ASEAN ENERGY MARKET INTEGRATION (AEMI) FORUM

ENERGY PRICING AND SUBSIDIES

27-28 February 2015, Pathumwan Princess Hotel, Bangkok

Forum held under Chatham House Rule

DISCUSSION PAPER

A. FORUM OBJECTIVE

1. The core objective of the Forum is to analyze the impacts of energy subsidy removal at the ASEAN-level in the framework of ASEAN Energy Market Integration (AEMI), with a view to developing relevant policy recommendations for the new ASEAN Plan of Action for Energy Cooperation (APAEC) (2016-2020). It is convened to agree an analytical approach and division of labor among its participants from ASEAN academic and research institutions.

2. More specifically, the research to be undertaken would be designed to address three interrelated questions:

   (a) What are the options to "decouple" energy pricing from welfare objectives to assist the poor in most vulnerable ASEAN communities?

   (b) Can AEMI help develop ASEAN-wide subsidies instruments to protect the poor while allowing the energy market to function efficiently?

   (c) What are policy recommendations for the new APAEC (2016-2020)?

B. RATIONALE FOR ENERGY SUBSIDY REMOVAL[1]

3. Energy subsidies are a major impediment to AEMI within the ASEAN Economic Community (AEC). Moreover, based on numerous studies, the emerging consensus is that energy subsidies have several negative impacts at the macroeconomic, fiscal, welfare, and environmental levels.

4. At the macroeconomic level, energy subsidies depress gross domestic product growth through a number of channels: they can discourage investment in the energy sector; diminish private sector competitiveness; and create incentives for smuggling.

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[1] Sources: AEMI Group (2013), *ASEAN Energy Market Integration (AEMI): From Coordination to Integration*; Asia Development Bank (ADB) (2013), *Asian Development Outlook 2013: ASEAN's Energy Challenge*; International Energy Agency (IEA) (2012), *World Energy Outlook*; International Monetary Fund (IMF) (2013), *Energy Subsidy Reform: Lessons and Implications*; International Institute for Sustainable Development (IISD) (2013), *A Guidebook to Fossil-Fuel Subsidy Reform for Policy-Makers in Southeast Asia*; The World Bank (2010), *Subsidies in the Energy Sector: An Overview*.

5. At the fiscal level, energy subsidies exacerbate budget deficits; crowd out growth-enhancing public spending; and are inefficient tools to reach the poor. Subsidies have put governments under financial stress, often crowding out investments in health care, sanitation, education, and other public spending. It has also limited the ability of state owned utilities to build sufficient capacity, with negative implications on electricity supply (shortages) and on the134 million people in ASEAN without access to electricity.

6. At the social and welfare levels, energy subsidies are highly inequitable because they mostly benefit upper-income groups; and they divert public resources away from pro-poor spending. IEA finds that there is a substantial leakage of subsidy benefits to top income groups. Its analysis indicates that only 8% of the subsidy granted typically reaches the poorest income group. IMF study of 20 countries examined the direct impacts of increasing energy prices, and found that increasing prices for gasoline and electricity have a strong progressive impact, but the same is not true for kerosene which is strongly regressive.

7. At the environmental level, energy subsidies stall growth of cleaner fuels and technologies and as a result increase carbon dioxide and other greenhouse gas (GHG) emissions. It also delay development of renewable technologies and discourage adoption of energy efficient measures. According to the IMF, the effect of subsidy removal is a reduction in GHG emissions (through a reduction in usage of fossil fuel, and increase in cleaner forms of renewables). However, IISD argues that this net effect depends on the nature of the fuel and the technology substitution (increase in the use of coal).

C. TOWARDS A CONSISTENT METHODOLOGY

DEFINITIONS

8. Energy – covers primary hydro-carbons energy sources (oil, natural gas, coal) as well as electricity.

9. Price-gap approach – where energy subsidies are measured as the difference between a benchmark border price and price in the domestic market. In the case of electricity, it is the difference between the price charged to consumers and the appropriate benchmark price, which is the cost-recovery price for the domestic producer, including a normal return to capital and distribution costs.

