Asia-Pacific
Economic Cooperation

# APEC Peer Review on Energy Efficiency:

## Viet Nam Follow-up

### Evaluating & Monitoring the Implementation of National Energy Efficiency Programs

**WORKSHOP SUMMARY REPORT**

APEC Energy Working Group

November 2012

APEC Project EWG 02/2011

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# Evaluating & Monitoring the Implementation of National Energy Efficiency Programs

## Overview

The first follow-up of the Asia Pacific Economic Cooperation program, the Peer Review of Energy Efficiency (PREE) was held in Do Son, on Hai Phong Bay, Vietnam during the period of 27 February through 2 March, 2012. This workshop was requested by the Government of Viet Nam for the express purpose of training national and city government officials responsible for the collection, analysis and reporting of energy efficiency data.

This training was developed to help the Government of Viet Nam identify and utilize energy efficiency data to ensure that the National Energy Efficiency Programs of Viet Nam are carried out in accordance with the best practices currently employed in other economies worldwide. Among the more than 30 participants were senior officials from the government of Viet Nam; representatives from three APEC economies (Indonesia; Thailand; and Viet Nam) who presented the status of and plans for evaluation and monitoring in their economies; invited speakers from three APEC economies (New Zealand; Chinese Taipei; and the United States of America) who spoke on various aspects of energy efficient indicators, decomposition analysis, and monitoring and evaluation; and representatives of the Asia Pacific Energy Research Centre of Japan.

**The PREE follow-up training focused on two major aspects of energy data:**

1. how to perform a decomposition analysis of national, sectoral and subsectoral energy consumption and Gross Domestic Product (GDP) data to identify (i) contributions to energy efficiency and (ii) areas to enhance and improve energy efficiency efforts; and
2. understanding the importance of monitoring and evaluation of energy efficiency to ensure that claimed savings (energy, costs, pollution and/or greenhouse gases) are real, credible and trackable over time.

**The objectives of both PREE follow-up training aspects were successfully delivered:**

1. for the decomposition analysis, trainees were divided into three groups for the day and a half "practice session" and successfully performed decomposition analyses using actual energy and GDP data from three economies.
2. for the data evaluation, measurement, and verification (EM&V) road mapping session, the trainees understood the value and need for EM&V and actively participated in the road mapping session by providing many ideas that described a series of "next steps" that would lead the government of Viet Nam on a path to establish a strong EM&V program.

**The main topics of discussion at the meeting were:**

- The importance of evaluation and monitoring of national energy data as a cornerstone strategy for making determinations whether the economy is achieving significant energy savings to meet APEC energy efficiency goals, as well as to achieve numerous co-benefits (e.g., reduced carbon emissions and other criteria pollutants, increased national security, health benefits) in developing APEC economies;
- The current status and future plans for the evaluation and monitoring activities in three developing APEC economies (Indonesia; Thailand; and Viet Nam);
- Effective strategies for developing and strengthening energy efficiency indicators for policy making and determinations whether policy goals have been met;
- Decomposition analysis techniques of an economy's energy and economic (and other related) data for measuring energy efficiency improvements economy-wide, to explore a practical guide for the deployment of decomposition analysis, and to understand what the Best Practices are for energy efficiency data analysis and how to implement them;
- A learning and practice session on how to use a software tool for the decomposition analysis in the industrial sector; and
- The development of a roadmap to lay out the next steps for Viet Nam to improve its monitoring and evaluation of energy efficiency through the techniques and software presented in this workshop.

It is anticipated that in the coming months, the representatives of the government of Viet Nam will implement the next steps as identified in the roadmap to achieve a higher level of evaluation and monitoring of the economy's progress in meeting the national energy efficiency goals.

The workshop agenda is shown in Appendix 1 and summaries of the status reports and expert presentations, as well as the results of the road mapping effort, are included as Appendices 2-10.

## Discussion of EM&V of Energy Efficiency Programs and Policy

Drawing on their own experience as well as the experience of other developing APEC economies, workshop participants discussed the critical nature of having the correct techniques, tools, and knowledge of how to calculate an economy's energy savings, in order to present credible and accurate data for comparing actual savings to targeted savings set forth in national goals. Such data also provide important feedback on whether enacted policies and implemented programs worked and achieved a specified level of energy savings. This gives the government policy makers and program

implementers the knowledge they need to improve or enhance policies and programs over time to achieve desired goals. The key takeaways of these discussions are summarized below.

### *Status of Evaluation and Monitoring (E&M) in developing APEC economies*

- The key driving forces in Indonesia, Thailand, and Viet Nam are government regulations or laws that set targets for achieving energy efficiency by a certain date. These laws also require the development of energy efficiency programs in certain sectors relevant to the specific economy.
- Indonesia recognized the necessity for measuring energy efficiency and the Energy Intensity target is critical to that measurement. Thailand also set an Energy Intensity target of 1.5%/annum and legislation requires an energy balance to be completed as well.
- Both Thailand and Indonesia are required to gather energy consumption data from all sectors of the economy. Vietnam has set an absolute energy reduction target and has requirements for annual reporting on the progress of meeting that goal from industrial enterprises but not from any other sectors.
- Both Indonesia and Thailand have been collecting and analyzing sectoral data for a longer period of time than Vietnam, but all three recognize deficiencies in their data systems.
- All three economies noted a need to improve the quality and quantity of data collected.

