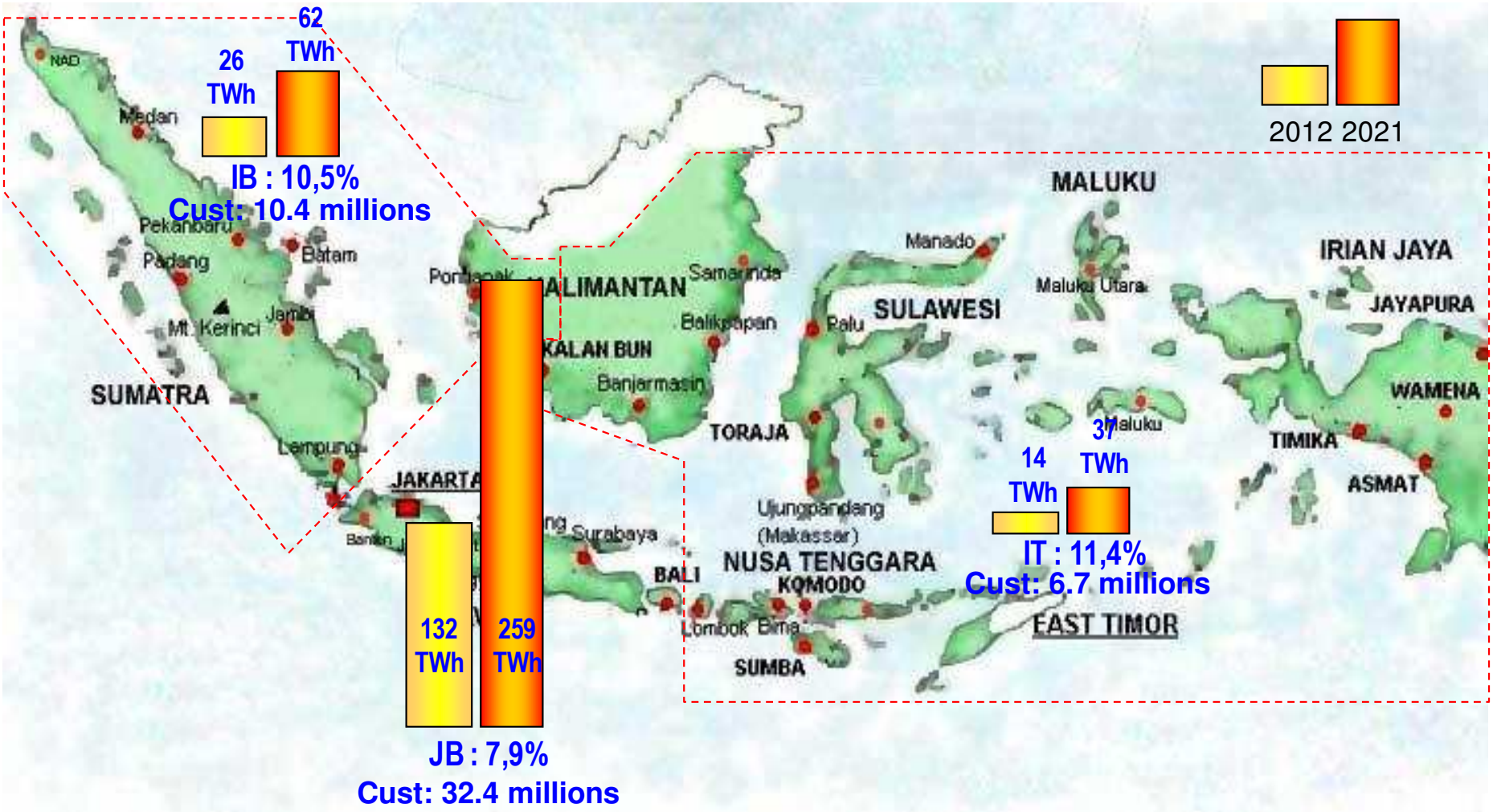


Coal classification (air-dry basis):

- Very high rank coal : ≥ 7,100 kCal/kg
- High rank (bituminous) coal : 6,100 – 7,100 kCal/kg
- Medium rank (sub-bituminous) coal : 5,100 – 6,100 kCal/kg
- Low rank (lignite) coal : ≤ 5,100 kCal/kg

