GOVERNMENT POLICY ON CLEAN COAL POWER TECHNOLOGY IN INDONESIA

The International Symposium of Clean Coal Day, Tokyo - Japan 2017
OUTLINE OF THIS PRESENTATION

- Context of Indonesia electricity system
- Electricity Policy and Business Planning in Indonesia
- Regulatory Framework for Electricity Planning
- Medium-term Electricity Business Plan (2017 – 2026)
- New Electricity Business Regulation for Coal-fired Power Plants
- Electricity Safety and Environmental Standards for Coal-fired Power Plants
THE STRUCTURE OF INDONESIA ELECTRICITY SUPPLIES AND DEMAND

INSTALLED CAPACITY
59,656 MW
- PLN: 41,049 MW
- IPP: 13,781 MW
- PPU: 4,826 MW

Electrification ratio
92.80%

ELECTRICITY PRODUCTION
290 TWh
ELECTRICITY CONSUMPTION
247 TWh

ELECTRICITY TRANSMISSION
49,799 kilometer circuits
ELECTRICITY DISTRIBUTION
946,101 kilometer circuits

INSTALLED CAPACITY FOR EACH POWER PLANT TECHNOLOGY

ELECTRICITY CONSUMPTION PER CAPITA
978.74 kWh/Capita
The actual electricity subsidies (Rp. Triliun)

<table>
<thead>
<tr>
<th>Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016 (unaudited)</th>
<th>APBN 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>103.33</td>
<td>101.21</td>
<td>99.3</td>
<td>56.55</td>
<td>59.23</td>
<td>44.98</td>
</tr>
</tbody>
</table>

Actual oil consumption for electricity (%)

<table>
<thead>
<tr>
<th>Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>8.28</td>
<td>7.51</td>
<td>7.26</td>
<td>5.47</td>
<td>3.80</td>
<td>2.65</td>
</tr>
<tr>
<td>%</td>
<td>14.97%</td>
<td>12.54%</td>
<td>11.81%</td>
<td>8.58%</td>
<td>6.51%</td>
<td>4.66%</td>
</tr>
</tbody>
</table>

The structure of electricity sales

<table>
<thead>
<tr>
<th>Year</th>
<th>kWh Subsidy</th>
<th>kWh Non Subsidy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>24%</td>
<td>76%</td>
</tr>
<tr>
<td>2015-2016</td>
<td>64%</td>
<td>36%</td>
</tr>
<tr>
<td>2017</td>
<td>77%</td>
<td>23%</td>
</tr>
</tbody>
</table>

Strategies to reduce oil consumption for electricity:

- The development of large size of coal power PPs, natural gas PPs, and geothermal PPs in large electric grids to reduce operations of oil-based PPs
- Develop Variable RE power plants in smaller grids and isolated islands
Challenges of improving efficiency and reliability of coal-fired power plants

1. Lower thermal efficiency on average against the international benchmark
2. Private power producers on average have higher availability
3. Low rank coal possesses challenges for electric power generation to achieve higher efficiency while reducing the exposure to operation safety


1. Substantial increase of CO$_2$ emissions that is projected to come from coal-fired power plants (batubara), constitutes more than 80% of total CO$_2$ emissions in 2026
2. CO$_2$ emissions from natural gas is forecasted to double over the projection period but it will only accounted for 18% of total CO$_2$ in 2026

Notes:
1. Measured in million ton of CO$_2$
2. Source: PT PLN (Persero) RUPTL 2017-2026
POLICY ON ELECTRICITY SUPPLIES

- Regulation, policies, and technical standards
- Provision of funding for:
  - Low income society;
  - Basic infrastructure in least developed regions;
  - Electricity development in remote and border areas;
  - Rural electricity development.

