



# **INDONESIA WIND POWER POTENTIAL & CHALLENGES**

**CHINA RE INVEST INDONESIA –  
A Renewable Energy Investment Forum  
Session III : Wind Energy  
May 19, 2022**

**IFNALDI SIKUMBANG**

**VICE CHAIRMAN - INDONESIAN WIND ENERGY ASSOCIATION  
(ASOSIASI ENERGI ANGIN INDONESIA)**



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**Introduction AEAI**

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# Introduction AEEI

**ESTABLISHED : 2014**

## **MEMBERSHIP**

AEAI's Membership is a limited liability company, institution or other Indonesian legal entity that engaged in Wind Power / Wind Energy;

1. Developer of Wind Energy Power Plant (IPPs - Independent Power Producers)
2. Wind Turbines and Components Manufacturers, Wind Power Equipment Manufacturers
3. Contractors, Service Company and the Consultant / Contractor, Services & Consultant
4. Related Companies / Related Parties

Extraordinary Member (Anggota Luar Biasa) as above criteria without Indonesia Legal Entity (

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1. RANCANG BANGUN PUTRA NUSANTARA
2. HYWIND ENERGY SOLUTION
3. LIMAPUTRA CONTRINDO
4. RADIANT UTAMA INTERINSCO, TBK.
5. PERTAMINA POWER INDONESIA
6. WINDLIFE GREEN INDONESIA
7. AWINA SINERGI INTERNASIONAL
8. MATLAMAT CAKERA CANGGIH (MARUBENI)
9. VENA ENERGY
10. ALPENSTEEL
11. SUMMIT NIAGA
12. ENERGI ANGIN INDONESIA
13. PONDERA
14. ISKANDARSYAH & PARTNERS LAW FIRM
15. WPD INDONESIA ENERGY
16. RENERGY ASIA SERVICES

# Indonesia Renewable Energy & Wind Potency



# INDONESIA'S NRE POTENTIAL

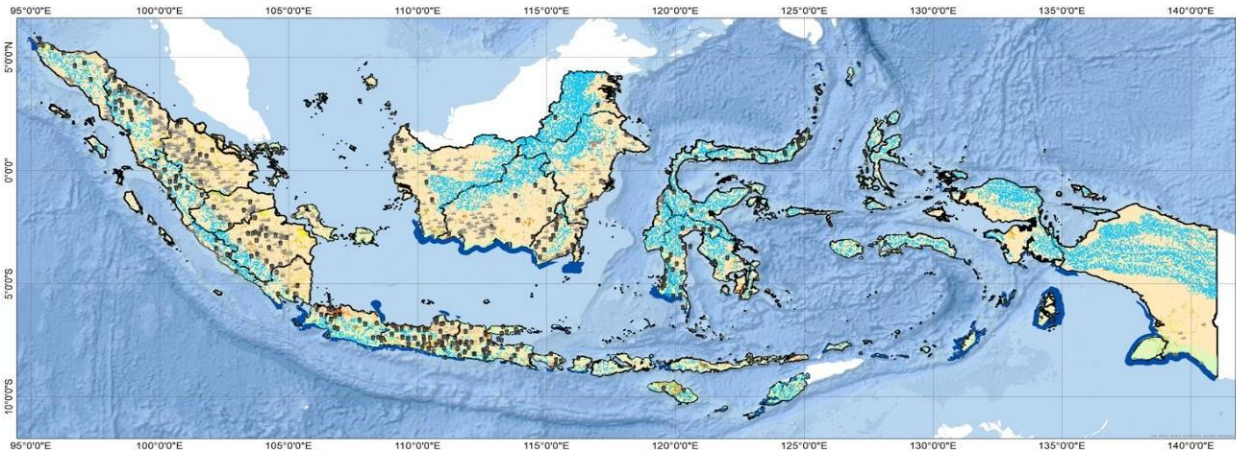


Abundant NRE potential provides huge opportunities to be developed

## LARGE NRE POTENTIAL, LOW UTILIZATION

### Wind Challenges

1. Intermittency
2. Affordability for Wind Offshore



- Hydro potential is spread throughout Indonesia, especially in North Kalimantan, Aceh, West Sumatra, North Sumatra and Papua.
- Solar potential is spread throughout Indonesia, whereas NTT, West Kalimantan and Riau having higher radiation.
- Wind potential (>6 m/s) is mainly found in NTT, South Kalimantan, West Java, South Sulawesi, Aceh and Papua.**
- The potential of marine energy is spread throughout Indonesia, particularly in Maluku, NTT, NTB and Bali.

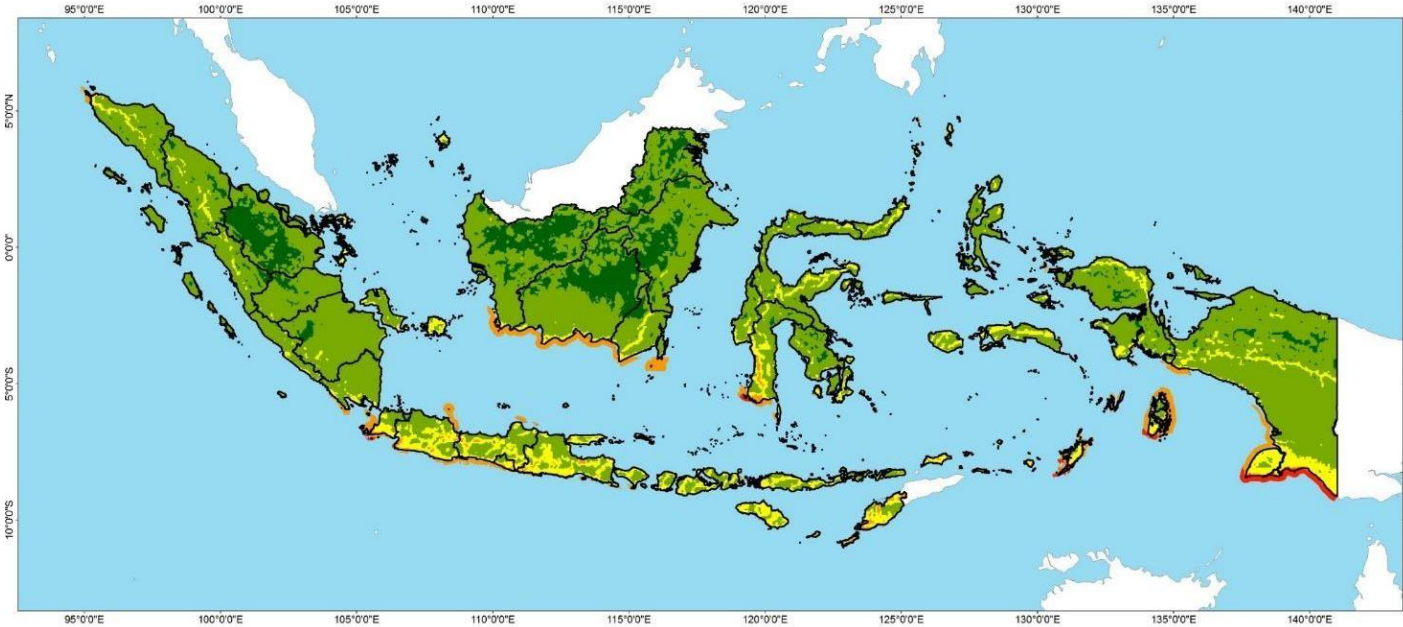
| ENERGY            | POTENTIAL (GW) | UTILIZATION* (MW) |
|-------------------|----------------|-------------------|
| SOLAR             | 3,295          | 203.7             |
| HYDRO             | 95             | 6,601.9           |
| BIOENERGY         | 57             | 1,920.4           |
| <b>WIND</b>       | <b>155</b>     | <b>154.3</b>      |
| GEOTHERMAL ENERGY | 24             | 2,276.9           |
| OCEAN             | 60             | 0                 |
| <b>TOTAL</b>      | <b>3,686</b>   | <b>11,157</b>     |

**01** The potential for new renewable energy in the predictable category is still being calculated. Currently, only 0.3% of the total potential has been utilized.

