



**Asia-Pacific
Economic Cooperation**

APEC OIL AND GAS SECURITY EXERCISES

Final Report

30 May 2014

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PREFACE

At the 10th APEC Energy Ministers Meeting in St. Petersburg, Russia on 24 -25 June 2012, the Ministers instructed, "We encourage EWG and APERC to work in collaboration with the International Energy Agency (IEA) and the Association of Southeast Asian Nations (ASEAN) on activities to improve the response to oil and gas emergency situations in the APEC region, including emergency response workshops and exercises" (St. Petersburg Declaration on Energy Security: Challenges and Strategic Choices, in 24-25 June 2012).

The APEC leaders also agreed to "promote activities to improve the response to oil and gas emergency situations in the APEC region" at the APEC Summit Meeting on 8-9 September 2012 in Vladivostok, Russia.

Upon the APEC Energy Ministers' instruction, APERC started the "Oil and Gas Security Exercises: 2013-2014(EWG 01 2013)" in close cooperation with IEA and ASEAN. The main objectives of the APEC Oil and Gas Security Exercises are as follows:

1. To investigate the domestic systems for the emergency preparedness in each APEC economy;
2. To develop possible scenarios of oil and gas emergency situations; and
3. To accumulate the necessary information and analysis by mobilizing capable experts in the APEC region.

Two Fora (a kick-off and a wrap-up meeting) and two Case Study Exercises were held with the participation of energy security experts and APEC economies' delegates in the Fora or the hosting economies'/economies' stakeholders in the Exercises. The dates and venues of these events were as follows:

- The 1st Oil and Gas Security Forum (18-19 April 2013 in Tokyo, Japan)
- The Joint Southeast Asian Exercise (18-20 September 2013 in Bangkok, Thailand)
- The Indonesia Exercise (22-24 October 2013 in Jakarta, Indonesia)
- The 2nd Oil and Gas Security Forum (25 March 2014 in Tokyo, Japan)

While carrying out two Exercises, APERC surveyed the development of APEC's approach to oil and gas security and major challenges to oil and gas security in the APEC region. APERC also contemplated purpose of possible future activities for oil and gas security in APEC. APERC's surveys and proposal were discussed in the 2nd Forum.

The results of the APEC Oil and Gas Security Exercises are compiled in this draft. This draft report was submitted to the 47th EWG Meeting in May 2014 in Kunming, China. The completion of the project will be reported to the 11th APEC Energy Ministers' Meeting in September 2014 in Beijing, China.

APERC wishes to thank all the participants in the two Fora and two Exercises. Special thanks go to the International Energy Agency (IEA) and energy-related institutions under Association of Southeast Asian Nations (ASEAN), namely, the ASEAN Center for Energy (ACE), the ASEAN Council on Petroleum (ASCOPE) and the Heads of ASEAN Power Utilities/Authorities (HAPUA) for their continuous support for this project. The lists of the participants in the two Exercises are attached to Chapter 3 and Chapter 4 of this report. The lists of the participants in the two Fora are attached at the end of this report.

EXECUTIVE SUMMARY

Development of APEC's Approach to Oil and Gas Security

Given the dominance of fossil energy in the APEC economies' energy mix and the APEC region's growing dependency on imported oil and gas/LNG from the regions prone to instability, APEC leaders, APEC energy ministers, the Energy Working Group and the Asia Pacific Energy Research Centre have been especially concerned about oil and gas security. They have dealt with a large number of issues of significance to this subject in their reaction to regional and international developments of relevance to oil/gas security of the APEC economies.

Joint Southeast Asian Exercise, Bangkok

The oil and gas joint exercise in Bangkok was participated in by seven Southeast Asian economies, namely, Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam, each have their own fair share of oil and gas supplies in the APEC region. The Bangkok exercise presented two stages of emergency scenarios to the seven participating economies to which they responded. The first stage dealt with a common oil emergency situation for the participating economies. It consisted of three phases during which the imported oil and LNG supplies from the Middle East would be reduced and their prices go up due to terrorist activities. The second stage on the other hand dealt with incidents unique to each of the economy.

The recommendations provided by the Experts were mostly comments and suggestions on the responses, including identifying other institutions of the economies to be involved in the emergency exercise and their key priorities and suggesting human capability enhancement as an additional measure to be used during oil and gas emergency situation.

Indonesia Exercise

Indonesia's oil and fuel production's downward trend and the resulting growth of dependency on vulnerable oil and fuel imports constitute a growing threat to the economy's sustainability of energy supply. Against this background, the three-stage Indonesia exercise was conducted.

At the 1st stage of the oil emergency scenario, an earthquake damaged Indonesia's Cilacap Refinery leading to the loss of certain amount of petroleum products for three months affecting two Provinces. Commenting on PERTAMINA's countermeasures, the Experts recommended such as the Indonesian Government's full support of PERTAMINA's measures by securing not only financial but also through policy and regulatory measures; the Government and PERTAMINA need to prepare a public communication plan to avoid panic buying of fuels.

The 2nd stage of the oil emergency scenario envisaged the worsening of the situation in the Cilacap Refinery because of a major aftershock resulting in the refinery's inability to process oil for one year to affect the entire economy. In reaction to Indonesia's emergency response, the Experts recommended such as Indonesia should prepare for the real emergency situations in certain areas; it should also be ready to repair damaged refineries as soon as possible and prepare a priority list for oil-rationing.

The 3rd stage of the oil emergency scenario considered the total shut down of the Cilacap Refinery and a short-term cut of crude oil supplies to the Dumai Refinery due to the local residents' action. Commenting on the Indonesian Government's emergency response, the Experts recommended that certain preparations to be done to

make feasible those responses in emergency situations such as devising detailed regulations to implement energy export restrictions and car-pooling. Implementing work time shift, including work at home (telecommuting), is also useful for reducing fuel consumption.

Major Challenges to Oil and Gas Security in the APEC Region

Certain energy-related issues pose challenges to oil and gas security of the APEC economies of which some are existent while others are potential. Examples of major conceivable challenges include the potential impact of instability in APEC's largest oil and LNG supplying region, the Middle East, on APEC's oil and gas security. Another challenge is the depletion of the regional fossil energy reserves and resource nationalism threatening the intra-regional oil/gas supplies and APEC's objective of cross border energy networks and interconnections. Potential of unconventional oil and gas involves challenges and also opportunities. Central Asia's growing role as an energy supplier to China and potential threats to its supplying role form yet another challenge.

The Arctic's melting impact on APEC's oil and gas security is a challenge involving opportunities as well. Potential impact of the security-challenged economies on the TAGP (Trans-ASEAN Gas Project) project and energy security of APEC's seven ASEAN economies (threat to APEC's objective of the regional cross border energy networks and interconnections) is also a challenge.

Finally, threats to oil/gas pipeline safety/security as the North-East Asian APEC economies are becoming increasingly dependent on piped oil and especially gas imports pose another challenge.

Possible Future Activities for Oil and Gas Security in APEC

– Proposal of APEC Oil and Gas Security Initiative (OGSI) –

Given the existing and emerging challenges to oil and gas security in the APEC region, activities for oil and gas security by APEC should be continued in the future. Therefore, *the APEC Oil and Gas Security Initiative (OGSI)* should succeed the APEC Oil and Gas Security Exercises (OGSE). The OGSI will consist of three overarching activities:

First, APEC should strongly encourage APEC Economies to implement a *voluntary Oil and Gas Security Exercise*. In order to facilitate this voluntary Exercise, APERC will establish an "Oil and Gas Security Exercise Model Procedure (EMP)". APERC will also dispatch experts upon the request of each Economy in order to assist the voluntary Exercise.

Second, as information exchange among APEC Economies is very useful, particularly in emergency situations, it is better to establish an *APEC Oil and Gas Security Network (OGSN)* in order to encourage information sharing and transmission through a mailing list. APERC will maintain the mailing list of OGSN and publish the OGSN "Newsletter" monthly in order to transmit updated information on oil and gas security. Also, APERC will hold the OGSN Forum in principle once a year in order to share information and exchange views on oil and gas security and also jointly discuss how to improve emergency preparedness.

Third, APERC will research issues related to oil and gas security and publish one or two reports per year as part of *the Oil and Gas Security Studies (OGSS)* series.

Chapter 1

Introduction

Oil and gas security (OGS) is a component of the broader concept of energy security (ES). ES is a multifaceted concept for which there are various definitions according to circumstances, including specifics of one's energy situation, which could be interpreted in different ways. Briefly, it implies economies' quest for ensuring adequate amount of energy to sustain and grow, which is affected by various factors.

ES therefore deals with the factors, which affect positively or negatively the feasibility, affordability, plausibility and sustainability of a given economy's energy mix. Depending on the specifics of economies and their energy requirements, the affecting factors and their significance may differ. This is true for the APEC region's economies, which are different in terms of their energy needs (required amount and energy mix's components), availability or absence of certain required types of energy, their energy capabilities as importers or exporters of energy and thus their degree of dependency on imported energy and their types, the ease or difficulty of such imports, their financial situation, and the affordability of such imports, among others.

Preferred long-term national energy plans for the APEC economies must reflect the specific of their respective economies along the line mentioned above and be able to answer the main energy security challenges they face in achieving sustainable development. Needless to say, various measures and policies should be taken to ensure and enhance the APEC economies' energy security while mitigating greenhouse gas (GHG) emissions. Added to security-related ones, they include maintaining adequate national/regional fuel strategic reserves, using low-carbon energy sources and deploying low-carbon and carbon-free energy technologies, increasing the share of renewables of the regional energy mix, promoting greater efficiency on supply and demand sides, and providing efficient transmission and distribution systems.

Identification of the existing, potential and predictable energy security challenges should be followed by conducting emergency assessments to prepare the APEC economies to meet such challenges should the need arise. Two such assessments have so far been conducted as reported in this documents.

Given fossil energy (oil, gas and coal) dominates the global energy mix and particularly that of the APEC region, ES is mainly focused on such energy and thus how to ensure its availability, accessibility, affordability, plausibility and sustainability for its concerned economies, being the APEC ones. Based on all projections for the foreseeable future, the continuity of this domination in the foreseeable future despite impressive efforts in the APEC region to increase the share of the environmentally-friendly non-fossil energy of the regional energy mix will ensure the status of fossil energy and particularly oil and gas as the main preoccupation of ES. For this matter, the oil and gas security project is in tune with the energy realities and needs of the APEC economies.

Chapter 2
Development of APEC's Approach to
Oil and Gas Security

Energy security has been a major preoccupation for APEC since its establishment. Given the dominance of fossil energy in the APEC economies' energy mix, it has been especially concerned about oil and gas security. The APEC region, which produces a significant amount of oil and gas and some of its economies are even oil and gas exporters of regional and international significance, is not self-sufficient in these fuels. Thanks to its expanding economies, growing population and improving living standards, the region, which is now the world's largest energy consumer, has been experiencing a rapid depletion of its oil and gas reserves. This reality has resulted in its growing dependency on imported oil and gas from other regions, particularly the Middle East, which are prone to crises and conflicts to a varying extent. Such political developments could affect their oil and gas exports leading to energy supply disruptions for the APEC region. Owing to its large and growing energy requirements, the APEC region's oil and gas dependency will continue and expand in the foreseeable future to ensure oil and gas security will remain a major concern for this region.

Mindful of this reality, APEC's major entities concerned with oil and gas security, namely APEC leaders (AL), APEC energy ministers (AEM), the Energy Working Group (EWG) and the Asia Pacific Energy Research Centre (APEREC), have dealt with a large number of issues of significance to this subject in their reaction to regional and international developments of relevance to the energy security of all or some of the APEC economies, of course, to a differing extent as justified by their mandates. In a broad sense, these issues cover energy topics such as *improving energy efficiency, reducing/eliminating inefficient subsidies, upgrading energy standards, decreasing energy intensity, pricing and addressing energy-created environmental challenges* as well as the *availability, accessibility, affordability, plausibility and sustainability* of the regional oil and gas supplies. Of these, the major ones are summarized below with a focus on their time of initiation and their initiators, i.e., one of the mentioned four APEC entities, and examples of the involvement of others; as justified, subsequent activities, including recent ones, are also stated in cases.

Towards this end, APEC's oil-gas security activities are covered under their three respective decades starting in 1990 when the EWG was established followed by the beginning of the AL's and AEM's annual meetings (1993 and 1996, respectively) and the APEREC's foundation (1996). Although these decades are different in terms of the mentioned activities, they all have one common characteristic, namely the absence of a concern about the long-term availability of adequate amounts of especially oil and also gas reserves to result in their decreasing global productions when such productions reach their peak levels. The expected result of their lowering productions when no viable alternative to oil and gas is in sight will be an energy crisis for all the global oil and gas consumers. Such concern and, particularly, that of oil characterizing their immediate preceding decades, lost their ground due to the discovery of many new oil and gas reserves, leading to the eventual disappearance of 'peak oil' as a major preoccupation of all economies, including the APEC ones, in the first decade. This development is evident in the significant and steady increase in the world's proven oil (1992:1039.3; 2002:1321.5; 2012:1668.9, all in thousand million barrels)¹ and gas (1992:117.6; 2002:154.9; 2012:187.3, all in trillion cubic meters)² reserves. It has become quite clear since the 1990s that these reserves

¹ BP (2013), 'Oil: Proved Reserves', *BP Statistical Review of World Energy June 2013*, London, UK, 2013, p. 6, http://www.bp.com/content/dam/bp/pdf/statistical-review/statistical_review_of_world_energy_2013.pdf

² BP (2013), 'Natural Gas: Proved Reserves', *BP Statistical Review of World Energy June 2013*, London, UK, 2013, p. 20, http://www.bp.com/content/dam/bp/pdf/statistical-review/statistical_review_of_world_energy_2013.pdf

will last for many decades and thus their large-scale productions to meet the growing global requirements are feasible.

While oil and gas abundance has ensured the availability of fuel reserves to meet the APEC region's energy requirements, their accessibility and affordability have become a major preoccupation for the regional economies especially those depending on oil and gas imports. These concepts imply whether the oil consumers, including the APEC economies, can obtain uninterruptedly their required amounts of oil and gas from reliable suppliers through the economies' desired means of fuel transportations (e.g., sea tankers and pipelines) in a timely manner and at affordable prices.

In all the three decades, the existence of various natural and human-made factors affecting the latter, in one form or another, including crises, military conflicts, terrorist activities and natural disasters, with an effect on oil/gas production and exports/imports, have made the APEC economies worried about oil and gas security. This commonality has justified a focus on this issue translated in various related activities by the AL, the AEM, the EWG and the APERC.

Briefly, the three decades cannot be characterized in terms of fluctuations of attention to oil and gas security by APEC economies as such security has remained their constant common characteristic since 1990.