### *Energy Efficiency Indicators (EEI)*

- Governments can and often do set economy-wide targets (e.g. to continue to achieve a rate of energy intensity improvement of 1.3 percent per annum for a period of five years).
- The challenge is to translate this economy wide target into sector-specific targets since it is common for governments to develop energy efficiency programs for specific sectors or subsectors.
- The EEIs are important because they define the status quo, they can be used to set credible and achievable targets, and they can measure progress toward achieving the targets.
- However, EEIs must be sufficiently specific to be meaningful and have to be able to differentiate from other economic/ demographic trends. For example, energy use can be changed by factors other than energy efficiency (often defined as a change in energy per unit of production). Those changes can include:
    - Changes in Activity (e.g., Changes in value added (GDP), population);
    - Changes in Structure (the Changes in the production mix - e.g. more commerce, less industry);

- Quality Effect (Fuel substitution (1J electricity ≠ 1J coal); and
- External Effects (e.g., weather).

Therefore the technique or method used to analyze the energy data must be sufficiently flexible to include other factors[1] as required.

- A critical first step is to create an Energy Balance Table from which Energy Indicators can be derived, for example:
  - Energy self sufficiency;
  - Energy use mix / reliance;
  - Energy intensity per GDP; and
  - Energy intensity per capita.

However, these are aggregate indicators and do not provide necessary information on the sectoral level. It is therefore important to gather more detailed energy data by end use, mode and technology and to carry out analysis (such as a decomposition analysis) to isolate energy efficiency from other trends.

- Therefore, it is necessary to differentiate between factors driving energy consumption:
  - Activity: levels of economic, demographic and production activity;
  - Structure: shifts between sub-sectors with different energy intensities;
  - Efficiency: energy use per unit of output, service or activity; and
  - Quality: shifts between fuels which can be used at different efficiencies (subset of efficiency).
- To measure Energy Efficiency[2] it must be set it against a number of parameters, such as;
  - Economic: GDP/Value Added;
  - Demographic: population, housing $m^2$;
  - Production: end use energy, tonnes of output; and
  - Activity: passenger kilometres travelled, freight tonnes kilometres.
- The conclusions drawn relative to EEIs include the following:
  - Energy balance tables are the starting point for basic energy indicators, energy accounts, and $CO_2$ emissions calculations;

[1] Different sectors may require different breakdowns, whether data is available, or what the needs are of the decision maker

[2] Energy efficiency may be the same as energy intensity at the subsector level

- Index decomposition analysis is an analytical tool for measuring trends and policy making on national energy;
- This is a shared challenge for energy analysts, statisticians and policy makers; and
- Detailed and quality data provide a stronger foundation for policy and market analysis and can better inform the policy making process.

***Decomposition Analysis***

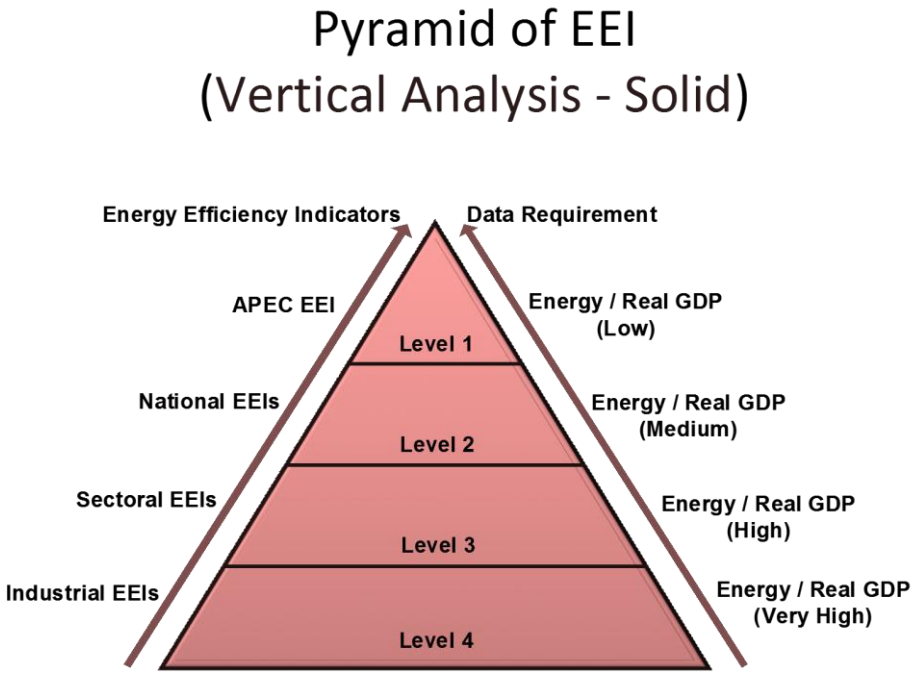
The IEA has developed an EEI methodology for assessing how economic and technical driving factors shape energy use and ultimately $CO_2$ emissions.

- The factors include:
  - Energy prices;
  - GDP; and
  - New technologies
- The key problems with using indicators are:
  - How to weight the indicators from different fields?
  - How to collect suitable data for indicators?

These questions are fraught with a wide variety of data problems.

