APEC Energy Demand and Supply Outlook 6th Edition

2-2 Improved Efficiency Scenario (IES)

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1. Scenario Introduction
Energy efficiency is the most effective tool APEC economies have to curve energy demand and realize associated benefits.

- The international Energy Agency calls energy efficiency the “first fuel”

APEC has a 45% energy intensity reduction target compared to 2005

IES explores a more aggressive approach to energy efficiency compared to BAU to enable APEC to meet its target and maybe more?

The IES assumes energy efficiency opportunities and policies in each sector that are available and are cost effective today:

- In fact most of these policies are in place in some way somewhere
Estimated potential savings in the industrial subsector from adoption of BATs

<table>
<thead>
<tr>
<th>Sub-sector</th>
<th>Assumed improvement potential (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Developed economies</td>
</tr>
<tr>
<td>Iron and steel</td>
<td>10 - 15</td>
</tr>
<tr>
<td>Chemical and petrochemicals</td>
<td>10 - 25</td>
</tr>
<tr>
<td>Non-metallic mineral</td>
<td>20 - 25</td>
</tr>
<tr>
<td>Food and tobacco</td>
<td>25 – 40</td>
</tr>
<tr>
<td>Paper, pulp and printing</td>
<td>20 - 30</td>
</tr>
<tr>
<td>Non-ferrous metals</td>
<td>5 - 40</td>
</tr>
</tbody>
</table>

Source: Saygin et al. (2010).

*Industrial subsectors still have efficiency potentials of up to 55% in APEC economies.*
## Key efficiency assumptions in buildings in the BAU and IES by sub-sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Appliances</th>
<th>Measure</th>
<th>Highest in IES</th>
<th>Lowest in BAU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>Fridges</td>
<td>Yearly consumption</td>
<td>216 kWh/y</td>
<td>644 kWh/y</td>
</tr>
<tr>
<td></td>
<td>Air conditioners</td>
<td>Efficiency ratio</td>
<td>5.81</td>
<td>2.55</td>
</tr>
<tr>
<td></td>
<td>Water heaters – fuel</td>
<td>Percentage</td>
<td>91%</td>
<td>76%</td>
</tr>
<tr>
<td></td>
<td>Lighting</td>
<td>Watts</td>
<td>10 W LED</td>
<td>60 W Inc.</td>
</tr>
<tr>
<td></td>
<td>TV</td>
<td>Yearly consumption</td>
<td>102 kWh/y</td>
<td>261 kWh/y</td>
</tr>
<tr>
<td></td>
<td>Washing machines</td>
<td>Yearly consumption</td>
<td>6 kWh/y</td>
<td>194 kWh/y</td>
</tr>
<tr>
<td></td>
<td>Standby</td>
<td>Watts per device</td>
<td>1 W</td>
<td>5 W</td>
</tr>
<tr>
<td>Commercial and residential</td>
<td>Space heating – fuel</td>
<td>Percentage</td>
<td>96%</td>
<td>71%</td>
</tr>
<tr>
<td>Commercial</td>
<td>Space heating – heat pump</td>
<td>Coefficient of performance</td>
<td>5.81</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>Lighting</td>
<td>% Improvement</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cooling</td>
<td>% Improvement</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ventilation</td>
<td>% Improvement</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refrigeration</td>
<td>% Improvement</td>
<td>34%</td>
<td></td>
</tr>
</tbody>
</table>

Source: McNeil et al. (2008)

**Appliances and buildings have significant energy efficiency potentials, especially in space conditioning options.**
### Transport energy efficiency assumptions

#### Transport efficiency annual improvement assumptions in BAU and IES, 2013-40

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Labelling scheme</th>
<th>Group of economies</th>
<th>2013-30</th>
<th>2030-40</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BAU</strong></td>
<td><strong>No</strong></td>
<td>Brunei Darussalam, Indonesia, Malaysia, Mexico, Papua New Guinea, Peru, Philippines, Russia, Thailand</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td><strong>Yes</strong></td>
<td>Australia, Canada, Chile, China, Hong Kong, Japan, Korea, New Zealand, Singapore, United States, Viet Nam, Chinese Taipei</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Improved Efficiency</strong></td>
<td><strong>No</strong></td>
<td>Brunei Darussalam, Indonesia, Malaysia, Mexico, Papua New Guinea, Peru, Philippines, Russia, Thailand</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td><strong>Yes</strong></td>
<td>Australia, Canada, Chile, China, Hong Kong, Japan, Korea, New Zealand, Singapore, United States, Viet Nam, Chinese Taipei</td>
<td>2.7%</td>
<td>2%</td>
</tr>
</tbody>
</table>


