POWER AND ENERGY INFRASTRUCTURE
DEVELOPMENT, CHALLENGES AND OPPORTUNITIES

BIMP-EAGA Virtual Symposium Series

presented by:
Senda H. Kanam
Coordinator of Electricity Cooperation

18 November 2021
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<td>5</td>
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ASEAN ENERGY COOPERATION
ASEAN ENERGY COOPERATION

APAEC
ASEAN Plan of Action for Energy Cooperation 2016 - 2025

Theme: Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All

Sub-theme: Accelerating Energy Transition and Strengthening Energy Resilience through Greater Innovation and Cooperation.

Programme Area:

- ASEAN Power Grid
  - To initiate multilateral electricity trade

- Trans-ASEAN Gas Pipeline
  - To enhance connectivity for energy security and accessibility

- Coal and Clean Coal Technology
  - To enhance the image of coal through promotion of CCT.

- Energy Efficiency and Conservation

- Renewable Energy

- Regional Energy Policy and Planning

- Civilian Nuclear Energy
  - To better profile the energy sector internationally
  - To build capabilities in policy, technology and regulatory aspects of nuclear energy

APAEC Phase I
- Increase RE to 23% by 2025 in Total Primary Energy Supply.
- Reduce EI by 20% in 2020 based on 2005 level.

APAEC Phase II
- Increase RE to 23% by 2025 in Total Primary Energy Supply.
- Achieve 35% share of RE in installed power capacity by 2025
- Reduce EI by 32% in 2025 based on 2005 level.

Ref. www.aseanenergy.org

www.gatrik.esdm.go.id

To initiate multilateral electricity trade

To enhance connectivity for energy security and accessibility

To enhance the image of coal through promotion of CCT.

To better profile the energy sector internationally

To build capabilities in policy, technology and regulatory aspects of nuclear energy
ASEAN POWER GRID

### Status vs MW

<table>
<thead>
<tr>
<th>Status</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing</td>
<td>7,720</td>
</tr>
<tr>
<td>Ongoing (up to 2021)</td>
<td>555 - 625</td>
</tr>
<tr>
<td>Future</td>
<td>18,369 - 21,769</td>
</tr>
<tr>
<td>Grand Total</td>
<td>26,644 - 30,114</td>
</tr>
</tbody>
</table>

**Early COD**

1. P. Malaysia – Singapore
   - Julien – Woodlands
   - P. Malaysia – Singapore
2. Thailand – P. Malaysia
   - Saado – Chuping
   - Khlong Ngae – Guru
   - Su Ngal Kolek – Rantau Panchor
   - Khlong Ngae – Guru (2nd Phase, 300MW)
3. Sarawak – P. Malaysia
4. P. Malaysia – Sumatra
5. Banten – Singapore
6. Sarawak – West Kalimantan
7. Philippines – Sabah
8. Sarawak – Sabah – Brunei
   - Sarawak – Brunei
   - Sarawak – Sabah
9. Thailand – Lao PDR
   - Nakhon Phanom – Tham Hinboun
   - Ubon Ratchathani 2 – Mouay Kho
   - Roi Et 2 – Suannakhon – Nhm 2
   - Udon Thani 3 – Na Song 2 – Nam Ngum 2
   - Nakhon Phanom 2 – Tha Khieot – Tham Hinboun (Exp.)
   - Mae Moh 3 – Nam 2 – Hong Sa (300MW)
   - Udon Thani 3 – Nobang (converted to 500KV)
   - Ubon Ratathani 3 – Pakse – Xe Plun Xe Namnoi
   - Khon Kaen 4 – Loei 2 – Xayaburi
   - Thailand – Lao PDR (New)
10. Lao PDR – Vietnam
    - Xekaman 3 – Thanh My
    - Xekaman 1 – Pleiku 2
    - Nam Mo – Ban Ve
    - Luang Prabang – Nho Quan
11. Thailand – Myanmar
12. Vietnam – Cambodia (New)
    - Chau Doc – Ta Keo – Phnom Penh
    - Toy Ninh – Sung Truong
13. Lao PDR – Cambodia
    - Ban Hat – Kampeng Srlao
    - Ban Hat – Sung Truong
14. Thailand – Cambodia (New)
    - Watthana Nakhon – Anayaprathe – Banheay Meancheay
    - Thailand – Cambodia
15. East Sabah – North Kalimantan
16. Singapore – Sumatra