Source: Geological Agency, MEMR, 2010

Projection of Electricity Demand 2012-2021

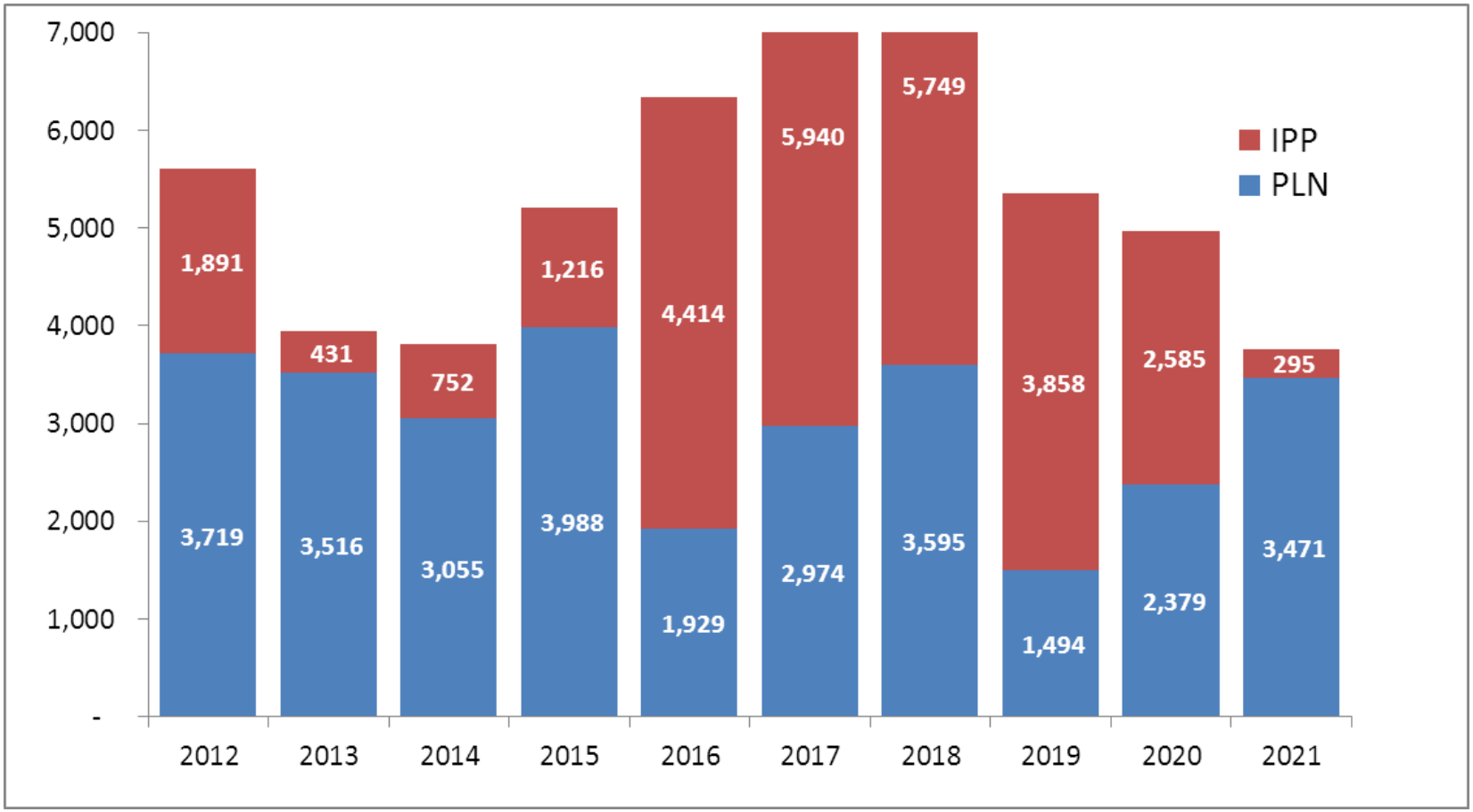


Average of national electricity demand growth 2012-2021 is 8,65% annually.