Added to the mentioned factors, APEC was founded in 1989 when the major political and military developments of the decade put oil and gas security on the top of its membership's list to be reflected naturally by the four mentioned APEC entities. In particular, the devastating Iran-Iraq War (1980-88) pitted two major Persian Gulf oil-exporters of global significance against each other only to seriously damage each other's production and export capabilities as part of their military efforts. Unsurprisingly, the conflict raised questions about the reliability of their region especially as an oil-exporter given the threat of the military conflict's expansion to the entire Persian Gulf (having the world's largest oil and gas reserves and housing most of the world's large oil and gas suppliers) was present. Started by Iraq in 1984 and lasted until 1988, the tanker war especially reduced the two sides' oil exports as hundreds of commercial vessels, particularly oil tankers mainly carrying Iranian and Iraqi oil but also a small number of those carrying Kuwait oil, were hit by Iran and Iraq. The war and especially its tanker-war phase affected tanker navigation (oil and LNG tankers, alike) in the Persian Gulf and shot up oil prices while creating uncertainty about the accessibility of the regional supplies.

1. First decade (1990-1999)

Against this background, the AL, the AEM, the EWG and the APERC began their activities in a decade which was marked with many political and military upheavals challenging the APEC region's oil and gas security, particularly, the accessibility of oil and gas by many APEC members depending on a varying amount of such fuels. Chief among them was the Iraqi invasion and subsequent annexation of Kuwait in August 1990, which suddenly stopped the two major Persian Gulf oil exporters' supplies to the APEC region as a result of sanctions imposed on Iraq. It also raised concerns about major interruptions in mainly oil exports of the other Persian Gulf exporters should the conflict expand to their countries.

Aimed at restoring the *status quo ante*, the US-led coalition's military operation against Iraq (lasted until February 1991) damaged both the Iraqi and Kuwaiti oil facilities. The latter and, especially, the Iraqi-inflicted damages to the Kuwaiti oil industry, including setting fire to several oil fields of Kuwait by the retreating Iraqi forces, delayed the return of Kuwaiti oil supplies to the global markets following its liberation. Added to other factors (e.g., investment and technology shortages), the imposition of punitive sanctions on Iraq in the conflict's aftermath stopped its exports for years only to be resumed at a small scale in 1996 under the UN *Oil-for-Food Programme* lasted in full force until 2003 when the US-led invasion of Iraq ended the reign of Saddam Hussein.

Many other oil and gas-exporting countries, including those supplying the APEC region, faced situations, which either affected their production and/or export capabilities to a varying extent or created uncertainty about their uninterrupted exports. They include the continued Angolan civil war (1975-2002) inherited from the Cold War pitting rivals groups against each other over governing their country and the Sudanese civil war (1983-2005) between the Sudanese government and its separatist southern part (reflecting the ethnic divide between the mainly-Arab-dominated north and the black-dominated south). The rise of ethnic and political unrest and armed insurgency in Nigeria (continued to this date), the Algerian civil war in the aftermath of the country's cancelled 1991 elections (continued throughout the decade) and Mexico's armed conflict between its Zapatista indigenous people and the Mexican government (1994 continued through the 1990s) are three other examples.

Facing this volatile situation affecting particularly oil and gas accessibility and prices, the four APEC energy-concerned entities sought to improve through regional cooperation the APEC economies' ability to cope with threats and potential threats to their region's oil and gas security through their various activities summarized below in a chronological order.

Energy (oil & gas) Data Collection and Publication of Energy Statistics: Providing the APEC economies with up-to-date oil and gas statistics as a means for their achieving oil and gas security has been stressed over time by all the energy-concerned APEC entities leading to a systematic publication of energy statistics especially in support of the ESI. Collecting energy data, including oil and gas, on the APEC economies for developing a regional database and outlook on energy supply and demand was agreed in the EWG's first meeting in 1990.³ The EWG initiated a trial period leading to the publication of *APEC Energy Statistics 1992* and *APEC Time Series Statistics 1980-1991* in 1994 when a firm target date for the annual publication of energy statistics was proposed.⁴ In its 1997 Santiago meeting, the EWG agreed on a related project, *Construction of Database on the Oil and Gas Fields in the APEC Region*, to be conducted in 1998.⁵

3Es Initiative (economic growth, energy security and environmental protection): The AL's adopted the *3Es Initiative* in its 1995 Osaka meeting in recognition of the sustainability of the APEC region's economic growth

³ EWG (Energy Working Group) (1990), *1st Energy Working Group Meeting 1990*, Singapore, http://mddb.apec.org/_layouts/aq/forms/mddb/DownloadMeeting.aspx?Name=1st%20Energy%20Working%20Group%20Meeting%201990&y=1990&m=05&d=17&g=%22Energy%20Working%20Group%20%28EWG%29%22&loaded=1

⁴ EWG (1994), *8th Energy Working Group Meeting 1994, 1994/05/25, 25-26 May 1994*, Tokyo, Japan http://mddb.apec.org/_layouts/aq/forms/mddb/DownloadMeeting.aspx?Name=8th%20Energy%20Working%20Group%20Meeting%201994&y=1994&m=05&d=25&g=%22Energy%20Working%20Group%20%28EWG%29%22&loaded=1

⁵ EWG (1997), *14th Energy Working Group Meeting 1997*, Santiago, Chile, 13-14 May 1997, http://mddb.apec.org/_layouts/aq/forms/mddb/DownloadMeeting.aspx?Name=14th%20Energy%20Working%20Group%20Meeting%201997&y=1997&m=05&d=13&g=%22Energy%20Working%20Group%20%28EWG%29%22&loaded=1

if fuelled with a sustainable energy mix.⁶ The initiative is meant to address the environmental problems, including global warming, in the region while ensuring the APEC economies' energy security and economic growth. Towards that end, it provides for sharing policy principles and enhancing closer cooperation toward the development of APEC as a sustainable energy community for which the following actions should be taken: setting priority on fostering a common understanding on regional energy issues; facilitating investment in the energy sector where appropriate; reducing the environmental impact of the energy sector; and, accepting equivalence in accreditation and increasing harmonization of energy standards.⁷ The initiative also encourages the APEC membership to develop a range of shared energy goals, and build on and expand the fourteen non-binding policy principles for rational energy consumption.⁸

Natural Gas Initiative (Natural Gas Initiative: Accelerating Investment in Natural Gas Supplies, Infrastructure and Trading Networks in the APEC Region) (NGI): To meet the increasing needs of the APEC economies for gas requiring the removal of the barriers to its production, movement and trade in the APEC region, the AEM endorsed the NGI in their 1998 Ginowan meeting as recommended in the report on *Accelerating Investment in Natural Gas Supplies, Infrastructure and Trading Networks in the APEC Region*.⁹ The NGI is meant to promote the "acceleration of investment in natural gas supplies, infrastructure and trading networks" in the APEC region.¹⁰ The following Kuala Lumpur AL meeting in that year welcomed the NGI.¹¹

2. Second decade (2000-2009)

The second decade was equally challenging to the APEC region's oil and gas security. The four energy-concerned APEC entities had to be mindful of a host of human-made as well as natural factors posing threats or potential threats to such security. The former include a significant number of military conflicts of a differing scale and scope engulfing APEC's oil- and gas-suppliers. Undoubtedly, the 2003 US-led invasion of Iraq was the single most important one taking place after 12 years of war, civil war and sanctions that crippled the Iraqi oil and gas industry and reduced its exports to an insignificant amount. The 2003 war further damaged the Iraqi oil and gas industry and gave birth to the rise of an armed insurgency, which has since targeted that industry, including its export infrastructure, as part of its plan to overthrow the post-2003 Iraqi government. Repairing the severely damaged industry and its modernization proved to be difficult in a country engulfed in a bloody armed insurgency with the effect of prolonging the restoration of the Iraqi export-capability at its pre-1991 level.

Other military conflicts include the outbreak of civil war in oil- and LNG-exporting Yemen in 2004 lasted until the end of the decade and the continuity of the Sudanese Civil War (1983- 2005) pitting Sudan's southern part (housing the bulk of the country's oil reserves) against its northern part (controlling the Sudanese oil export

⁶ APEC (1995), *1995 Leaders' Declaration*, 19 November 1995, Osaka, Japan, *THE OSAKA ACTION AGENDA: Implementation of the Bogor Declaration*, http://www.apec.org/Meeting-Papers/Leaders-Declarations/1995/1995_aelm.aspx

⁷ Ibid.

⁸ Ibid.

⁹ APEC (1998), *1998 APEC Energy Ministerial Meeting*, 9 - 10 October 1998, Ginowan, Okinawa, Japan, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/1998_energy.aspx

¹⁰ Ibid.

¹¹ APEC (1998), *1998 Leaders' Declaration*, 18 November 1998, Kuala Lumpur, Malaysia , http://www.apec.org/Meeting-Papers/Leaders-Declarations/1998/1998_aelm.aspx

facilities consisting of pipelines and Red Sea oil terminals). Ending in the massive destruction of Georgia, the 2008 Georgian-Russian war raised questions about Azerbaijan's oil exports'sustainability mainly done through its neighboring Georgia. Moreover, the continuity of the armed conflict in Nigeria's oil and gas-rich Niger Delta and the extensive damages inflicted on its pipelines because of that conflict, theft and vandalism seriously affected the country's oil and gas production and exports.

Among the human-made factors, terrorism and certain political developments are also noteworthy. The 11 September 2001 terrorist attacks on the United States followed by such attacks on Indonesia (Bali, 2002), Turkey (Istanbul, 2003), Spain (Madrid, 2004) and the UK (London, 2005) and those by the Jihadist militant groups in oil and gas-exporting countries such as Algeria in this decade did not target the mentioned countries's oil and gas sectors *per se*. Nevertheless, they raised questions about the vulnerability of APEC's oil and gas sectors and also those of its oil and gas suppliers to such threat.

As a major political development affecting APEC's oil and gas security in this decade, various UN- and US- sanctions on Iran and its energy industry (beginning in 2005 and continuing to this date) decreased its oil exports and prolonged the realization of its export-oriented projects, including the LNG one. Other major political developments with that effect include the change of guards in Bolivia (2005) and Ecuador (2007), which brought to power Evo Morales and Rafael Vicente Correa, respectively. This development raised concern about the future of Bolivia's gas and Venezuela's oil exports to affect the global energy markets as the two leaders hinted at their dissatisfaction with the *status quo*, including their countries's energy ties with major foreign oil/gas corporations.

Finally, the December 2004 earthquake and tsunami, which hit Southeast Asia affecting certain APEC economies, particularly Thailand and oil/gas-exporting Malaysia and Indonesia, and major hurricanes in the United States in 2005 (Katrina, Rita and Ike) alarmed the APEC economies about natural disasters as a factor affecting their region's oil and gas security.

The abundance of factors challenging the regional oil and gas security strengthened the commitment of APEC's four major energy-concerned entities to continuing their efforts to help the APEC economies meet the increasing challenges to their oil and gas security. Towards that end, these entities conducted various activities, including the following, presented in a chronological order and also in the order of relevance of activities to each other.

Joint Oil Data Initiative (Joint Data Initiative-Oil & Joint Data Initiative-Gas) (JODI): APEC joined five other entities involved in oil statistics (IEA, OPEC, Eurostat, OLADE, and UN Statistics Division) at the International Energy Forum (IEA) in Paris/France in 2000 to discuss harmonising and improving oil statistics as a means for achieving supply security in the APEC region through cooperation between energy-consuming and energy-producing countries.¹² The Paris discussions followed by another round of discussions in that year at the 7th IEA meeting in Riyadh/Saudi Arabia which resulted in an agreement on cooperation among relevant organizations, as well as participating countries, in improving and timely accessing energy data í important for market assessment and transparency.¹³ The following Bangkok workshop (April 2001) initiated the *(Monthly) Joint Oil Data Exercise* to which about 90 countries, including all the APEC economies, contribute through the

¹² APERC (2003), "ANNEX: THE JOINT OIL DATA INITIATIVE AND REAL-TIME EMERGENCY INFORMATION SHARING SYSTEM," *Energy Security Initiative: Some Aspects of Oil Security*, Tokyo, Japan.

¹³ Ibid.

mentioned entities.¹⁴ The JODI was officially launched in 2001 and its first set of data was released on 19 December 2005 in Riyadh.¹⁵ The AEM have since instructed the EWG to build the capacity of member economies to collect data and report to the JODI, including in its 2004 Manila meeting.¹⁶ The APEC economies statistics contributions to the JODI now covers both oil and gas statistics.

Energy Security Initiative (ESI): The AL adopted the ESI in their 2001 Shanghai meeting as a means for strengthening the regional energy security and as a key measure for enhancing counter-terrorism in the APEC region.¹⁷ In its aftermath, the AEM endorsed the ESI's recommendations in their 2002 Mexico City meeting and directed the EWG to promote their implementation as they specified the following ESI's short- and long-term objectives:

Short-term objectives: *improving monthly oil data; real time emergency information sharing; option of oil stocks among interested members; considering a feasibility study on possible joint stocks among interested members; and organising dialogues on sea lane security issues.*

Long-term objectives: *looking into energy exploration and development; alternative fuels; high efficiency vehicles; and more energy-efficient modes of public transport.*¹⁸

The AL demanded accelerating the ESI's implementation by endorsing its Implementation Plan in their 2003 Bangkok meeting.¹⁹

APERC's immediate activities related to the ESI include organizing the *Sea-Lane Disruption Simulation Exercise* (Tokyo, 18-19 April 2002), and the *APEC Energy Security Initiative Workshop* (Chinese Taipei, 23-24 April 2002), as well as producing an EWG- commissioned report, i.e., *Energy Security Initiative: Emergency Oil Stocks As an Option to Respond to Oil Supply Disruptions*.²⁰ Added to its involvement in the *Oil and gas security exercises* detailed below, APERC's subsequent ESI-related activities include organizing events such as *A Quest for Energy Security in the 21st Century—Resources and Constraints* (2007)²¹ and *APERC Mid-Year Workshop 2006*.²² The EWG's involvement in the ESI is detailed in this summary's dealing with the initiative's various respective measures.

¹⁴Ibid.; EWG (2005), , *Agenda Item 13, Attachment A, Progress Report : Export Group on Energy Data and Analysis (EGEDA), EWG32*, 4-5 October 2005, Yuzhno-Sakhalinsk, Russian Federation, http://www.ewg.apec.org/documents/13A_EGEDA_Progress_EWG32.pdf.

¹⁵ EWG (2005), , *Agenda Item 13, Attachment A, Progress Report : Export Group on Energy Data and Analysis (EGEDA), EWG32*, 4-5 October 2005, Yuzhno-Sakhalinsk, Russian Federation, http://www.ewg.apec.org/documents/13A_EGEDA_Progress_EWG32.pdf.