**The Existing Project as of August 2020**
The Priority Projects, which refer to the APAEC 2016-2020, are underlined and indicated in Red.
TBC stands for to be confirmed

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The Existing Project as of August 2021

Legend:
- Existing
- Under Construction
- Future

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Info Gatrik
### Updating APG List: opportunities to expand the interconnections

<table>
<thead>
<tr>
<th>No</th>
<th>Connection (Unit: MW)</th>
<th>Current APG list</th>
<th>Base Case (Existing PDP)</th>
<th>ASEAN RE Target Case</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2020</td>
<td>Additional / Ongoing</td>
<td>Future</td>
</tr>
<tr>
<td>1</td>
<td>P. Malaysia - Singapore</td>
<td>525</td>
<td>525</td>
<td>1,050</td>
</tr>
<tr>
<td>2</td>
<td>Thailand - P. Malaysia</td>
<td>300</td>
<td>400</td>
<td>700</td>
</tr>
<tr>
<td>3</td>
<td>P. Malaysia - Sarawak</td>
<td>1,600</td>
<td>1,600</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>P. Malaysia - Sumatra</td>
<td>600</td>
<td>600</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Batam - Singapore</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Sarawak - Kalimantan</td>
<td>230</td>
<td>230</td>
<td>230</td>
</tr>
<tr>
<td>7</td>
<td>Philippines - Sabah</td>
<td>500</td>
<td>500</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Sarawak - Sabah - Brunei</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Sarawak - Sabah - Brunei</td>
<td>30-100</td>
<td>50-300</td>
<td>80-400</td>
</tr>
<tr>
<td></td>
<td>Sabah - Sarawak</td>
<td>0</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>9</td>
<td>Thailand - Lao PDR</td>
<td>5,427</td>
<td>1,310</td>
<td>6,737</td>
</tr>
<tr>
<td>10</td>
<td>Lao PDR - Vietnam</td>
<td>538</td>
<td>5,000</td>
<td>5,538</td>
</tr>
<tr>
<td>11</td>
<td>Thailand - Myanmar</td>
<td>11,709-14,859</td>
<td>11,709-14,859</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>Vietnam - Cambodia</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>13</td>
<td>Lao PDR - Cambodia</td>
<td>200</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>14</td>
<td>Thailand - Cambodia</td>
<td>230</td>
<td>2,200</td>
<td>2,430</td>
</tr>
<tr>
<td>15</td>
<td>Sabah - Kalimantan</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>Sumatra - Singapore</td>
<td>0</td>
<td>0</td>
<td>600</td>
</tr>
<tr>
<td>17</td>
<td>Lao PDR - Myanmar (New)</td>
<td>0</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>18</td>
<td>Internal Indonesia (New)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Java – Kalimantan</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Sumatra – Java</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Existing total</td>
<td>7,650</td>
<td>7,650</td>
<td>8,735</td>
</tr>
<tr>
<td></td>
<td>Total Additional Connection Required</td>
<td>555-625</td>
<td>23,369-28,769</td>
<td>31,574-35,044</td>
</tr>
</tbody>
</table>

- Compared to the existing APG list, AIMS III identified the possible opportunities to increase the interconnection capacities, and add the new interconnections (e.g. LAO-MYR).

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ASEAN RENEWABLE ENERGY POTENTIAL

The potential of renewable energy sources in ASEAN countries according to the IEA (International Energy Agency).
Additional planned interconnection projects will unlock potential power trade of 145,635 GWh (a 218% increase over current levels).

With 44% of the capacity as RE, this translates into 64,079 GWh of RE.
RE share was 33.5% in 2020, only 1.5% gap from 2025 target

- Most of the increase in RE has been in hydro and bioenergy; solar and wind began to increase sharply in 2015.
- Despite different RE potential among the AMS, all their shares of RE increased.
Annex 4:
AMS’ Renewable Energy Targets

- ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025 Phase 2: 2021-2025: To achieve aspirational target for increasing the share of renewable energy to 23% by 2025 in the ASEAN energy mix, including through increasing the share of RE in installed power capacity to 35% by 2025.