**02** In addition to renewable energy, the existing potential of new energy is still not widely developed.

Note:  
 \*) Based on the data of December 2021  
 Nuclear has Uranium potential for 89,483 tons and Thorium for 143,234 tons

# MAP OF WIND SPEED (ONSHORE AND OFFSHORE)



Potency of offshore wind PP **94,23 GW**

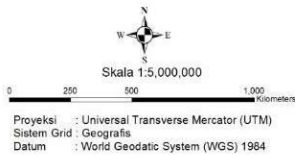


Potency of onshore wind PP **60,647 GW**

Total potency of wind power plant **154,88 GW**

## Kecepatan Angin (m/s)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- > 8



## Metode :

1. Data Final (FNL) NCEP periode 2001-2015 resolusi 1 derajat
2. Data Cross-Calibrated Multi-Platform (CCMP) periode 2001-2015 resolusi 0,25 derajat
3. Downscaling resolusi 5 KM menggunakan WRF (P3TKEBTKE, 2020)
4. Interpolasi di ketinggian 50 m (P3TKEBTKE, 2020)

## Sumber Peta:

1. Peta batas administrasi skala 1:250,000 (BIG, 2019)
2. Peta batimetri nasional (BIG, 2019)
3. Peta kelola laut provinsi (BIG, 2020)
4. Peta zonasi kawasan konservasi perairan (BIG, 2020)



**KEMENTERIAN ENERGI DAN SUMBER DAYA MINERAL**

BADAN PENELITIAN DAN PENGEMBANGAN ENERGI DAN SUMBER DAYA MINERAL  
PUSAT PENELITIAN DAN PENGEMBANGAN TEKNOLOGI KETENAGALISTRIKAN,  
ENERGI BARU, TERBARUKAN, DAN KONSERVASI ENERGI

Potency of wind (>6 m/s) is mainly in NTT, South Kalimantan, West Java, South Sulawesi, Aceh and Papua

PETA INI HANYA SEBAGAI PETA INDIKATIF POTENSI ENERGI ANGIN. UNTUK KEPERLUAN PEMBANGUNAN PLT ANGIN PERLU DILAKUKAN STUDI KELAYAKAN



# WIND ENERGY POTENTIAL PER PROVINCE



| No    | Provinsi                  | Potensi onshore (MW) |             | Potensi offshore (MW) |
|-------|---------------------------|----------------------|-------------|-----------------------|
|       |                           | Kec 4 - 6 m/s        | Kec > 6 m/s | Kec > 6 m/s           |
| 1     | Bali                      | 757                  | 262         | 535                   |
| 2     | Banten                    | 1.199                | 554         | 3.744                 |
| 3     | Bengkulu                  | 1.428                | 85          | 0                     |
| 4     | DI Yogyakarta             | 560                  | 519         | 979                   |
| 5     | DKI Jakarta               | 4                    | 0           | 0                     |
| 6     | Gorontalo                 | 137                  | 0           | 0                     |
| 7     | Jambi                     | 37                   | 0           | 0                     |
| 8     | Jawa Barat                | 5.236                | 1.800       | 5.691                 |
| 9     | Jawa Tengah               | 4.374                | 839         | 3.347                 |
| 10    | Jawa Timur                | 6.450                | 1.457       | 2.297                 |
| 11    | Kalimantan Barat          | 464                  | 90          | 4.878                 |
| 12    | Kalimantan Selatan        | 971                  | 35          | 7.449                 |
| 13    | Kalimantan Tengah         | 437                  | 244         | 11.136                |
| 14    | Kalimantan Timur          | 212                  | 0           | 0                     |
| 15    | Kalimantan Utara          | 73                   | 0           | 0                     |
| 16    | Kepulauan Bangka Belitung | 1.596                | 191         | 0                     |
| 17    | Kepulauan Riau            | 797                  | 125         | 0                     |
| 18    | Lampung                   | 1.072                | 65          | 2.372                 |
| 19    | Maluku                    | 1.573                | 1.615       | 19.330                |
| 20    | Maluku Utara              | 504                  | 0           | 17                    |
| 21    | Nanggroe Aceh Darussalam  | 663                  | 231         | 1.467                 |
| 21    | Nusa Tenggara Barat       | 2.004                | 601         | 1.388                 |
| 23    | Nusa Tenggara Timur       | 6.459                | 3.729       | 1.836                 |
| 24    | Papua                     | 1.159                | 252         | 19.894                |
| 25    | Papua Barat               | 425                  | 12          | 1.366                 |
| 26    | Riau                      | 22                   | 0           | 0                     |
| 27    | Sulawesi Barat            | 379                  | 135         | 137                   |
| 28    | Sulawesi Selatan          | 2.569                | 1.624       | 4.152                 |
| 29    | Sulawesi Tengah           | 908                  | 0           | 266                   |
| 30    | Sulawesi Tenggara         | 1.157                | 257         | 381                   |
| 31    | Sulawesi Utara            | 925                  | 289         | 1.569                 |
| 32    | Sumatera Barat            | 428                  | 0           | 0                     |
| 33    | Sumatera Selatan          | 301                  | 0           | 0                     |
| 34    | Sumatera Utara            | 356                  | 0           | 0                     |
| Total |                           | 60.647               |             | 94.231                |