¹⁶ APEC (2004), *2004 APEC Energy Ministerial Meeting*, 10 June 2004, Manila, Philippines, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2004_energy.aspx

¹⁷ APEC (2001), *2001 Leaders' Declaration, Statement on Counter-Terrorism*, Shanghai, China, 21 October, 2001, http://www.apec.org/Meeting-Papers/Leaders-Declarations/2001/2001_aelm/statement_on_counter-terrorism.aspx

¹⁸ APEC (2002), *2002 APEC Energy Ministerial Meeting*, Mexico City, Mexico, 23 Jul 2002, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2002_energy.aspx

¹⁹ APEC (2003), *2003 Leaders' Declaration*, Bangkok, Thailand, 21 October 2003, http://www.apec.org/Meeting-Papers/Leaders-Declarations/2003/2003_aelm.aspx

²⁰ APERC (Asia Pacific Energy Research Centre) (2002), *Energy Security Initiative: Emergency Oil Stocks As an Option to Respond to Oil Supply Disruptions*, Tokyo, Japan.

²¹ APERC (2007), *A Quest for Energy Security in the 21st Century—Resources and Constraints*, APERC Annual Conference 2007, Tokyo, Japan, http://aperc.ieej.or.jp/publications/papers_and_presentations/others_detail.php?article_info_id=124

²² APERC (2006), *APERC Mid-Year Workshop 2006*, 24-25 October 2006, , Tokyo, Japan, http://aperc.ieej.or.jp/publications/papers_and_presentations/others_detail.php?article_info_id=61

Oil/Petroleum Stockpiling (Petroleum Stocks as an Option to Respond to Oil Supply Disruptions): As part of the ESI, oil stockpiling has been promoted in the APEC region as a means to address oil supply disruptions. In its 2000 Cusco meeting, the EWG agreed on a proposal on *Energy Security Initiative: Petroleum Stocks as an Option to Respond to Oil Supply Disruptions*.²³ This was followed by the AEM Mexico City meeting in 2002, which directed the EWG to work on the 'option of oil stocks among interested members'.²⁴ *Best practice principles for strategic oil-stockpiling* have been prompted by the energy-concerned APEC entities, particularly the AEM. In its 2004 Manila meeting, it encouraged interested APEC economies to 'move towards best practice as identified in 'Best Practice Principles for the Establishment and Management of Strategic Oil Stocks' and consider the feasibility of joint stocks among interested parties'.²⁵ The APERC's research on this topic has reflected in its certain publications, including *Emergency Oil Stocks and Energy Security in the APEC Region*, *Energy Security Initiative: Emergency oil Stocks as an Option to Respond to Oil Supply Disruptions*, and *Energy Security Initiative: Some Aspects of Oil Security*.²⁶

Energy Emergency Responses (EER): Mindful of possible supply disruptions because of various potential threats, including terrorism, the AL stressed in their 2001 Shanghai meeting the need for strengthening the APEC region's energy security through the ESI, including measures to respond to temporary supply disruptions and longer-term challenges facing the region's energy supply.²⁷ Such responses initially emerged as *oil supply emergency response* in an APERC publication in 2001 (*Scoping Paper – Energy Security Initiative: Emergency Oil Stocks as an Option to Respond to Oil Supply Disruptions*) to be adopted by the EWG.²⁸

The EWG discussed energy emergency responses as an ESI measure in its 2003 Portland meeting and agreed that, at each EWG meeting beginning with EWG26, one member economy would make a presentation to the EWG on its energy emergency response arrangements on a voluntary basis.²⁹ The initiative was noted under the ESI's recommendations and actions in the EWG's 2004 Beijing meeting.³⁰ It has since become one of the ESI's short-term measures. Examples of APERC's research on EER include *Energy Security in APEC: Assessing the Costs of Energy Supply Disruptions and the Impacts of Alternative Energy Security Strategies*.³¹

²³ EWG (2000), *20th Energy Working Group Meeting 2000*, 19-20 October 2000, Cusco, Peru,

http://mddb.apec.org/_layouts/aq/forms/mddb/DownloadMeeting.aspx?Name=20th%20Energy%20Working%20Group%20Meeting%202000&y=2000&m=10&d=19&g=%22Energy%20Working%20Group%20%28EWG%29%22&loaded=1

²⁴ APEC (2002), *2002 APEC Energy Ministerial Meeting*, 23 July 2002, Mexico City, Mexico, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2002_energy.aspx

²⁵ APEC (2004), *2004 APEC Energy Ministerial Meeting*, 10 June 2004, Manila, Philippines, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2004_energy.aspx

²⁶ APERC (2000), *Emergency Oil Stocks and Energy Security in the APEC Region*. Tokyo, Japan; APERC (2002). *Energy Security Initiative: Emergency oil Stocks as an Option to Respond to Oil Supply Disruptions*. Tokyo, Japan; APERC (2003). *Energy Security Initiative: Some Aspects of Oil Security*. Tokyo, Japan.

²⁷ APEC (2001), *2001 Leaders' Declaration, Statement on Counter-Terrorism*, Shanghai, China, 21 October 2001, http://www.apec.org/Meeting-Papers/Leaders-Declarations/2001/2001_aelm/statement_on_counter-terrorism.aspx

²⁸ EWG (2001), *21st Energy Working Group Meeting 2001*, Kuala Lumpur, Malaysia, 18-19 May 2001, http://mddb.apec.org/_layouts/aq/forms/mddb/DownloadMeeting.aspx?Name=21st%20Energy%20Working%20Group%20Meeting%202001&y=2001&m=05&d=18&g=%22Energy%20Working%20Group%20%28EWG%29%22&loaded=1

²⁹ EWG (2003), *25th Energy Working Group Meeting 2003*, Portland, USA, 19-20 June 2003, http://mddb.apec.org/_layouts/aq/forms/mddb/DownloadMeeting.aspx?Name=25th%20Energy%20Working%20Group%20Meeting%202003&y=2003&m=06&d=19&g=%22Energy%20Working%20Group%20%28EWG%29%22&loaded=1

³⁰ EWG (2004), *Summary Report - 27th Energy Working Group Meeting 2004*, Beijing, People's Republic of China, 24-25 March 2004, http://mddb.apec.org/Documents/2004/EWG/EWG27/04_ewg27_summary.pdf

³¹ APEC Secretariat (2005). *Energy Security in APEC: Assessing the Costs of Energy Supply Disruptions and the Impacts of Alternative Energy Security Strategies*. Singapore.

Maritime Security/Sea Lane Security: Given the dependency of the APEC region on sea-based transportation of goods, including oil and gas, maritime or sea lane security has been a major component of the APEC region's security stressed by the AL in their various meetings. They include their 2001 Shanghai one in whose *Statement on Counter-Terrorism* the AL demanded the adherence by all the regional economies to relevant international requirements for the security of air and maritime transportation.³² Following that statement, the EWG and the APERC conducted various activities on this issue such as the APERC's *Sea Lane Disruption Simulation Exercise* (Tokyo, April 2002) whose report was discussed in the EWG's 2002 meeting in Bangkok within the ESI context³³, and the APERC's publications, e.g., *Energy Security Initiative: Some Aspects of Oil Security*.³⁴ Concerns about sea lane security prompted the AEM to direct the EWG in their 2002 Mexico City meeting to organize dialogues on this issue.³⁵ The latter was a focus of EWG's 2003 Seoul meeting³⁶ followed by the AEM's directing the EWG in its 2004 Manila meeting to monitor efforts to strengthen sea-lane security.³⁷

Facilitating Investment and Trade in Downstream and Upstream Oil Markets: APEC's large and growing consumption of oil and refined oil products has given prominence to the challenges to its oil downstream and upstream sectors. Among the relevant issues, addressing barriers to investment and trade have been of special importance to APEC's energy-concerned entities such as the EWG whose various types of work on this issue include seminars such as *Workshop on "Lessons on Energy Sector Liberalization"* (2001).³⁸ Along the same line, and to increase the regional production and distribution of crude oil and refined products as a means for reducing APEC's heavy dependency on oil imports, the AEM considered certain related measures in their 2007 Darwin meeting, including *facilitating investment and trade in downstream and upstream oil markets*.³⁹ The following EWG Hong Kong meeting in the same year signified the importance of the issue by clearly identifying certain relevant measures as part of the *longer-term ESI responses to improve regional energy security*, namely *removing market impediments to oil exploration and production*, *facilitating investment in new downstream oil infrastructure*, and *facilitating more effective utilisation of existing downstream oil infrastructure*.⁴⁰ Apart from many references to this issue in its previously-mentioned annual publications, examples of the APERC's works on the issue include *APEC Downstream Oil Market Study*.⁴¹ The APERC's 2007 annual

³² APEC (2001), *2001 Leaders' Declaration, Statement on Counter-Terrorism*, Shanghai, China, 21 October 2001, http://www.apec.org/Meeting-Papers/Leaders-Declarations/2001/2001_aelm/statement_on_counter-terrorism.aspx

³³ EWG (2002), *23rd Energy Working Group Meeting 2002*, Bangkok, Thailand, 15-16 May 2002, <http://mddb.apec.org/layouts/aq/forms/mddb/DownloadMeeting.aspx?Name=23rd%20Energy%20Working%20Group%20Meeting%202002&y=2002&m=05&d=15&g=%22Energy%20Working%20Group%20%28EWG%29%22&loaded=1>

³⁴ APERC (2003), *Energy Security Initiative: Some Aspects of Oil Security*, Tokyo, Japan.

³⁵ APEC (2002), *2002 APEC Energy Ministerial Meeting*, Mexico City, Mexico, 23 July 2002, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2002_energy.aspx

³⁶ EWG (2003), *Summary Report, Twenty-Sixth Meeting*, Seoul, Korea, 3-4 December 2003, <http://mddb.apec.org/layouts/aq/forms/mddb/DownloadMeeting.aspx?Name=26th%20Energy%20Working%20Group%20Meeting%202003&y=2003&m=12&d=03&g=%22Energy%20Working%20Group%20%28EWG%29%22&loaded=1>

³⁷ APEC (2004), *2004 APEC Energy Ministerial Meeting*, Manila, Philippines, 10 June 2004, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2004_energy.aspx

³⁸ APEC (2001), APEC Publications, APEC Seminar - Workshop on *Lessons on Energy Sector Liberalization*, December 2001, http://publications.apec.org/publication-detail.php?pub_id=579

³⁹ APEC (2007), *2007 APEC Energy Ministerial Meeting*, 29 May 2007, Darwin, Australia, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2007_energy.aspx

⁴⁰ EWG (2007), *Eighth Report on the Implementation of the Energy Security Initiative*, EWG34, 3-7 September 2007, Hong Kong, China, http://www.ewg.apec.org/documents/EWG34_8thESIReport.pdf

⁴¹ APERC (2005). *APEC Downstream Oil Market Study*. Tokyo, Japan.

conference (*A Quest for Energy Security in the 21st Century—Resources and Constraints*) dealt with some of the related issues.⁴²

Energy (oil & gas) Data Collection and Publication of Energy Statistics: Being relevant to the JODI, work on this project, which started in the first decade, continued in the second one. As part of its promoting the ESI, the AEM directed the EWG to undertake work on improving *monthly oil data* in its 2002 Mexico City meeting.⁴³ Reporting monthly oil data by the APEC economies was endorsed by the AL in their 2002 Los Cabos meeting, which had been highly commended by the *8th International Energy Forum* in 2001.⁴⁴ Improving the quality of gas statistics have also been stressed on occasions by the AEM, including in their 2005 Gyeongju meeting.⁴⁵

Real-time Emergency Information Sharing System (RTEIS): The AEM directed the EWG in its 2002 Mexico City meeting to undertake work on real time emergency information sharing among the APEC economies as part of the ESI's short-term measures.⁴⁶ In the same year, the following EWG meeting in Taipei discussed preparing a proposal on this initiative as part of its discussion on the ESI's implementation.⁴⁷ The RTEIS aims at providing the basic data and a communications room for APEC member economies to share oil information with each other for the purpose of facilitating improved crisis management during emergencies.⁴⁸ In 2004 the AEM directed the EWG to implement RTEIS in its Manila meeting⁴⁹ and encouraged the APEC economies' participation in RTEIS in its 2005 Gyeongju.⁵⁰ In its focus on the ESI, the APERC has elaborated on the RTEIS in its publications such as *Energy Security: Some Aspects of Oil Security*.⁵¹

Russia's Initiative on the Establishment of the Protection of Critical Energy Infrastructure Point of Contacts Network: Being meant to enhance the RTEIS and APEC's policy on energy stockpiling to deal with supply disruptions, the initiative, which is an anti-terrorist measure, involves the APEC economies' identifying points of contact to be contacted in case of energy emergencies to help the affected economies cope with their energy emergencies. Toward this end, Russia gave a presentation on the establishment of an 'APEC Rapid Response Network/Points of Contacts for Protection of Critical Energy Infrastructure' in the March 2007 EWG

⁴² APERC, *A Quest for Energy Security in the 21st Century—Resources and Constraints*, APERC Annual Conference 2007, 14 February 2007, Tokyo, Japan.