- An input-output (I/O) methodology can begin to solve the problems. Coupling the methodology with an Energy Balance table is a first step in creating a decomposition model. Using the decomposition model allows for recalculating the primary energy demand by changing a single variable to see the change in demand due to a single effect. Running the model over and over, changing only one variable at a time, decomposes the primary energy data into its various parts and depending on the levels of data available, it can calculate changes down to the sectoral or subsectoral level.
- The biggest challenge has been that IEA and others have done detailed work in individual levels (even with multiple sectors in a level), see the Pyramid[3] below, but not in multiple levels. The Decomposition methodology discussed in this workshop allows one to work across (up and down) levels to get to the lower levels of analytical data that define and quantify the results of the economies' energy efficiency programs.

[3] Two of the speakers, Ms. Dang and Prof. Bor, referred to this chart in their presentations.



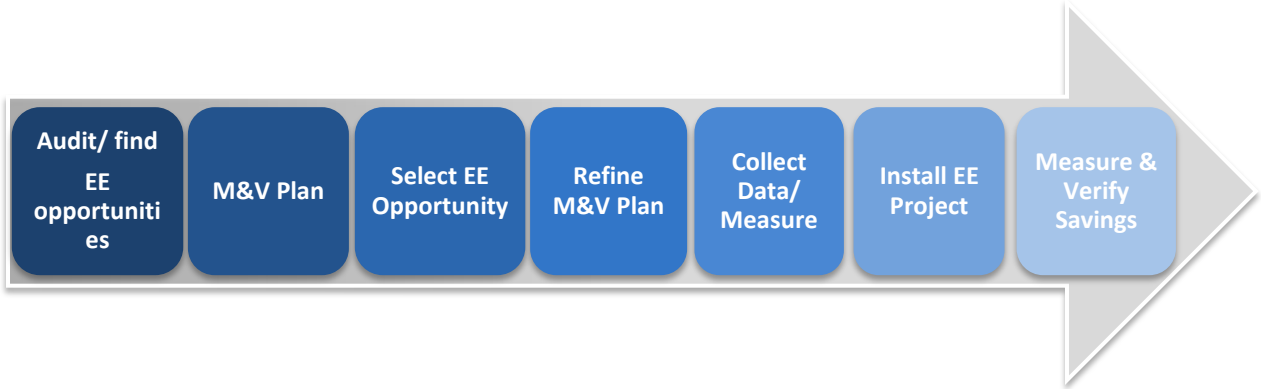

- The major conclusion to be drawn from the training is that decomposition methodology and analysis clearly defines the energy efficiency results from the top national level down to the industrial level and the results can lead to strong and useful energy efficiency policies and decisions.

### *Evaluation, Monitoring, and Verification (EM&V)*

Evaluation, monitoring, and verification (EM&V) is important within the context of implementing national energy efficiency (EE) policies and programs.

- The Need for EM&V is twofold:
  - Documentation of energy savings and associated goals; and
  - Growing need for credible data due to Increasing scrutiny and investment.
- The EM&V challenge is estimating the Energy *not* Consumed – a very difficult task even in the best situation as it requires one to prove a counterfactual, i.e. What would the energy consumption have been in the absence of the applied measure?
- There are a number of difficult issues in EM&V:
  - Measurement challenges;
  - Cost and uncertainty Issues in EM&V;
  - Transparency and credibility; and
  - Varying assumptions, definitions, methodologies.

- Transparency and Credibility are critical in data analysis and even more so in calculating energy savings. Some of the key areas explored were:
  - Methods, data, and assumptions;
  - Consistency of methods and assumptions;
  - Professional competency and integrity; and
  - Managing stakeholder expectations.
- Existing Best Practice Guides and Protocols were seen as critical and two key reference materials were discussed:
  - Projecting/measuring M&V: Efficiency Valuation Organization's International Performance Measurement and Verification Protocol (IPMVP); and
  - Program/ Portfolio Evaluation: NAPEE Model Energy Efficiency Program Impact Evaluation Guide.
- A key takeaway for the trainees was a thorough case study illustrating EM&V Best Practices – specifically, IPMVP's use in an energy efficiency program in Australia.
  - This Greener Government Buildings (GGB) case study described a best practice program that was developed to improve energy and water efficiency and reduce energy costs and GHG emissions through retrofits of all existing government buildings and infrastructure in Victoria. Energy reduction targets were set and a stringent EM&V process was put in place.
  - This process, coupled with Energy Performance Contracting, mitigates the risk of loan default and therefore enables the Victorian government to fund GGB projects.
  - A seven step process illustrated below set a standard for all activities related to data analysis of the projects, leading to great credibility of the results.




  - **The conclusions drawn were to:**
    - Develop M&V plan at early stage (during detailed facility study):

"Departments/agencies should work closely with energy service providers to ensure the M&V plan clearly meets the needs of both parties."

- Follow an Energy Performance Contracting (EPC) process:
  ESCOs identify and install cost-effective energy & water efficiency solutions and provide a guarantee on project savings (detailed in M&V plan).
- If EPC projects are not appropriate, an 'equivalent' approach may be used which does not include a performance guarantee.
- Include M&V of Savings:
  EM&V is a crucial part of an EPC as it determines the ESCO's compliance with its contractual savings obligations.
- Measure and verify using IPMVP:
  May use any of the four IPMVP options – in fact, in any one project, the EM&V plan generally will include a mix of various options.