Wind Energy Potential  
onshore **60,647 GW**

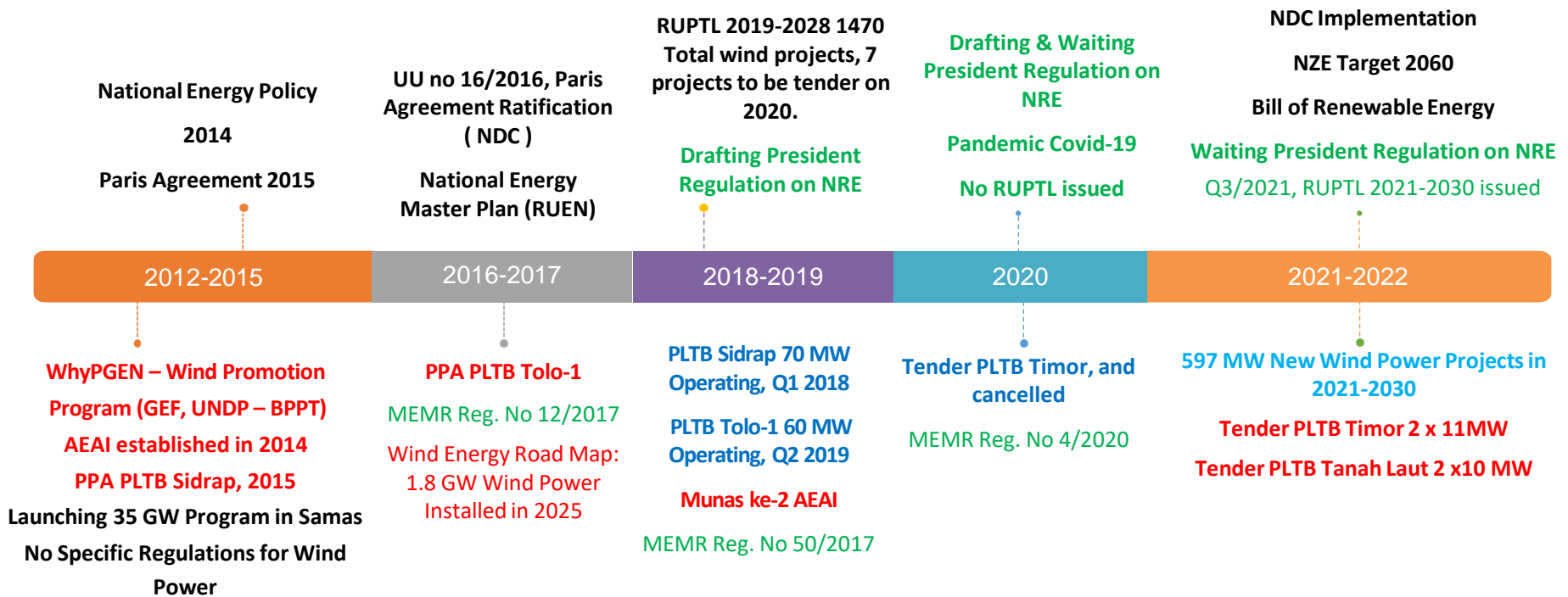
Wind Energy Potential  
offshore **94,231 GW**

Total Wind Energy  
Potential **154,88 GW**



# Wind Power Status In Indonesia

# LAST 10 YEARS NOTED!



# DEVELOPMENT STATUS HIGHLIGHT



| POTENCY                                                                                                                                                       | STATUS                                             | 2022 Q2                        | REMARK                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--------------------------------|-------------------------------------------------------------------------|
| <b>ONSHORE</b><br><b>15 GW</b><br><b>6 m/sec up</b><br>-<br><b>60.6 GW</b><br><b>4 m/sec up</b><br><br><b>OFFSHORE</b><br><b>94.8 GW</b><br><b>6 m/sec up</b> | <b>INSTALLED</b>                                   | 149 MW<br>(PPA 130 MW)         | Sidrap 75 MW<br>Jenepono 72 MW<br><br>Small Scale & Non Commercial 2 MW |
|                                                                                                                                                               | <b>CONSTRUCTION</b>                                | 0                              |                                                                         |
|                                                                                                                                                               | <b>PPA</b>                                         | 0                              | No PPA since 2017                                                       |
|                                                                                                                                                               | <b>TENDER 2022</b>                                 | 42 MW                          | Oel Boeboek 2 x 11 MW<br>Tanah Laut 20 MW                               |
|                                                                                                                                                               | <b>Wind Project in RUPTL 2021-2030 (Confirmed)</b> | 597 MW +<br>PLTB Tersebar      | Other Opportunities                                                     |
|                                                                                                                                                               | <b>MEASURED POTENCY</b>                            | Around 3 GW                    | Private/PLN/ P3TEK<br>EBTKE                                             |
|                                                                                                                                                               | <b>TARGET</b>                                      | 28 GW by 2050<br>39 GW by 2060 | NEP 2014<br>NZE Road Map                                                |

# Draft Presidential Regulation On Re Power Purchasing By PLN

01

## **FiT staging 2 no escalation phase, location factor is valid for Staging 1:**

- Hydro PP (including Hydro PP reservoir) for capacity up to 5 MW
- Solar PV and **Wind PP** for capacity up to 5 MW
- Biomass PP and Biogas PP for capacity up to 5 MW
- Solar PV and **Wind PP** expansion for capacity up to 5 MW
- Biomass PP and Biogas PP expansion for capacity up to 5 MW

02

## **Ceiling price (HPT) staging 2 no escalation phase, location factor is valid for staging 1:**

- Geothermal PP for all capacity
- Hydro Power Plant (including Hydro Power Plant reservoir) for capacity >5 MW
- PV and **Wind PP** >5 MW
- Biomass PP and Biogas PP for capacity >5 MW
- PV and **Wind PP** expansion >5 MW
- Biomass PP and Biogas PP expansion >5 MW
- *excess power* Geothermal, Hydro, Biomass, Biogas PP all capacity.

03

## **Agreement Price:**

- Hydro Power Plant Peaker for all capacity
- Waste PP, Biofuel PP, Ocean Energy PP for all capacity

04

**FiT Price with no Location Factor** for Hydro PP, PV, **Wind PP** built entirely by State Budget/Grant

05

**HPT with no Location Factor** for Geothermal, Hydro PP, PV and **Wind PP** built partially by State Budget/Grant and Biomass PP, Biogas PP and Waste PP built entirely by State Budget/Grant

06

**The agreement price requires the approval from the Minister of EMR**

07

**The provision of electricity purchase price is evaluated 3 years at the most.**

08

In the event the evaluation resulting in price change, **the provision of price change is regulated by Ministerial Regulation.**





# Prices of Electricity Generated by Wind Power in President Regulation on Renewable Energy ( Final Draft )

## Pembangkit Listrik Tenaga Bayu (PLTB)

| Capacity<br>(MW) | Feed In Tarrif    |                    | Highest Benchmark Price (HPT) (Tender) |                    |                   |                    |
|------------------|-------------------|--------------------|----------------------------------------|--------------------|-------------------|--------------------|
|                  | ≤ 5 MW            |                    | >5 MW s.d 20 MW                        |                    | >20 MW            |                    |
|                  | Staging year 1-10 | Staging year 11-30 | Staging year 1-10                      | Staging year 11-30 | Staging year 1-10 | Staging year 11-30 |
| (cent \$/kWh)    | 13,57 x F         | 8,48               | 13,57 x F                              | 8,48               | 11,31 x F         | 7,07               |
| LCOE c\$/kWh)    | 12,00             |                    | 12,00                                  |                    | 10,00             |                    |

## Pembangkit Listrik Tenaga Bayu (PLTB) + BESS

| Capacity<br>(MW) | Feed In Tarrif    |                    |             | Highest Benchmark Price (HPT) (Tender) |                    |             |                   |                    |             |
|------------------|-------------------|--------------------|-------------|----------------------------------------|--------------------|-------------|-------------------|--------------------|-------------|
|                  | ≤ 5 MW            |                    |             | >5 MW s.d 20 MW                        |                    |             | >20 MW            |                    |             |
|                  | Staging year 1-10 | Staging year 11-30 | HPT battery | Staging Year 1-10                      | Staging year 11-30 | HPT battery | Staging year 1-10 | Staging year 11-30 | HPT battery |
| (cent \$/kWh)    | 13,57 x F         | 8,48               | 7,20        | 13,57 x F                              | 8,48               | 7,20        | 11,31 x F         | 7,07               | 6,00        |
| LCOE c\$/kWh)    | 12,00             |                    |             | 12,00                                  |                    |             | 10,00             |                    |             |

