APEC Energy Demand and Supply Outlook 6th Edition

2-5 Investment, Energy Security and Climate Change

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1. Investment
Upstream investments account for about half of the projected investment requirements in the energy sector.
Note: Oceania (Australia, New Zealand and PNG), Other Americas (Canada, Chile, Mexico and Peru), Other north-east Asia (Hong Kong, Japan, Korea and Chinese Taipei), South-East Asia (Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam).

Upstream and/or electricity account for bulk of investments across all regions
Upstream investments by region and fuel

- China requires 64% of its upstream investments for coal;
- The United States and Russia spend 90% of upstream investments on oil and gas;
- Other Americas uses 99% of its upstream investment for oil and gas; and
- Other north-east Asia invests only marginally in upstream due to lack of fossil resources.

Note: Oceania (Australia, New Zealand and PNG), Other Americas (Canada, Chile, Mexico and Peru), Other north-east Asia (Hong Kong, Japan, Korea and Chinese Taipei), South-East Asia (Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam).

More than half of the upstream investment is required for oil production.
Investment in the electricity sub-sector

- Solar and wind take 45% and 33% of the total RE generation capacity investment, respectively.
About 60% of total downstream investment is for LNG export terminals. Largest downstream investors are the United States, other Americas and China.

Gas accounts for over 60% of all investment requirements in energy transport.
Investment in alternative scenarios

In the Improved Energy Efficiency Scenario, a 15% reduction in TPES leads to a 13% reduction in investment compared with BAU, equivalent to USD 2.2 trillion savings.

The High Renewables Scenario results in a 6% increase in investment, USD 1.1 trillion higher than BAU.
2. Energy Security
Defining Energy Security

Most organisations define energy security as encompassing four common dimensions: availability, affordability, accessibility and acceptability.

**Availability**
- Reserve/production ratios
- Primary Energy Self-Sufficiency
- Stockpiles and storage
- Energy diversity ratios (HHI)
- Energy Import dependence
- Market share of suppliers

**Indicators**
- Carbon intensity
- Retail Price
- Power interruption SAIDI, SAIFI
- Power Quality
- Electrification rate

**Affordability**

**Accessibility**

**Acceptability**

*Non-exhaustive indicators*
APEC able to meet 93% of its primary energy demand in 2013

**APEC primary energy self-sufficiency and diversity 2013**

- **APEC total primary energy production, 2013**
- **APEC total primary energy demand, 2013**
  - 100% sufficient
  - 85% sufficient
  - 100% sufficient

Source: IEA statistics 2015 and APERC analysis

**With primary energy supply diversity of HHI 0.27, oil is the major fuel that is insufficient in APEC.**

Note: Oil demand includes international transport.
### BAU vs. Alternative Scenarios in 2040

<table>
<thead>
<tr>
<th></th>
<th>BAU</th>
<th>Improved Efficiency</th>
<th>High Renewables</th>
<th>Cleaner Coal</th>
<th>High Nuclear</th>
<th>High Gas 50%</th>
<th>High Gas 100%</th>
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<tbody>
<tr>
<td>Primary energy supply diversity (HHI)</td>
<td>0.24</td>
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<tr>
<td>Primary energy supply self-sufficiency (%)</td>
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<td>Coal self-sufficiency (%)</td>
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<td>Oil self-sufficiency (%)</td>
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<td>Gas self-sufficiency (%)</td>
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<td>Input fuel for electricity generation diversity (HHI)</td>
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Source: IEA statistics 2015 and APERC analysis

**Improved Efficiency Scenario and High Nuclear Case show largest improvements in diversity of fuel and self-sufficiency**
### Primary energy supply self sufficiency across all scenarios

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<thead>
<tr>
<th>Country</th>
<th>2013 Actual</th>
<th>BAU</th>
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**Source:** IEA statistics 2015 and APERC analysis

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**In most economies, energy self sufficiency declines in the future. Energy efficiency and renewables can improve the situation in many economies**

Note: The self-sufficiency level was determined based on shares of primary energy demand and production. Some economies may see deterioration in self-sufficiency due to increase in certain fuel will effect another fuel. Renewables and nuclear are considered as indigenous.
3. Climate Change
Rising electricity demand pushes up APEC emissions