Source: RUPTL PLN 2012-2021

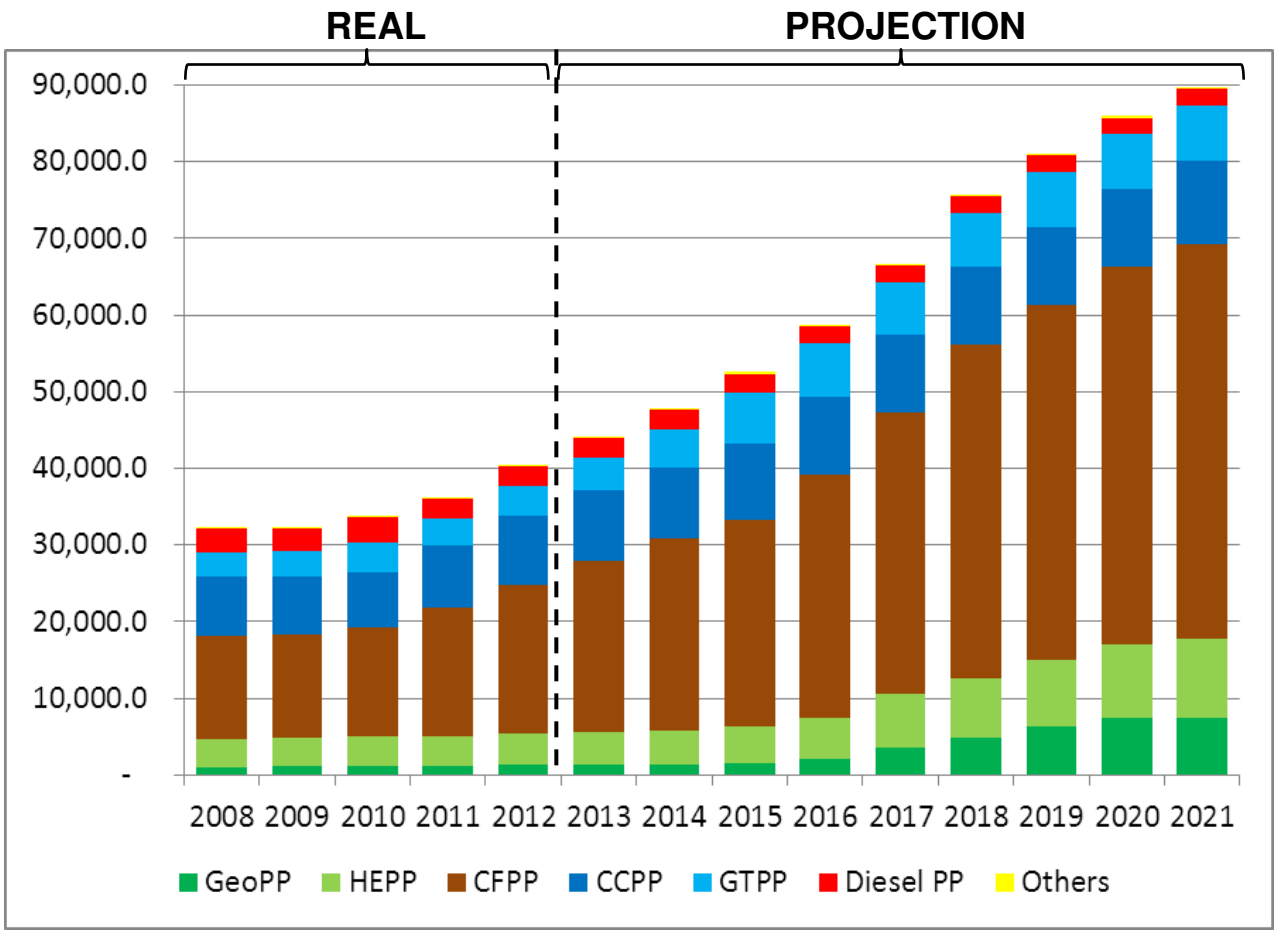
New Power Plant Capacity Addition by Owner [Incl. IPP]

- Total capacity addition to 2021: approx 55 GW or 5.5 GW per year
- Allocation for IPP and PLN are not firmly defined except those projects already committed.