⁴³ APEC (2002), *2002 APEC Energy Ministerial Meeting*, Mexico City, Mexico, 23 July 2002, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2002_energy.aspx

⁴⁴ APEC (2002), *2002 Leaders' Declaration*, Los Cabos, Mexico, 27 October 2002, http://www.apec.org/Meeting-Papers/Leaders-Declarations/2002/2002_aelm.aspx

⁴⁵ APEC (2005), *2005 APEC Energy Ministerial Meeting*, Gyeongju, Korea, 19 October 2005, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2005_energy.aspx

⁴⁶ APEC (2002), *2002 APEC Energy Ministerial Meeting*, 23 July 2002, Mexico City, Mexico, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2002_energy.aspx

⁴⁷ EWG (2002), *24th Energy Working Group Meeting 2002*, 9-10 October 2002, Taipei, Chinese Taipei, http://mddb.apec.org/_layouts/aq/forms/mddb/DownloadMeeting.aspx?Name=24th%20Energy%20Working%20Group%20Meeting%202002&y=2002&m=10&d=09&g=%22Energy%20Working%20Group%20%28EWG%29%22&loaded=1

⁴⁸ APEC (2002), *2002 APEC Energy Ministerial Meeting*, 23 July 2002, Mexico City, Mexico, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2002_energy.aspx

⁴⁹ APEC (2004), *2004 APEC Energy Ministerial Meeting*, 10 June 2004, Manila, Philippines, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2004_energy.aspx

⁵⁰ APEC (2005), *2005 APEC Energy Ministerial Meeting*, 19 October 2005, Gyeongju, Korea, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2005_energy.aspx

⁵¹ APERC (2003), *Energy Security Initiative: Some Aspects of Oil Security*, Tokyo, Japan.

meeting in Auckland to which the EWG membership was receptive.⁵² Viewing it as part of APEC's objective of *enhancing emergency preparedness*, the AEM backed the initiative and encouraged the APEC economies to facilitate the establishment of an *APEC Rapid Response Points of Contact Network for the Protection of Critical Energy Infrastructure* in its 2007 Darwin meeting and encouraged APEC's economies to participate in it.⁵³

Cross-border Energy Trade: Concerned about the APEC region's large and growing dependency on energy imports and therefore its vulnerability to developments in its supplying countries and price fluctuations, APEC has sought to help its membership fully utilize the regional energy resources in meeting their energy requirements for which encouraging and facilitating cross-border energy trade is necessary. For that matter, the AL agreed on certain measures in their 2005 Busan meeting, including *expanding cross-border energy trade*, as part of their required urgent response to the particularly high oil prices.⁵⁴ Reacting to such prices and the need to enhance the regional security of oil supply, the AEM also identified expanding trade of "all energy types" as a means to help the regional economies achieve their energy security in its 2005 Gyeongju meeting.⁵⁵ They also directed the EWG to develop further initiatives to increase cross-border energy trade as encouraging the APEC economies to adopt *best practice principles* developed to facilitate cross-border energy trade.⁵⁶ Among the related issues considered and encouraged by the APEC energy-concerned entities the following are important. *Cross-border inter-connections of energy systems* was stressed in the AEM 2002 Mexico City meeting for its potential to provide significant energy trade opportunities, as the AEM directed the EWG to expand its preliminary work on addressing *barriers to cross-border connection of power grids to cover gas pipeline networks*.⁵⁷ *Cross-border interconnection of gas pipelines* was agreed upon in the EWG's 2002 Taipei meeting as an important issue for the APEC member economies that should form part of the EWG's work program.⁵⁸ Cross-border gas pipelines were especially emphasized by the AEM in their 2004 Manila meeting as a means for the APEC economies' energy diversification and therefore a means to *expand our [APEC] energy choices*.⁵⁹

Natural Gas Initiative (NGI): In the second decade, more attention was paid to gas as part of APEC's oil and gas security because of the growing importance of gas/LNG for the APEC region as reflected in the NGI and its following activities. Started in the first decade (1998) as discussed above, the 2000 AEM meeting in San Diego reconfirmed the APEC's commitment to the NGI by "identifying principles and best practices for reducing investor risk and mobilizing private investment."⁶⁰ Examples of the APEC's work on this topic following the

⁵² EWG (2007), *33rd Energy Working Group Meeting 2007*, 26-30 March 2007, Auckland, New Zealand, http://mddb.apec.org/Documents/2007/EWG/EWG33/07_ewg33_summary.pdf

⁵³ APEC (2007), *2007 APEC Energy Ministerial Meeting*, 29 May 2007, Darwin, Australia, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2007_energy.aspx

⁵⁴ APEC (2005), *2005 Leaders' Declaration*, 18-19 November 2005, Busan, Korea, http://www.apec.org/Meeting-Papers/Leaders-Declarations/2005/2005_aelm.aspx

⁵⁵ APEC (2005), *2005 APEC Energy Ministerial Meeting*, 19 October 2005, Gyeongju, Korea, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2005_energy.aspx

⁵⁶ Ibid.

⁵⁷ APEC (2002), *2002 APEC Energy Ministerial Meeting*, 23 July 2002, Mexico City, Mexico, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2002_energy.aspx

⁵⁸ EWG (2002), *24th Energy Working Group Meeting 2002*, 9-10 October 2002, Taipei, Chinese Taipei, http://mddb.apec.org/_layouts/aq/forms/mddb/DownloadMeeting.aspx?Name=24th%20Energy%20Working%20Group%20Meeting%202002&y=2002&m=10&d=09&g=%22Energy%20Working%20Group%20%28EWG%29%22&loaded=1

⁵⁹ APEC (2004), *2004 APEC Energy Ministerial Meeting*, 10 June 2004, Manila, Philippines, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2004_energy.aspx

⁶⁰ APEC (2000), *Joint Statement on Clean Energy and Sustainable Development*, 2000 APEC Energy Ministerial Meeting,

NGI's initiation include *Natural Gas Infrastructure: Southeast Asia-Costs and Benefits*, *Gas Storage in the APEC Region*, and *Natural Gas Market Reform in the APEC Region*.⁶¹ As a significant relevant development, the AEM directed the EWG in its 2007 Darwin meeting to 'review the uptake and currency of Best Practice Principles on Accelerating Investment in Natural Gas Supplies, Infrastructure and Trading Networks in the APEC Region', 'Facilitating the Development of LNG Trade', and 'Financing Energy Projects; and Natural Gas Trade'.⁶²

Natural Gas/LNG Trade: Given the growing importance of gas for the APEC region, removing the barriers to gas trade has become an important issue reflected in the AEM's 2004 Manila meeting in which the AEM expressed their support for the creation of a 'competitive and transparent marketplace for gas trade' and encouraged the APEC economies to 'move towards best practice as identified in 'Facilitating the Development of LNG Trade in the APEC Region''.⁶³ They also directed the EWG to continue its work to 'improve the security of natural gas supply by identifying vulnerabilities, supporting trade promotion and establishing convenient information links to gas market data available in existing data systems'.⁶⁴ The AEM stressed the importance of gas trade in their 2005 Gyeongju meeting as they instructed the EWG to develop further initiatives for increasing cross-border energy trade while encouraging the APEC economies to move towards *best practice in facilitating natural gas trade*.⁶⁵ The AL agreed in their following Busan meeting in 2005 to respond to high oil prices by 'addressing the supply and demand of the energy market simultaneously through various means, including expanding cross-border energy trade'.⁶⁶ The APERC's work on gas trade have reflected in its publications such as *APEC Energy Demand and Supply Outlook*, whose 2006 volume containing elaboration on that subject, for instance, was published following the AEM's mentioned remarks on gas trade.⁶⁷

LNG Public Education and Communication Information Sharing Initiative: As an indicator of the importance of LNG for the APEC region as the region's gas consumption is increasing, in their 2005 Gyeongju meeting, the AEM directed the EWG to implement the *LNG Public Education and Communication Information Sharing Initiative* aimed at educating the public on the importance of LNG for the regional economies.⁶⁸ The EWG identified implementing this objective in its 2007 Hong Kong meeting as one the longer-term ESI measures.⁶⁹ Towards this end among other objectives, the APERC's elaboration on different issues pertaining to gas and LNG and their security have reflected in its various publications such as *APEC Energy Demand and Supply*

12 May 2000, San Diego, United States,

http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2000_energy/00cleanenergy.aspx

⁶¹ APERC (2000). *Natural Gas Infrastructure: Southeast Asia-Costs and Benefits*, Tokyo, Japan; APERC (2002). *Gas Storage in the APEC Region*. Tokyo, Japan; APERC (2003). *Natural Gas Market Reform in the APEC Region*. Tokyo, Japan.

⁶² APEC (2007), *2007 APEC Energy Ministerial Meeting* 29 May 2007, Darwin, Australia,

http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2007_energy.aspx

⁶³ APEC (2004), *2004 APEC Energy Ministerial Meeting*, 10 June 2004, Manila, Philippines,

http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2004_energy.aspx

⁶⁴ Ibid.

⁶⁵ APEC (2005), *2005 APEC Energy Ministerial Meeting*, 19 October 2005, Gyeongju, Korea,

http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2005_energy.aspx

⁶⁶ APEC (2005), *2005 Leaders' Declaration*, 18 - 19 November 2005, Busan, Korea,

http://www.apec.org/Meeting-Papers/Leaders-Declarations/2005/2005_aelm.aspx

⁶⁷ For example, see RECENT TRENDS AND CHARACTERISATION, Findings: increasing oil and gas import-dependency and threat to the region's energy security, BRIEF SUMMARY OF FINDINGS, in APERC (2006), *APEC Energy Demand and Supply Outlook 2006*, Tokyo, Japan.

⁶⁸ APEC (2005), *2005 APEC Energy Ministerial Meeting*, 19 October 2005, Gyeongju, Korea,

http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2005_energy.aspx

⁶⁹ EWG (2007), *Eighth Report on the Implementation of the Energy Security Initiative*, EWG34, 3-7 September 2007, Hong Kong, China. http://www.ewg.apec.org/documents/EWG34_8thESIRReport.pdf

Outlook – 5th Edition (2013),⁷⁰ *APEC Energy Demand and Supply Outlook – 4th Edition* (2009),⁷¹ *APEC Energy Demand and Supply Outlook 2006*⁷² and *APEC Energy Demand and Supply Outlook 2002*⁷³.

Creation of APEC Gas Forum (APGAS) to Expand Cross-Border Energy Trade: In its 2005 Gyeongju meeting, the AEM encouraged the APEC economies to support the establishment of the *APEC Gas Forum* as part of APEC's efforts to help its membership meet their energy requirement and facilitate cross-border energy trade in the APEC region.⁷⁴ Creating the APGAS as a longer-term ESI measure was stated in the EWG's 2007 Hong Kong meeting.⁷⁵ Composed of regional gas industry experts from APEC's Energy Business Network, the APGAS submitted a number of recommendations to the AEM's 2007 Darwin meeting.⁷⁶

3. Third decade (2010-present)

The third decade is not any different from its preceding ones when it comes to oil and gas security. Many oil- and gas-exporters to APEC have been affected by certain developments to maintain the top status of oil and gas security on the four mentioned APEC entities' agenda. Starting in December 2010 in a non-oil/gas-supplying country (Tunisia), the 'Arab Spring' has since expanded to just about all the Arab oil- and gas-suppliers, namely Algeria, Egypt, Yemen, Libya, Sudan, Syria and the Persian Gulf Arab countries (Bahrain, Kuwait, Oman and Saudi Arabia). Facing a much smaller (and thus easier to suppress) popular challenge than those of the other mentioned Arab countries, the last four countries and Algeria have survived the development although they may well be drawn back into the 'Arab Spring' given the existence of a fertile ground for such scenario in their countries.

Of the remaining five countries, Libya, Syria and Yemen have been dragged into a brutal civil war while Egypt has experienced extensive political unrest being currently on the verge of such war if the current situation continues. Surviving the 'Arab Spring', Sudan was divided into two countries (Sudan and South Sudan) in July 2011 as part of an earlier agreement to end hostility between its two opposing northern and southern parts only to experience various forms of armed conflicts in its both succeeding countries. Having the bulk of the united Sudan's oil reserves, South Sudan has been pulled back into a civil war since December 2013. These developments have created concerns about the affected countries' oil exports' sustainability. Syria's bloody civil war since 2011 have ended its oil exports as a result of various sanctions on such exports, including the US and the EU ones. Factors affecting Nigeria's oil and gas exports in the preceding decade have continued in the current decade to affect negatively such exports. Thanks to the continuing and expanding UN/US/EU sanctions on its oil and gas industry, Iran's oil exports now mainly confined to certain APEC East-Asian

⁷⁰ APERC (2013), *Energy Demand and Supply Outlook 5th Edition*, Tokyo, Japan, http://aperc.ieej.or.jp/publications/reports/outlook/5th/volume1/EDSO5_V1_C11_Oil.pdf

⁷¹ APERC (2009), *Energy Demand and Supply Outlook 4th Edition*, Tokyo, Japan, http://aperc.ieej.or.jp/file/2010/9/24/Outlook_Volume_I_4E.pdf

⁷² APERC (2006), *Energy Demand and Supply Outlook 2006*, Tokyo, Japan, http://aperc.ieej.or.jp/file/2010/9/23/EDSO2006_Vol_I_Whole.pdf

⁷³ AOERC (2002), *APEC Energy Demand and Supply Outlook 2002*, Tokyo, Japan, <http://aperc.ieej.or.jp/file/2010/9/24/APEC-EDSO2002.pdf>

⁷⁴ APEC (2005), *2005 APEC Energy Ministerial Meeting*, 19 October 2005, Gyeongju, Korea, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2005_energy.aspx

⁷⁵ EWG (2007), *Eighth Report on the Implementation of the Energy Security Initiative*, EWG34, 3-7 September 2007, Hong Kong, China. http://www.ewg.apec.org/documents/EWG34_8thESIReport.pdf

⁷⁶ EWG (2008), *PROGRESS REPORT TO EWG35 OF THE ENERGY WORKING GROUP, EXPERT GROUP ON VLEARN FOSSIL ENERGY-* EWG 04/2008T - Actions by Government and Industry to Promote LNG Trade and Investment in the APEC Region, EWG35, 2 - 7 March 2008, Iquitos, Peru, http://www.ewg.apec.org/documents/EWG35_EGCFE.pdf

economies (China, Chinese Taipei, Japan and South Korea) as well as India have been minimized since July 2012 when the EU imposed news sanctions. The November 2013 *Interim Agreement* between Iran and the UN 5 +1 set the ground for a future resumption of Iranian oil at its pre-sanction level provided the ongoing negotiations lead to a settlement to the prolonged dispute on Iran's nuclear energy sector, an uncertain result.

Given the continuity of factors affecting APEC's oil and gas security, efforts to deal with this challenge have continued by the regional organization's four energy-concerned entities. Presented in a chronological order, their major engagements in this respect include the following activities.

3Es Initiative: Started in the first decade, continued interest in the initiative in the current decade is reflected in the AEM's considering the *3Es Initiative* as part of their implementation strategy for APEC's *Energy Program* in its 2010 San Diego meeting.⁷⁷

Joint Oil Data Initiative (JODI): Given its importance for the APEC's oil and gas security, the JODI, which was launched in the previous decade, has maintained its importance in the ongoing decade. Thus, the AEM emphasized improving the quality of such contribution in its instructions to the EWG and also the EGEDA (Expert Group on Energy Data and Analysis) in their 2010 Fukui meeting.⁷⁸

Oil/Petroleum Stockpiling: Started in the second decade, **work on this initiative has continued in the current decade. In this regard, the AL's** various relevant references include their encouraging the APEC economies to aim at *effective management of strategic oil stocks* in their 2010 Fukui meeting.⁷⁹ The APERC's also elaborated on this topic in its 2013 annual publication: *APEC Energy Demand and Supply Outlook* and *APEC Energy Overview*.⁸⁰

Oil and Gas Security Exercises (OGSE): In their 2010 Fukui meeting, the AEM instructed the EWG to develop joint programs with the International Energy Agency (IEA) to improve response to oil and gas emergency situations in the APEC region (e.g., energy response workshops and exercises).⁸¹ The AEM further encouraged the implementation of the initiative in their 2012 Saint Petersburg meeting.⁸² In collaboration with the host countries, APERC has so far organized one exercise in Bangkok (17-19 September 2013, in which Brunei, Indonesia, Malaysia, Philippines, Thailand, Singapore and Vietnam participated) and another in Jakarta (22-24 October 2013 in which Indonesia participated).

⁷⁷ APEC (2010), *Implementation Strategy for APEC's Energy Program*, 2010 APEC Energy Ministerial Meeting, 12 May 2000, San Diego, United States,

http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2000_energy/00attachmt.aspx

⁷⁸ APEC (2010), *2010 APEC Energy Ministerial Meeting*, 19 June 2010, Fukui, Japan,

http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2010_energy.aspx

⁷⁹ APEC (2010), *2010 APEC Energy Ministerial Meeting*, 19 June 2010, Fukui, Japan,

http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2010_energy.aspx

⁸⁰ Recent examples include: APERC (2013), "The Challenge of Oil Security," *APERC Energy Supply and Demand – Fifth edition*. Tokyo, Japan.