### Some References

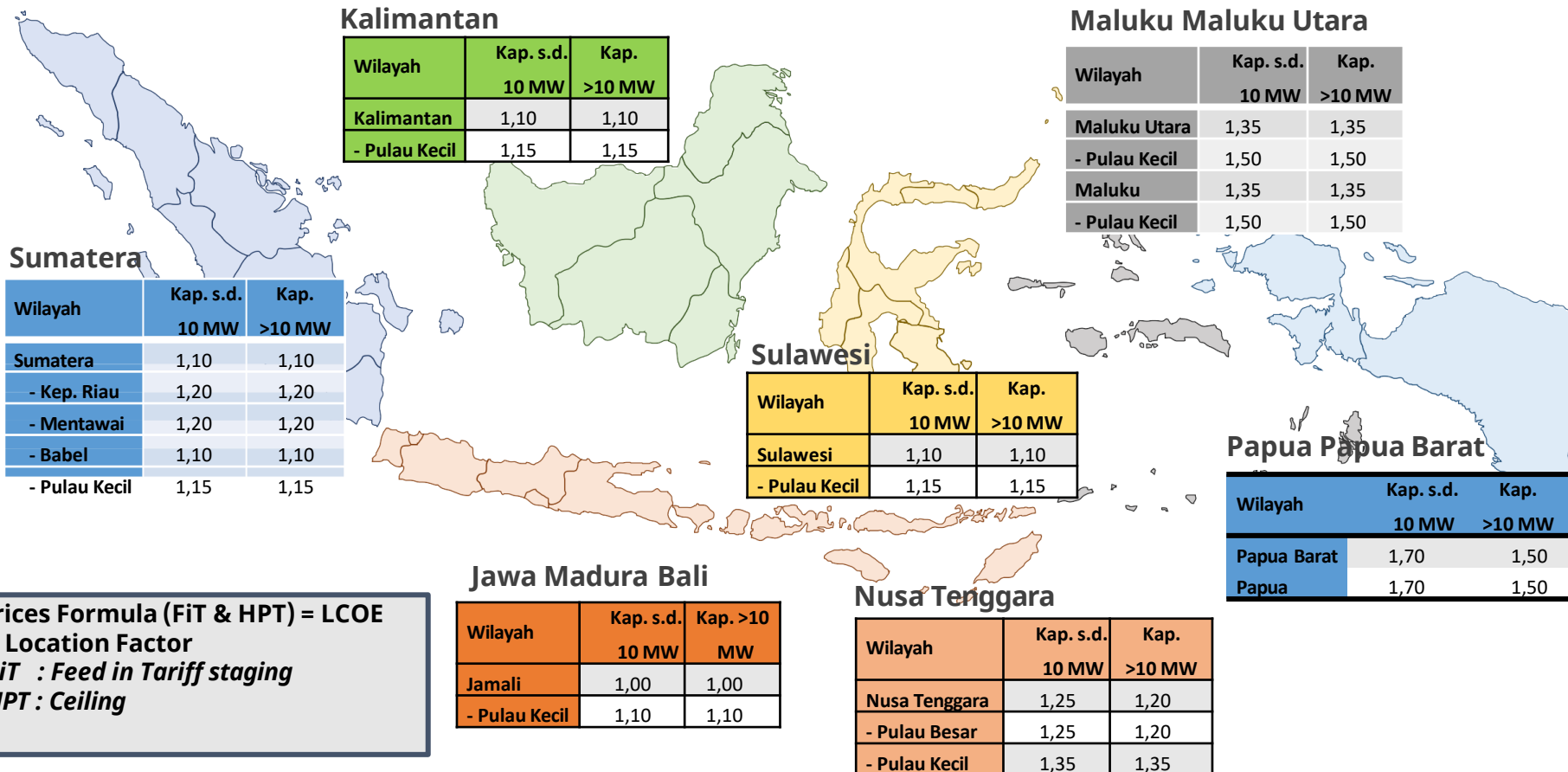
PLTB Sidrap, 70 MW , investment cost US\$150 billion or Rp 2,02 trillion with PPA: cent \$ 11/kWh or Rp 1.463/kWh for 30 years.

PLTB Jeneponto , 65 MW, investment cost US\$ 150 million and PPA US\$ 10,89 cents/kWh (MEMR, 2017)

Feasibility Study of Probolinggo of 20 x10 kW with investment cost of about Rp. 52 Billion and PPA Rp 2.627,-/kWh equal to cent \$ 11.6/kWh (MEMR, 2016)



# LOCATION FACTOR (F)



• Prices Formula (FiT & HPT) = LCOE x Location Factor  
*FiT : Feed in Tariff staging*  
*HPT : Ceiling*



# PROJECTS & OPPORTUNITIES



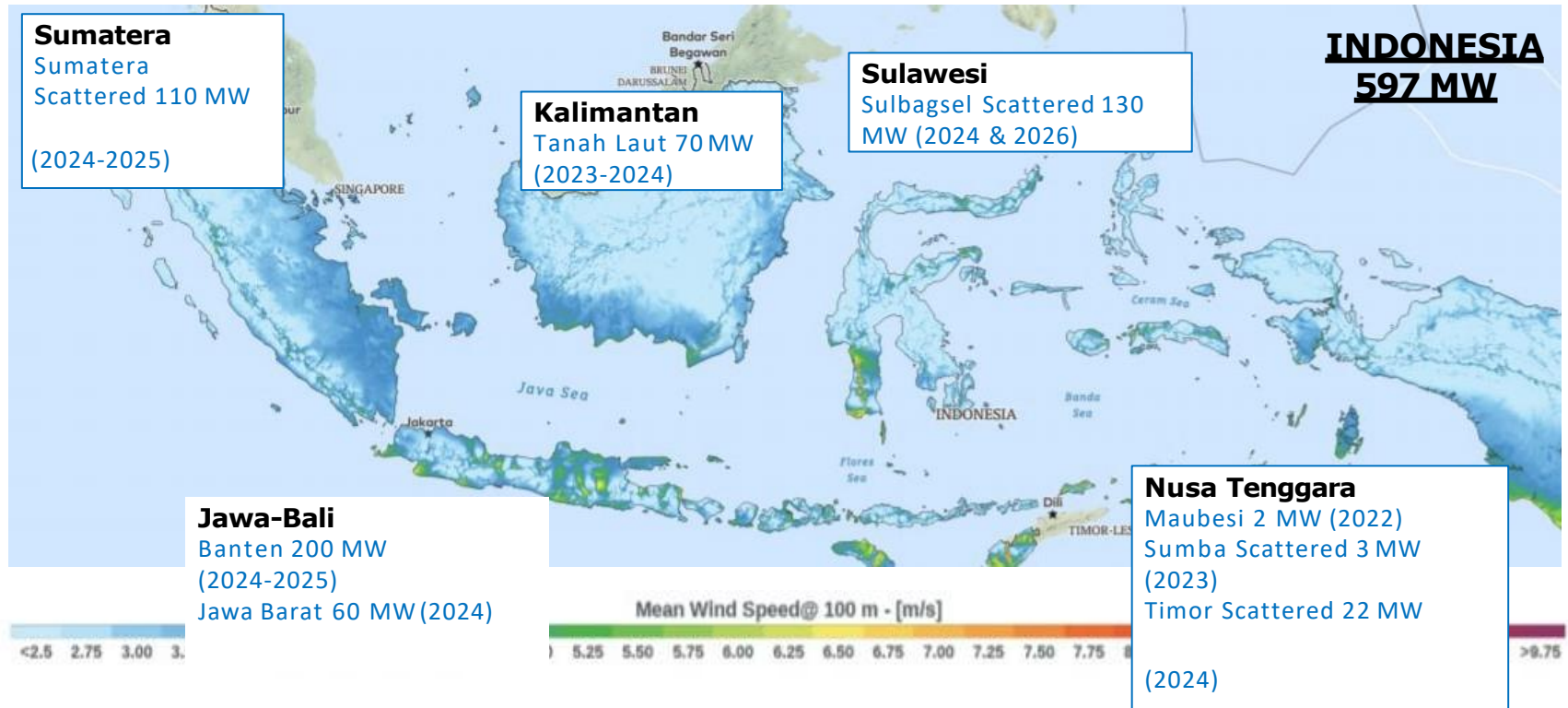
# Wind Power Project in Next Ten Years (Green RUPTL 2021-2030)