## Road Mapping Exercise and Next Steps for EM&V in Viet Nam

The Road Mapping exercise is best described as a brainstorming session involving all the trainees and experts to building a roadmap that would identify the next steps needed by Viet Nam to calculate and improve the credibility of energy efficiency savings. We explored institutional issues, technical issues, and other issues and identified key next steps for Viet Nam to pursue. The key steps under each area included the following:

- **Institutional area:**
  - Improve data collection
    - Provide incentives (or greater penalties to enterprises)
    - Enhance their knowledge of what to report and why it is important
    - Good guidance is critical and clear definitions most important
    - Stricter regulations needed
    - Develop stronger Policy options
    - Develop better and stronger relationships with companies
  - Improve data correction capability
    - More training for government staff
    - Create common template
    - Train staff to identify "bad" data
    - Reduce errors by linking spreadsheet directly to data base
    - Increase enforcement activities (e.g. on-site inspections)

- Move to create single agency for all data activities
  - Eliminate 53 provinces' authority to collect data
  - Centralize data to allow better access to the data

- **Technical Area:**
  - Reduce technical barriers
    - Follow international protocols (do not reinvent the wheel)
    - Use conventional sector and sub-sectors for analysis
  - Increase Budget for Data activities
    - Enhance the skills of data staff through trainings
  - Improve coordination with other Ministries
    - Establish system where one Ministry or Agency collects all needed data from an enterprise
    - Require ministries to share data freely among themselves
    - Allow for more data sharing among respondents, but masking companies' confidential data

- **Other Areas:**
  - Set up an independent data office
  - Develop an organizational chart, focusing on demand and supply, fuel offices, consumption sectors, and responsibilities
  - Follow international templates for organization structure
  - Plan for significant training for all data people
  - Prepare an annual report for publication highlighting sectoral data analysis
  - Develop a plan to work on weak sectors' data and analytical needs – but integrate it into the operations over a number of years
  - Vet data collection surveys and forms to get buy-in from the respondents, thereby raising the response rate and getting better data.

# Appendix 1

## MEETING AGENDA

(27 February - 2 March 2012, Viet Nam)

| DAY 1 - Monday, 27th February 2012 | | |
|---|---|---|
| Venue: Hotel Conference Room, 2nd Floor | | |
| ***8:30 – 9:00*** | ***Registration*** | |
| 9:00 – 9:10 (10) | ***I. Opening Session***<br>***Moderator, APERC*** | |
| 9:00 – 9:05 (05) | I-1: Welcome Remark | Ministry of Industry and Trade<br>METI, Japan |
| 9:05 – 9:10 (05) | I-2: Opening Remarks | Mr. Kenji Kobayashi, President, APERC |
| ***9:10 – 11:50 (160)*** | ***II. Kick-off Session***<br>***Moderator, APERC*** | |
| 9:10 – 9:30 (20) | II-1(a): Presentation on PREE Project Phase 3 (PREE+follow-up PREE)<br>II-1(b): Q&A on presentation | Mr. Kenji Kobayashi, President, APERC |
| 9:30 – 9:55 (25) | II-2(a): Presentation on Objectives and the Format of the Training Workshop<br>II-2(b): Q&A on presentations | Dr. Tran Thanh Lien, Team leader, APERC |
| 9:55 – 10:00 (5) | II-3: Photo session | |
| 10:00 – 10:20 (20) | ***Coffee Break*** | |
| 10:20 – 10:50 (30) | II-4(a) Presentation on the Current Status and Future Plan of E&M of National EE Program in Indonesia<br>II-4(b) Q&A on the presentation | Mr. Kunaefi of MEMR |
| 10:50 – 11:20 (30) | II-5(a): Presentation on the Current Status and Future Plan of E&M of National EE Program in Thailand<br>II-4(b) Q&A on the presentations | Ms. Jarasphan Phumpuang of DEDE, MoEN |
| 11:20 – 11:50 (30) | II-6(a): Presentation on the Current status and Future Plan of E&M of National EE Program in Viet Nam<br>II-6(b) Q&A on the presentations | Mr. Do Tuan Linh, Institute of Strategy and Policy for Industry, MOIT |
| ***11:50 - 13:30 (100)*** | ***Lunch Break*** | |
| ***13:30 – 16:50 (200)*** | ***III. Experts' Lecture Session***<br>***Decomposition Analysis Methods and Other Related Issues*** | |

| | | |
|---|---|---|
| 13:30 - 14:30 (60) | III-1 (a) Energy Efficiency indicators in policy making<br>III-1 (b) Q&A on the presentation | Mr. John Duncan, EECA, New Zealand |
| 14:30 - 15:30 (60) | III-2 (a) Decomposition technique for measuring energy efficiency economy-wide improvement<br>III-2 (b) Q&A on the presentation | Ms. Hien Dang, EECA, New Zealand |
| 15:30 - 15:50 (20) | ***Coffee Break*** | |
| 15:50 - 16:50 (60) | III -3 (a) Decomposition technique for measuring energy efficiency improvements in all sectors<br>III-3 (b) Q&A on the presentation | Ms. Hien Dang, EECA, New Zealand |
| 16:50 - 17:00 (10) | Summary of Day 1 | ASE and APERC |