⁸¹ APEC (2010), *2010 APEC Energy Ministerial Meeting*, Fukui, Japan, 19 June 2010,

http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2010_energy.aspx

⁸² APEC (2012), *2012 APEC Energy Ministerial Meeting*, Saint Petersburg Declaration, Saint Petersburg, Russia, 24-25 June 2012,

http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2012_energy.aspx

Unconventional Gas Census: Gas has remained a major focus of the four energy-concerned APEC entities' oil and gas security activities as evident in this activity and its following one. Developing the APEC region's unconventional gas resources is now seen as a means to decrease the APEC region's growing dependency on imported gas while its gas resources are depleting. To that end, the AEM instructed the EWG to conduct an *Unconventional Gas Census* with the assistance of the APERC, the EGCFE and the EGEDA in their 2010 Fukui meeting.⁸³ The objective is to 'evaluate the potential of unconventional resources and to recommend cooperative actions which could increase natural gas output, boost natural gas trade and use and moderate natural gas prices to the extent appropriate both for producers and consumers in the APEC region.'⁸⁴ In its 2011 Vancouver meeting, the EWG announced developing a project on *Census of Unconventional Gas in the APEC economies*.⁸⁵ The importance of unconventional gas for the APEC region is evident in the AEM's 2012 Saint Petersburg meeting in which they demanded the 'evaluation of the production, trade potential and environmental impact of shale gas and other unconventional natural gas resources'.⁸⁶

Promoting Gas/LNG (Broaden Fossil Energy Options of the APEC Economies, Cleaner Fossil Energy Option and Fuel for Transition to a Lower Carbon Economy): The energy-concerned APEC entities have promoted over time the idea of increasing the share of gas (piped & LNG) of their region's energy mix as a means for broadening fossil energy options of the APEC economies (currently, by and large, heavily focused on oil and coal), as a cleaner substitute to oil and coal, and as a transitional fuel to a low or lower-carbon economy. A most recent example in this regard, is the AEM's 2012 Vladivostok meeting in which they announced their agreement to review

the current state and prospects of energy markets of the APEC region, with a view to increasing the share of natural gas in the energy mix as one of the most widespread and cleanest burning fossil fuels in the region in order to facilitate the transition to a lower carbon economy without prejudice of other energy sources; Evaluate production, trade potential and environmental impact of shale gas and other unconventional natural gas resources; [and] Promote steady investment in energy infrastructure, including natural gas liquefaction facilities, as appropriate for increasing energy security and economic growth in the APEC region.⁸⁷

The 2012 Saint Petersburg meeting is a recent example for the AEM in this regard as, in their elaboration on enhancing energy security in the APEC region, they stated their 'working to enhance and balance the share of natural gas in the [regional] energy mix'.⁸⁸ Apart from the already mentioned publications and many references to gas/LNG in APERC's annual publications (*APEC Energy Demand and Supply Outlook* and *APEC Energy*

⁸³ APEC (2010), *2010 APEC Energy Ministerial Meeting*, 19 June 2010, Fukui, Japan, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2010_energy.aspx

⁸⁴ Ibid.

⁸⁵ EWG (2011), *EWG41 Summary Record, EWG41*, 9-13 May 2011, Vancouver, Canada, <http://www.ewg.apec.org/documents/EWG41%20Summary%20Record%206%2020%2011.pdf>

⁸⁶ APEC (2012), *2012 APEC Energy Ministerial Meeting*, Saint Petersburg, Russia, 24 - 25 June 2012, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2012_energy.aspx

⁸⁷ APEC (2012), *ANNEX B - Strengthening APEC Energy Security, 2012 Leaders' Declaration*, 8-9 September 2012, Vladivostok, Russia, http://www.apec.org/Meeting-Papers/Leaders-Declarations/2012/2012_aelm/2012_aelm_annexB.aspx

⁸⁸ APERC (2012), *2012 APEC Energy Ministerial Meeting*, 24-25 June 2012, Saint Petersburg, Russia, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2012_energy.aspx

Overview),⁸⁹ the APERC's recent work on this topic include organizing conferences such as the *LNG Producer - Consumer Conference* (2012).⁹⁰

Natural Gas/LNG Trade: Beginning in the second decade, work on this initiative has continued in the current decade. As gas/LNG trade, is expanding in the APEC region, in their 2012 Saint Petersburg meeting, the AEM instructed the EWG to "review the current state and prospects of the energy markets of the APEC region, with emphasis on the role of natural gas in the total energy balance" in collaboration with APERC, the Expert Group on Clean Fossil Energy (EGCFE) and the Expert Group on Energy Data and Analysis (EGEDA).⁹¹ Based on the review's results, the EWG will develop "specific measures and recommendations to expand natural gas trade, investment and production in the APEC region."⁹²

⁸⁹ Examples include: *APEC Energy Demand and Supply Outlook – 5th Edition* (2013), *APEC Energy Demand and Supply Outlook – 4th Edition* (2009), *APEC Energy Demand and Supply Outlook 2006*, and *APEC Energy Demand and Supply Outlook 2002*.

⁹⁰ APERC (2012), *LNG Producer - Consumer Conference*, 19 September 2012, Tokyo, Japan.

⁹¹ APEC (2012), *2012 APEC Energy Ministerial Meeting*, 24 - 25 June 2012, Saint Petersburg, Russia, http://www.apec.org/Meeting-Papers/Ministerial-Statements/Energy/2012_energy.aspx

⁹² Ibid.

Chapter 3
APEC Oil and Gas Security Exercises:
Joint Southeast Asian Exercise
(Bangkok, 17-19 September 2013)

PREFACE

One of the important activities of the APEC-OGSE in 2013 was the joint Southeast Asian Exercise in Bangkok involving seven South-east Asian economies, including the host economy, Thailand. This Chapter details the Bangkok Exercise, including the involved economies' responses to the presented hypothetical emergency scenarios as well as the recommendations from the participating experts which were discussed during the joint exercise held on 17-19 September 2013.

During the exercise, the Expert Review Team and the APERC Secretariat (Appendix A) had comprehensive discussions on oil emergency responses and preparedness with the stakeholder delegates from the government entities, energy companies, and energy associations of the invited seven economies (see Appendix C).

The Expert Review Team and APERC Secretariat wish to thank all the participants and delegates who engaged with the team for discussions. Special thanks go to the representatives of the Department of Alternative Energy Development and Efficiency of the Ministry of Energy, Thailand who organized the event.

EXECUTIVE SUMMARY

The event was well organised and showed that the participating economies are all aware of the need and the usefulness of having emergency policies and procedures ready in case of oil/gas supply disruptions. It was also apparent that some economies are much more developed than others with respect to their preparedness to deal with oil and/or gas supply disruptions.

The South-east Asian economies play an important role in securing energy supply within the APEC region. Depending on the energy resources of the regional economies, these economies' oil and gas resources contribute to energy supply security within and outside the region or just provide for their respective economies' domestic use. In 2010, the combined oil and gas supply in South East Asia (SEA) accounted for 8% of the total APEC oil and gas supply. The following describes further the seven economies' oil and gas trade movements;

- **Brunei Darussalam** is a net exporter of oil and gas (LNG), but imports about half of its refined petroleum products' supply, since it has limited domestic refining capacity;
- **Indonesia** has a considerable amount of natural gas reserves and currently producing 8 BCFD, half of which are exported as LNG and piped gas. However, it imports about 40% of its crude oil despite its domestic oil production and oil exports;
- **Malaysia** is well-endowed with conventional oil and gas resources, produces 13% of the world's LNG exports and exports crude oil and piped gas. The economy is both exporter and importer of petroleum products;
- **The Philippines** has modest indigenous energy resources, and imports most of its oil and petroleum products;
- **Singapore** has no indigenous hydrocarbon resources and imports all of its crude oil and gas requirements, but it is one of Asia's main energy and petrochemicals' hubs and one of the world's top-three oil trading and refining centers;
- **Thailand** has limited domestic oil production and reserves, and like most of the South-east Asian economies, imports make up a significant portion of the economy's oil consumption. However, it holds large proven reserves of natural gas whose production has increased substantially over the last few years.; and
- **Viet Nam** has emerged as an important oil and natural gas producer in SEA. Although a net exporter of crude oil it imports about 70% of oil products and produces gas for its domestic consumption.

The Bangkok oil and gas security exercise presented two stages of emergency scenarios to the seven participating economies to which they responded. The first stage dealt with a common oil emergency situation for the participating economies. It consisted of three phases during which the imported oil and LNG supplies from the Middle East would be reduced and their prices go up due to terrorist activities.

The participating economies' responses to the first stage vary according to their available resources and contingency plans. However, they all involve the mobilization of the government agencies concerned with energy and emergency situations affecting their respective economies. In terms of supply measures, most economies' responses involve the diversification of their oil and gas sources to meet their domestic demands.

Increasing their respective domestic productions and decreasing their exports to give priority to their own demand are part of the measures of the five oil/gas-producing economies (Brunei Darussalam, Indonesia, Malaysia, Thailand and Viet Nam). Other measures include plans that meant to help the participating economies cope with the emergency situation and prepare them for future emergencies. Brunei Darussalam and Viet Nam has plans to increase its oil stockpile. Viet Nam in particular plans to reach the 90 days of stock by 2015 while Indonesia is considering the activation of the ASEAN Petroleum Security Agreement. Fuel allocation and rationing can mitigate the resulting loss in Singapore's gas supply by procuring LNG from other sources if an existing source for Singapore becomes unavailable. Thailand's measures include reducing oil feedstock for its petrochemical plant and those of Viet Nam comprise releasing its oil stockpile.

In terms of demand measures, all economies' responses involve energy conservation. Specifically, facing Stage 1, Brunei Darussalam will encourage carpooling as the economy's oil demand comes mostly from its transportation sector. Indonesia will implement shifting in working hours while Malaysia will decrease exportation to give preference for its domestic demand. The Philippines and Viet Nam will intensify the implementation of their respective energy and efficiency conservation plans and fuel diversification. Singapore will encourage the use of public transport system and discourage the use of personal vehicles like Thailand. While most economies have mentioned worthwhile demand-side measures, they all admitted lacking the proper plans in place to actually activate this or in other words all agreed that demand side measures could prove effective in supply disruption situation, however, most economies in the region are yet to develop these specific programmes.

As the scenario's second stage is unique for each economy, responses vary accordingly. Nevertheless, they include common measures such as the mobilization of the concerned government entities. Several measures are also common for certain economies, i.e. limiting oil and gas exports (Brunei Darussalam and Thailand), fuel diversification and the optimization of other sources for power generation (Indonesia, Malaysia, Philippines, Thailand and Viet Nam), and the activation of APSA (Brunei Darussalam, Philippines and Singapore). The economy-specific measures include limiting the sale of diesel products to vehicles (Brunei Darussalam) and allowing the major oil and gas traders to take their own initiatives to increase the economy's buffer stocks (Singapore).

The energy demand measures for the second stage do not differ much from those of the first stage to include the strengthening of the energy conservation measures and the use of alternative fuel for transport and power generation.

The recommendations provided by the Experts were mostly comments and suggestions on the responses, including identifying other institutions of the economies to be involved in the emergency exercise and their key priorities and suggesting human capability enhancement as an additional measure to be used during oil and gas emergency situation. In the assessment of impact, the Experts recommended the need to include some statistics to clearly show how a particular emergency situation could affect the economies' supply and demand situation. On the energy supply and demand measures, it was recommended that additional measures should be considered as most of the indicated ones cannot be implemented immediately when an emergency situation is unfolding.

The Experts and the APERC Secretariat recognized the confidential nature of the responses on the presented scenarios. Hence, it was agreed that the respective economies would be appropriately consulted as to which part of this report could be used for public dissemination.

INTRODUCTION

The APEC Oil and Gas Security Exercises (OGSE) are being implemented in response to the APEC Energy Ministerial Meeting Declaration in St. Petersburg (June 2012) and the 20th APEC Economic Leaders' Declaration in Vladivostok (September 2012) on oil and gas emergency situations in the APEC region.

As stated in the St. Petersburg Declaration, the Energy Ministers firmly believe that the current political developments in the Middle East and North Africa will pose new challenges and opportunities to the secure and sustainable growth of global and regional markets. Hence, the Ministers instructed the APEC-EWG and the APERC to work in collaboration with the International Energy Agency (IEA) and the Association of South East Asian Nations (ASEAN) on activities to improve the response to oil and gas emergency situations in the APEC region, including emergency response workshops and exercises (APEC, 2012).

An important part of the OGSE in 2013 was the joint Southeast Asian Exercise held on 17-19 September 2013 involving seven economies, namely Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore, Viet Nam and the host economy, Thailand. The joint exercise served as a venue to present the two stages of the Oil and Gas Emergency Scenarios prepared by the APERC with cooperation from renowned oil and gas experts to review the possible responses by the participating economies to certain hypothetical emergency situations.

The seven economies of SEA were chosen for the exercise because of their significance as oil and gas exporters (Brunei Darussalam, Indonesia and Malaysia) or refined oil supplier (Singapore) to the APEC region, including SEA, and/or large energy consumers (Malaysia, Indonesia, Philippines, Thailand and Vietnam) within the APEC region. Although Viet Nam produces enough gas and oil to meet its domestic consumption but not its entire requirements to make it still dependent on oil imports to some extent and exports only coal. In 2011, the combined oil and gas supplies in SEA accounted for 8% of the total APEC oil and gas supplies (Figure 1) (EDMC, 2013).

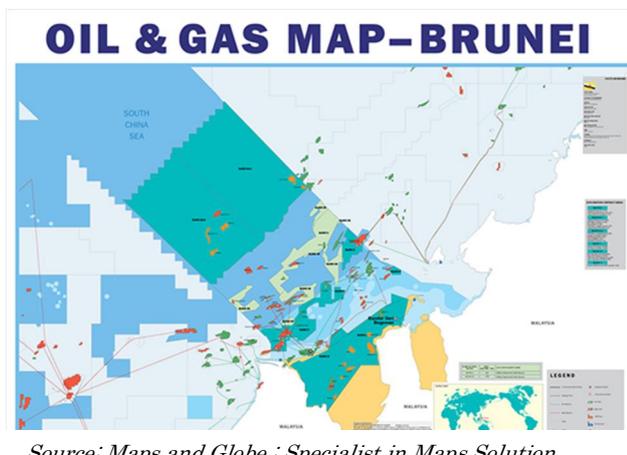
In addition, it is worthy to note that natural gas demand in the Southeast Asian economies has been increasing greatly. As domestic gas production potential is limited, LNG demand in SEA likewise been expanding (APERC, 2013a). Taking shape also in SEA is the Trans-ASEAN Gas Pipeline (TAGP) a significant initiatives in SEA region which aims to establish interconnecting arrangements of electricity and natural gas in ASEAN to ensure greater security and sustainability of energy supply in the region (ASCOPE, 2013).