* : First priority of electricity provision
** : Integrated electricity business license
III

REGULATORY FRAMEWORK FOR ELECTRICITY PLANNING
REGULATORY FRAMEWORK FOR ELECTRICITY POLICY IN INDONESIA

- Basic Law 1945
- Energy Law Number 30 Year 2007
- Electricity Law Number 30 Year 2009
- Government Regulation Number 14 Year 2012 of Electricity Business
- RUEN (GENERAL OF ENERGY), RUKN (GENERAL PLAN OF ELECTRICITY)

ENERGY MIX
PP 79/2014 (KEN)

- CLEAN FOSSIL FUEL POLICY
- RENEWABLE ENERGY DEVELOPMENT POLICY

SUSTAINABLE ECONOMIC GROWTH,
(ENERGY SECURITY, PRICE AFFORDABILITY,
ENVIRONMENT SUSTAINABILITY)
Law 30/2007 (ENERGY)

GOVERNMENT REGULATION 79/2014 (NATIONAL ENERGY POLICY)
- National energy policies based on the principles of inclusive energy access, sustainable and environmentally acceptable to achieve self reliance on energy and enhanced energy security,
- Prepared by the National Energy Council
- Published by the Government after gaining approval from the Parliament

LAW 30/2009 (ELECTRICITY)

Government Regulation 14/2012 jo PP 23/2014 (Electricity Supply Businesses)

Presidential Regulation 22/2017 (General Plan of National Energy - RUEN)
- Energy policy at the national level that outlines overall energy plan at the national level
- Prepared by the Government and published by the National Energy Council

General Plan of Electricity (RUKN)
- General Plan of Electricity prepared by the Central Government that contains development plan for electricity generation, transmission, and distribution.
- Prepared by the National Government and needs to be approved by the Parliament.

Regional Plan of General Energy (RUED)
Prepared by the respective local government that is in accordance with the RUEN

Regional Plan of General Electricity (RUKD)
Prepared by the respective local government in accordance with the RUKN and consultation with the local parliament

Business Plan for Electricity Supplies (RUPTL)
- Key reference document for electricity business
- Prepared by state owned enterprise/private utility companies
- Approved by the respective minister/Governor in accordance with their authority

*) RUK: RUKN dan RUKD
THE STRUCTURE OF ENERGY MIX – CURRENT AND THE MEDIUM TERM OUTLOOK

ENERGY MIX FOR ALL SECTORS
(The National Energy Plan, PP No.79/2014)

ENERGY MIX FOR POWER GENERATIONS
(GENERAL PLAN OF NATIONAL ELECTRICITY 2015-2034)

ENERGY MIX FOR POWER GENERATIONS
(RUPTL PT PLN (PERSERO) 2017-2026)
The policy objective is to meet the electricity demand and improve security of electricity supplies through adequate installed capacity for reserve margin.

- **CFPP**: Indonesia will continue to develop coal fired power plants to serve the baseload electricity demand. It will mainly focus on the utilization of clean coal technology for new power plants in the Java-Bali and Sumatera power grids.

- **GAS-TURBINE PPs and Pump Storage of Hydro PPs** are developed to fulfil the electricity peak demand and reduce the oil-based power plants operating at the peak loads.

- **New Energy Sources and Renewable Power Generations** are being developed to supply electricity and meet the national targets on CO$_2$ emission reductions.

- **Nuclear Power Plants** are to be considered as the last option for electricity supplies when other fuel and power plant technologies could not meet the substantial increase of electricity demand more economically and environmentally sustainable. Stringent electricity safety regulations will be applied if Nuclear PPs will be developed in the future.
Electricity Energy Mix (2017-2026)

(Source: PT PLN Business Plan (RUPTL) 2017 – 2026)
Outlook of Electricity Fuel Consumptions (2017 – 2026)