10. Consumer/consumption subsidies—arise when the prices paid by consumers (firms and households) are below a benchmark price (international price). For electricity, this includes subsidy for electricity generation, and any direct subsidy on the electricity price for consumers (household and firms).

11. Producer/production subsidies—arise when prices received by suppliers are above the benchmark price. These are mainly subsidies to major oil companies in the form of tax reimbursements, accelerated depreciation, and research and development grants.

12. Subsidies to account for pre-tax subsidy—price paid below supply and distribution costs; or tax subsidy—taxes below their efficient level. Note that IEA has published an on-line database to increase the availability and transparency of energy subsidy data.

MODELING TOOLS

13. The objective is to use consistent modeling tools and data, for coherent comparison across countries.

14. The price-gap approach is the most useful and widely used and recommended (IEA, IMF, IISD).

15. The choice of appropriate models to conduct the quantitative impact analysis includes: Computable General Equilibrium (CGE) (with supply and demand behaviors across all markets in an economy); linear programming; and econometric models.

DATA

16. Agree on identifying or building a consistent ASEAN economic database, from those typically used (e.g., household income expenditure surveys, I-O tables, Social Accounting Matrices (SAMs)).

17. Agree on sufficiently disaggregated data -- by fuel type and by household income level.

18. For modeling the impacts of energy subsidy removal (ESR), agree that it will be sufficient to capture the top "largest" subsidies accounting for, say, more than 80% of total energy subsidies.

D. NATIONAL SCENARIOS

IMPACTS OF ESR

19. Macroeconomic impact: negative on gross domestic product growth in the short run, positive in the middle and long run.

20. Fiscal impact: net savings in government budgets.

21. Household and social welfare impacts: regressive. Overall, an increase in prices of energy has a negative impact on welfare. However, welfare distributions for increasing prices differ by type of fuel (LPG, kerosene).

22. Environmental impact, through greenhouse gas emissions: generally positive. Subsidies removal will lead to a reduction of carbon dioxide (IMF). However, the net impact depends on fuel substitution (IISD). Models need to be adequately disaggregated to project fuel consumption after subsidy removal, including fuel-switching behavior, and can then multiply the new projected level of consumption by carbon-emission factors for each fuel. If addressed properly, GHG emissions savings from fuel subsidy removal could be large, and this may be helpful in raising financial and technical support from international agencies and donors.

MITIGATION MEASURES

23. Safety nets are necessary to reduce the impact of subsidy removal on the poor. Analysis of such measures and their effectiveness needs to be country specific.

24. In the short term: support is needed to shield the poor from price rises. In the long term, there could be a need for more permanent social assistance, or measures to help the poor cope with energy price volatility.

25. Targeted transfers or near-cash transfers (vouchers) are the preferred approach to compensation (IISD). However, other options include reallocating government net savings into social investments, and productive infrastructure expansion geared towards the poor (public transport, access to clean energy and electricity).

26. Phasing-in subsidies removal over time (gradual removal say, over five years) is recommended over one step implementation (big bang). Also, sequencing sectors could be factored in, rather than removing subsidies in all sectors at the same time.

SCENARIOS

27. Scenarios would be agreed on for the implementation across all national analyses. There would essentially be three types of phased subsidy removal: without any mitigation measures; reallocating government net savings towards the poor at the national level; reallocating them towards greater ASEAN energy connectivity.

28. Reallocating government net savings from ESR towards the poor could include:

    (a) Reallocating towards social safety nets: increased expenditures on assistance of poor for health and education, or targeted poverty reduction programs (e.g., environmental protection and disaster management; extending social welfare schemes);

    (b) Reallocating towards social reinvestments: increased investment in health and education, infrastructure and agriculture, in public sector transport networks, in access to electricity and clean energy sources).

29. Five scenarios would project the ESR impacts and government use of net savings:

    (a) No mitigation measures

    (b) Paying out cash (or near cash) compensation to the poor(say the 20% bottom income)

    (c) Reallocate net savings into social safety nets

    (d) Reallocate net savings towards social reinvestments

    (e) Reallocate net savings in greater ASEAN Connectivity (ASEAN Grid and Gas Pipeline).