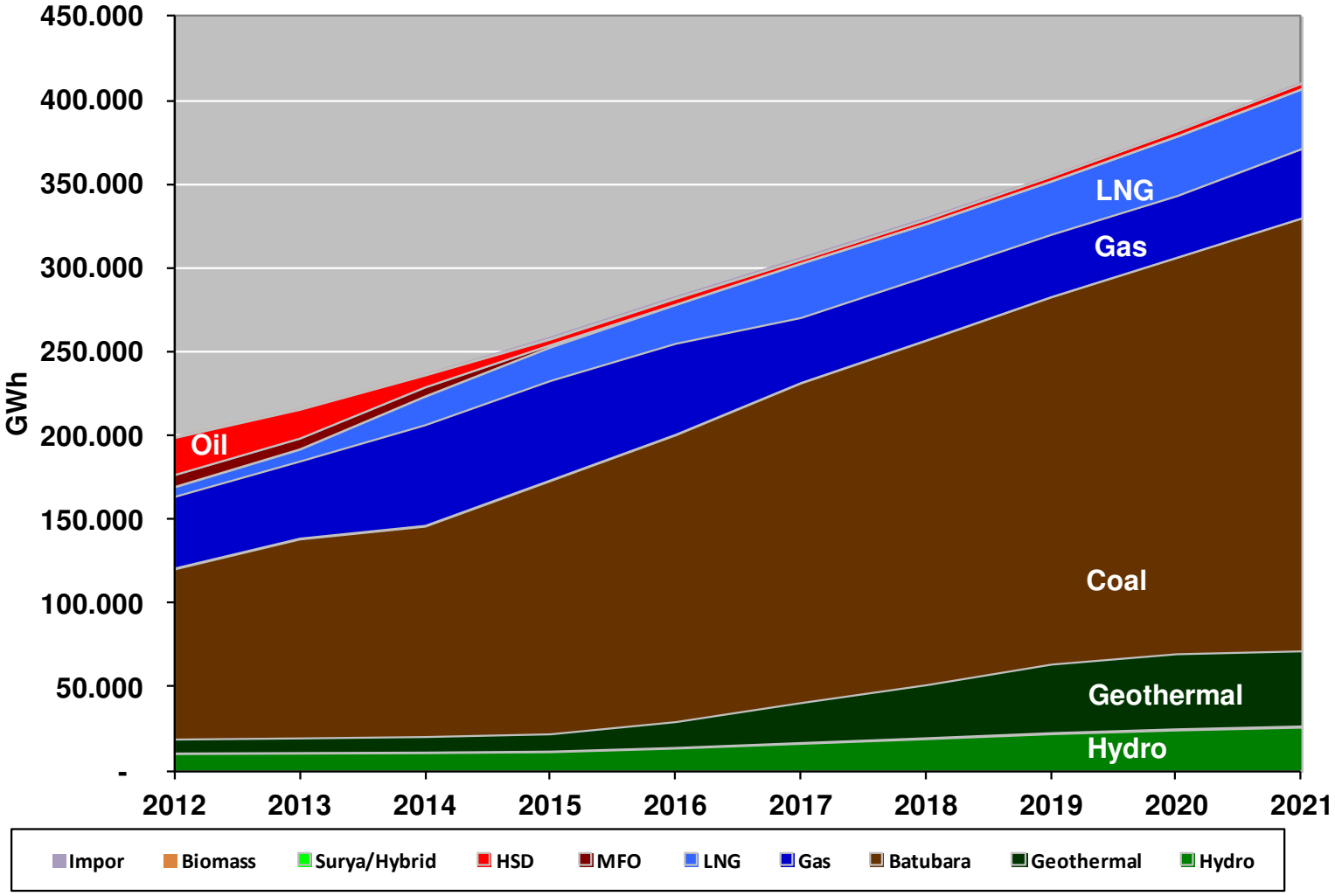
Source: RUPTL PLN 2012-2021

Total Installed Capacity by Technology [Incl. IPP]



- Power plants capacity increase from 32.1 GW in 2008 to 40.3 GW in 2012 or additional 1,700 MW per year.
- The biggest capacity is for CFPP (48%), then CCPP (23%), HEPP (10%), GTPP (9%), dieselPP (7%) and geoPP (3%).
- From about 18.000 MW existing CFPP:
  - 64% using subbituminous and 36% lignite. The lignite share will increase when FTP1 projects completed.
  - 99% pulverized boiler and 1% CFB.