*Fuel efficiency standards can double the rate of fuel economy improvements between 2030 and 2040.*
IES: Results
Total savings of 13% or 921 Mtoe

APEC’s target can be met by 2032 under the Improved Efficiency Scenario

**APEC Energy Intensity target**

- 45% reduction target
- 13% savings
- 921 Mtoe

**Overall results**

- 2032
- 2037

Total savings of 921 Mtoe equivalent to the combined current demand of Russia, Japan and Korea. Causing demand to peak by 2025
China and the US account for 64% of savings

Energy savings in the IES by regional grouping, 2015-40

- **BAU**
  - Oceania
  - Other north-east Asia
  - Russia
  - Other Americas
  - South-East Asia
  - United States
  - China
  - Improved Efficiency Scenario

*China has the largest saving potential: it delivers 43% of total APEC savings. The US follows with 21%*

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).
Industry saves 372 Mtoe or 16%

Industry final energy demand in the BAU and IES, 2013-40

**Business as Usual**

**Improved Efficiency**

**Strong energy demand-GDP growth decoupling in industry, where 79% output growth is fuelled by only 10% energy demand growth**

Note: Excludes non-energy use.
Sources: APERC analysis and IEA (2015a)
Note: The three most energy-intensive sub-sectors in the APEC region are iron and steel, chemical and petrochemicals, and non-metallic minerals.
Unlike industry and transport, buildings energy demand does not peak in the IES, although growth is very small at end of the period.

Sources: APERC analysis and IEA (2015a)
Space and water heating and lighting have the largest potential in the residential subsector

Note: Space heating includes building improvements as well as appliances.
Transport provides 29% of the savings

Road transport energy savings, 2015-40

Transport energy demand peaks in 2025 at 1 695 Mtoe.
Urban design reduces vehicle stock by 9%.

Shares of vehicle stock by technology in the BAU and Improved Efficiency Scenarios, 2013 and 2040

- **2013**
  - Gasoline: 79%
  - Diesel: 18%
  - CNG: 1%
  - LPG: 1%
  - Hybrid: 1%
  - PHEV: 1%
  - EV: 1%
  - Total: 663 Million

- **BAU 2040**
  - Gasoline: 52%
  - Diesel: 20%
  - CNG: 7%
  - LPG: 4%
  - Hybrid: 2%
  - PHEV: 2%
  - EV: 2%
  - Total: 1,272 Million

- **Improved Efficiency Scenario 2040**
  - Gasoline: 47%
  - Diesel: 19%
  - CNG: 17%
  - LPG: 4%
  - Hybrid: 1%
  - PHEV: 8%
  - EV: 4%
  - Total: 1,156 Million

**New technology vehicles increases by 70 million units (increasing its share to 29%)**

Notes: LNG = liquefied natural gas; CNG = compressed natural gas.
The size of the circle reflects overall growth of transport energy demand.
Sources: APERC analysis and IEA (2015a).
Key messages

- The IES shows 13% energy savings compared to BAU and demand peaks by 2029. Saving 921 Mtoe.
- China provides the largest savings, accounting for 43% of the total.
- Industry provides the largest sector share—40% or 372 Mtoe—of savings through promoting best available technologies (BATs).
- Fuel efficiency standards for vehicles are key to achieve the 15% reduction in demand in the transport sector.
- Buildings save 279 Mtoe (13%) from appliance and building envelope improvements. Heating and cooling are particularly important.
- APEC achieves its 45% energy intensity target by 2032 in this scenario, and is 49% lower than 2005 by 2035.
- Is a more ambitious target possible?
Thank you for your kind attention

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