Progress on Energy Intensity Reduction Assessment

- Framing the Discussion of APEC's Intensity Reduction Goal -

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Ralph D. Samuelson, APERC

Asia-Pacific
Economic Cooperation

Background (1)

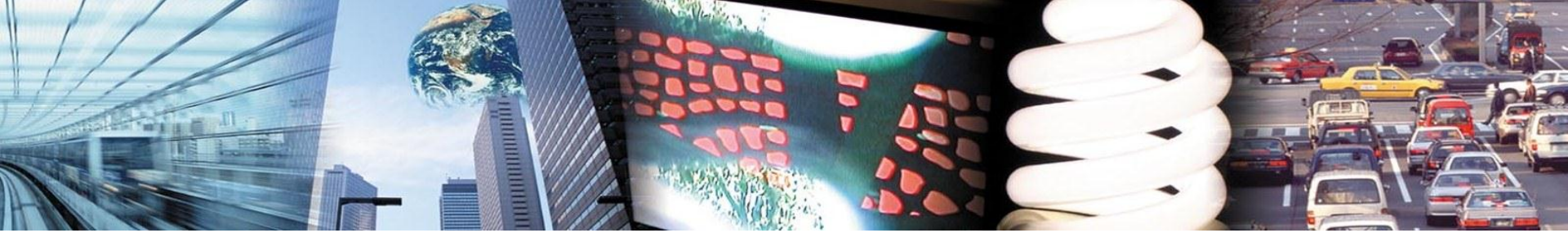
- 2007 Sydney APEC Leaders' Declaration on Climate Change, Energy Security and Clean Development
  - " We agree to work towards achieving an APEC-wide regional aspirational goal of a reduction in energy intensity of at least 25 per cent by 2030 (with 2005 as the base year)."
- 2010 Fukui APEC Energy Ministers Declaration
  - " The aspirational energy intensity goal agreed by APEC Leaders (in 2007…) will be far surpassed if recent trends continue. We therefore instruct the EWG to intensify analysis of the potential for further energy intensity improvement with a view to recommending an enhanced goal."

Background (2)

- 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"

The Two Key Questions EWG Faces

1. How should ‘energy intensity’ be defined?
2. Given the definition, at what numerical level should the APEC-wide energy intensity reduction goal be set?



How Should Energy Intensity Be Defined?

Defining Energy Intensity

- Energy Intensity is generally defined as Energy Demand/Real GDP
  - But what kind of Energy Demand?
  - And what kind of real GDP?
- The Leaders did not give a precise definition of energy intensity in their declarations; hence APEC EWG will need to consider carefully not only the numerical value of its energy intensity reduction target, but also its definition
- The choice of what type of energy demand to use is particularly important

What Kind of Energy Demand?

- ‘Final Energy Demand’ = Direct use of fuels and electricity by end-users (including industry, transport, residential, services, agriculture, and non-energy use)
- ‘Primary Energy Demand’ = Final Energy Demand + transformation losses, such as in electricity generation, heat (steam) plants, and refineries
- APERC has found that the definition of energy demand used (primary vs. final energy demand) does not change the numerical results very much, but it does significantly affect the incentives that APEC economies will face in meeting the goal

How Are Electricity Generation Losses Measured?

- For generation from a primary fuel (fossil fuels, combustible renewables and waste) = energy content of fuel input *minus* energy content of electricity output
- For generation from nuclear and geothermal = energy content of fluids (steam) produced *minus* energy content of electricity output
- For generation from other renewables (hydro, wind, solar PV) = no losses

(source: IEA, *Energy Statistics Manual)*

Should We Define Energy Intensity in Terms of Primary or Final Demand?

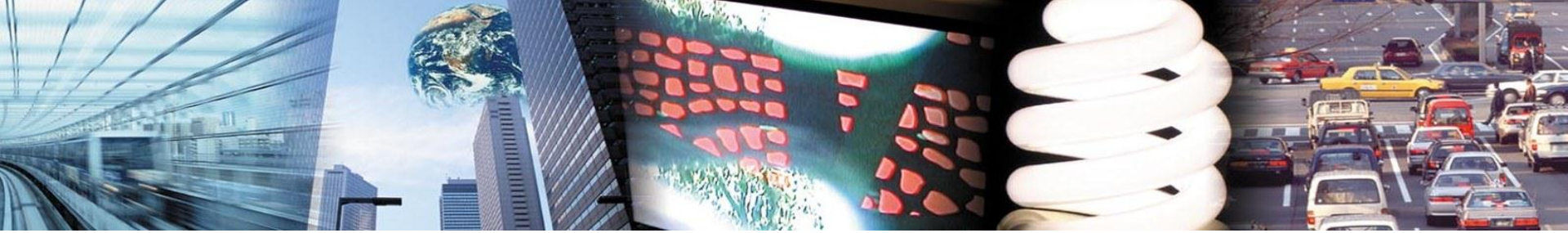
- Defining energy intensity using Primary Energy Demand would provide the broadest measure of energy efficiency improvement
  - Improvements in the efficiency of electricity generation and refineries would be reflected in this energy intensity measure
- Defining energy intensity using Final Energy Demand would provide a narrower measure of energy efficiency improvement, but one that is the focus of many government policy efforts: demand side (end-user) energy efficiency improvement