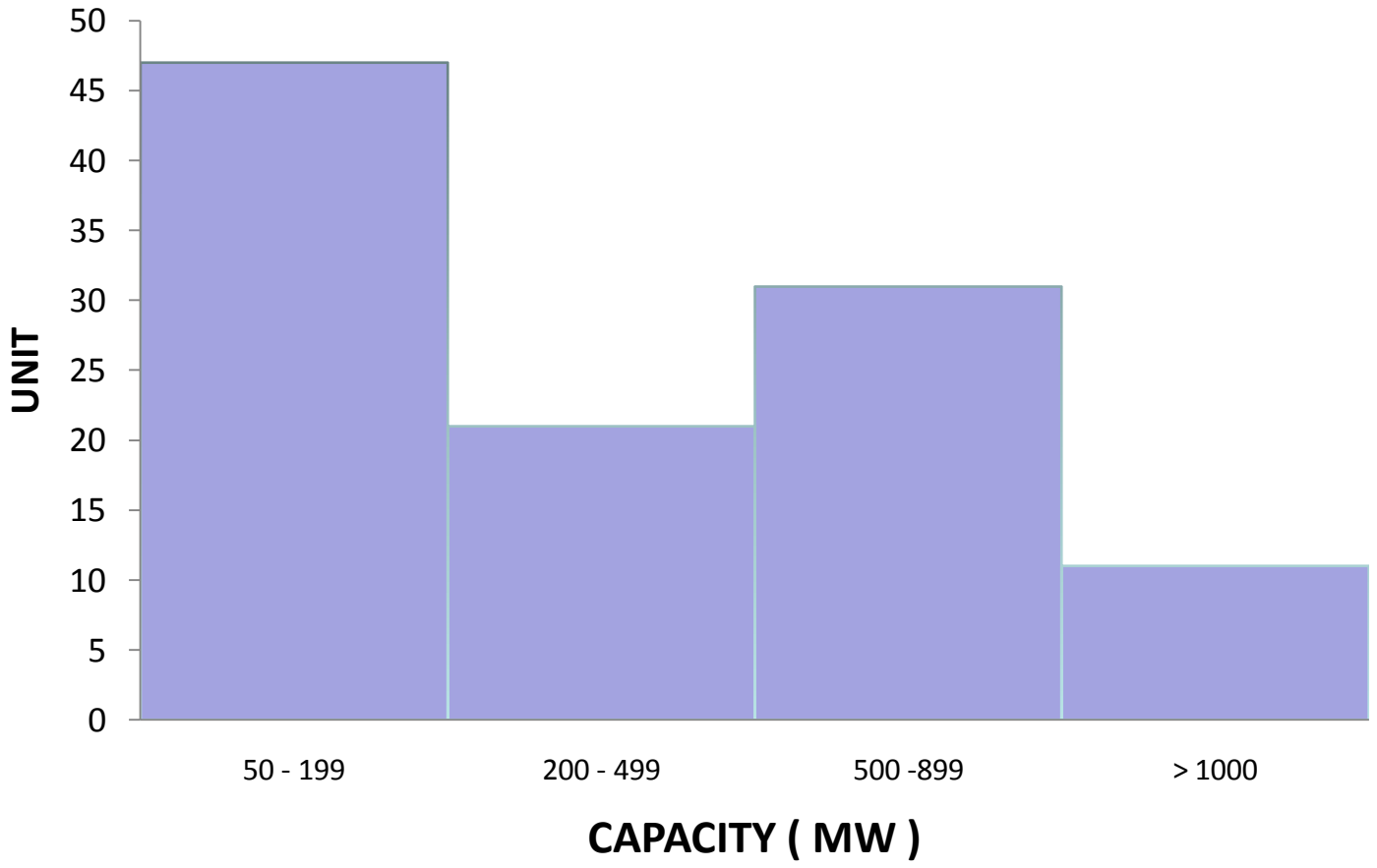
Fuel Mix for Electricity Production [GWh]
Total Indonesia [Incl. IPP]