<table>
<thead>
<tr>
<th>ASEAN Member States</th>
<th>RE share in installed power capacity (%)</th>
<th>RE Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunei Darussalam</td>
<td>0.2%</td>
<td>10% of RE in power generation mix by 2035.</td>
</tr>
<tr>
<td>Cambodia</td>
<td>54.8%</td>
<td>55% of hydro and 10% of other RE in power generation mix by 2030.</td>
</tr>
<tr>
<td>Indonesia</td>
<td>14.8%</td>
<td>23% of RE in Total Primary Energy Supply (TPES) by 2025, 31% by 2050.</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>83.4%</td>
<td>30% of RE in Total Final Energy Consumption (TFEC) by 2025, including 20% output by RE (excluding large hydropower).</td>
</tr>
<tr>
<td>Malaysia</td>
<td>24.6%</td>
<td>31% of RE in installed capacity by 2025.</td>
</tr>
<tr>
<td>Myanmar</td>
<td>49.4%</td>
<td>20% of RE in installed capacity by 2025 (excluding large scale hydropower).</td>
</tr>
<tr>
<td>Philippines</td>
<td>29.1%</td>
<td>RE in installed capacity to reach 15.3GW in 2030 and 20GW in 2040.</td>
</tr>
<tr>
<td>Singapore</td>
<td>4.3%</td>
<td>Achieve the solar energy target of 1.5GWp in 2025 and 2GWp in 2030.</td>
</tr>
<tr>
<td>Thailand</td>
<td>30.3%</td>
<td>30.18% of RE in Total Final Energy Consumption (TFEC) in 2037.</td>
</tr>
<tr>
<td>Vietnam</td>
<td>55.8%</td>
<td>15-20% of RE share in Total Primary Energy Supply (TPES) by 2030, 25-30% by 2050.</td>
</tr>
<tr>
<td>ASEAN</td>
<td>33.5%</td>
<td>35% of RE in installed power capacity by 2025.</td>
</tr>
</tbody>
</table>
**AIMS III – Identified interconnection and the required cost (short/long term)**

**Potential interconnections and its capacities, all scenarios**

**Net Present Value of the System Cost, 2018-2040 (USD)**

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Base</th>
<th>Optimum RE</th>
<th>ASEAN RE Target</th>
<th>High vRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Generator Build Cost</td>
<td>89.3</td>
<td>88.2</td>
<td>86.4</td>
<td>69.9</td>
</tr>
<tr>
<td>Firm Units Build Cost (except vRE)</td>
<td>77.8</td>
<td>77.8</td>
<td>77.8</td>
<td>77.8</td>
</tr>
<tr>
<td>Interconnection Build Cost</td>
<td>0.7</td>
<td>2.4</td>
<td>3.0</td>
<td>16.2</td>
</tr>
<tr>
<td>Solar Build cost</td>
<td>10.9</td>
<td>13.9</td>
<td>34.7</td>
<td>58.9</td>
</tr>
<tr>
<td>Wind Build cost</td>
<td>5.9</td>
<td>3.4</td>
<td>10.1</td>
<td>24.8</td>
</tr>
<tr>
<td>Total Build costs</td>
<td>184.8</td>
<td>185.8</td>
<td>211.9</td>
<td>247.6</td>
</tr>
<tr>
<td>O&amp;M Cost</td>
<td>26.7</td>
<td>25.4</td>
<td>25.7</td>
<td>22.0</td>
</tr>
<tr>
<td>Fuel Cost</td>
<td>484.4</td>
<td>479.0</td>
<td>458.7</td>
<td>421.8</td>
</tr>
<tr>
<td>FO&amp;M Cost</td>
<td>75.2</td>
<td>74.9</td>
<td>74.6</td>
<td>72.5</td>
</tr>
<tr>
<td>Cumulative Production Costs</td>
<td>586.3</td>
<td>579.3</td>
<td>559.0</td>
<td>516.3</td>
</tr>
<tr>
<td>Total Cost (Build + Production Costs)</td>
<td>771.0</td>
<td>765.1</td>
<td>770.9</td>
<td>764.0</td>
</tr>
</tbody>
</table>

**Interconnections**: To reach ASEAN RE Target in 2025 will require 15,246 MW interconnection capacity, potential commitment to establish the priority projects under APG up to 2025.

**Cost**: With inter-play between the Build Costs and the Production Costs, the Total Costs NPV is the lowest in the High vRE Scenario in the long term (2040), but high cost to be covered in the short term (2025).
THE POLICY OF INDONESIA’S ELECTRICITY SECTOR
5 K OF ELECTRICITY

1. **SUFFICIENCY (KECUKUPAN)**
   Planning to fulfill the national electricity

2. **RELIABILITY (KEANDALAN)**
   Utilization of proven technology

3. **SUSTAINABILITY (KEBERLANJUTAN)**
   Use of NRE

4. **AFFORDABILITY (KETERJANGKAUAN)**
   Striving for competitive electricity prices.

