Making the NZE Moonshot as the Indonesia Epicentrum in Global Energy Transition

Decarbonization Initiative in Indonesia

June 2024
PLN's core competency is to provide electricity through the integrated management of the electricity business, encompassing power generation, transmission, and distribution, as well as retail with incorporated customer service throughout Indonesia.

In the future, PLN’s competency will be to offer quality energy solutions to customers by developing electrical infrastructure that combines technological adaptability with business model innovations. This approach will support the company’s vision of becoming a Global Top 500 Company by 2028.
PLN faces significant challenges that must be addressed with full effort. Every department must mobilize. All resources must be deployed. A new direction for transformation must be established.
A precise strategy and mechanisms are needed to identify current and future challenges, ensuring that the transition to low-carbon energy is fair and equitable.

(President Joko Widodo in his keynote speech at the G20 High Level Policy Webinar on Just Energy Transition)
The Next Chapter of Transformation will realize PLN’s vision through "Moonshots" focusing on Growth, Digital, and Net Zero Emission.

Vision
To Become a Global Top 500 Company and Number 1 Customer’s Choice for Energy Solution

Growth Moonshots
Entering the ranks of the world’s top 500 companies through the growth of electricity sales and beyond kWh business, while still prioritizing contributions to national development.

Digital Moonshots
Becoming a leading company that implements digitalization to deliver excellent customer experiences, operational excellence, and cost efficiency.

NZE Moonshots
Leading the transition of Indonesia’s energy and integrated green economy alongside the development of industrial zones.

Moonshot Launchpad
Building an organization and relevant competencies for future business needs through the optimization of Subholding roles, risk management, competency development, partnerships, and technology.
Transformation 2.0 focuses on 4 pillars: Growth Moonshots, Digital Moonshots, NZE Moonshots, supported by Moonshot Launchpad as an enabler.
PLN has established the ARED\(^1\) scenario as a bridge towards Net Zero emissions 2060.

~480
GW of renewables capacity by 2060

~700
USD Bn of total investment needed

~19
GW of coal and gas CCUS required

0
Mn tCO2 emissions in 2060

1. Accelerated Renewable Energy Development with coal phase down
2. Gas with hydrogen cofiring up to 75% in 2060
3. Coal CCS with biomass cofiring up to 30% in 2060
Going forward, PLN has set short-term and long-term strategy to achieve NDC 2030 and NZE 2060 commitments

<table>
<thead>
<tr>
<th>Short term initiatives (2030)</th>
<th>Long-term initiatives (beyond 2030)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> 21.3 GW additional Renewable capacity + De-dieselization</td>
<td><strong>1</strong> 76% Renewable capacity share</td>
</tr>
<tr>
<td><strong>2</strong> 8-10% biomass co-firing rate across 52 CFPPs</td>
<td><strong>2</strong> ~30% biomass co-firing rate</td>
</tr>
<tr>
<td><strong>3</strong> Energy efficiency (1.4% grid loss improvement + heat rate improvement)</td>
<td><strong>3</strong> Hydrogen co-firing</td>
</tr>
<tr>
<td><strong>4</strong> 2.7 GW of more efficient coal technology (on top of existing 5.8 GW)</td>
<td><strong>4</strong> Carbon Capture Utilization + Storage</td>
</tr>
<tr>
<td><strong>5</strong> 6.7 GW PLTGU expansion</td>
<td><strong>5</strong> New Technology (e.g., Nuclear)</td>
</tr>
</tbody>
</table>

Total ~120-130

Projected annual emissions reduction contribution, mn tCO2 by 2030 and 2060

TOTAL ~1,100
ARED aims to fulfill DRUPTL 2024-2033 target of ~30GW RE generation assets and ~49,200kms of critical transmission infrastructure

PRELIMINARY  BASED ON DRUPTL 2024-2033 AS OF APRIL 2024

Executing ARED requires additional deployment of ~30GW RE generation capacity (out of total ~44GW) and new transmission & system enablers

<table>
<thead>
<tr>
<th>Add'l. generation capacity plan by technology between 2024-2033, GW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add. generation capacity plan, 2024-2033</td>
</tr>
<tr>
<td>Baseload fossil-fuel</td>
</tr>
<tr>
<td>Baseload RE</td>
</tr>
<tr>
<td>VRE (Variable RE)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New transmission &amp; system enablers in DRUPTL 2024-2033</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interconnection</td>
</tr>
<tr>
<td>Backbone</td>
</tr>
<tr>
<td>Fishbone</td>
</tr>
<tr>
<td>Substation</td>
</tr>
</tbody>
</table>