E. CONSISTENT NATIONAL AND ASEAN ANALYSES

NATIONAL-LEVEL ANALYSIS

30. Conduct national analysis of ESR impacts, on coherent and comparable:

    (a) Consistent ASEAN data sets at national level

    (b) Consistent CGE family of models

    (c) Equivalent scenarios for subsidy removal at national level

ASEAN-LEVEL MODELING TOOLS

31. Based on national analyses, how can we draw conclusions at the ASEAN level? As a first step, can we integrate and "aggregate" the tools we already have available at the national-levels into an ASEAN-level analysis?

32. How do we proceed to build ASEAN-level CGE? Or econometric models? Tables 1-4 describe some of the CGE models most relevant to a multi-country ASEAN-level analysis (these are existing multi-country models used by the IEA, EU, and UNFCCC as well as one ASEAN model built by researchers).

ASEAN-LEVEL ANALYSIS

33. Parallel to the national-level analysis, conduct ASEAN-level analysis based on:

    (a) ASEAN data set, consistent with data used for the national-level analyses

    (b) Agreed assumptions for AEMI within the AEC

    (c) Agreed scenarios consistent with those in national-level analyses.

33. Two methodologies would be developed in parallel:

    (a) Econometric analysis at the ASEAN-level

    (b) ASEAN-level CGE Model, to be constructed simultaneously

F. RESEARCH OUTLINE

1 Overview of energy subsidies within ASEAN

2 Review of the literature on ESR: concepts, theory, experience

(a) Globally
(b) Within ASEAN

3 Review of the literature on ESR impacts on the following indicators:

(a) Macroeconomic indicators
(b) Fiscal indicators
(c) Net Energy consumption: sectors, household, firms
(d) Social welfare indicators
(e) Energy efficiency
(f) Renewable energy
(g) GHG emissions

4 Defining a cohesive methodological approach across ASEAN member states (data sources, CGE models, and econometric approach).

5 Compilation of a panel matrix of sectoral energy demand and supply for the ASEAN

6 Compilation of a harmonized panel database for the ASEAN on:

(a) Energy subsidies and
(b) Related energy, economic and trade data required for scenarios

7 Using a coherent family of CGE models, analyse the impacts of ESR in each ASEAN member states under five scenarios:

(a) No mitigation measures
(b) Paying out cash (or near cash) compensation to the poor (20% lowest income)
(c) Reallocate net savings into social safety nets
(d) Reallocate net savings towards social reinvestments
(e) Reallocate net savings in greater ASEAN Connectivity (ASEAN Grid and Gas Pipeline).

8 Construction, estimation and validation tests of an econometric model of ESR at the ASEAN level in the framework of AEMI. This model should allow an analysis of ESR impacts on:

(a) Economic growth
(b) Fiscal balances
(c) Net Energy demand / compensation
(d) Social welfare
(e) Energy efficiency
(f) Renewable energy
(g) GHG emissions

9 Construction of an ASEAN level CGE energy model in the framework of AEMI. This model should allow an analysis of ESR impacts on:

(a) Economic growth
(b) Fiscal balances
(c) Net Energy demand / compensation
(d) Social welfare
(e) Energy efficiency
(f) Renewable energy
(g) GHG emissions

10 Policy Implications and Recommendations for the ASEAN, addressing key issues, including:

(a) ESR and the poor energy consumers: welfare issues
(b) ESR and the energy producers: efficiency issues
(c) ESR and environmental issues: GHG emissions and renewables
(d) AEMI and ESR: would ESR mitigation be more efficient? Are mitigation impacts within ASEAN bigger than the sum of national impacts?
(e) AEMI and ESR: does AEMI provide ASEAN with new tools to mitigate ESR impacts?
(f) What are ASEAN policy recommendations to build AEMI in a way that enhances ability for each member state to protect the poor?