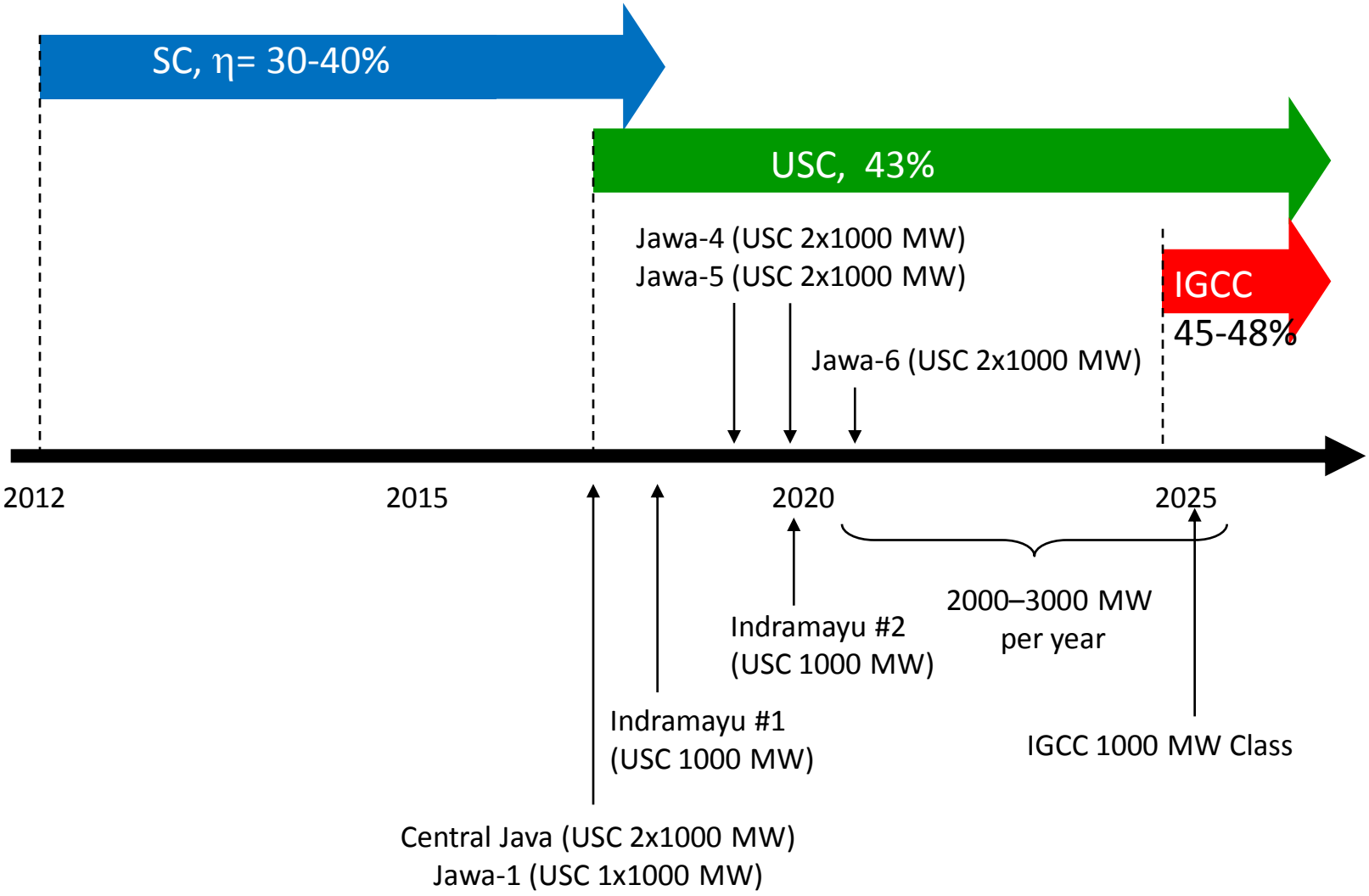
Energy production in 2012: coal (50%), gas (23%), oil (15%), hydro (6%) and geothermal (5%)