Part 1 of the report presents the background information on the seven SEA economies, including their respective oil and gas data. The first and second stages of the scenarios and their respective economies' responses to them are detailed in Part 2 while Part 3 reflects the Experts' comments and recommendations on the latter during the exercise.

PART 1 PARTICIPATING ECONOMIES' BACKGROUND INFORMATION

A. BRUNEI DARUSSALAM

Brunei Darussalam is located on the north-west coast of the island of Borneo. It covers a total land area of around 5,765 square kilometres and has a 161 kilometre coastline along the South China Sea. It is bordered on the north by the South China Sea and on all other sides by the Malaysian State of Sarawak, which divides the economy into two parts consisting of four districts. Its capital, Bandar Seri Begawan, is located in the Brunei-Muara District. Brunei Darussalam is a small economy with a



Source: Maps and Globe : Specialist in Maps Solution

population of around 0.41 million in 2011. Brunei Darussalam is one of the richest economies in SEA with a GDP reaching US\$16.5 billion in 2011 (Table 1) (EDMC, 2013) which is expected to grow at an average annual rate of 1.7% over the next 25 years (APERC, 2013b).

Oil and Gas Supply

Brunei Darussalam's existing and potential oil and gas reserves lie within the economy's northern landmass and extend offshore to the outer limits of its exclusive economic zone. Most of the existing oil and gas production is located in scattered sites around 70 kilometres offshore. While its proven oil and gas reserves are expected to last for at least several decades, several onshore and offshore locations have been opened up for exploration. As of end 2011, Brunei Darussalam's proven oil reserves stood at 1.1 billion barrels and its gas reserves were estimated at 390 billion cubic meter (bcm) (APERC, 2013b).

The economy's oil and gas supplies stood at 773 ktoe and 2,621 ktoe, respectively in 2011 with indigenous oil supply accounting for 8,876 ktoe and gas domestic production of 11,890 ktoe (Table 2a and 2b) (EDMC, 2013).

Brunei is the largest net exporter of total oil liquids in the Asia-Pacific region with net oil exports of around 8,200 ktoe, mostly in the form of crude oil sent to key Asian oil consumers. Only a small fraction of the oil produced is refined in its sole refinery which has a distillation capacity of less than a million barrels per day (mbpd) as of 2010 (APERC, 2013b). The economy has a country-wide stock pile of 31 days (Brunei, 2013).

Brunei has been a stable and long-term LNG exporter to Japan and South Korea with a total of 9.1 bcm in 2012 (BP, 2013).

Oil and Gas Consumption

The total final oil and gas demand of Brunei in 2011 reached 652 ktoe (EDMC, 2013). Oil which was used mainly in the transportation sector comprised more than 90% of this total. Natural gas consumption on the other hand is used mainly for generation of electricity.

B. INDONESIA

Indonesia is a large archipelago located south-east of mainland South-East Asia, between the Pacific Ocean and the Indian Ocean. Indonesia's territory encompasses 17,508 large and small islands and large bodies of water at the equator over an area of 7.9 million square kilometres. Its population in 2011 was 243.8 million when its GDP reached US\$880.64 billion (Table 1) (EDMC, 2013). Indonesia's GDP is projected to increase at an average annual rate of 5% from 2010 to 2035 (APERC, 2013b).



Source: Maps and Globe : Specialist in Maps Solution

Oil and Gas Supply

As of end of 2011, Indonesia's proven reserves of crude oil stood at 4.0 billion barrels and proven reserves of natural gas at 3,070 bcm (BP, 2013). Indonesia's ten refineries have the total capacity of 1.1571 mbpd (DJMIGAS, 2013).

The economy is both an oil producer and exporter, but imports most of its crude oil (Arabian Light Crude) from the Middle East through the Hormus Strait. Indonesia's total oil supply reached 81,733 ktoe while its total gas supply stood at 46,214 ktoe in 2011 (Table 2a and 2b) (EDMC, 2013). Out of the total oil supply, more than 60% are indigenous and around 21,000 ktoe were exported mostly to Japan. Importations in the amount of 41,123 ktoe are usually in the form of petroleum products a quarter of which came from Saudi Arabia, and the remaining from other significant countries such as Malaysia, Nigeria and Australia.

Meanwhile, more than 50% of the economy's gas was exported as piped gas and LNG. Indonesia has three LNG liquefaction facilities in operation and a localized pipeline networks. The LNG exports (mostly to the Asia Pacific region) reached 25 bcm in 2012 while natural gas supplied to Singapore and Malaysia through its pipeline networks was at 10.2 bcm of the same year (BP, 2013).

The economy has no regulation obliging the oil companies operating in Indonesia to have emergency reserves of fuels. However, one of the economy's state-owned oil companies has a self-imposed policy of maintaining fuel reserves to secure its daily operation translated into 17 average COD (coverage of days). For specific fuel type, HSD or ADO⁹³ is 21 COD and Avgas⁹⁴ is 28 COD. (Indonesia, 2013).

Oil and Gas Consumption

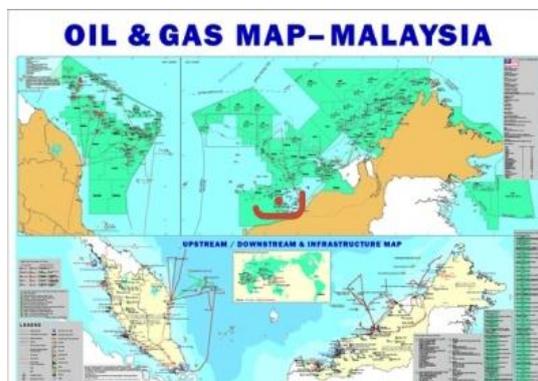
⁹³ ADO (Automotive Diesel Oil) and HSD (High Speed Diesel) are Diesel Oil types used as fuel for high speed diesel engine in Indonesia.

⁹⁴ Avgas (aviation gasoline) is an aircraft fuel that consists of light hydrocarbons distilling between 100°C and 250°C. The distillation product has at least 20% volume at 143°C.

Indonesia's combined oil and gas consumption in 2011 was 81,516 ktoe which was more than 70% of the economy's total final energy demand (EDMC, 2013). Like Brunei Darussalam, oil comprised the bulk of the combined total which was consumed in the transportation sector while natural gas was for power use.

C. MALAYSIA

Malaysia is located in South-East Asia. Its territory covers 330,803 square kilometres, spread across the southern part of the Malay Peninsula and the Sabah and Sarawak states on the island of Borneo. In 2011, Malaysia's population was around 28.76 million and its GDP was US\$362.89 billion (Table 1) (EDMC, 2013). Based on the current trends, Malaysia's annual GDP growth is predicted to be 4% for the next 25 years (APEREC, 2013b).



Source: Maps and Globe: Specialist in Maps Solution

Oil and Gas Supply

Malaysia is rich in oil and gas resources which come mainly from offshore fields. As of 1 January 2011, Malaysia's crude oil reserves, including condensate, were 5.858 billion barrels. Malaysia also has abundant natural gas reserves, estimated to be 2,510 bcm of the same year (EC, 2012, pp. 31, 37 & 43).

The economy's total oil supply reached 29,127 ktoe in 2011 and more than 31,000 ktoe comes from domestic production (Table 2a and 2b) (EDMC, 2013). Malaysia is a net exporter economy with 21,315 ktoe mostly to Asia Pacific economies bulk of which is sent to Australia, India, Thailand, and Japan. To make up for its domestic requirements, it imports more than 20,000 ktoe from Middle East, primarily Saudi Arabia, United Arab Emirates, and Qatar.

According to Oil and Gas Journal (OGJ), Malaysia has nearly 539,000 barrels per day (bbl/d) of refining capacity from its seven facilities). The economy has no existing policy to hold oil reserve. According to the US-EIA analysis for 2013, Malaysia plans to become a regional oil trading and storage hub by increasing the economy's refining and storage capacity in view of the rising regional and domestic demand for crude oil and oil products (US-EIA, 2013).

In 2011, Malaysia's natural gas supply stood at 28,819 ktoe and exports more than half of it through its gas pipeline and LNG facilities. It has two gas pipeline networks, one of which includes over 2500 km of pipelines linking most cities in Peninsular Malaysia and has cross-border interconnections to Singapore and Songkhla, Thailand. The pipeline system incorporates six gas-processing plants with a combined capacity of 56.6 million cubic metres per day, producing methane, ethane, butane and condensate. About half of this gas is consumed by the power sector while the rest goes to non-power industries and is exported to Singapore.

Malaysia was the second largest global LNG exporter after Qatar. It operates three LNG export facilities and produces about 10% of the world's LNG exports of 327.9 bcm in 2012 (BP, 2013) half of which goes to Japan and other major APEC economies such as South Korea, Chinese Taipei and China.

Oil and Gas Consumption

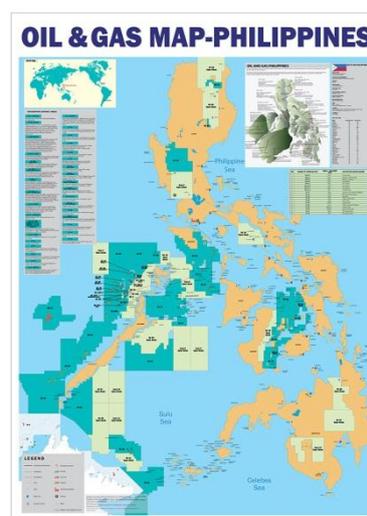
In 2011, Malaysia's consumption of oil and gas accounted for more than 70% of the economy's total final energy consumption (42,003 ktoe). Oil remains dominant in Malaysia's energy demand mainly for the transportation sector with a consumption of about 24,000 ktoe. Natural gas which is mostly used in the industry sector accounts for about 17% of the economy's total final energy consumption during the said year (EDMC, 2013).

D. THE PHILIPPINES

The Philippines is an archipelago of 7,107 islands in the middle of South-East Asia's main water bodies: the South China Sea, the Philippine Sea, the Sulu Sea, the Celebes Sea, and the Luzon Strait. It covers a total land area of 300,000 square kilometres, including inland bodies of water, spread over the three main islands, Luzon, Visayas and Mindanao. Its total population in 2011 reached 95 million when its GDP was US\$306.09 billion (Table 1) (EDMC, 2013). Its GDP is expected to continue to grow 4.5% per year until 2035 (APERC, 2013b).

Oil and Gas Supply

The economy's energy sector has aggressively pursued the exploration and development of indigenous oil and gas resources through its Philippine Energy Contracting Round. The economy has 16 sedimentary basins with a combined potential of 4,777 million barrels of oil equivalent (mboe). The proved fossil fuel reserves are around 100 million barrels of oil including condensate and 70.4 bcm of natural gas (APERC, 2012).



Source: Maps and Globe: Specialist in Maps Solution

The Philippines' total oil and gas supply in 2011 stood at 12,753 ktoe and 3,473 ktoe, respectively (Table 2a and 2b) (EDMC, 2013). The economy imports most of its crude oil with more than 70% coming from the Middle East.

The economy has two major oil refineries with a combined capacity of about 0.3 mbpd. More than 90% of its oil products, however, are imported, the biggest share of which came from Taiwan (33%) in 2011 (Philippines, 2013). The economy has an Oil Contingency Plan ready to be activated in case of emergency and has a commercial oil stockpile of 30 days.

The Philippines has its own fair share of natural gas resource which comes from offshore fields. It has an estimated daily production capacity of 0.01 bcm, mainly for the economy's domestic use (APERC, 2013b).

Oil and Gas Consumption

Similarly with other Southeast Asian economies, oil comprises the bulk of the Philippines' final energy consumption. With around 11,000 ktoe, oil was used for the economy's transportation sector and the natural gas demand of about 82 ktoe was accounted largely for the generation of electricity (EDMC, 2013).

E. SINGAPORE

Singapore is an economy situated in South-East Asia, south of the Malaysia Peninsula between the Strait of Malacca and the South China Sea. Singapore had a total land area of 712.4 square kilometres and a population of 5.1 million in 2011. Despite its small land area and population, Singapore is one of the most highly industrialised and urbanised economies in South-East Asia with a GDP of US\$247.77 in 2011 (Table 1) (EDMC, 2013). Between 2010 and 2035, its GDP is projected to grow moderately, at about 3.6% per year (APERC, 2013b).



Source: Power Oil and Gas

Oil and gas Supply

Singapore has no indigenous fossil energy resources. Singapore imports all the crude oil and gas it requires for its energy needs. In 2011, the economy's total oil and gas supplies were 13,862 ktoe and 6,605 ktoe, respectively (Table 2a and 2b) (EDMC, 2013). Oil is mostly imported from the Middle East while natural gas from Malaysia and Indonesia.

Singapore is the third-largest oil and oil products trading hub in the world (EDB, 2011). It has a complex refining and petrochemical integration with a refining capacity of about 1.395 mbpd (BP, 2013) exporting refined oil products to Asian markets, with over a quarter of it sent to Malaysia and major quantities sent to Australia and China (US-EIA, 2013).

The four offshore natural gas pipelines, from Indonesia and Malaysia, supply Singapore's natural gas needs the total of which reached 9.5 bcm in 2012 (BP, 2013).

Oil and Gas Consumption

Singapore's combined oil and gas consumption in 2011 was almost 9,000 ktoe (EDMC, 2013). Over 80% of Singapore's electricity generation comes from natural gas and the remaining generation requirement comes from fuel oil.

F. THAILAND

Thailand is a South-East Asian economy with an area of 513,115 square kilometres and a population of about 67 million at the end of 2011. Thailand shares borders with Malaysia to the south and with Myanmar, the Lao People's Democratic Republic and Cambodia to the north and east. In 2011, Thailand's GDP was US\$470.9 billion (Table 1) (EDMC, 2013). Thailand's economy is expected to grow moderately at an annual average growth rate of 4.3% until the benchmark year of 2035 (APERC, 2013b).

Oil and Gas Supply

Thailand is a net importer of oil but is also a growing producer of natural gas. The economy has proved reserves of 442 million barrels of oil and nearly 300 bcm of natural gas as of 2011 (BP, 2013).

Its total oil supply reached 45,222 ktoe in 2011, more than 90% of which was imported and the remaining 19,000 ktoe were indigenous from its offshore fields (Table 2a and 2b) (EDMC, 2013). Of the total imports, about 78 percent originate from the Middle East, and the remaining share from other Asian suppliers.

Thailand has refining capacity of 1.26 mbpd in 2011 (BP, 2013) from its eight facilities and exports some of its refined products to neighbouring Asian economies. The economy has a mandatory oil stock (working stock plus legal stock) equivalent to 45 days (Thailand, 2013).

Thailand's natural gas supply in 2011 was 39,913 ktoe. The economy has also increased its reliance on imported natural gas, both in the form of piped gas and liquid natural gas which reached almost 10 bcm in 2011 (BP, 2013).

