The role of coal and LNG in Asia’s future energy mix: defying the odds?

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As global electricity changes, coal retains an edge.

Global electricity mix

23,809 TWh
2014
Electricity generation

39,045 TWh
2040
Electricity generation

Coal, not gas, leads the charge in Asia...

Coal and gas-fired power investment in Asian markets (2015)

Because its costs are far lower,

Infrastructure investment cost for a 1 GW power plant in Asia.

Coal will dominate Asian electricity for decades

Non-OECD Asia electricity generation

The Paris Agreement includes low emissions coal.
ASEAN’s first step to cleaner coal is possible

**Scenario Description**

- **Mix per current pipeline**
  - Total installed coal capacity by 2035 based on IEA SEA-EO projections with linear extrapolation between current pipeline of projects as reported by the Platts WEPD (percentage of subcritical capacity through 2035 based on current pipeline)

- **Shift to Supercritical**
  - Shift capacity from subcritical to supercritical except plant that are under construction or planned subcritical plant with capacity lower than 300 MW

- **Shift to Ultra-supercritical**
  - Shift all capacity from supercritical in the previous scenario to ultra-supercritical

**Capacity Mix**

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<tr>
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<th>USC</th>
<th>SC</th>
<th>SubC</th>
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<tbody>
<tr>
<td>Mix</td>
<td>15</td>
<td>44</td>
<td>63</td>
</tr>
<tr>
<td>Supercritical</td>
<td>15</td>
<td>103</td>
<td>113</td>
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<tr>
<td>Ultra-supercritical</td>
<td>4</td>
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**NPV Capital Costs**

- **(S Billion)**
  - from 2016 through 2040
  - **$89 Billion**
  - **$96 Billion**
  - **$108 Billion**

Additional $19 billion required to shift to ultra-supercritical

**CO₂ Emissions**

- **(tCO₂)**
  - Cumulative from 2016 through 2040, undiscounted
  - **8.9 Billion**
  - **8.1 Billion**
  - **7.5 Billion**

Additional funding can reduce carbon emissions by 1.3 billion tons
... and the benefits are significant

<table>
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<tr>
<th>Scenario</th>
<th>Capacity mix&lt;sup&gt;1&lt;/sup&gt;</th>
<th>CO&lt;sub&gt;2&lt;/sub&gt; emissions (tCO&lt;sub&gt;2&lt;/sub&gt;) (over 40 years)</th>
<th>CO&lt;sub&gt;2&lt;/sub&gt; abated equivalent to</th>
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<tr>
<td></td>
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<td>Subcritical plant closure&lt;sup&gt;2&lt;/sup&gt;</td>
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<tr>
<td>Mix per development pipeline</td>
<td>USC: 15</td>
<td>SC: 44</td>
<td>SubC: 63</td>
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New policies are required to drive CCS

Policies and incentives are required to stimulate second generation CCS investments

- Power purchase agreements
- Product purchase agreements
- Policy parity in portfolio standards
- Policy parity in NDCs

- Project development grants
- Streamlined permitting
- Land rights access
- Long term CO₂ liability transfer
- Hub storage/transport infrastructure

- Improve project economics e.g. investment & production tax credits, CCS emissions trading
- Improve access to capital e.g. loan guarantees or preferred bonds

- R&D tax credits
- R&D grants
- Pilot and commercial scale projects
- Storage resource characterisation

Source: CIAB, An international commitment to CCS; policies and incentives to enable a low-carbon future, 2016