Table 1: Some Response Measures Models
(used by the UNFCCC)

E3ME	
Name and contact of organization	**Cambridge Econometrics** Covent Garden, Cambridge, CB1 2HS, UK Tel: +44 (0)1223 460760
Description of model	The econometric E3ME model has been built as a framework for assessing energy-environment-economy issues and policies. Its close links between energy demand and economic indicators make it well-suited to assessing the social and economic impacts of response measures. In particular, additional taxes or the removal of subsidies can be assessed with the model. E3ME can also be used to examine the impacts of efficiency measures, including rebound effects. In the past the model has mainly been used for: 1. general macro and sectoral economic analysis; 2. more focused analysis of policies relating to greenhouse gas mitigation; 3. assessing incentives for industrial energy efficiency; 4. analysing sustainable household consumption – for example to assess impacts of raw material taxation on household consumption patterns and other economic variables. Recently the model has been used to contribute to several official policy assessments in Europe, including the Energy Taxation Directive, the Energy Efficiency Directive and the 2030 environmental targets. It is also frequently being applied at national level, both within and outside Europe.
Particular relevance	E3ME is relevant in assessing the socio-economic impacts of the climate change mitigation policies, for example the effect these policies have on specific industries or on income distribution. E3ME can be particularly useful in analysing changes to policies regarding taxation, subsidies and efficiency improvements of activities relating to fossil fuels.
Coverage	Global coverage. 53 regions.
Model applications	COMETR assessed the economic and environmental impacts of European environmental tax reforms carried out in the 1990s. E3ME was used to examine both the short and long-term effects of these reforms, with particular emphasis on competitiveness. (http://www2.dmu.dk/cometr/). The CLIMACAP project provided improved modelling capacity and policy formulation to support the development and implementation of low carbon development strategies in Latin America. The project integrated model improvement, capacity building and policy strategy support into a single coherent process. E3ME publications (http://www.camecon.com/EnergyEnvironment/EnergyEnvironmentEurope/ModellingCapability/E3ME/publications.aspx).

<table>
<tr><td>Other projects / research</td><td colspan="2">E3ME Asia - The main outcome of this project is the book E3 Modelling for a Sustainable Low Carbon Economy in East Asia, which will be published in 2015.For this purpose, a previous version of the E3ME model is expanded to provide detailed coverage of China, Japan, Korea and Taiwan.</td></tr>
<tr><td colspan="3" align="center">E3MG</td></tr>
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Source:http://unfccc.int/adaptation/adverse_effects_and_response_measures_art_48/items/5158.php

Table 2: EU multi-country modeling system

QUEST is the global macroeconomic model DG ECFIN (European Commission) uses for macroeconomic policy analysis and research. It is a structural macro model in the New-Keynesian tradition with rigorous microeconomic foundations derived from utility and profit optimisation and including frictions in goods, labour and financial markets.

There are different versions of the QUEST model, estimated and calibrated, each used for specific purposes. Model variants have been estimated using Bayesian methods, jointly with colleagues at the Joint Research Centre of the European Commission. These dynamic stochastic general equilibrium (DSGE) models are used for shock analyses and shock decompositions, e.g. to assess the main drivers of growth and imbalances (Euro area, Germany, Spain, the US).

Larger multi-country calibrated model versions are used to address issues for which a deeper level of disaggregation is required, both at the regional and sector level. Many of the main applications deal with fiscal and monetary policy interactions and either use a one-sector model or models that explicitly distinguish tradables and non-tradables sectors. Other model variants also include housing and collateral constraints, and a banking sector. All calibrated model versions are employed using different country disaggregation, focusing on the euro area or EU as a whole, and other global regions, or on individual member states.

For the analysis of structural reforms, we use an extended version of the QUEST model that captures both investment in tangibles and intangibles (R&D), and disaggregates employment into three skill categories. In this model, variant technological change is semi-endogenous, adopting the Jones (1995) knowledge production function, and this model is used to analyse the impact of structural reforms in the EU.

Source: http://ec.europa.eu/economy_finance/research/macroeconomic_models_en.htm

Table 3: Energy Technology Systems Analysis Program (ETSAP)

ETSAP is an Implementing Agreement of the International Energy Agency (IEA), first established in 1976. It functions as a consortium of teams and invited teams that actively cooperate to establish, maintain, and expand a consistent multi-country energy/economy/environment/engineering (4E) analytical capability.