Base on the National Master Plan of Power Supply (RUPTL 2021-2030), Indonesia to add power plant of 40.6 GW for 10 years with the portion of NRE reaching 20.9GW or 51.6%. It is planned to retire coal generators of 1.1GW and replacement of old Diesel/Gas plants around 3.6GW so that PLN's generating capacity in 2030 will be 99.2GW.

| TYPE                 | [MW]          | [%]        |
|----------------------|---------------|------------|
| <b>NEW RENEWABLE</b> | 20.923        | 51,6       |
| Hydro                | 10.391        | 25,6       |
| <b>Wind</b>          | <b>597</b>    | <b>1,5</b> |
| Bioenergy            | 590           | 1,5        |
| Geothermal           | 3.355         | 8,3        |
| Solar                | 4.680         | 11,5       |
| NRW Base             | 1.010         | 2,5        |
| BESS                 | 300           | 0,7        |
| <b>FOSSIL</b>        | 19.652        | 48,4       |
| Coal                 | 13.819        | 34,0       |
| Gas                  | 5.828         | 14,4       |
| Diesel               | 5             | 0,01       |
| <b>TOTAL</b>         | <b>40.575</b> | <b>100</b> |

| COD Plan |      |      |      |      |      |      |
|----------|------|------|------|------|------|------|
| Year     | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
| MW       | -    | 2    | 33   | 337  | 155  | 70   |

# Wind Power Development in Indonesia Base on Green RUPTL 2021 - 2030





# Wind Power Project in Indonesia



| No       | Developer                        | Location                  | # Unit | Unit Capacity      | Total Capacity | COD Year   |
|----------|----------------------------------|---------------------------|--------|--------------------|----------------|------------|
| <b>A</b> | <b>Operation</b>                 |                           |        |                    |                |            |
| 1        | UPC Renewable                    | Sidrap, South Sulawesi    | 1      | 70                 | 70             | 2018       |
| 2        | Vena Energy                      | Jeneponto, South Sulawesi | 1      | 60                 | 60             | 2019       |
| <b>B</b> | <b>RUPTL 2021-2030</b>           |                           |        |                    |                |            |
| 1        | PLN                              | Sumatera                  | 2      | 55                 | 110            | 2024, 2025 |
|          |                                  | Banten                    | 2      | 100                | 200            | 2024, 2025 |
|          |                                  | Timor, NTT                |        |                    | 2              | 2022       |
| 2        | IPP                              |                           |        |                    |                |            |
|          |                                  | West Java                 |        |                    | 60             | 2024       |
|          |                                  | Kalimantan                | 2      | 30, 40             | 70             | 2023,2024  |
|          |                                  | Sulawesi Tersebar         | 2      | 60, 70             | 130            | 2024, 2026 |
|          |                                  | Timor, NTT                | 2      | 11                 | 22             | 2024       |
|          |                                  | East Sumaba, NTT          |        |                    | 3              | 2023       |
|          |                                  |                           |        |                    | <b>597</b>     |            |
| <b>C</b> | <b>Terminated</b>                |                           |        |                    |                |            |
|          | 1. PLTB Sukabumi 10 MW ( Rp >>>  |                           |        | project terminated |                |            |
|          | 2. PLTB Samas 50 MW ( 12,51 <>>> |                           |        | project terminated |                |            |

# OPPORTUNITIES – 1: LIST OF LOCATIONS MENTIONS RUPTL (POTENTIAL PROJECTS)



## Sumatera 180 MW

Aceh Besar, Padang Sidempuan

## Java 1188 MW

|                     |        |
|---------------------|--------|
| PLTB Kab Lebak      | 150 MW |
| PLTB Kab Pandeglang | 200 MW |
| PLTB Cirebon        | 85 MW  |
| PLTB Garut          | 150 MW |
| PLTB Sukabumi       | 170 MW |
| PLTB Samas          | 50 MW  |
| PLTB Tegal          | 132 MW |
| PLTB Gunung Kidul   | 10 MW  |
| PLTB Samas Bantul   | 50 MW  |
| PLTB Banyuwangi     | 75 MW  |
| PLTB Probolinggo    | 50 MW  |
| PLTB Tuban          | 66 MW  |

## Kalimantan 70 MW

PLTB Tanah Laut 70 MW

## Bali 60 MW

|                            |       |
|----------------------------|-------|
| PLTB Lembongan/N. Ceningan | 20 MW |
| PLTB Nusa Penida           | 20 MW |
| PLTB Bali Utara            | 20 MW |

## Sulawesi 458 MW

|                       |        |
|-----------------------|--------|
| PLTB Bitung           | 63 MW  |
| PLTB Selayar          | 5 MW   |
| PLTB Sidrap Expansion | 63 MW  |
| PLTB Jeneponto II     | 72 MW  |
| PLTB Bulukumba        | 50 MW  |
| PLTB Bantaeng         | 100 MW |
| PLTB Takalar          | 60 MW  |
| PLTB Buton            | 15 MW  |
| PLTB Majene           | 30 MW  |

## Maluku 50 MW

|                            |       |
|----------------------------|-------|
| PLTB Ambon                 | 20 MW |
| PLTB Ambon                 | 15 MW |
| PLTB Maluku Tenggara Barat | 5 MW  |
| PLTB Kei kecil             | 5 MW  |
| PLTB Nusa Saumlaki         | 5 MW  |

## Papua 108 MW

|                  |       |
|------------------|-------|
| PLTB Papua       | 50 MW |
| PLTB Papua Barat | 58 MW |

## Nusa Tenggara 171 MW

|                       |        |
|-----------------------|--------|
| PLTB Lombok           | 115 MW |
| PLTB Mandalika        | 30 MW  |
| PLTB Oelbubuk – Timor | 20 MW  |
| PLTB Sumba            | 3 MW   |
| PLTB Sumba Timur      | 3 MW   |


**Total 2.285 MW**


# OPPORTUNITIES – 2 DIESEL CONVERSION PROGRAM




## Diesel Conversion Program Phase 2 (Converted to any RE close to Diesel Generator locations)


Small Scale in remotes, small 1-5 MW, dozen location in a cluster .