***End of Day 1***

## DAY 2 - Tuesday, 28th February 2012

| | | |
|---|---|---|
| | **III *Experts' Lecture Session (continue)*** | |
| | ***Decomposition Analysis Methods and Other Related Issues*** | |
| 9:00 - 10:00 (60) | III-4(a) Practical guide for the approach to decomposition analysis<br>III-4 (b) Q&A on the presentation | Dr. Yunchang Jeffrey Bor, Chinese Culture University |
| 10:00 - 11:00 (60) | III-5(a) Best practice for designing and Performing E&M by the Application of Decomposition Analysis<br>III-5 (b) Q&A on the presentation | Dr. Yunchang Jeffrey Bor, Chinese Culture University |
| 11:00 - 11:20 (20) | ***Coffee Break*** | |
| 11:20 - 12:20 (60) | III-6(a) Introduction of use of a software tool (applied to the industrial sector) for the decomposition method<br>III-6 (b) Q&A on the presentation | Ms. Wen-Chi Chen, Chinese Taipei |
| 12:20 - 14:00 (100) | ***Lunch Break*** | |
| | **Ⅳ Practice Session** | |

| | | |
|---|---|---|
| 14:00 - 15:00 (60) | Ⅳ-1 Practice for the use of a software tool provided by Dr. Yunchang Jeffrey Bor<br>(Each trainee uses the software and analyzes the results by himself/herself based on available data of Chinese Taipei or other economy given by Prof. Bor. and Ms. Chen). | Coach by:<br>• Dr. Yunchang Jeffrey Bor, Chinese Culture University<br>• Ms. Wen-Chi Chen, Chinese Taipei |
| 15:00 - 15:20 | ***Coffee break*** | |
| 15:20 – 17:20 | Ⅳ-2 Practice in use of software in analysis of the industry sector<br><br>(Each allocated group - using of input data to be provided by Viet Nam, Indonesia and Thailand) | Coach by:<br>• Dr. Yunchang Jeffrey Bor, Chinese Culture University<br>• Ms. Wen-Chi Chen, Chinese Taipei |
| 17:20 - 17:30 (10) | Summary of Day 2 | ASE and APERC |

*End of the DAY 2*

## DAY 3 - Wednesday, 29th February 2012

| | | |
|---|---|---|
| | Ⅴ ***Technical Visit***<br>***Decomposition Analysis Methods and Other Related Issues (continue)*** | |
| 8:00 - 15:00 | Visit an energy facility that applies energy efficiency measures , TBC<br>(Domestic participants can stay in the training room to prepare their presentations for the next day - if necessary)<br><br>**Ⅵ Presentation on the group practice** | MOIT |
| 15:00 - 16:50 (110) | **Ⅵ-1 Presentation**<br><br>Participants prepare their presentations on analysis of the industry sector or (sub-sector) by allocated groups (TBC)<br>(Group prepare their presentations by themselves based on tasks allocated for each group in the previous day) | Coach by:<br>• Dr. Yunchang Jeffrey Bor, Chinese Culture University.<br>• Ms. Wen-Chi Chen, Chinese Taipei. |
| 16:50 - 17:00 (10) | Summary Remarks of Day 3 | APERC and ASE |

*End of the DAY 3*

| DAY4 - Thursday, 1st March 2012 | | |
|---|---|---|
| **9:00 - 12:20 (200)** | ***Decomposition Analysis Methods and Other Related Issues***<br>***Group's presentations from trainees*** *(assume 3 groups).*<br>***Moderators,*** Dr. Yunchang Jeffrey Bor, Chinese Culture University<br>Ms. Wen-Chi Chen, Chinese Taipei | |
| 9:00 - 10:00 (60) | Ⅵ-2 (a) Presentation on group A 's results and findings<br>(a representative of group A)<br>(b) Q&A on the presentation | Group A |
| 10:00 - 11:00 (60) | Ⅵ-3 (a) Presentation on group B 's results and findings<br>(a representative of group B)<br>(b) Q&A on the presentation | Group B |
| 11:00 - 11:20 (20) | ***Coffee Break*** | |
| 11:20 - 12:20 (60) | Ⅵ-4 (a) Presentation on group C 's results and findings<br>(a representative of group C)<br>(b) Q&A on the presentation | Group C |
| 12:20 – 14:00 (100) | ***Lunch Break*** | |
| ***14:00 – 16:30 (150)*** | ***Ⅶ Experts' Lecture Session (continue)***<br>***Mechanism for monitoring and reporting system***<br>***Moderator,*** *Mr. Brian Castelli, ASE* | |
| 14:00 - 15:00 (60) | Ⅶ-1 (a) Subtopic 1 (TBC) Mechanism for monitoring and reporting system<br>(b) Q&A on the presentation | Mr. Brian Castelli, ASE |
| 15:00 – 15:20 (20) | ***Coffee Break*** | |
| 15:20 - 16:20 (60) | Ⅶ-2 (a) Subtopic 2 (TBC) for Mechanism for monitoring and reporting system<br>(b) Q&A on the presentation | Mr. Brian Castelli, ASE |
| 16:20 – 17:20 (60) | Ⅶ3 (a) Subtopic 3 (TBC) for Mechanism for monitoring and reporting system<br>(b) Q&A on the presentation | Mr. Brian Castelli, ASE |
| 17:20 — 17:30 (10) | Summary of Day 4 | APERC and ASE |