5. **EQUALITY (KEADILAN)**
   Access electricity including remote area
CURRENT ELECTRICITY CONDITION
STATUS OF NATIONAL ELECTRICITY (STATUS OF JULY 2021)

By Ownership

- Government: 73.473 MW (55.012 kWh/capita)
- PPU: 67.214.700 MVA (5,9%)
- IPP: 20.620 MW (28,1%)
- IUPTLS: 4.335 MW (5,9%)

BY OWNERSHIP

Generation

- PLN: 43.451 MW (59.1%)
- IPP: 3.908,56 MW (47%)
- IUPTLS: 4.335 MW (5,9%)
- GTPP/CCPP/GEPP: 20.938 MW (28%)
- DEPP: 4.958 MW (7%)
- CFPP Oil/Gas: 2.060 MW (3%)
- Hydropower: 6.255 MW (9%)
- Geothermal: 2.188 MW (3%)
- Other NRE: 2.217 MW (3%)

By Power Plant Type

Energy Mix

- Coal: 59.1% (73.473 MW)
- Gas: 17.86% (3.81%)
- Oil (Incl. Biofuels): 3.81% (7,05%)
- Other REs: 0,37% (5,61%)
- Geothermal: 3% (7,05%)
- Gas: 17.86% (3,81%)
- Oil (Incl. Biofuels): 3,81% (7,05%)
- Other REs: 0,37% (5,61%)
- Geothermal: 3% (7,05%)
- Coal: 59.1% (73.473 MW)

Notes:

- GTPP: Gas Turbine Power Plant
- CCPP: Combined Cycle Power Plant
- CFPP: Coal Fired Power Plant
- DEPP: Diesel Engine Power Plant
- GEPP: Gas Engine Power Plant
- IUPTLS: Electricity Business Supply for Private Use holders (which are not using oil fuel)
- PLN: Publicly owned
- PPU: Private Power Utility

Transmission

- Transmission: 62.917 kms
- Substation: 152.153 MVA
- Distribution: 1.014.823 kms
- Distribution Substation: 62.414.700 MVA

Electricity Consumption per Capita

- PLN: 1.103 kWh/capita (87,5%)
- Non PLN: 12,5%

Sources: RUPTL PT PLN (Persero) 2019-2028
ELECTRIFICATION RATIO (STATUS OF SEPTEMBER 2021)

December 2019 98,89%

NRE Composition:
- NRE PLN: 97,20%
- NRE Non PLN: 1,73%
- NRE LTSHE: 0,47%

September 2021 99,40%
ELECTRICITY PLANNING IN INDONESIA
1. Electrification ratio target 100% in 2022;
2. Maintaining supply and demand balance in the power grids;
3. Achieving the target of 23% NRE mix starting in 2025 and keeping electricity production cost from increasing:
   a. Prioritizing renewable energy power plants that do not significantly increase electricity production costs;
   b. Encouraging more solar PV power plants (prices tend to fall) and utilizes reservoirs as floating solar PV;
   c. Co-firing of CFPP is encouraged while preserving the environment;
   d. “Dedieselisation” by using NRE power plant;
4. No longer adding CFPP, except those that have financial closing or construction;
5. Accelerate the implementation of system interconnection in order to increase reliability, decrease electricity production costs, and share renewable energy resources (demand is dominant in Java while renewable energy resources are dominant in outside Java);
6. Total capacity of power plants are 40.575 MW, reduced by 15.820 MW compared to RUPTL 2019-2028. The portion of NRE power generation compared to fossil power plants in the RUPTL 2021-2030 (51.6%: 48.4%) is larger than the RUPTL 2019-2028 (30%: 70%). So that RUPTL 2021-2030 is “green”.

CFPP Retirement 1,1 GW
Diesel/Gas Replacement 3,6 GW
1. 150 kV Sumatera-Bangka (2022)
2. 150 kV Sumatera-Bengkalis (2023)
3. 150 kV Sumatera-Selat Panjang-Tanjung Balai Karimun (2025)
4. 500 kV Koridor Utara Jawa (2021)
5. 500 kV Jawa-Bali (2024)
6. 275 kV Medan Barat-Pangkalan Susu-Arun-Sigli (2023)
7. 500 kV Perawang-Rantau Prapat-Galang (2025)
8. 500 kV Interkoneksi Sumatera-Jawa (under review)
9. 500 kV interkoneksi Nusa Tenggara-Paiton (on going FS)
10. 150 kV Muna-Buton (2022)
11. 150 kV Kalbar-Kalseltengtim (2023)
12. 150 kV Sulteng-Gorontalo Ruas Tambu-Bangkir (2024)
13. 150 kV & 70 kV Nusa Tenggara (2021-2027)
14. 150 kV & 70 kV Maluku & Maluku Utara (2021-2030)
15. 150 kV & 70 kV Papua & Papua Barat (2021-2029)
16. 500 kV Kaltim-Kaltara (2028)
17. 275 kV Wotu-Bungku-Andowia-Kendari (2027)
18. 500 kV 500 kV Backbone Ring Kalimantan-Sabah (FS)
19. Sebagian besar wilayah 3T (Maluku, Malut, Papua & Pabar)