**Oil (kilo litres)**

<table>
<thead>
<tr>
<th>Year</th>
<th>MFO</th>
<th>HSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>1,898</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>1,762</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>1,024</td>
<td>786</td>
</tr>
<tr>
<td>2020</td>
<td>526</td>
<td>494</td>
</tr>
<tr>
<td>2021</td>
<td>41</td>
<td>491</td>
</tr>
<tr>
<td>2022</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>2023</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>2024</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>2025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Coal (million tons)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Batu Bara</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>85</td>
</tr>
<tr>
<td>2018</td>
<td>89</td>
</tr>
<tr>
<td>2019</td>
<td>99</td>
</tr>
<tr>
<td>2020</td>
<td>111</td>
</tr>
<tr>
<td>2021</td>
<td>127</td>
</tr>
<tr>
<td>2022</td>
<td>138</td>
</tr>
<tr>
<td>2023</td>
<td>148</td>
</tr>
<tr>
<td>2024</td>
<td>151</td>
</tr>
<tr>
<td>2025</td>
<td>146</td>
</tr>
<tr>
<td>2026</td>
<td>155</td>
</tr>
</tbody>
</table>

**Natural Gas (TBTU)**

<table>
<thead>
<tr>
<th>Year</th>
<th>LNG</th>
<th>GAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>432</td>
<td>397</td>
</tr>
<tr>
<td>2018</td>
<td>449</td>
<td>361</td>
</tr>
<tr>
<td>2019</td>
<td>355</td>
<td>372</td>
</tr>
<tr>
<td>2020</td>
<td>447</td>
<td>370</td>
</tr>
<tr>
<td>2021</td>
<td>453</td>
<td>349</td>
</tr>
<tr>
<td>2022</td>
<td>486</td>
<td>345</td>
</tr>
<tr>
<td>2023</td>
<td>523</td>
<td>360</td>
</tr>
<tr>
<td>2024</td>
<td>615</td>
<td>343</td>
</tr>
<tr>
<td>2025</td>
<td>752</td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>851</td>
<td></td>
</tr>
</tbody>
</table>

(Source: PT PLN Business Plan (RUPTL) 2017 – 2026)
POWER PLANT BUSINESS DEVELOPMENT PLAN (2017 – 2026)

Source: PT PLN (Persero) Electricity Business Development Plan (2017 – 2026)
Existing coal-fired power plants

- Periodic refurbishment of main power plant equipment to improve power plant operation reliability and thermal efficiency;
- Long term retirement plan of coal-fired power plants that utilize subcritical pulverized technologies and substitution with more efficient technology, once they have reached the economic life time.

Medium term plan for new coal-fired power plants (RUPTL 2017-2026)

- The adoption of supercritical and ultra-supercritical coal power technology for large scale power plants in the Java-Bali electric grid.
- The adoption of supercritical for coal power plants with installed capacity of 600 MW in the Sumatera electric grid.

Source: PT PLN (Persero) Electricity Business Development Plan (2017 – 2026)
BUSINESS INCENTIVE FOR COAL-FIRED POWER PLANTS

(ACCORDING TO THE MINISTRY OF ENERGY AND MINERAL RESOURCES NUMBER 19/2017)

- Direct appointment of new power purchase agreement can be applied to:
  - Mine-mouth power plants
  - Power plant capacity expansion in the same location of the existing plants

- The concession period for electricity purchase is calculated from the plant commercial operation date up to the 30 years with capacity factor of 80% and scheme of Build, Own, Operate and Transfer (BOOT)

- The commercial arrangement for transmission lines between the mine-mouth power plants and the grid interconnection substation is conducted as business to business between Independent Power producers (IPPs) and state utility offtaker

- The price of electricity purchased from the IPPs is established based on the referenced costs of electricity production at the national or regional level.
## Reference Costs of Electricity Productions

(According to the Ministry of Energy and Mineral Resources Number 19/2017)

<table>
<thead>
<tr>
<th>Power Plant capacity</th>
<th>Mine-mouth PPs</th>
<th>Regular CFPPs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All capacity</td>
<td>&gt;100 MW</td>
</tr>
<tr>
<td>Ceiling price (BPP_S ≤ BPP_N)</td>
<td>75% BPP_S</td>
<td>BPP_S</td>
</tr>
<tr>
<td>Ceiling price (BPP_S &gt; BPP_N)</td>
<td>75% BPP_N</td>
<td>BPP_N</td>
</tr>
</tbody>
</table>