*End of Day 4*

| Day 5 Friday, 2nd March 2012 | |
|---|---|
| ***Closing Session*** | |
| ***Moderator, APERC and ASE*** | |
| 9:00 - 10:00 (60) | Key point for discussion prepared by ASE about how to apply analytical methods to the existing national EE Program/strategy under the practical situation in Viet Nam. |
| 10:00 - 10:30 (30) | Take note on discussions and preliminary recommendations for Viet Nam (prepared by ASE) |
| 10:30 - 11:00 (30) | Discussion, comments |
| 11:00 - 11:20 (20) | ***Coffee Break*** |
| 11:20 - 11:40 (20) | Summary of Prof. Bor's lectures, practice |
| 11:40 – 12:10 (30) | Summary report by Mr. Brian Castelli, ASE |
| 12:10- 12:15 (5) | Closing Remark by MOIT |
| 12:15- 12:20 (5) | Closing Remark by METI, Japan |
| 12:20 - 12:30 (10) | Closing Remark by Dr. Tran Thanh Lien, Team leader, APERC |

***End of the Meeting***

# Appendix 2

## Status Report and Future Steps for Evaluation and Monitoring in Three APEC Economies

### - INDONESIA -

*Mr. Kunaefi, MEMR*

Mr. Kunaefi of MEMR in Indonesia indicated that a change that was driving energy efficiency was a major reduction in energy subsides that occurred in 2005. He also noted that Government Regulation #70 is driving energy efficiency as it required large industrial enterprises to appoint an energy manager, develop energy efficiency programs, conduct annual energy audits, and other good measures. Measuring energy efficiency is important and an Energy Intensity target has been set. He also noted that Indonesia has a single department that is responsible for data collection and analysis.

1. **Main Issues:**
   - Electricity access improving but only at 67% of the current population
   - Energy subsidy exist for electricity, fuel oil and LPG
   - Some subsectoral data available, but not at the level of individual plant or operational unit

2. **Goals:**
   - Development of a data reporting system
   - Initiate a training and certification program for energy auditors (50 in 2012)
   - Formulate competency standard for energy auditors
   - Continue EM&V activities
   - Train and certify 200 energy managers in 2012

3. **Next Steps:**
   a) Begin formulating a plan to add residential and transportation data for sectoral analysis
   b) Initiate a pilot program to begin collecting individual plant data and operational unit data
   c) Utilize existing commercial and industrial data for decomposition analysis to identify opportunities for targeted energy efficiency programs

# Appendix 3

## Status Report and Future Steps for Evaluation and Monitoring in Three APEC Economies

### - THAILAND -

*Ms. Jarasphan Phumpuang, (MoEN)*

Ms. Phumpuang of DEDE, in the MoEN, explained the energy efficiency targets of Thailand (e.g. 8% by 2015; 15% by 2020 and 25% by 2025 (=17.5k TOE) (1.5%/yr decrease in Energy Intensity). She also noted that they are required to do an Energy Balance for the whole economy and also provide analysis on a sectoral basis. The E&M policy in Thailand *currently* requires - i) Collection of energy data consumption in all sectors; and ii) the use of EI for E&M EE at *macro* level. The requirements for the future will be - i) the same as the current requirement but will eventually be done by survey collection; and ii) the use of EI for E&M at the *micro* level.

1. **Main Issues:**
   - Meeting energy reduction targets for 2015, 2020, and 2030
   - Collecting energy data consumption in all economic sectors

2. **Goals:**
   - Collect end-use energy data consumption in all economic sectors by survey
   - Study methodology for evaluating and monitoring energy efficiency measures in micro level, for example, using specific energy consumption (SEC) data in each industry classified by ISIC, using energy consumption data of lighting, cooling, household appliances in household sector.

3. **Next Steps:**
   a) Propose more training for data analysis staff

# Appendix 4

## Status Report and Future Steps for Evaluation and Monitoring in Three APEC Economies

### - VIET NAM -

*Mr. Do Tuan Linh, Institute of Strategy and Policy for Industry, MOIT*

1. **Main Issues:**
   - Data responsibility diffused in a number of government agencies and offices
   - Need to improve data collection and correction
   - Lack of trained government staff and low capacity to implement energy efficiency data analyses
   - Better coordination between government agencies is still needed

2. **Goals:**
   - Get legal regulations in place for enforcement of data reporting requirements
   - Get approval from government and National Assembly to implement the Energy Efficiency and Conservation law
   - Build capacity and increase resources of government agencies responsible for data activities
   - Develop long-range plan to create a single integrated, focused agency to collect, analyze and report on energy data in Vietnam

3. **Next Steps:**
   a) Work with others to get approvals in place for regulations and laws to Implement better data collection, analysis and reporting tasks
   b) Get more training on data activities for staff
   c) Initiate more pilots throughout the economy to classify and correct data that is reported
   d) More coordination between GSO and MOIT
   e) Establish more incentives and penalties related to data reporting

# Appendix 5

## Energy Efficiency Indicators in Policy Making

*Mr. John Duncan, EECA, New Zealand*

John Duncan provided detailed information about New Zealand's Energy Strategy priorities which includes diverse resource development, EE and EC improvements, and an increase in renewable energy. New Zealand's target is an improvement in Energy Intensity of 1.3%/yr for five years.

1. **Main Issues:**
   - Obtain higher economic development in a low emissions future.
   - Promote a mix of Government measures to increase energy efficiency throughout the economy.
   - Ensure that energy efficiency indicators are meaningful and differentiate from other economic or demographic trends.
   - Recognize that Activity, Structure, and Quality are three factors that drive energy consumption and effects must be known for accurate analysis of energy efficiency programs.

2. **Goals:**
   - Meet the goals set out in the economy's Energy Strategy document.
   - Meet the economy wide target of 1.3% improvement in energy intensity for five years (through 2016).
   - Translate the economy wide target into sector-specific targets.