Oil and Gas Consumption

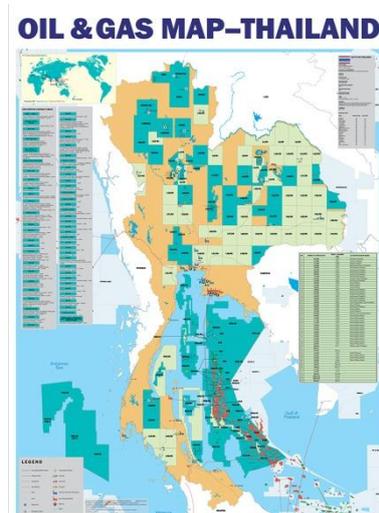
Thailand's oil and gas consumption reached 37,472 ktoe and 6,414 ktoe in 2011, respectively (EDMC, 2013). Majority of the economy's refined products were consumed locally mainly in the transport sector while natural gas is used mostly for power generation. Gas use was also promoted in the transport sector, as a replacement for conventional petroleum products such as diesel and gasoline.

G. VIET NAM

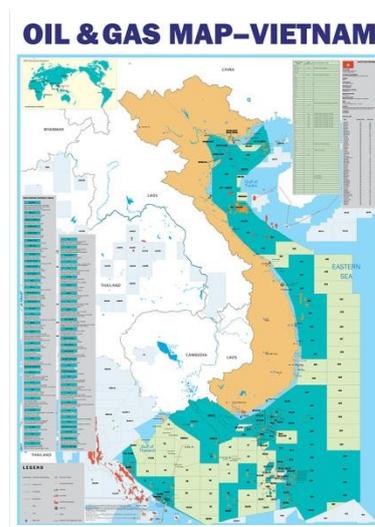
Viet Nam is an economy located in South-East Asia that shares borders with Cambodia and Laos to the west and China to the north. Viet Nam has an area of 331,501 square kilometres and a population of 86.9 million in 2011. Viet Nam has experienced major economic development as a transitional economy since 1986 when it began rapid economic development. Its GDP was US\$234.94 billion in 2011 (Table 1) (EDMC, 2012) and is projected to further grow at an average annual GDP rate of 6.3% for the next 25 years (APERC, 2013b).

Oil and Gas Supply

According to OGJ, Vietnam now ranks third in terms of proven oil reserves for the Asia-Pacific region. The economy has 4.4 billion barrels of proved oil reserves and 600 bcm of gas reserves in 2011 (US-EIA, 2012).



Source: Maps and Globe: Specialist in Maps Solution



Source: Maps and Globe: Specialist in Maps Solution

Viet Nam's sole refinery which started operation in 2009 has a capacity of 0.14 mbpd. Currently the economy has 60-day oil stockpiling system and has plans of increasing to 90 days by 2015 (Viet Nam, 2013).

Viet Nam's total oil and gas supplies in 2010 were recorded at 20,203 ktoe and 8,123 ktoe, respectively (Table 2a and 2b) (EDMC, 2012). Crude oil production from its offshore fields reached 0.3 mbpd in the same year 30% of which was supplied to its only refinery and the rest was exported mostly to Japan. Vietnam has been importing mostly petroleum products (from Singapore, Korea, China, Chinese Taipei) since early 2000 and started importing crude oil from Malaysia and Brunei Darussalam in 2010.

The natural gas production of Vietnam reached 9 bcm in 2011 (BP, 2013). It has three gas pipelines connecting offshore fields supplying its power plants and onshore gas distribution systems.

Oil and Gas Consumption

Viet Nam's total oil and gas consumption reached 18,624 ktoe in 2010 (EDMC, 2012). Petroleum products comprised bulk of the oil demand which was used mainly for the transportation sector. Of the total gas demand on the other hand, 90% was used for power generation and the remaining volume for other industries.

PART 2 OIL AND GAS SECURITY EXERCISE

The Bangkok exercise had a format different from that of the subsequent Jakarta exercise. As a result, the responses provided by its seven participating economies reflected this reality.

2.1 The First Stage of Oil and Gas Emergency Scenario

The 1st stage of the scenario envisaged a common oil emergency situation for the participating economies consisting of three different phases wherein the imported oil and gas (LNG) from the Middle East would be disrupted in the period 2014-2015 and their prices would shoot up based on certain energy economic conditions as follows:

❖ *Energy Economic Conditions*

- ✓ The world economy recovers from the Lehman Shock at last and achieves strong growth led by Asia, as seen in the middle of the 2000s;
- ✓ While unconventional oil and gas resources development makes progress in North America, LNG or crude oil exports from the region have yet to start;
- ✓ Oil output in oil-producing countries in the Middle East stood at 22.48 mbpd in May 2013 and posts no major change from that level for the immediate future.

❖ *Emergency Situation*

- ✓ A group calling itself "Anonymous" issues a declaration of war against a specific number of countries that are toughening their Internet restrictions to crack down on their citizens. In response to certain terrorist attacks by Al-Qaida and other groups, Anonymous issues a statement denying any joint struggle or cooperation with Al-Qaida
- ✓ The United Nations Security Council chair issues a statement denouncing Anonymous.

❖ *Development of Emergency Situation*

<Phase1>

- ✓ The apparent Anonymous cyber terrorist attacks hit the key infrastructures in Iran (crude oil production: 2.68 mbpd in 2013), Iraq (crude oil production: 3.14 mbpd in 2013) and the GCC (Gulf Cooperation Council) countries (crude oil production: 17 mbpd in 2013) that result in a temporary disruption of their oil and gas productions, but more importantly causes security holes.
- ✓ Saudi Arabia (crude oil production: 9.56 mbpd in 2013) and Qatar (crude oil production: 0.73 mbpd in 2013), subjected to the mentioned attacks, denounce Iran for staging such attacks.
- ✓ Iran, subjected to the same attacks as well, denounces the United States and Israel for the attacks.
- ✓ The cyber-attacks on the above-mentioned Middle Eastern countries force them to suspend crude oil and gas production and exports, while causing cut-offs of their lifeline electricity and water supplies for at least 10 days.
- ✓ International organizations pledge support in response to humanitarian crises, but fail to take appropriate measures which gives room for the affected Arab citizens (GCC and Iraqi nationals) familiar with the "Arab Spring" popular movement to organize demonstrations urging respective governments to improve the situation.

- ✓ As social unrest expands, security authorities in some of the affected countries are preoccupied with addressing the spreading destabilization.
- ✓ The spot crude oil price shoots up to \$130 per barrel and the spot LNG price for Asia to \$20 per million British thermal unit (BTU).

<Phase 2>

- ✓ Meanwhile, after taking advantage of Yemen's civil war to upgrade its combat strength and returning to the Persian Gulf to attack the regional Shiite nations' interests, Al-Qaida declares an economic jihad against oil facilities in Iraq and Iran.
- ✓ As the security authorities are preoccupied with addressing turmoil in the mentioned Arab countries, Al-Qaida stages surprise terrorist attacks on major GCC crude oil and gas export facilities, e.g. Ras Tanura (SA), Mina al-Ahmadi (Kuwait), Messaid and Ras Raffan (Qatar), and Ruwais and Das Island (UAE), whose security systems have been breached and paralyzed by Anonymous cyber-terrorist attacks only a few days earlier.
- ✓ Al-Qaida issues a statement forecasting further destruction.
- ✓ Because of such development, the spot crude oil price increases to \$170 per barrel and the spot LNG price for Asia to \$25 per million BTU.

<Phase 3>

- ✓ Due to the destruction of the GCC crude oil and gas export facilities, crude oil and LNG exports through the Strait of Hormuz (crude oil: 17 mbpd, LNG: 90.38 million tons in 2013) are halved for at least two months.

As the industrialized countries in Northeast Asia buy the bulk of the available crude oil and LNG in spot markets the seven Southeast Asian countries affected by the emergency scenario lag behind them and have difficulties in procuring spot crude oil and LNG. (It takes about 10 days for tankers to reach Asian areas from the Middle East)

The participating economies' delegates were requested to consider how to respond to the mentioned Oil & Gas Emergency Scenario in consultation with other officials in their respective economies' energy ministries, organizations or companies and other relevant government departments before coming to the Joint Southeast Asian Exercise.

Based on such condition, the delegates made a presentation each in response to the 1st stage of oil and gas scenario on the first day of the Joint Exercise. The participating economies were asked to cover the following in their responses:

- ✓ **Government's Initial Actions:** These measures concern with the emergency arrangement that an affected government will make in response to the initial emergency reports, such as, but not limited to, establishing an emergency headquarters and a chain of command, developing an information collection arrangement, cooperating with relevant parties and providing information to people, as well as the required laws and regulations for these actions.

- ✓ **Assessment of Direct Impact:** This issue covers the social implications or economic damage brought about by the oil (gas) supply drops.
- ✓ **Basic Stance of the Government:** The latter explains the top priorities of the government in considering responses to such emergency, including, but not limited to the priority policy challenges, e.g., energy supply security, living-related measures, people's understanding and security means that the government will take as justified by the respective energy supply/demand, trade, industrial and political/social systems of the participating economies.
- ✓ **Energy Supply Measures:** These measures involve energy supply actions which every concerned government will take to offset a substantial decline in its respective economy's energy supply, such as importing or increasing the imports or procuring from the alternative oil and gas suppliers at home and abroad; releasing reserves; switching to fuel substitutes and restricting energy exports, as well as their priority order; and the possibility of any positive government intervention, diplomatic efforts (cargo sharing/allocation) and regional cooperation to implement these measures.
- ✓ **Demand Side Measures:** These are the measures that a concerned government will take for each energy consumption sector of its respective economy if no measure can be projected to offset an energy supply drop, such as electricity supply restrictions, fuel switching, manufacturing production curbs, traffic restrictions, consumption restrictions and other measures aimed at reducing demand/consumption.
- ✓ **Other Points for Consideration:** The oil and gas supply reduction as a result of the mentioned emergency may bring about not only a quantitative supply fall, but also oil and gas price hikes. It may also lead to stagnant distribution, daily commodity shortages and their respective price hikes, traffic problems, groundless rumours, social unrest, financial market destabilization and fiscal predicament. In addition to the abovementioned situation, the participants were asked to consider explaining specific expected developments, the actions that their respective government would take in response to such developments and the priorities which the government would consider.

2.2 Response from Participating Economies

A. BRUNEI DARUSSALAM

In response to the emergency situation, Brunei's measures consist of the following:

- ✓ **Initial Action**
 - Brunei government will lead a national response to emergencies of all kinds, including those that affect oil and gas emergency;
 - The National Disaster Management Centre's (NDMC) will have the role as the lead agency in coordinating disaster relief;
 - Energy Department Prime Minister Office (EDPMO) serves as the regulator of oil and gas and will serve this function under the mentioned scenario;
- ✓ **Economic and Social Impact**
 - Brunei Darussalam is an oil and gas exporting economy. Hence, generally-speaking, it will benefit from price hikes during oil/gas supply shortages in other economies. While it benefits from such situation, it is vulnerable to increases in its imported commodities

prices resulting from oil and gas price increases. Consequently, to lessen the impact on the consumers of such commodities, the government will be forced to increase the subsidies it normally provides for imported refined products, e.g. diesel fuel.

- **Basic Stance of the Government** The government's priority is to be self-sufficient in energy;
 - To secure fuel supply and storage capacity to meet projected fuel demand
 - As Brunei has very limited refined petroleum capacity, it will try to increase its reserves by importing fuel from abroad to avoid shortage in times of refinery maintenance;
 - Any surplus in Brunei's oil-production capacity will be shared within the region.
- ✓ **Energy Supply Security Measures**
 - Oil
 - To maximize oil production, Brunei's respective production and facility capacity has been tested and a refurbishment project will be implemented;
 - Brunei is aiming at increasing its Country-Wide Stock (CWS) from 31 days to 43 days by the end of 2017.
 - Gas
 - To secure gas supply for the next 20 years and beyond, the economy will continue its LNG production, and increase its LNG storage capacity;
 - There will also be a need to increase its LNG shipment capacity.
 - Power
 - Ensuring secure, reliable and efficient supply and use of energy;
 - Upgrading the power system to improve energy efficiency;
 - Promoting the use of renewable energy.
- ✓ **Energy Demand Measures**
 - Oil and Gas
 - Curtailing unnecessary travels by motor vehicles;
 - Increasing public transportation capacity/ imposing car-pooling;
 - Prioritizing major construction projects;
 - Increasing border security to avoid smuggling.
 - Power
 - Encouraging people to reduce their use of energy;
 - Rationing power to ensure its fair distribution while still supplying those who have special needs.
- ✓ **Other Points for Consideration (Short and Medium Term)**
 - Improving refinery and plant reliability;
 - Expanding the maintenance strategy of the oil industry;
 - Stocking all the required critical parts/equipment for the economy's refinery and LNG plants
 - Diversifying import sources of the required critical parts/equipment
 - Embarking on alternative sources of energy projects.

B. INDONESIA

Indonesia's response to the emergency situation is as follows:

✓ **Initial Action**

- Closely monitoring the situation, and working with APEC RTEIS⁹⁵;
- Maximizing the domestic crude production or allocation for refinery feed stock (prioritizing supply from domestic crude production for its domestic refinery use);
- Diversifying fuel and LPG Import;
- Activating the ASEAN Petroleum Security Agreement (APSA)⁹⁶;
- Restraining demand;
- Increasing biofuel consumption;
- Enforcing working hour shifting.

✓ **Economic and Social Impact (pertaining to the Hormus Strait's closure)**

- The following share of the imported crude oil from the Middle East through the Hormus Strait will be affected in case of the strait's closure: Arabian Light Crude (ALC), 103 thousand barrels per day (bpd) (38%) supplied to the Cilacap Refinery. The products derived from the imported ALC to be affected whose shares of Indonesia's production of such products are: naphtha (17%); kerosene (9%); LDO (15%); HDO (10%) and gas (1%). Singapore's dependency on the Middle East may cause a supply disruption to Indonesia as Indonesia's fuel imports amount to 50% of its total supply of which 90% is imported from Singapore.
- LPG imports account for 70% of the economy's total supply, which are imported from Iran (43%), Saudi Arabia (15%), UAE (23%), Qatar (10%) and others (9%).

C. MALAYSIA

Malaysia's response to the emergency situation includes the following:

✓ **Initial Action**

- The Malaysian government through a weekly cabinet meeting will assess the developing oil and gas situation;
- The government will direct relevant agencies to prepare reports on the impact of the emerging situation. These agencies include PETRONAS, the Economic Planning Unit of the Prime Minister's Department, the Ministry of International Trade and Industry, the Ministry of Domestic Trade, Cooperatives and Consumerism, and the Ministry of Energy, Green Technology and Water. Their significance for the economy's oil industry and thus their relevance to the emergency situation are detailed below;
 - PETRONAS is vested with the entire ownership and control of the petroleum resources in Malaysia through the Petroleum Development Act, 1974. PETRONAS reports to the Prime Minister through the Economic Planning Unit;

⁹⁵ Real-time Emergency Information System;

⁹⁶ APSA is an ASEAN Emergency Petroleum Sharing Scheme for crude oil and/or petroleum products in times or circumstances of both shortages and oversupply. Full text found on p. 41 of this report.