Regional changes to CO$_2$ emissions, 2013 to 2040

Only the United States and Other north-east Asia see emissions declining
Level of ambition of APEC energy targets need to be raised if global climate goal is to be achieved
## APEC INDCs

<table>
<thead>
<tr>
<th>Economy</th>
<th>Reduction level (%)</th>
<th>Reference year</th>
<th>Emissions 2030 based on INDCs (MtCO₂)</th>
<th>Change 2010 to 2030 (%)</th>
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<tbody>
<tr>
<td>Australia</td>
<td>26 to 28</td>
<td>2005</td>
<td>287 to 279</td>
<td>-22.6 to -24.7</td>
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<td>Brunei Darussalam</td>
<td>63 (energy use in 2035)</td>
<td>Business as Usual</td>
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<td>Canada</td>
<td>30</td>
<td>2005</td>
<td>91 to 71</td>
<td>-22.6 to -24.7</td>
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<tr>
<td>Chile</td>
<td>30 to 45 (intensity)</td>
<td>2007</td>
<td>371</td>
<td>-26</td>
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<td>China</td>
<td>60 to 65 (intensity)</td>
<td>2005</td>
<td>11 715 to 10250</td>
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<td>Indonesia</td>
<td>29 to 41</td>
<td>Business as Usual</td>
<td>411 to 341</td>
<td>7.2 to -10.9</td>
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<tr>
<td>Japan</td>
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<td>927</td>
<td>-25</td>
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<td>Korea</td>
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<td>-18.4</td>
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<td>2005</td>
<td>327 to 277</td>
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<td>411 to 337</td>
<td>1.4 to -16.8</td>
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<td>Business as Usual</td>
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<td>214 to 124</td>
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<tr>
<td>Papua New Guinea</td>
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<td></td>
<td></td>
<td>100% renewable power by 2030 conditional to financial support</td>
</tr>
<tr>
<td>Philippines</td>
<td>70*</td>
<td>Business as Usual</td>
<td>193 to 38</td>
<td>63 to -51</td>
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<tr>
<td>Russia</td>
<td>25 to 30</td>
<td>1990</td>
<td>1 495 to 1 395</td>
<td>6.7 to -0.4</td>
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<td>Singapore</td>
<td>36 (intensity)</td>
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<td>396 to 323</td>
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<td>APEC</td>
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<td>21 653 to 19 555</td>
<td>19 to 8</td>
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</tbody>
</table>
Evaluating INDC ambition levels

- Percentage change
  - Unconditional INDC
    - Range of emissions reductions compared to 2030 BAU
  - Conditional INDC
    - Range of intensity reductions compared to 2010

Countries: The Philippines, Indonesia, Mexico, New Zealand, Chile, Canada, Australia, Thailand, Peru, Chinese Taipei, Korea, United States, China, Viet Nam, Russia, Malaysia, Japan, Singapore
APEC INDCs

Energy related CO₂ emissions

APEC economies need to raise INDC ambitions as well as APEC energy targets if the global climate goal is to be achieved.
Regional cooperation may help to create a suitable business environment that attracts long-term financing.

Economies should carefully assess the investment implications of their policy agenda and initiatives.

Diversity of primary energy supply in APEC is expected to improve as a result of higher share of renewables.

Strengthening and expanding regional cooperation and trade within APEC can play important role in improving energy security.

Accelerating technology development and deployment is central to establishing more secure and sustainable energy systems.

APEC energy targets need to be enhanced to meet long term global climate objectives and economies should monitor and strengthen INDCs where possible.
Thank you for your support!

http://aperc.ieej.or.jp/
• Should the Outlook period be extended from 2040 to 2050?

• Should APERC develop a low carbon scenario consistent with limiting global temperature increases to 2°C? What recommends do you have for how emissions reductions should be shared across APEC economies in this scenario?

• What other alternative scenarios or special topics would you recommend APERC consider developing?

• Do you expect low oil prices to persist? Should APERC develop a low oil price scenario?

• What game changers (either technological or consumer driven) should be considered? Revolution in transport (EVs, big data, Uber and self-driving vehicles) and quicker uptake of renewables.