3. **Next Steps:**
   a) Increase partnerships with non-governmental organizations (Not for profits, businesses).
   b) Work toward getting more detailed energy data by end use, mode and technology.
   c) Use decomposition analysis to see isolate energy efficiency from other factors.

# Appendix 6

## Decomposition Techniques for Measuring Energy Efficiency Economy-wide in All Sectors

*Ms. Hien Dang, EECA, New Zealand*

1. **Main Issues:**
   - It is not enough to know energy data, but you must also know what energy is used for.
   - GDP is measured annually by sector, energy data needs to follow suit.
   - The reason for changes in energy consumption can only be known by looking at the changes in Activity, Structure, and Energy Efficiency.
   - An energy data base must be flexible in order to include enough factors to understand what caused the changes.
   - Measurable data still may not ensure that it can explain the change in consumption without understanding what drives that change.
   - Since Energy Efficiency is not directly observable it is best measured as the "residual" component once economic growth, changing structure, etc are removed.

2. **Goals:**
   - Have the trainees understand the concept of measuring energy efficiency and the factors that are needed to be segregated to calculate it.
   - Prepare the students for understanding what decomposition analysis is and how it is used to calculate energy efficiency.

3. **Next Steps:**
   a) Trainees should plan to get more training on data issues.

# Appendix 7

## Practical Guide for the Approach to Decomposition Analysis

*Prof. Yunchang Jeffrey Bor, Chinese Culture University, Chinese Taipei*

1. **Main Issues:**
   - Many economies have set energy efficiency (or energy intensity) targets and a method to calculate the progress against those goals that addresses sectors.
   - IEA developed a methodology for assessing how economic and technical driving factors shape energy use; energy prices, GDP and new technologies.
   - Most economies have only calculated Energy Efficiency Indicators (EEIs) for the top triangle in the pyramid shown in the Decomposition Analysis section of this report; only a few economies get to the second level and very few economies go below those levels to determine EEIs.
   - Index decomposition analysis allows for use in (i) national/international arenas, (ii) communicating with other fields (e.g. economic state, social state), and balancing use of resources against the impact on the environment.
   - Weighting indicators from different fields is a problem that can be resolved by decomposition analysis.
   - An example showing how the analysis is based on an Input/ Output model helped the trainees understand the workings of the decomposition analysis methodology.

2. **Goals:**
   - To determine the primary energy needed for a change in final demand.
   - Have trainees understand the input/output model which serves as the basis for the decomposition methodology.
   - To calculate the changes in EEIs among multiple levels.

3. **Next Steps:**

   a) In a practical exercise, have the trainees utilize the decomposition methodology to show sectoral changes in actual data from three economies

   b) Have the groups of trainees present their findings and defend them in a peer review format

# Appendix 8

## Results of the Trainees' Practice Session Case Studies

*Facilitator: Prof. Yunchang Jeffrey Bor, Chinese Culture University, Chinese Taipei*

### The first group presentation: Viet Nam

Led by Nyguyen Hoang Ahn and Messrs. Hung, Phuc, Tung and Linh were in the group. From the decomposition analysis, we learned that the growth rate of Energy use shows a problem with the Services 1 sub-sector during the 06-09 time period. The energy structure shows Industry and Services 2 are the biggest contributors to GDP (Energy consumption in Agriculture contributes 20% to GDP while only using 5% electricity).

The presentation also highlighted a clear drop in EEI in 04 and 09. The 04 to 06 increase shows something happened in that period and next slide shows which sub-sectors contributed to it (services and industries drove it down equally). In 04 to 06, industry drives the EEI upwards. The findings were determined to be very informative to policy and decision makers in identifying sectors and subsectors to target energy efficiency programs.

### The second presentation: Thailand

Led by Ms. Phumpuang and Phan Duy, Ta Tuan, Duong Cinh and Do Linh were part of the group. We immediately learned that the EE Index was variable throughout 1995 to 2009. It was speculated that the steep increase from 05 could be due to incentives that the government initiated for energy efficiency during that year. Energy Intensity was shown to be very stable (the industry portion decreased in 08-09). We noted that of the 3 subsectors of industry, construction clearly drove 08-09 drop.

The real contribution is driven by industry and it also shows a precipitous drop in 09 driven by a smaller industry contribution. We saw that the sub-sector "transport efficiency" drives contributions in 06-09 time period in the Service sector while wholesale goes negative (and long-term the gradual down turn in Services from 96 to 09 needs to be explored).

We also saw growth in energy consumption compared to GDP and in 08 Energy consumption is greater than GDP. In 96 to 05, energy consumption and energy tracked closely but in 05 a big energy efficiency program began and GDP then exceeded energy consumption. In 08-09, the change is attributed to one company issue and the financial crisis and printing of excess money.

**The third presentation: Indonesia**

Led by Mr. Kunaefi and Messrs. Hai, Vinh, Fong and Bing were in the group. The energy consumption does NOT equal the GDP (data availability and sector identification problems are illustrative of general data issues for any economy). The group resolved this problem by assigning subsectors to specific sector groupings; this resolution allowed the group to do comparable analyses.

GDP is growing at faster rate than energy consumption, so the hypothesis is that elasticity is less than 1. Also, the GDP share by sector remains same while it grows overall. The transportation subsector is seen to be growing faster than industrial sub sector.