Source: RUPTL PLN 2012-2021

UNIT CAPACITY DISTRIBUTION OF COAL POWER PLANT

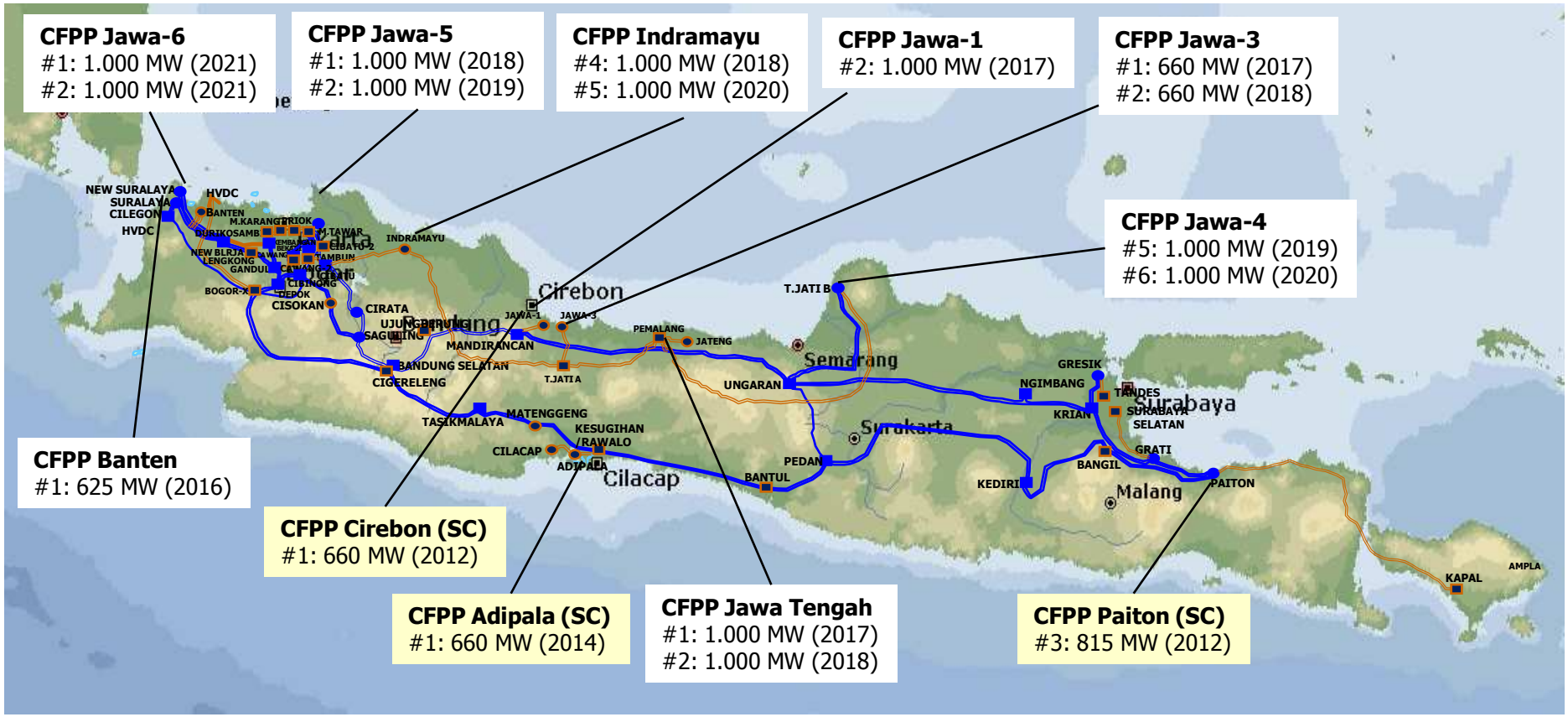


Roadmap of Clean Coal Technology [CCT] in Indonesia

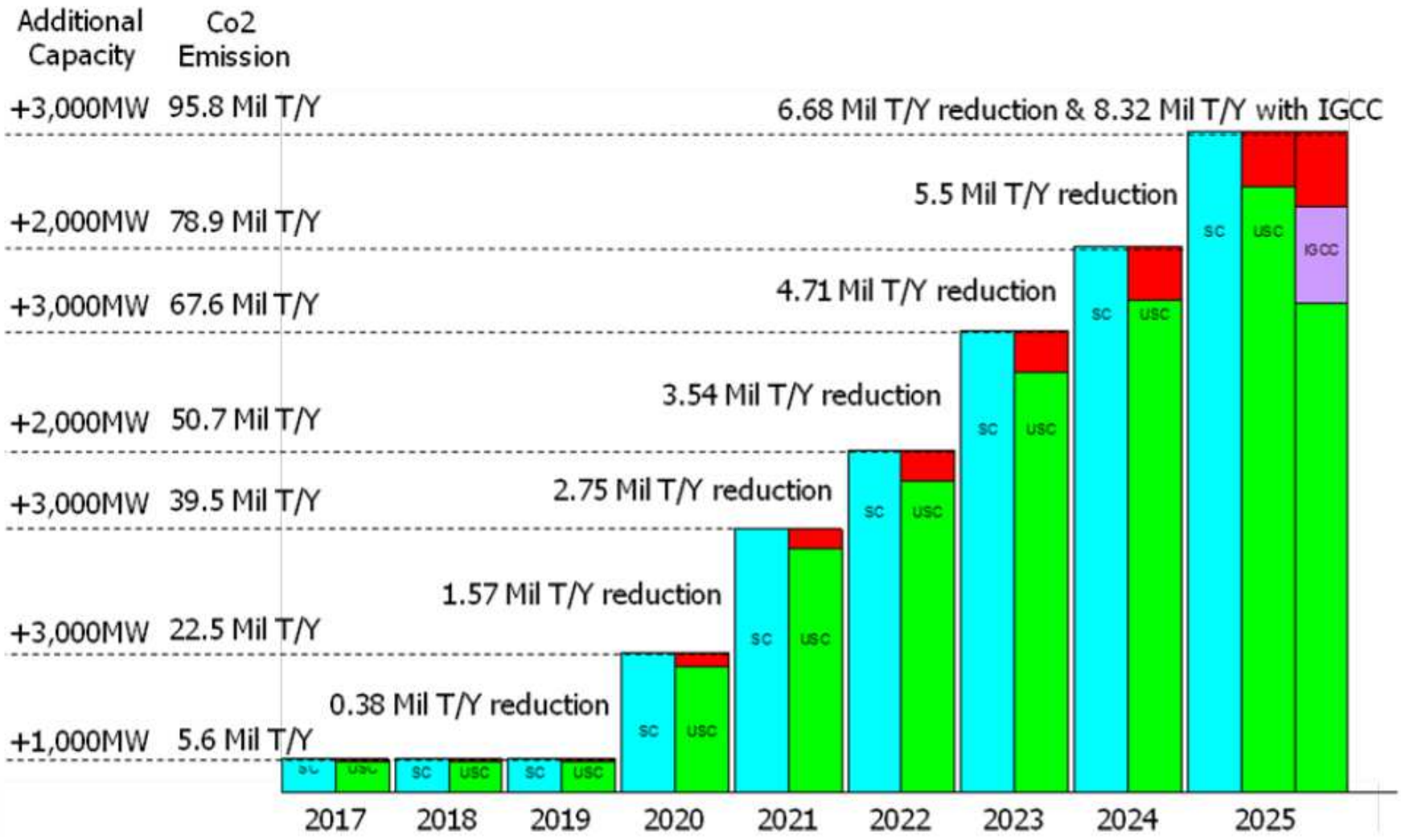


Source: JICA CCT Study, October 2012, with updated projects and schedule by PLN

Super Critical Generation Coal Fired Power Plants (CFPP) in Java-Bali System



CO_2 Reduction Effect By Introduction of CCT

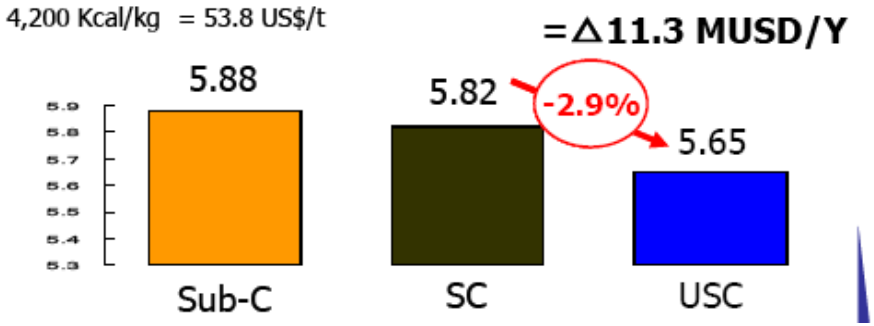


Source: JICA CCT Study, October 2012

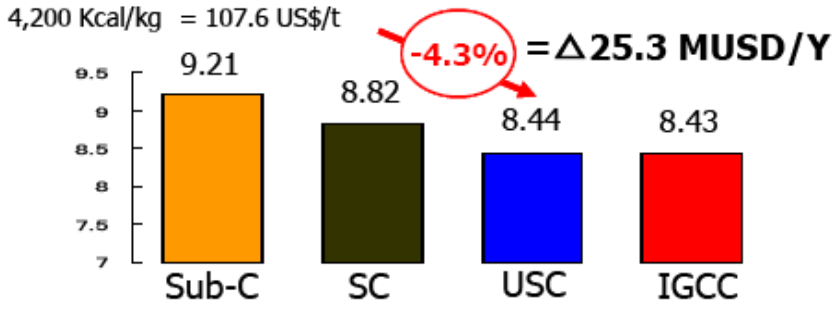
Economical Evaluation of CCT

	Sub Critical	SC	USC	IGCC	Coal Price 4,200 kCal/kg ($/ton)	
Total Gross Power	1,000 MW	1,000 MW	1,000 MW	1,000 MW	Y2011	Y2020
Plant Efficiency	36%	39%	42%	49%	53.8	107.6
Construction Cost	100% (Base)	106.5%	108.5%	130%		
Coal Consumption	100% (Base)	90%	84%	75%		
O&M Cost	2.5%	3%	3%	3%		

2010 Generation Cost (US cent/kWh)



2020 Generation Cost (US cent/kWh)



Source: JICA CCT Study, October 2012, with updated projects and schedule by PLN

Future Development of Coal Fired PP

1. Fuel Supply
   - The type of coal that would be used more in electricity generation Indonesia is low rank coal, due to plentiful availability in Kalimantan and Sumatera and more economical, thus securing more stable supply, whilst most high rank coal would be exported to global market.

2. Boiler Type :
   - CFB: for small to medium scale CFPP outside Java-Bali system.
   - USC: should be introduced for next new CFPP project in Java-Bali system (2017).

3. Further Development
   - Coal gasification – Syngas:
   - IGCC: will be introduced around 2025, considering the development situation in the world.
   - CCS: in the early stage of development, and will reduce a significant amount of CO2 emission. Will be introduced in Indonesia maybe after 2025.

Terimakasih