 Recording



 **BUMN** UNTUK INDONESIA

International Seminar :  
**Renewable Energy Technology  
 as Driver for Indonesia's  
 De-Dieselization**

 **PLN**




Talking: SEMINAR ROOM

**Wiluyo Kusdiharto**  
Director of Mega Project, PLN

### Concept of Clustering in De-dieselization



**Clustering Concept**

To improve **project optimization**, **location clustering** will be carried out by considering the economic value, project size & geographical location of each PLTD. Phase I consists of 8 clusters.

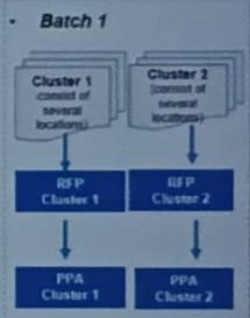
Technology for Phase I, will be **PV + BESS (Battery Energy Storage System)** hybrid with existing PLTD.

**Modular incremental development** will be implemented for accommodating demand growth by adding capacity in stages. This model is suitable for isolated off-grid areas, where characteristics of demand growth are different and tend to be stable, as well as the only source of supply in that area.

**Overview of Procurement**

- PLN has launched procurement of De-dieselization on March 1<sup>st</sup>, 2022. Bidders invited from PLN Shortlist Company (DPT)
- Procurement will be carried out in several batches consisting of several clusters. Each cluster has separated RFP consist of several locations.
- Participants are free to offer technology that will be chosen while prioritizing reliability, efficiency & economy.

**Batch 1**



```

      graph TD
        C1[Cluster 1  
(consist of several locations)] --> RFP1[RFP Cluster 1]
        C2[Cluster 2  
(consist of several locations)] --> RFP2[RFP Cluster 2]
        RFP1 --> PPA1[PPA Cluster 1]
        RFP2 --> PPA2[PPA Cluster 2]
    
```

| Cluster | Province                 | Location | PLTD (MW) |
|---------|--------------------------|----------|-----------|
| I       | Sulawesi & Maluku Utara  | 38       | 55,03     |
| II      | Sulawesi & Nusa Tenggara | 18       | 38,95     |
| III     | Maluku & Papua           | 24       | 30,15     |
| IV      | Jawa Madura              | 9        | 19,17     |
| V       | Kalimantan I             | 27       | 17,08     |
| VI      | Kalimantan II            | 19       | 18,63     |
| VII     | Sumatera I               | 23       | 18,43     |
| VIII    | Sumatera II              | 25       | 14,60     |
| TOTAL   |                          |          | 212,04    |

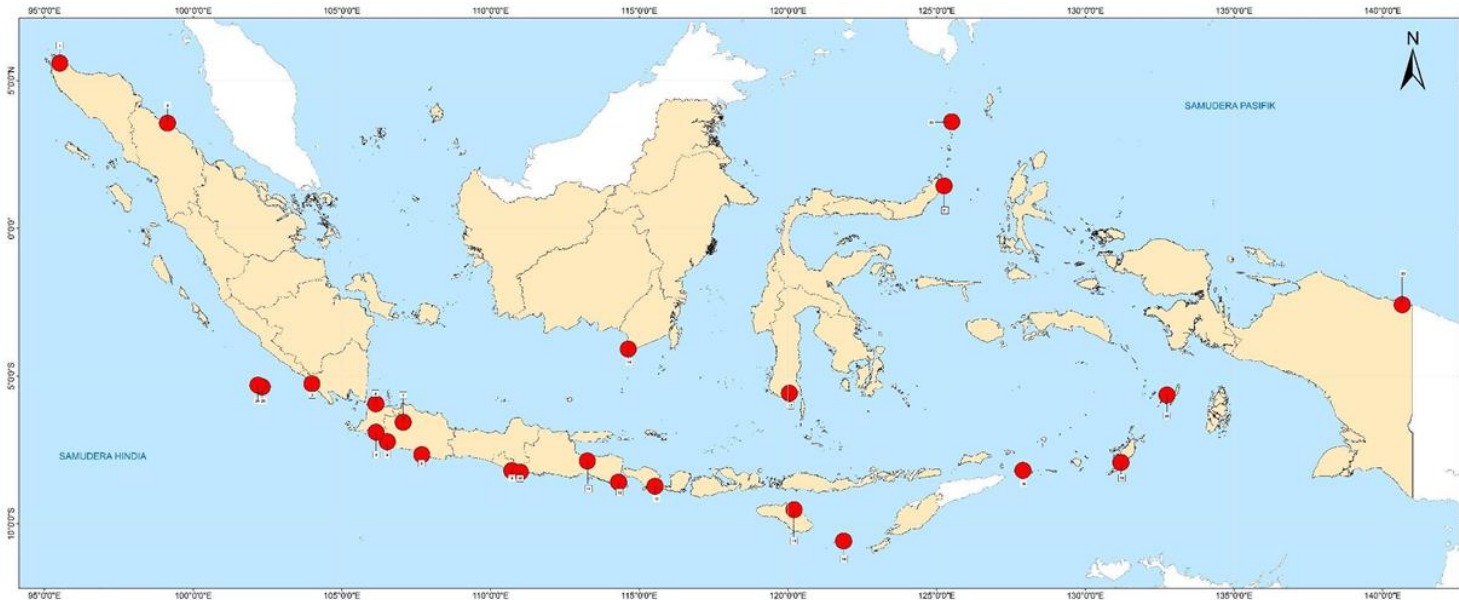
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INDONESIA  
2022

# OPPORTUNITIES – 3 : Efforts by Developers



1. RUPTL is a dynamic plan: Intermittent Generation PLTS/PLTB Tersebar (spread) planned in Java almost 3GW, only 60 MW for Wind. Wind is less intermittent compare to Solar. So prepare ready projects and propose to PLN.
2. Partnership with SOEs (51:49)
3. Initiator for Wind Off-Shore
4. Partnership with Public Services Agency (BLU P3Tek)



P3Tek, Wind  
Measurement  
Locations

# OPPORTUNITIES – 4 : 10 GW ++ Gap Up To 2025



## Target as NEP/RUEN :

23% share Renewable Energy on National Energy equal 45.GW Installed Capacity.

## Current Status :

Installed Capacity around less than 10% or 11,2 GW.

## Gap up to 2025 : 33 GW

## How to Fulfil the 33 GW Gap?

1. Green RUPTL up to 2025 around 11 GW, including PLN Green Booster Program; Cofiring Biomass on PLTU, Special Solar PV Project (Floating & Building), De-dieselization, Hydro (using Dam)
2. Green RUPTL 2026-2030, around 10 GW
3. **10-12 GW ??, (Hope open for Initiation, Proposal) as long no issues on Demand**