**Notes:**

1. **BPP_S** is the electricity production cost at the respective regional level (Biaya Pokok Produksi setempat)
2. **BPP_N** is the electricity production cost at the national level (Biaya Pokok Produksi nasional)
THE 2017 CEILING PRICE OF MINE-MOUTH COAL-FIRED POWER PLANTS

Ceiling Price | cent/kWh

BPP (National): 7.39 cent/kWh

Electricity price 75% BPP*

BPP (regional)

Mine-mouth coal-fired power plants according to RUPTL 2017-2026 (Total: 5,490 MW)
### THE 2017 CEILING PRICE OF NON-MINE-MOUTH COAL-FIRED POWER PLANTS

#### Non-Mine-mouth coal-fired power plants according to RUPTL 2017-2026 (Total: 4,500 MW)

<table>
<thead>
<tr>
<th>Non Mine Mouth</th>
<th>2,400</th>
<th>200</th>
<th>600</th>
<th>400</th>
<th>600</th>
<th>100</th>
<th>200</th>
</tr>
</thead>
</table>
REGULATIONS ON ELECTRICITY SAFETY AND ENVIRONMENT COMPLIANCE FOR CFPPs
Every electrical installations must obtain the electrical installation-worthy certificates

Every service providers in electricity business must obtain relevant certificates for electricity service providers

Every people working in electrical industry must hold relevant certificate of personal competencies

All electrical equipment and appliances must meet mandatory of the National Standard of Indonesia

All electricity business shall comply with electricity safety regulations

Law No. 30 /2009 About Electricity

All electricity business must meet the mandatory requirements concerning environmental sustainability
Fuel consumption test that is measured in the *Nett Plant Heat Rate (NPHR)* is conducted as a pre-requisite before a coal-fired power plants can commence commercial operation.
**Local government level:**
- May set emission quality standards with the provisions of the same or more stringent than the standard that has been set nationally;
- May set additional emission parameters after the approval of the Minister in the environmental field.
Environmental licences are issued based on Law 32 Year 2009. The issuance process involves preparing the Environmental Impact Analysis (EIA) or Environmental Management and Monitoring Scheme (EMMS), followed by an assessment and the application and issuance of environmental licenses (based on EIA or EMMS approval).

Environmental licence issued by:
- Regent/Mayor
  - The installation is located in the regent/city;
- Governor
  - The installation is located in the province, where the regent/city is not able to conduct environmental licensing;
- Minister
  - The installation is located in a protected area (ex: protected forest).
<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter</th>
<th>Maximum level (mg/Nm(^3))</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Sulfur Dioxide (SO(_2))</td>
<td>750</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Nitrogen Oxide (NOx) stated as NO(_2)</td>
<td>850</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Total Particulate</td>
<td>150</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Opacity</td>
<td>20%</td>
<td>20%</td>
<td></td>
</tr>
</tbody>
</table>

A. For CFPPs that commenced operation before 1 December 2008;  
B. For CFPPs that commenced operation after 1 December 2008.

Notes:
- Gas volume is measured under standard condition (25°C and 1 atm).
- Opacity is used as a practical indicator for monitoring.
- All parameters corrected by O\(_2\) : 7 %
- For CFPP with CEMS installed, the imposition of emission quality standard is for 95 % of normal operation time for 3 months.
Coal will continue to be utilized for generating electricity over the medium term period although its share to the total energy mix will be reduced.

The Government of Indonesia adopts clean coal power technology to reduce carbon emissions from electricity generations while it improves thermal efficiency of the power plants.

The Government of Indonesia introduces ministry regulations to improve business process of coal power development for mine-mouth and regular coal-fired power plants.

All coal power plants must comply with electricity safety regulations and environmental standards.
THANK YOU