One More Consideration: the "Inefficiency" of Nuclear and Geothermal

- Nuclear usually has a low thermal efficiency: 33% is the default assumption, implying 66% 'losses'
- Geothermal has an even lower thermal efficiency: 10% is the default assumption, implying 90% 'losses'
- These rates are well below the efficiency of most fossil-fueled electricity generation
- Hence, if we use Primary Energy Supply to define energy intensity, increases in the use of nuclear or geothermal are likely to make energy intensity increase (get *worse)*
  - Thus, defining energy intensity using Primary Energy Supply may be giving APEC member economies an incentive against these types of low-carbon energy supply

APERC's Proposal on Definition of Energy Intensity

- Measuring transformation losses and transformation efficiencies for nuclear and renewables is generally a meaningless exercise
  - Unlike fossil fuel transformation losses, nuclear and renewable (geothermal) transformation losses have little or no environmental, economic, or energy security significance
- Therefore, APERC would suggest that energy intensity be measured using Primary Energy *minus* all transformation losses for nuclear and renewables
  - Use of this measure is feasible , as IEA statistics report the production of electricity and heat by primary energy type.
- APEC could then have a broad measure of energy intensity, reflecting both end-user energy efficiency and fossil-fueled transformation efficiency



Given the Definition of Energy Intensity, at What Numerical Level Should the APEC-wide Energy Intensity Reduction Goal Be Set?

Progress Report on Assessment on APEC's Potential for Reducing Energy Intensity

- APERC has been endeavouring to assist the EWG in their response to the APEC Energy Minister's instruction by analyzing a variety of evidence regarding
  - rates of historical energy intensity reduction
  - analysing various modelling results on APEC's potential for reducing energy intensity
- APERC has focused the modeling analysis on three key questions

The Three Key Questions

A. What level of APEC-wide energy intensity reduction would be consistent with business-as-usual?
B. What level of APEC-wide energy intensity reduction would be consistent with what APEC economies currently pledge to achieve?
C. What level of APEC-wide energy intensity reduction would be consistent with a global effort to limit temperature rises to 2^{o} C?

The Uncertainties

- Any projection of what the world will be like in 25 years, even under business-as-usual, is subject to many technological, political, economic, and environmental uncertainties
- Beyond this, analyzing what economies currently pledge to achieve is subject to many uncertainties regarding how their pledges should be interpreted, the extent to which economies are able to actually implement them, and what happens after they expire
- Analyzing what it takes to limit temperature rises to 2 degrees involves additional uncertainties regarding emission reductions in APEC vs. the rest of the world, emission reductions in the energy sector vs. other sectors, and emission reductions through intensity improvement vs. lower carbon energy

Some Indicative APEC-wide Energy Intensity Reduction Potentials for 2005-2030 Based on the Results Presented Here

A. As a rough approximation, a 38-40% APEC-wide energy intensity reduction would be consistent with business-as-usual

B. As a rough approximation, a 42-43% APEC-wide energy intensity reduction would be consistent with with “cautious” implementation of current pledges

C. As a rough approximation, a 47% APEC-wide energy intensity reduction would be consistent with cooperative efforts to limit temperature rises to 2^{0} C

Some Reasons for Setting a High APEC-Wide Energy Intensity Reduction Goal

- Only a high APEC-wide energy intensity reduction goal would be consistent with the Cancun Agreement's goal of limiting global temperature rise to 2^{o} C
- A high APEC-wide goal would be a 'stretch goal', encouraging APEC economies to move well beyond business-as-usual and put APEC on a more sustainable path to growth and development

One Option If APEC Wishes to Adopt a High-Level Goal

- Given that the model results are (and, for 25 years in the future, always will be) very approximate, APEC might choose a goal that is a round number that would send a powerful message to the public
- A 50% reduction goal by 2030—that is a doubling of output per unit of energy—might be such a goal

Some Reasons for Setting a Mid-Range APEC-Wide Energy Intensity Reduction Goal

- A mid-range APEC-wide energy intensity reduction goal still requires APEC economies to move one step toward a more sustainable path of growth and development, although such level of intensity reduction would not be consistent with the Cancun Agreement's goal of limiting global temperature rises to 2^{o} C
- A mid-range APEC-wide energy intensity reduction goal would be achievable if APEC economies fully implement the voluntary pledges that they have already made

Key Question for EWG: What is the Purpose of This 'Aspirational Goal'?

- The APEC Leaders defined this APEC-wide goal as an 'aspirational goal', which could be interpreted as something APEC should strive for
- If the purpose is to send a message about what we *need* to do, then a high-level APEC-wide energy intensity reduction goal is appropriate.
- If the purpose is to send a message about what we realistically think we *can* do through voluntary APEC cooperation alone, then a mid-range target is appropriate

Next Steps

- APERC invites your feedback on the analysis presented here and in the APERC Workshop on May 9

- APERC will do our best to address any gaps identified in time for EWG 42