**With Wind Ready Resources, New Wind Power can develop in 3 years or less !!**

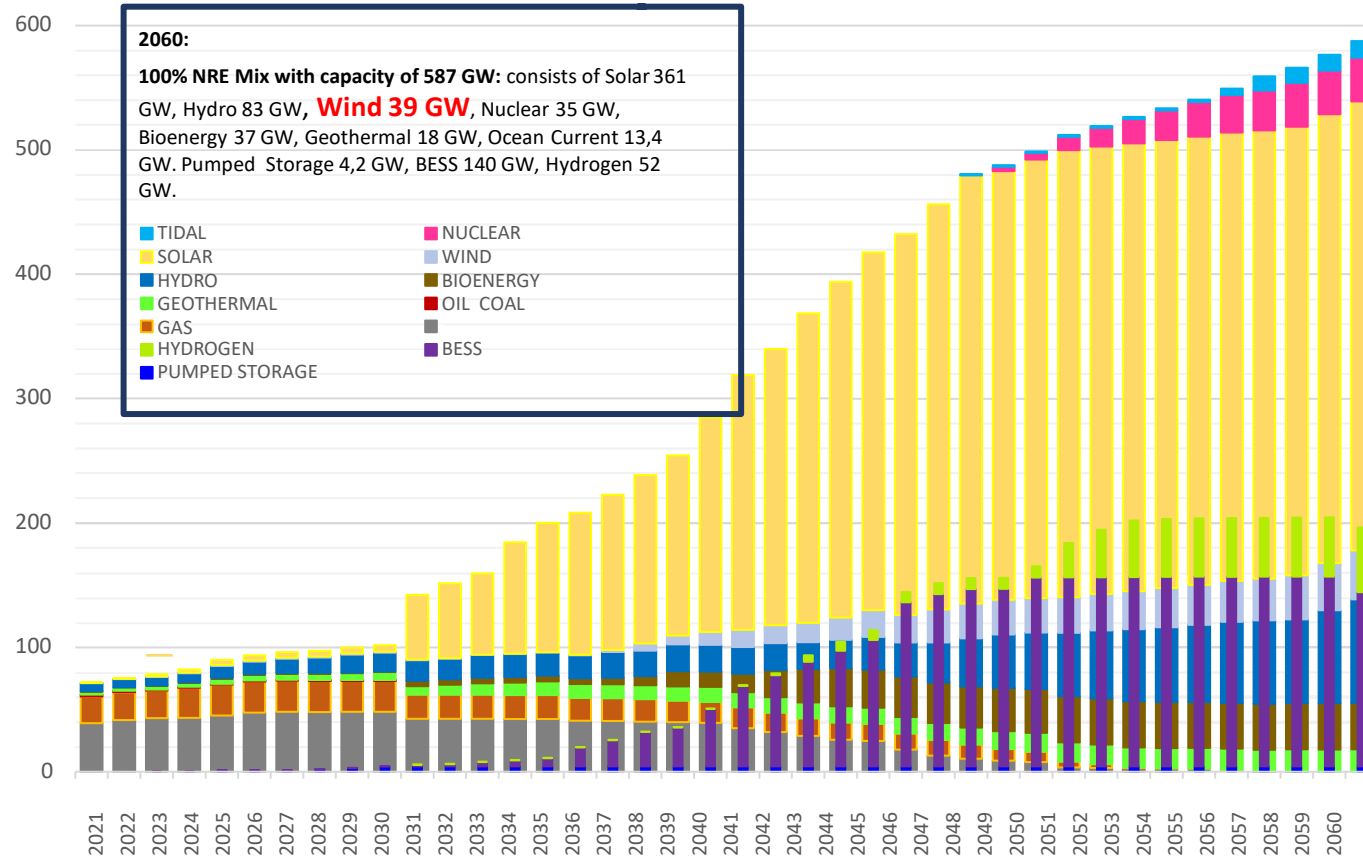


# OPPORTUNITIES – 5 : FUTURE ELECTRICITY SUPPLY PLAN



VRE as the backbone, with PV's domination

Capacity :Giga Watt

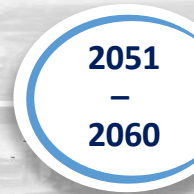


- 1 **Coal/Gas PP:** No additional CFPP unless contracted/under construction. PLN CFPP will be retired earlier than asset revaluation. IPP CFPP retired after PPA ends. Gas PP retired after 30 years (residual < 1 GW, CFPP: 2057, Gas PP: 2054).
- 2 **NRE:** Additional power plant after 2030 will only come from NRE. Starting from 2035, it will be dominated by Variable Renewable Energy (VRE) in form of Solar PP, followed by Wind PP and Ocean Current PP in the following year.
- ~~3 **Geothermal PP:** Maximized up to 75% of its potential.~~
- 4 **Hydro PP:** Will be maximized and sent to load center in other islands. Serves to balance VRE power plants.
- 5 **STORAGE:** Pumped storage start in 2025, Battery Energy Storage System (BESS) massively used in 2021. Hydrogen will be utilized gradually starting from 2031 and massively by 2051.
- 6 **Nuclear PP:** Enter the system in 2049 to maintain system reliability and will reach 35 GW by 2060.

# OPPORTUNITIES - 5 ROADMAP OF ENERGY TRANSITION TO NZE



75%-85% Final Energy is Electricity ( at present only around 20%), Indonesia need around 2000TWh by 2060 from Green and Clean Energy, VRE (Solar and Wind) and all other RE will be the sources of Electricity, At least 40 GW Wind power to develop by 2060.



**2025: Emission reduction**  
198 Million tons CO<sub>2</sub>

**Supply:**

- Implementation of 3.6 GW PV Rooftop
- Construction of NRE PP with capacity of 10.6 GW
- Gasification PP 1.7 GW
- Take out CFPP 8.8 GW on RUPTL
- Convert Diesel PP to NRE PP
- Gas PP 0.8 GW as a replacement for CFPP

**Demand:**

- Electric vehicles 400 thousand cars and 1.7 million motorcycles
- City gas (Jargas) for 8.2 million households
- Gas fueled cars 100 thousand
- Application of Energy Management and SKEM
- Decrease in LPG imports with Induction cookers for 8.2 million households

**2030: Emission reduction**  
314 Million tons CO<sub>2</sub>

**Supply:**

Construction of 10.3 GW NRE PP to replace CFPP

**Demand:**

- Decrease in LPG imports with Induction cookers for 18.2 million households
- Electric Vehicles 2 million cars and 13 million motorcycles
- City gas (Jargas) for 10 million households
- Gas fueled cars 300 thousand
- DME utilization as LPG substitution for 20.4 million households
- Application of Energy Management and SKEM

**2035: Emission reduction**  
475 Million tons CO<sub>2</sub>

**Supply:**

- No additional fossil PP
- No Diesel PP
- Retirement CFPP 6 GW<sup>\*)</sup>
- Construction of NRE PP: PV 99 GW, Hydro 3.1 GW, Bioenergy 3.1 GW and Geothermal PP 5.6 GW
- Hydrogen utilization 328 MW
- Battery utilization 7 GW

**Demand:**

- Induction cooker for 28.2 million households
- Electric Vehicles 5.7 million cars and 46.3 million motorcycles
- City gas (Jargas) for 15.3 million households
- Gas fueled cars 800 thousand

**2040: Emission reduction**  
796 Million tons CO<sub>2</sub>

**Supply:**

- Retirement CFPP 3 GW<sup>\*)</sup>
- Construction of NRE PP: PV 68.5 GW, **Wind PP 9.4 GW**, Hydro 3.7 GW, Bioenergy 7.8 GW, and Geothermal 1 GW
- Hydrogen utilization 332 MW
- Battery utilization 46 GW

**Demand:**

- Induction cooker for 38,2 million households
- Electric vehicles 12.3 million cars and 105 million motorcycles
- City gas (Jargas) for 20.3 million households
- Gas fueled cars 2 million

**2050: Emission reduction**  
956 Million tons CO<sub>2</sub>

**Supply:**

- Retirement CFPP 31 GW
- Construction of NRE PP: PV 180.2 GW, **Wind PP 17.5 GW**, Hydro 13.7 GW, Bioenergy 23 GW, Geothermal 3 GW, Ocean current PP 1.3 GW and Nuclear PP 5 GW
- Hydrogen utilization 9 GW
- Battery utilization 151 GW