**Priority Transmission**

**18 section line**

**Interconnection Sumatera & Jamali**
- 1. 150 kV Sumatera-Bangka (2022)
- 2. 150 kV Sumatera-Bengkalis (2023)
- 3. 150 kV Sumatera-Selat Panjang-Tanjung Balai Karimun (2025)
- 4. 500 kV Koridor Utara Jawa (2021)
- 5. 500 kV Jawa-Bali (2024)
- 6. 275 kV Medan Barat-Pangkalan Susu-Arun-Sigli (2023)
- 7. 500 kV Perawang-Rantau Prapat-Galang (2025)
- 8. 500 kV Interkoneksi Sumatera-Jawa (under review)
- 9. 500 kV interkoneksi Nusa Tenggara-Paiton (on going FS)

**Interconnection Kalimantan, Sulawesi, Maluku & Papua**
- 10. 150 kV Muna-Buton (2022)
- 11. 150 kV Kalbar-Kalseltengtim (2023)
- 12. 150 kV Sulteng-Gorontalo Ruas Tambu-Bangkir (2024)
- 13. 150 kV & 70 kV Nusa Tenggara (2021-2027)
- 14. 150 kV & 70 kV Maluku & Maluku Utara (2021-2030)
- 15. 150 kV & 70 kV Papua & Papua Barat (2021-2029)
- 16. 500 kV Kaltim-Kaltara (2028)
- 17. 275 kV Wotu-Bungku-Andowia-Kendari (2027)
- 18. 500 kV 500 kV Backbone Ring Kalimantan-Sabah (FS)

**Smart Grid (7 projects)**
- a. Cawang, Jakarta
- b. Jawa Control Center (JCC) Gandul, P2B, Depok
- c. Cirata Hydro Electric Power Plant (HEPP) Smart Control Project, Jawa Barat
- d. Regional Control Center (RCC) Cigareleng, Jabar
- e. RCC Ungaran, Jawa Tengah
- f. RCC Waru, Jawa Timur
- g. RCC Bali

**NRE Potential**

<table>
<thead>
<tr>
<th>Source</th>
<th>Capacity (GW)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar</td>
<td>208</td>
<td>NTT &amp; throughout archi</td>
</tr>
<tr>
<td>Hydro</td>
<td>75</td>
<td>Papua, Kaltara, Sumbar</td>
</tr>
<tr>
<td>Wind</td>
<td>61</td>
<td>Sulsel, NTT, Jabar</td>
</tr>
<tr>
<td>Bioenergy</td>
<td>33</td>
<td>Sumatera-Kalimantan</td>
</tr>
<tr>
<td>Geothermal</td>
<td>24</td>
<td>Jabar, Sumut, NTT</td>
</tr>
<tr>
<td>Tidal</td>
<td>18</td>
<td>Selat Larantuka</td>
</tr>
</tbody>
</table>

**Transmisi**

<table>
<thead>
<tr>
<th>Voltage (kV)</th>
<th>Masa (Tahun)</th>
<th>Keterangan</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>2024 Interconnection in Sumatera, Jawa, Kalimantan and Sulawesi selesai</td>
<td></td>
</tr>
<tr>
<td>275</td>
<td>2024</td>
<td>Interkoneksi Kalimantan, Sulawesi, Maluku &amp; Papua</td>
</tr>
<tr>
<td>150</td>
<td>2024</td>
<td>Interkoneksi Nusa Tenggara-Paiton (on going FS)</td>
</tr>
</tbody>
</table>