Its backbone consists of individual national teams in nearly 70 countries, and a common, comparable and combinable methodology, mainly based on the MARKAL / TIMES family of models, permitting the compilation of long term energy scenarios and in-depth national, multi-country, and global energy and environmental analyses.

ETSAP promotes and supports the application of technical economic tools at the global, regional, national and local levels. It aims at preparing sustainable strategies for economic development, energy security, climate change mitigation and environment.

As part of its outreach activities, ETSAP collaborates with many other research teams throughout the World, participates in various global forums (EMF 22, for example), and makes its Newsletter and its Proceedings available online to the public at large.

By statute, ETSAP meets twice a year to exchange experiences, discuss ways to improve the tools and manage the common activities. Local experts are invited to these meetings so that they are exposed to the paradigm and can interact with the ETSAP participants from their country. These meetings are also held in non-Annex I countries and they often lead to collaborative model building projects with local and third party funds.

Members in ASEAN:

Malaysia

Philippines

Singapore

Thailand

Vietnam

Other Members include:

Norway

Australia

Source: http://www.iea-etsap.org/web/index.asp

<u>Table 4</u>: Inter-Regional System of Analysis for ASEAN (IRSA-ASEAN) Model

The IRSA-ASEAN model is a multi-country CGE model that stem from other developments in CGE modeling over the last 20 years; some of these sources of inspiration are direct and easily identified, including one of the first CGE models for Indonesia by Lewis (1991) and Resosudarmo (2002), the GTAP model (Hertel, 1997), and the Globe model (McDonald et al., 2007), meaning that the IRSA-ASEAN model is a unique model in its own right, both structure-wise and purpose-wise. The IRSA-ASEAN model itself is a multi-country model that solves at the country level, meaning that optimizations are performed at this level. This approach allows for variation in price as well as in quantity for each country to be observed using this model. This approach enables observation of the impact of a shock specific to one country compared with other countries, the whole ASEAN economy, and within the country itself. The IRSA-ASEAN model includes six ASEAN member countries, namely Indonesia, Malaysia, The Philippines, Singapore, Thailand, and Vietnam. As optimization is performed at the country level, and taking into account the "sovereignty" element of each country, the model uses neither a bottom-up nor a top-down approach2. Each country is instead connected through commodity flows (i.e. trade of goods and services), as well as transfer flows (i.e. remittances and savings-investments). The model also allows direct transfer of primary factors of production, e.g. fragmentation. As a consequence of the sovereignty element in the IRSA-ASEAN model, each country has its own balance of payments as well as savings and investment accounts. Each country deals directly with other countries in terms of trading and is allowed its own set of tariff barriers. For example, in the IRSA-ASEAN model, each country can export/import goods and services directly to/from the rest of the world (ROW). Another important highlight of the IRSA-ASEAN model deals with the issue of double-dividends. The model internalizes the double-dividend hypothesis by explicitly incorporating various recycling mechanisms. In this regard, aside from the government increasing its expenditure, the carbon tax revenue can either be recycled directly to households (e.g. by a direct one-time lump-sum cash transfer to low-income households), or recycled back to industry (e.g. by indirect tax reduction, so that it creates a less distortionary tax system, or supposedly so). Another distinctive feature of the IRSA-ASEAN model is that it is connected to a microsimulation model to disaggregate the four household groups, namely Rural-Low, Urban-Low, Rural-High, and Urban-High. Once a solution has been found for a particular simulation, through the microsimulation model, household groups are disaggregated further into one hundred groups based on population percentile groups in both rural and urban areas. The microsimulation basically disaggregates household expenditure for each commodity using an expenditure share coefficient for each percentile household group.

Source: Ditya A. Nurdianto and Budy P. Resosudarmo, *ASEAN Economic Community and Climate Change* (2014).

[2] This is in line with real world evidence in which unlike the EU, ASEAN is not a supranational organization.