Remarkably, the analysis shows base year as 2005 when oil price increased dramatically (and the government starts to reduce the oil subsidy). Therefore, energy efficiency increased dramatically after 2005 due to both energy price increase and some regulations that increased energy efficiency.
We also see from the analysis is that the Transportation sector efficiency drove the EEI upwards (reasons: behavior change from cars to motorcycle and public transportation). The analysis also shows government needs to target industry for more energy efficiency – this was caused by the financial crisis which lowered export demand for products but still has the industrial/manufacturing infrastructure which still used energy during that time but produced less product.

# Appendix 9

## EM&V: Mechanism for Monitoring and Reporting System

*Mr. Brian T. Castelli, Alliance to Save Energy, USA*

Evaluation, monitoring, and verification (EM&V) is important within the context of implementing national energy efficiency (EE) policies and programs.

- The Need for EM&V is two-fold:
  - Documentation of energy savings and associated goals; and
  - Growing need due to Increasing Scrutiny and Investment.

The EM&V challenge is estimating the Energy *not* Consumed – a very difficult task even in the best situation as it requires one to prove a counterfactual, i.e. What would the energy consumption have been in the absence of the applied measure?

- There are a number of challenges involved in EM&V:
  - Measurement challenges;
  - Cost of EM&V; and
  - Transparency
  - Varying assumptions, definitions, methodologies.
- Transparency and Credibility are critical in data analysis and even more so in calculating energy savings. Some of the key areas explored were:
  - Methods, data, and assumptions;
  - Consistency of methods and assumptions;
  - Professional competency and integrity; and
  - Managing stakeholder expectations.
- Existing Best Practice Guides and Protocols were seen as critical and two key reference materials were discussed:
  - Projecting/Measuring M&V: Efficiency Valuation Organization's International; Performance Measurement and Verification Protocol (IPMVP); and
  - Program/ Portfolio Evaluation: NAPEE Model Energy Efficiency Program Impact Evaluation Guide.
- A key takeaway for the trainees was a thorough case study illustrating EM&V Best Practices – IPMVP's use in Energy Efficiency Program in Australia.
  - The Greener Government Buildings (GGB) case study described a best practice program that was developed to improve energy and water efficiency and reduce energy costs and GHG emissions through retrofits of all existing government buildings and

infrastructure in Victoria. Energy reduction targets were set and a stringent EM&V process was put in place.

- This process, coupled with Energy Performance Contracting, mitigates the risk of loan default and therefore enables the Victorian government to fund GGB projects.
- A seven step process set a standard for all activities related to data analysis of the projects, leading to great credibility of the results.

*The conclusions drawn were to:*

- Develop M&V plan at early stage (during detailed facility study):
  "Departments/agencies should work closely with energy service providers to ensure the M&V plan clearly meets the needs of both parties."
- Follow an Energy Performance Contracting (EPC) process:
  - ESCOs identify and install cost-effective energy & water efficiency solutions and provide a guarantee on project savings (detailed in M&V plan); and
  - If EPC projects are not appropriate, an 'equivalent' approach may be used which does not include a performance guarantee.
- Include M&V of Savings:
  - M&V is a crucial part of an EPC as it determines the ESCO's compliance with its contractual savings obligations.
- Measure and verify using IPMVP:
  - May use any of the four IPMVP options – in fact, in any one project, the EM&V plan generally will include a mix of various options.

# Appendix 10

## Road Mapping Exercise and Next Steps for EM&V in Viet Nam

*Facilitator: Mr. Brian T. Castelli, Alliance to Save Energy, USA*

Mr. Castelli then began a brainstorming session involving all the trainees and experts on building a roadmap to plan out the next steps needed by Viet Nam to improve the credibility of energy efficiency savings. We explored institutional issues, technical issues, and other issues and identified key next steps for Viet Nam to pursue. These next steps include:

1. **Institutional Area:**
   - Improve data collection
     - Provide incentives (or greater penalties to enterprises).
     - Enhance their knowledge of what to report and why it is important
     - Good guidance critical and clear definitions most important
     - Stricter regulations needed
     - Stronger policy needed
     - Develop better and strong relationships with companies
   - Improve data correction capability
     - More training for government staff
     - Create common template
     - Train staff to identify "bad" data
     - Reduce errors by linking spreadsheet directly to data base
     - Increase enforcement activities (e.g. on-site inspections)
   - Move to create single agency for all data activities
     - Eliminate 53 provinces authority to collect data
     - Centralizing data allows better access to the data

2. **Technical Area:**
   - Reduce technical barriers
     - Follow international protocols (don't reinvent the wheel)
     - Use conventional sector and sub-sectors for analysis
   - Increase Budget for data activities
     - Enhance the skills of data staff through trainings
   - Improve coordination with other Ministries

- Establish system where one Ministry or Agency collects all needed data from an enterprise
- Require ministries to share data freely among themselves
- Allow for more data sharing among respondents, but masking companies' confidential data

3. **Other Areas:**
   - Set up an independent data office.
   - Develop an organizational chart, focusing on demand and supply, fuel offices, consumption sectors, and responsibilities.
   - Follow international templates for organization structure.
   - Plan for significant training for all data people.
   - Prepare an annual report for publication highlighting sectoral data analysis.
   - Develop a plan to work on weak sectors data and analytical needs – but integrate it into the operations over a number of years.
   - Vet data collection surveys and forms to get buy-in from the respondents, thereby raising the response rate and getting better data.