Smart grid & storage: Smart transmission, smart control system, smart distribution, and BESS

Coal | Gas | Other RE, e.g., Biomass | Geothermal | Hydropower | Solar | Wind

kJms of transmission

~49,200
PLN will play an integral role to support GOI's ambition to deploy ~54GW of additional renewable energy by 2040 (~30 GW in DRUPTL 2024-2033)

Government of Indonesia aims at deploying ~54GW of additional renewable energy (RE) by 2040

Indonesia RE capacity expansion plan, 2023-40, GW

Note: Capacity expansion plan does not include rooftop solar PV (additional of ~5.0GW between 2024-2040)

Source: PLN data
Indonesia’s net zero ambition will drive RUPTL 2024-2033 towards renewables

PRELIMINARY

GoI aims to accelerate renewable energy and phasing-down use of coal

PLN’s fuel mix between 2024-2033 based on DRUPTL 2024-2033, %

Key highlights

- Share of coal will decrease from ~66% in 2024 to ~52% in 2033; No new coal power plant beyond 2030
- In the transition, gas will still play critical role, supplying reliable baseload power at a stable proportion (~16.5% in 2024 to ~15% in 2033)
- Share of RE\(^1\) will increase significantly from ~14% in 2023 to 33% in 2033, dominated by hydropower, geothermal, solar, and wind

1. Renewable = Hydro + Geothermal + VRE + other Renewables (Biomass, Tidal, etc.)

Source: DRUPTL 2024-2033 PLN (April 2024)
Prestigious Project of Accelerated Renewable Development

Cirata Floating Solar PV 192 MWp (11th Sep 2023)

and more than 5 Solar PV major projects Pipeline are waiting for CODÖ
PLN is implementing biomass cofiring as one of the short-term goals for carbon abatement to support NDC 2030 and achieve Net Zero Emission 2060.

Update 52 Cofiring locations as of April 2024
- 44 Implemented
- 3 Trial
- 5 FS

**Cofiring Roadmap (in Mn Ton)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Capacity (GW)</th>
<th>Production (TWh)</th>
<th>Biomass (Mn Ton)</th>
<th>CO₂ Reduction (Mn Ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2024</td>
<td></td>
<td>47</td>
<td>0,94</td>
<td>2,83</td>
<td>2,88</td>
</tr>
<tr>
<td>2025</td>
<td></td>
<td>62</td>
<td>2,45</td>
<td>11,8</td>
<td>10,2</td>
</tr>
<tr>
<td>2026</td>
<td></td>
<td>52</td>
<td>2,45</td>
<td>11,6</td>
<td>10,1</td>
</tr>
<tr>
<td>2027</td>
<td></td>
<td>62</td>
<td>11,3</td>
<td>10,2</td>
<td>10,1</td>
</tr>
<tr>
<td>2028</td>
<td></td>
<td>52</td>
<td>11,3</td>
<td>10,2</td>
<td>10,1</td>
</tr>
</tbody>
</table>

**Energy Plantation**
- Indigofera
- Gmelina
- Akasia Branch
- Rice Husk
- Sugar Palm

**Plantation waste**
- Rubber Replantation
- Akasia Branch
- Casava Stem

**Agriculture waste**
- Kaliandra
- Gamal
- Corncob
Currently PLN is developing green hydrogen business ecosystem as the future energy to support energy transition agenda and high growth demand.

With 21 H₂ plant locations and 11 H₂ refuel station across Java Bali, total production of 124 Ton to fuel 424 Fuel Cell EV equal to 3,72 Mn tCO₂ reduction.
PLN has succeed implementing green ammonia co firing at Gresik and Keramasan power plant and intent to develop green ammonia ecosystem cooperating with potential partner.