**ASEAN Grid (Perawang-Malaka)**
ELECTRICITY DEVELOPMENT PLANNING FOR 2021 s.d. 2030

Sumatera
- 9,608 MW
- 12,350 KMS
- 17,570 MVA

Kalimantan
- 2,803 MW
- 11,024 KMS
- 6,310 MVA

Sulawesi
- 3,156 MW
- 7,193 KMS
- 4,702 MVA

Jawa Madura Bali
- 20,092 MW
- 12,675 KMS
- 45,010 MVA

Maluku Papua & Nusa Tenggara
- 3,574 MW
- 4,437 KMS
- 3,070 MVA

Source: RUPTL 2021-2030
ELECTRICITY SUPPLY PLANNING IN KALIMANTAN

Source: RUPTL PLN 2021-2030

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PLANNING OF POWER PLANT
2,803.7 MW

PLANNING OF TRANSMISSION LINE
11,026.8 KMS

PLANNING OF SUBSTATION
6,310 MVA

PLANNING OF DISTRIBUTION SYSTEM
JTM : 18,040 kms
JTR : 18,125 kms
DIST. SUBSTATION : 1,485 MVA
EFFORT TO THE ELECTRICITY DEVELOPMENT
Revision of the Ministerial Regulation No. 50/2017 jo. MEMR Regulation No. 53/2018 jo. MEMR Regulation No. 4/2020 regarding Utilization of Renewable Energy Sources for the Provision of Electric Power

- The concept of regulations related to the purchase of electricity and the benchmark price for the purchase of electricity by PLN in the form of a Presidential Regulation is being drafted by the Ministry of Energy and Mineral Resources.
- NRE power plants consisted of Hydro, PV, Wind, Biomass, and Biogas.
- The concept includes: procurement process; the purchase price of electricity, either through the benchmark price, the B to B scheme, or the assignment mechanism; and contract mechanisms for renewable energy generation and the purchase of excess power.
- Currently in the stage of drafting the NRE Presidential Regulation.

Flexibility of NRE Power Plant development in PLN RUPTL 2019-2028.

- Based on the Decree of the Minister of Energy and Mineral Resources No. 39K/20/MEM/2019 regarding the Ratification of PLN's 2019-2028 RUPTL, accelerating the achievement of the mix target and adding NRE power plants outside the details of PLN's 2019-2028 RUPTL according to the needs of the local electricity system.
- NRE development includes the use of irrigation dams for hydro power plants as well as refurbishment of existing hydropower plants.

Development PLTS Roof
(Ministry of Energy and Mineral Resources No. 49/2018 in conjunction with Minister of Energy and Mineral Resources No. 13/2019 in conjunction with Minister of Energy and Mineral Resources No. 16/2019)

- Since the implementation of the Minister of Energy and Mineral Resources No. 49 of 2018, PLN consumers can install PV rooftop. Consumers can generate their own electricity and even export it to PLN.
- As of December 2020, there were 3,007 PV rooftop customers with a total installed capacity is 21.4 MWp.
**EFFORT THE ELECTRICITY DEVELOPMENT (2/3)**

**Renewable Energy-Based Economic Development (REBED)**

- Encouraging the use of NRE to increase the electrification ratio in the 3T area so as to encourage economic growth.
- The realization of the REBED Program includes the implementation of part of the 2020 APdal by PLN, the issuance of biomass SNI by BSN, the signing of the three-party waste RDF feed stock between the Regional Government, PLN and the private sector, the signing of the provision of biomass feed stock between HTI entrepreneurs and PLN, encouraging PLN to operate the PLTU co-firing.

**Renewable Energy-Based Industry Development (REBID)**

- Integrating from the supply side to the demand side. This program encourages large-scale use of NRE to create industry-like growth.
- The realization of the REBID program includes discussions with Coordinating Ministry of Maritime and Investment, Ministry of Industry and The Executive Office of the President, regarding the development of hydropower in North Kalimantan.
- The future plan is to propose the 2021/2022 National Economic Recovery (PEN) including the development of Hydro PP in North Kalimantan (2-10 GW), Industrial Development in KIPI Tanah Kuning (i.e. Battery and PV Industry), as well as the construction of 500 kV Interconnection with PPP/KPBU scheme. Construction can start in 2022, and phased operations from 2027.

**Dedieselization**

- Aims to replace the use of Diesel PP into NRE Power plant in remote islands.
- This has a good impact on the environment and can reduce the portion of imported fuel.
In accordance with the General National of Electricity Planning 2019-2038, the smart grid has begun to be implemented in several regions in Java-Bali in 2020. Furthermore, it is gradually being applied to systems outside Java-Bali.
Thank you

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Terima kasih
Maraming Salamat