**Demand:**

- Induction cooker for 48.2 million households
- Electric vehicles 38.2 million cars and 205 million motorcycles
- City gas (Jargas) for 23.4 million households
- Gas fueled cars 2.8 million

**2060: Emission reduction**  
1.526 Million tons CO<sub>2</sub>

**Supply:**

- Retirement CFPP 8 GW<sup>\*)</sup>
- Retirement Gas PP 8 GW
- Construction of NRE PP: 8.2 GW, **Wind PP 11.6 GW**, Hydro 37.9 GW, Bioenergy 2.1 GW, Geothermal 3 GW, Ocean current 12.1 GW and Nuclear PP 30 GW
- Hydrogen utilization 52 GW
- Battery utilization 140 GW

**Demand:**

- Induction cooker for 58 million households
- Electric vehicles 69.6 million cars and 229 million motorcycles
- City gas (Jargas) for 23.9 million households

# CHALLENGES & CONCLUSIONS

# GENERAL RE CHALLENGES



What is faced by Wind Energy and other Renewable Energy in Indonesia in the last 5 years is a difficult situation for several reasons;

Under Demand / Negative Growth Conditions (due to Covid-19)

Competition among all types of Renewable Energy with a potential around 3600 GW while the potential for new projects in the next 10 years is less than 20 GW.

## GENERAL CHALLENGES

- Absence of workable regulations
- TKDN Policy vs Market Fact
- Expected Cheaper Tariff RE vs Subsidies for fossil energy (DMO and coal price caps)
- Uncertainty of RUPTL
- Delay of Procurement / Project Delays

# WIND POWER CHALLENGES

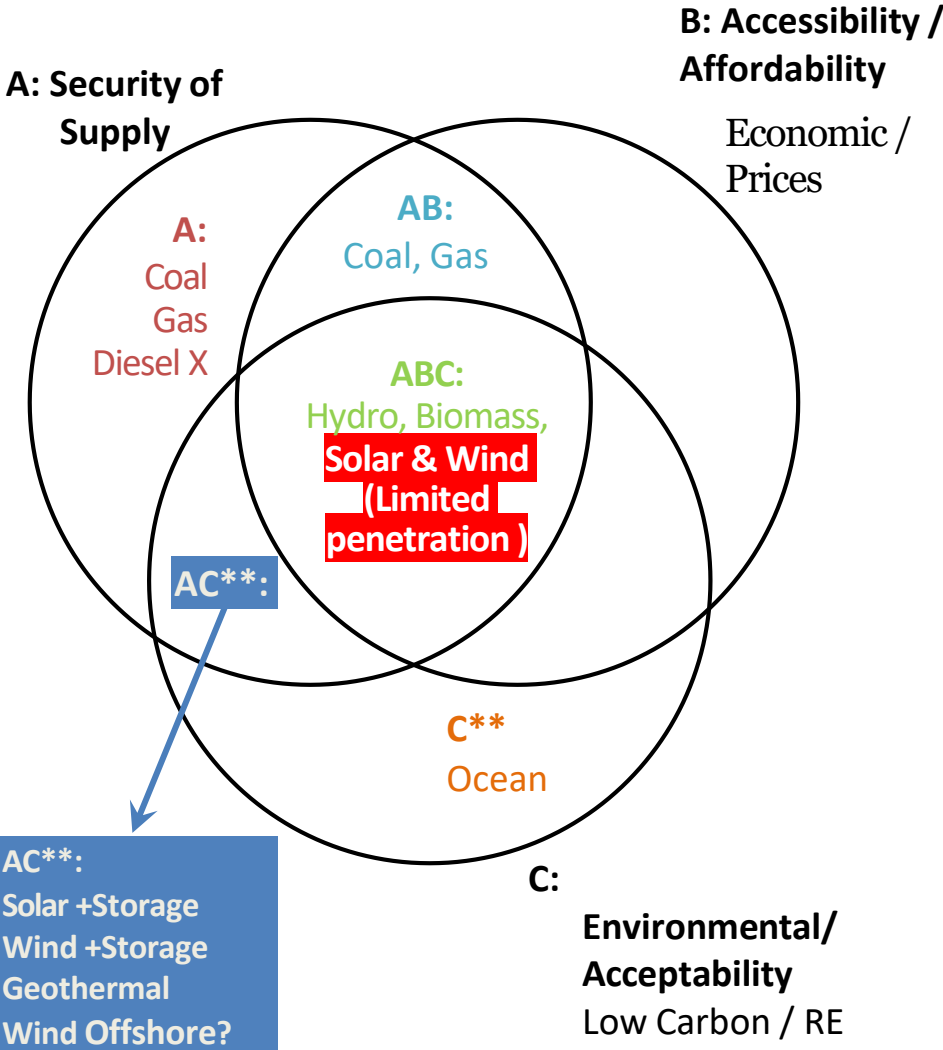


1. Intermittency Issues, Limited Penetration
2. Wind vs Solar → Solar is Preferable
3. Uncertainty of more than 2GW Wind Ready Resources, when and who will to develop?
4. Lack of Regulations ; Prices, Tender, Free Wind Measurement vs License to Develop
5. PLN “likely” to develop many Wind Power
6. Absence of Wind Power TKDN (Domestic Preferences)
7. Absence of Regulations for Small Scale Wind Power (less than 1 MW)
8. Affordability of Wind Power + BESS and Offshore Wind (Not Affordable Yet)

# NRE Plants vs Trilemma Energy Indonesia



## Security, Affordability dan Acceptability



If you have technology or initiation using other power plant such as; Nuclear, Hydrogen, Wind Offshore, CCUS or others, please locate on this Trilemma Diagram

Presidential regulation related to NRE, which has **been** awaited for more than 2 years, will change the level of B - "Affordability" and more NRE Plants will meet the ABC criteria

### Priorities

1. Prioritizing NRE generators that do not increase BPP much: ABC Criteria
2. More Solar to develop PLTS because the prices tends to fall, Floating Solar and inline with Solar Industry Development
3. Conversion Fossil Fuel to NRE
  - Co-firing Biomass
  - De-dieselization
  - Others Green Booster Project

# CONCLUSIONS



1. Be optimistic, conditions will soon change for the better and only NRE New Plant to build after 2025
2. Study All Opportunities 1-5, if any possible, try to follow up with a proposal to help the government fill the installed capacity gap



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**PLN DPT CONSULTANCY SERVICES**

## **What is DPT or List of Selected Providers ?**

**DPT or List of Selected Providers is a list of Special Providers of goods (manufacturers)/services (developer/IPP) declared to have passed by PLN through a qualification assessment mechanism which is updated periodically based on the performance of the providers of goods/services.**

自**2017**年年底以来，只有入选**PLN DPT**名单的公司才能参与可再生能源项目的采购流程。

# 目前开放申请的DPT

# DPT OPEN FOR APPLICATION

## Manufacture

Photovoltaic Solar Module Manufacture

## IPP Power Developer

IPP Biogas Power Plant (PLTBg)

IPP Biomass Power Plant (PLTBm)

IPP Wind Power Plant (PLTB)

IPP Solar PV Power Plant (PLTS)

IPP Geothermal Power Plant (PLTP)

TERIMA KASIH  
THANK YOU  
謝謝