**Value Chain of Hydrogen and Ammonia**

**Power Plant**

**Electrolysis**

H₂ Storage

**Haber Bosch**

NH₃ Storage

**Off Taker**

**PLN Supply**

**JV**

**PLN Sub Holding:**

- **Indonesia Power**
- **Nusantra Power**
- **Energi Primer Indonesia**

**Potential Partner:**

- **ACWA Power**
- **PT Pupuk Sriwijaya**
- **PT Petrokimia Gresik**
- **IHI**
- **Mitsubishi**
- **IHI**

**Ammonia co firing pilot project**

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>Testing Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keramasan, S. Sumatera</td>
<td>2 x 40 MW</td>
<td>40 MW</td>
</tr>
<tr>
<td>Gresik, East java</td>
<td>2.219 MW</td>
<td>100 MW</td>
</tr>
</tbody>
</table>

**Partner**

- Mitsubishi
- IHI

**Source**

- PT Pupuk Sriwijaya
- PT Petrokimia Gresik

**Partner**

- Mitsubishi
- IHI
Prioritization Efforts in The Selection of The Most Optimal Funding Options for Financing The Energy Transition

PLN Funding Prioritization:
1. Seeking funding from Government Equity Injection for projects that are not commercially viable
2. Striving for grants and low-cost financing.
3. Increasing the portion of rupiah denominated loans to reduce foreign exchange exposure and currency mismatch.
4. Adjusting long-term loans to the construction period and age of the asset.
5. Utilizing credit enhancement from multilateral or international guarantee institutions while reducing the risk of default and lending limit exposure to PLN.
6. Negotiating a more flexible covenant package in the loan agreement.
7. Considering fixed rate loans to reduce exposure to volatility in the reference interest rate.
8. Utilizing project clustering to process funding as a package.

The funding options used by PLN:
1. Two Step Loan / Subsidiary Loan Agreement
2. Direct Loans from Offshore and Onshore Funding with Government Guarantee
3. Export Credit Agency (ECA)
4. Offshore Banking Commercial Loans and Global Bonds
5. Onshore Banking Direct Loans and Local Bonds
6. Funding with Guarantees from Multilateral Institutions or Other Guarantee Institutions/Institutions
7. Or other financing option comply with financial market mechanism rules.
PLN has good collaborations with Japanese Institutions in Sustainable Financing

PLN's dedicated project loans funded by JBIC

<table>
<thead>
<tr>
<th>No</th>
<th>Project</th>
<th>Amount</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lontar CFSPP</td>
<td>USD 0.18 Bio and JPY 16.5 Bio</td>
<td>2016 - 2031</td>
</tr>
<tr>
<td>2</td>
<td>Jawa-2 CCPP</td>
<td>USD 0.45 Bio and JPY 30.8 Bio</td>
<td>2016 - 2031</td>
</tr>
<tr>
<td>3</td>
<td>Muara Karang CCPP</td>
<td>USD 0.37 Bio and JPY 14.5 Bio</td>
<td>2017 - 2031</td>
</tr>
<tr>
<td>4</td>
<td>Kalselteng-2 CCPP</td>
<td>USD 0.89 Bio and JPY 16.9 Bio</td>
<td>2017 - 2032</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td>USD 0.35 Bio and JPY 78.74 Bio (or Eqv. USD 0.85 Bio)*</td>
<td></td>
</tr>
</tbody>
</table>

* Exchange rates on 30 April 2024 USD/JPY = 157.72

Not only JBIC, PLN has also collaborated with Japanese banks and Export Credit Agency to fund both dedicated project loans and corporate loans, such as:

1. NEXI
2. JICA
3. MUFG Bank Ltd
4. SMBC
5. Musashino Bank
6. Bank of Yokohama
7. Nanto Bank
8. Hachijuni Bank, Ltd
9. NTT Leasing Co. Ltd
10. SBI Shinsei Bank, Limited
11. Hyakugo Bank

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1. On the side-lines of the G20 Summit in November 2022, the Government of Indonesia (GoI) established partnership with Japan under the Asia Zero Emission Community (AZEC) to support the energy transition in electricity sector in Indonesia.

2. PLN has signed Memorandum of Understanding (MoU) with Nippon Export and Investment Insurance (NEXI) aiming to secure the provision of financing insurance to support the efforts of PLN as the Indonesian state-owned fully integrated electric utility company to implement energy transition.

3. PLN has also signed MoU with JBIC to promote sustainable energy transition through collaboration between PLN and the Japanese business community to strengthen partnerships in the deployment of potential renewable energy projects and technology to reduce emission.