APEC’s Potential for Reducing Energy Intensity: The Research Evidence So Far

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Current Status of APEC’s Intensity Goal

• 2007 Sydney APEC Leaders’ Declaration on Climate Change, Energy Security and Clean Development –
  – “Agree to work towards achieving an APEC-wide regional aspirational goal of a reduction in energy intensity of at least 25 per cent by 2030 (with 2005 as the base year)”

• 2010 Yokohama APEC Leaders Growth Strategy –
  – “APEC will assess the potential for reducing the energy intensity of economic output in APEC economies between 2005 and 2030, beyond the 25 percent aspirational goal already agreed to by APEC Leaders in 2007”
Intensity Goal: Key Research Questions

A. What intensity goal can APEC achieve under current policies?
B. What intensity goal does APEC need to achieve?
C. What intensity goal do APEC economies currently pledge to achieve?
A. What Intensity Goal Can APEC Achieve Under Current Policies?
1. APERC’s Business-As-Usual Outlook

From APERC, *APEC Energy Demand and Supply Outlook 4th Edition*, Figure 1.5
2. What Happened to Energy Intensity Over the 25 Years from 1980-2005?

Energy Intensity Down 31% vs. 1980

*Excludes Vietnam and Russia, for which data was not available for the earlier periods.
3. What Has Happened to Energy Intensity Since 2005?

APEC % Reduction in Energy Intensity

<table>
<thead>
<tr>
<th>Year</th>
<th>% Reduction</th>
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<tbody>
<tr>
<td>2006</td>
<td>-0.5</td>
</tr>
<tr>
<td>2007</td>
<td>-1.0</td>
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<tr>
<td>2008</td>
<td>-1.5</td>
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Total Reduction Since 2005 = 6.0%

Indicated Reduction 2005-2030 at Average Rate So Far = 40%
4. How Do APERC’s Projections Compare to Other Organizations?

![Graph showing energy intensity projections](image)

- **Primary Energy Intensity in IEA Reference Scenario**
- **Primary Energy Intensity in EIA Reference Case**
- **Primary Energy Intensity in APERC BAU Projection**

*World Energy Outlook 2009 © OECD/IEA 2009*
Dual Threats to the APEC Economies

APEC Oil Production and Imports

CO$_2$ Emissions from Fuel Combustion

From APERC, *APEC Energy Demand and Supply Outlook 4th Edition*, Figures 1.4 and Figure 1.7
B. What Intensity Goal Does APEC Need to Achieve?
Impacts of Rising Temperatures

From Intergovernmental Panel on Climate Change, Fourth Assessment Report: Working Group II Report, Impacts, Adaptation and Vulnerability (2007), Technical Summary, Table TS.3
Have agreed on this Copenhagen Accord which is operational immediately.

1. We underline that climate change is one of the greatest challenges of our time. We emphasise our strong political will to urgently combat climate change in accordance with the principle of common but differentiated responsibilities and respective capabilities. To achieve the ultimate objective of the Convention to stabilize greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, we shall, recognizing the scientific view that the increase in global temperature should be below 2 degrees Celsius, on the basis of equity and in the context of sustainable development, enhance our long-term cooperative action to combat climate change. We recognize the critical impacts of climate change and the potential impacts of response measures on countries particularly vulnerable to its adverse effects and stress the need to establish a comprehensive adaptation programme including international support.

2. We agree that deep cuts in global emissions are required according to science, and as documented by the IPCC Fourth Assessment Report with a view to reduce global emissions so as to hold the increase in global temperature below 2 degrees Celsius, and
Why 450 PPM?

From: Intergovernmental Panel on Climate Change, *Climate Change 2007: Synthesis Report*, Figure 5.1, p 66.
F-gases include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) from several sectors, mainly industry.

What Worldwide Emission Reductions Would 450 PPM Require?

• Total CO$_2$-equivalent greenhouse gas emissions
  – Peak just before 2020 at about 3% above 2005 levels
  – Then decline to 12% below 2005 levels by 2030
  – Then continue to decline reaching about 50% of 2005 levels by 2050

• Energy-related CO$_2$ emissions
  – Peak just before 2020 at about 14% above 2005 levels
  – Then decline to 2% below 2005 levels by 2030
  – Then continue to decline reaching about 46% below 2005 levels by 2050
The IEA’s Model

• Very detailed and sophisticated
  – 16,000 equations
  – Developed over a 16 year period
• Comprehensive--modeling takes into account:
  – Highly disaggregated demand
  – Specific supply technologies
  – Investment costs
  – Macro-economic impacts
  – Field-by-field oil production
  – Vehicle stock model
  – Refinery model
  – Electricity access
Our work is focused on overall goals which APEC economies could pursue voluntarily
  – This is just one example of how to move toward sustainability

Please bear in mind:
  – Any allocation of emissions between economies is potentially fair given the ability to offer compensation in other ways
APEC Region Mitigation Results by Measure (vs. IEA Reference)

![Graph showing energy CO₂ mitigation results for 2020 and 2030, with categories including CCS, Renewables, Biomass & Waste, Hydro, Nuclear, Other Efficiency, and Generation Efficiency.]

Raw Data © OECD/IEA 2009; calculations by APERC
APEC Region Oil Demand and Oil Import Results

Raw Data for IEA Cases © OECD/IEA 2009; calculations by APERC
APEC Key Indicators (1)

• Energy Intensity Improvement 2005-2030 (primary energy/constant $ GDP)
  – Sydney Leaders Aspirational Goal: 25%
  – APERC BAU: 38%
  – IEA 450 PPM: ~50%

• Non-Fossil Primary Energy Share
  – 2005 Actual: 16%
  – 2030 APERC BAU: 18%
  – 2030 IEA 450 PPM: 30%
APEC Key Indicators (2)

- 2030 Low-Carbon Electricity Output Share ('Low-Carbon' Means Non-Fossil + CCS)
  - 2005 Actual: 29%
  - APERC BAU: 33% (No CCS Included)
  - IEA 450 PPM: 59% (52% Non-Fossil + 7% CCS)
• GDP Impacts of IEA 450 PPM case compared to IEA Reference Scenario
  – GDP down 0.1% to 0.2% in 2020
  – GDP down 0.9% to 1.6% by 2030
  – However, these impacts would be offset by reduced climate change mitigation costs and health benefits from reduced pollution
  – Net effect on GDP hard to quantify

• Additional investment 2010-2030 of $10,500 billion
  – Offset by lower energy bills of $8,600 billion 2010-2030 ($17,100 billion over life of investments) and other benefits
C. What Intensity Goal Do APEC Economies Currently Pledge to Achieve?
What If Every APEC Economy Kept Their Pledges?

- Complex question to answer:
  - Diverse nature of pledges: emission reductions; emission intensity reductions; energy demand reductions; energy intensity reductions; specific actions
  - Contingencies
  - What happens after pledge expires?
Pledges: The Bottom Line

• Making optimistic assumptions that:
  – Each economy effectively implements their mitigation actions
  – Everyone cooperates so contingencies can be met
  – Economies renew their current pledges when they expire with pledges to continue improvement at a similar rate to 2030

• 2030 emissions would be close to those required for a 450 PPM scenario
Impact of Pledges

CO₂ Emissions from Fossil Fuel Combustion (Mt/year)

2005 2010 2015 2020 2025 2030

APERC BAU  IEA Reference  IEA 450  Pledges