- The Ministry of International Trade and Industry has the authority to issue licences for the processing and refining of petroleum, as well as the manufacturing of petrochemical products through the Petroleum Regulations 1974.
- The Ministry of Domestic Trade, Cooperatives and Consumerism is empowered to issue licences for the marketing and the distribution of petroleum and petrochemical products, i.e. regulating domestic fuel prices, through the Petroleum Regulations, 1974.
- The Ministry of Energy, Green Technology and Water sets policies regarding the electricity supply industry.
- o The emergency headquarters will be established by the existing National Security Council of the Prime Minister's Department (established by the cabinet);

✓ **Economic and Social Impact**

- o The timing of the emergency, i.e. 2014-2015, will complicate the government's response to the emergency situation as the government will be continuing its efforts to scale back the fuel subsidies. Therefore, the government will have an additional pressure to face, i.e. rising fuel prices while seeking to reign in their subsidies;
 - The emergency scenario's scale of the oil supply drop is the same as that during the 2008 economic crisis. Hence, most likely, Malaysia's economic growth will slump to negative while inflation pressure will rise and the prices of food and essential commodity will increase. Many workers will be retrenched causing widespread unhappiness as well. The price of gasoline will increase by more than 30% causing hardship to people especially by being a major driver of inflation;
 - The economic downturn will also cause a drop in demand for non-essential items, causing, for example, a decrease in housing prices. Moreover, some house owners will be unable to pay their mortgage instalments resulting in their respective dwellings' foreclosures.
- o However, the emergency scenario's extent of the downturn is not as big as the one during the 1997 economic crisis;
- o Yet, as Malaysia is an oil producing nation, any increase of fuel prices will result in the people questioning the need for such increase;
- o The biggest impact of the emergency situation will be on the transportation sector since it will have no alternative to oil based fuels;
- o Facing an increase of the spot-LNG's price to \$25, the industrial sector currently meeting a portion of its gas consumption by LNG will be pressured for some time because the LNG pricing as agreed by the government is based on long-term weighted average North Asian sales;

✓ **Energy Supply Security Measures**

- o In terms of oil production, the Malaysian government will be producing as much as allowed under the "National Depletion Policy" in order to offset its lowered ability to procure oil abroad;

- Normally, PETRONAS sells its domestic supply and procures imported oil. Because of the emergency situation, the government will instruct PETRONAS to ensure that enough supply for domestic use is available before exporting. However, that is not an optimal measure as Malaysian's domestic oil is sweet but its refineries are configured to use sour oil;
- In terms of gas usage, the government through PETRONAS has made an effort to mitigate the impact of any Middle East supply crisis by developing gas fields in Canada and Australia. By 2014, however, most of those fields will still be under development;
- The government would ask PETRONAS to negotiate with Thailand and Indonesia to secure emergency gas supply that could ease the gas shortage. As there is no formal agreement for the supply with both economies, negotiation is done on a case-by-case basis based on available capacity;
- For oil, there is no policy yet to have any reserve. However, if the current high oil prices hold in the long run, the higher price will result in the development of marginal fields, which could be used for reserving oil;
- For electricity production, utilization of oil is the last priority, but gas is quite extensively used. The encountered higher gas price will result in the shifting from gas to coal for power generation. However, in the short-run, the cost of utilizing gas will increase.

✓ **Energy Demand Measures**

- If the emergency situation results in an imported-energy-supply drop, as mentioned earlier, the government will stop exporting oil and utilize oil stocks internally. Therefore, such measure will minimize the need to switch to other fuel or other restrictions;
- However, it would be prudent for the government to increase the prices of the oil-based products so that the desired consumption restriction will be achieved by a decrease in demand ;
- The government stand is to increase price to reflect the cost. However, in the emergency situation, this will probably prompt the people to protest;
- In terms of considering electricity supply restrictions, the emergency situation will create a situation where a switch to coal as much as possible is necessary. The inability to source for LNG will result in the full utilization of domestic gas to compensate. However, it will not be enough in the event of any supply disruption upstream. Even though the government will not restrict electricity supply, cases of load shedding are possible;
- Related to the latter, the priority for the government will be in the order of fuel switching, increasing prices, load shedding, and restricting supply.

✓ **Other Points of Consideration**

- As the oil and gas supplies fall, oil and gas price spikes and energy price hikes, in general, will happen resulting in the following:
 - Groundless Rumours: Rumours will arise on further price hikes. The government, as mentioned earlier, will tackle this issue through the media, explaining the actual

situation. Also, the government through the Ministry of Domestic Trade will be monitoring the situation on supply matters, whereas the Ministry of Internal Affairs will keep tab on the rumour mongering situation;

- Social Unrest: This will unlikely happen in Malaysia under the current circumstances especially if the government has explained the situation very clearly;
- Financial Market Destabilization: The financial market will be down. However, under the emergency circumstances, it will not likely lead to a meltdown because of that market's strong fundamentals, unlike during the 1997 crisis. At that time, the government had to take measures such as taking over the non-performing loans. Under the emergency situation, the non-performing loans will not cause a financial distress for the Malaysian banks;
- Fiscal predicament: Job losses will be a concern for the government. The government will be addressing that by the above economic stimulus packages.

D. THE PHILIPPINES

The Philippines's response to the emergency situation consists of the following:

✓ **Initial Action**

- The Philippine government will convene the Inter-Agency Energy Contingency Committee which consists of the Department of Energy (DOE) as the Lead Agency, Department of Finance (DOF) and Department of Budget and Management (DBM), among others;
- Most likely, the government, through the DOE will instruct the activation of the Oil Contingency Plan.

✓ **Economic and Social Impacts**

- There will be a shortage of oil supply;
- Consequently, oil prices will increase;
- Most likely, there will be a rationing of oil products;
- In view of the shortage in oil supply, the oil priority will be for the food, power and transport sectors.

✓ **Energy Supply Security Measures**

- At the 'Prepare Level' the following measures will be taken:
 - Supply diversification;
 - Building up of inventories and foreign currency, especially the US dollar which is used to purchase oil;
 - Securing energy facilities.
- At the 'Perform Level' the measures will include:
 - Implementing fuel allocation, rationing and energy conservation.

✓ **Energy Demand Measures**

- Intensifying the implementation of energy efficiency and conservation;
- Prioritizing dispatch of renewable energy power plants.

✓ **Other Points of Consideration**

- Under extreme circumstances, the government may invoke emergency powers for the President to ensure that the government is in control of the situation, thereby minimizing the possibility of chaos;
- It is a common knowledge that energy shortages can trigger tremendous civil unrest. Hence, the government must see to it that, aside from addressing the energy shortages, peace and order of the society must be maintained to avoid potential collapse of the economy.

E. SINGAPORE

In response to the emergency situation, Singapore's measures include the following:

✓ **Initial Action**

- The government will maintain watch over of security developments, e.g. through the Risk Assessment Horizon Scanning (RAHS) programme office;
- Depending on the risk level, an appropriate inter-agency government committee will be convened to manage the situation.

✓ **Economic and Social Impacts**

- Singapore is dependent on the Middle East for the bulk of its crude oil imports. While only about 5% (6.5Mtoe) of Singapore's imports of crude oil and petroleum products are for domestic consumption, an oil and gas disruption in the Middle East will still have an impact on Singapore's economy;
- The key impact will be from increased oil prices.
- **Power Sector Impact**
 - A sustained increase in the price of crude oil will lead to an increase in electricity prices, as natural gas prices in Singapore are pegged to oil prices.
- **Transport Sector Impact**
 - Higher oil prices will lead to higher costs of production for the transport sector, as the land transport and also aviation sectors are heavily dependent on petroleum products for inputs. This in turn could lead to higher domestic costs of transportation.
- **Social Impact**
 - The people will anticipate a higher cost of living due to increase in electricity prices;
 - If the emergency is sustained, energy-intensive businesses and cost-sensitive small businesses will likely face cost pressures, and jobs may be affected should these businesses close;
 - There will also be increased pressure on the government to do more to help lower income households and small businesses.

✓ **Basic Stance of the Government**

- Ensuring the continued supply of energy to meet domestic demands;

- Managing sharp increases in energy prices, including that of electricity, for consumers, while maintaining the fundamental principle of pricing energy correctly and not subsidising fuel costs;
 - Assuring the public that the government will take the necessary actions to manage the impact of the disruption.
- ✓ **Energy Supply Measures**
- Power Sector Response
 - Singapore imports piped natural gas (PNG) from Malaysia and Indonesia. Its liquefied natural gas (LNG) terminal commenced operations in May 2013, allowing the economy to import gas from the global gas markets as well. In the event of a gas supply disruption, the unaffected power generation companies will continue to use their PNG/LNG sources that are not disrupted. Meanwhile, affected generation companies can continue power generation using their fuel reserves.
 - Singapore's power generation companies will maintain a stockpile of fuel oil and diesel in line with the Energy Market Authority's licence requirements;
 - Restoration of gas supply is important. However, in an emergency, the economy can mitigate loss in gas supply by procuring LNG from other sources if an existing source for Singapore becomes unavailable;
 - The government will also ensure that there is a sufficient generation capacity to meet the forecasted electricity demand by minimising planned maintenance of generating plants during the curtailment periods;
 - To further enhance its energy security in the longer term, Singapore is exploring how to facilitate the entry of alternative energy sources, such as solar photovoltaic.
 - Transport Sector Response
 - There are commercially-driven arrangements to cope with transport sector needs.
- ✓ **Energy Demand Measures**
- Power Sector Response
 - The priority of the government is to ensure that essential services (e.g. water and electricity) will continue to function;
 - In the longer term, the government is exploring how a demand-response programme could allow consumers to make informed decisions in managing their energy consumption and costs.
 - Transport Sector Response
 - The government will encourage the public to take public transport instead of driving their personal vehicles;
 - Businesses will have to decide whether to continue normal operations, or to make the necessary adjustments in view of higher fuel prices. The government may consider measures to assist companies through this period;

- In the longer term, Singapore is exploring ways to reduce gasoline use in the transport sector, for example, through adoption of more fuel-efficient vehicles.

F. THAILAND

✓ Initial Action

- The Ministry of Energy will call a meeting with the Fuel Management Committee which includes the following agencies;
 - Office of the Permanent Secretary, which will serve as the National Emergency Strategy Organization (NESO) secretariat);
 - Energy Policy and Planning Office (dealing with planning and oil prices);
 - Department of Energy Business (focused on downstream oil business planning and regulation);
 - Department of Mineral Fuel (mandated with exploration and production regulations);
 - Department of Alternative Energy Development and Efficiency (concerned with renewable energy and demand side management);
 - Energy Regulatory Office;
 - Electricity Generating Authority of Thailand (National Power Authority);
 - PTT Public Company Ltd. (National Oil Company).
- For organization and enforcement, the Ministry of Energy will instruct the following entities:
 - National Security Council (dealing with Nation Preparedness Policy);
 - Department of Disaster Prevention and Mitigation (mandated with Nation Disaster Prevention and Mitigation Plan);
 - Department of Mobilization (or Military for the required mobilization of Defence Plan);
 - The following laws will be enforced by the Ministry of Energy:
 - DOEB: Fuel Trade Act B.E. 2543 (2000) for the Prevention of Shortage of Fuel Oil Plan;
 - EPPD: Emergency Decree on Remedy and Prevention of Shortage of Fuel Oil B.E. 2516 (1973).

✓ Economic and Social impacts

- Oil Supply
 - 70% of Thailand's crude oil import comes from the Middle East. Therefore, the incident's impact will be an estimated reduction of approximately 30% of the economy's oil supply;
 - The most affected sector will be the transportation sector as transportation of people and commodity will be affected;
 - Inflation due to high commodity prices is predictable.
- Gas Supply

- The LNG supply of Thailand comes from various sources; the incident's reducing impact on this supply is estimated at approximately 50% equal to 1.5 to 2 million metric ton per annum (MTPA).
- ✓ **Basic Stance of the Government**
 - Short term
 - Enforcing energy demand and supply measures;
 - Continuing communication with people by the government to avoid public panic.
 - Long term
 - Reducing dependency on oil imports;
 - Increasing public oil reserves;
 - Diversifying power-generation fuel.
- ✓ **Energy Supply Measures**
 - Oil Supply
 - Stimulating domestic production;
 - Restricting crude oil and oil product exports;
 - Increasing alternative energy use (biofuel/CNG);
 - Reducing feedstock to petrochemical plants;
 - Draw downing of legal oil stock.
 - Gas Supply
 - Restricting oil and gas field maintenance
- ✓ **Energy Demand Measures**
 - Oil Demand
 - Communicating with people to avoid panic and prevent fuel hoarding;
 - Restricting the use of private motor vehicles;
 - Enforcing speed limit;
 - Limiting opening time for gas stations;
 - Oil rationing (when necessary).
 - Electricity demand
 - Using alternative fuel for power generation;
 - Introducing electricity saving campaign;
 - Limiting opening time for department stores/theatres.

G. VIET NAM

- ✓ **Initial Action**
 - The Committee on the State Management of Domestic Market, including representatives from the relevant government entities (Ministry of Industry and Trade [MOIT], Ministry of Finance, and State Bank of Vietnam), will consider the emergency at their monthly meeting or their emergency meeting as requested from the General Directorate of Energy;
 - The MOIT Deputy Minister, the Committee's chairman will report urgently to the Prime Minister (PM) about the emergency situation that may affect the domestic market and

asks for the Prime Minister's instructions; According to the report and recommendations from the above Committee, the Prime Minister (or government if necessary) will give instructions to the relevant ministries to handle the emergency;

- The MOIT will be responsible to instruct the enterprises to implement the required measures to deal with the emergency;
- Based on the Prime Minister's direction, the relevant ministries will immediately implement the measures and the Committee will regularly report to and receive instructions from the Prime Minister;
- The required information-collection and processing, response plan and notice to the citizens will be properly assigned according to the functions of the concerned ministries and enterprises whose activities will be closely coordinated. The specific measures to be taken by them will be formally assigned to them in the form of urgent directives;
- The government will closely coordinate with APEC and the appropriate non-APEC countries in information collection and processing as well as oil and gas business.

✓ **Economic and Social impact**

- Vietnam imports about 70% of its required petroleum products from abroad. The remaining 30% is supplied by its recently-completed first refinery; 30% of its needed crude oil is imported from abroad. Thus, the emergency situation's created-crude oil shortages will affect directly the refinery and the availability of petroleum products in Vietnam's market;
- The lack of imported oil and gas supplies and oil price increases will bring difficulty directly to Vietnam and affect the following sectors:
 - Electricity generation: 90% of gas consumption in Vietnam is used to generate electricity. The economy's gas-fuelled thermal power generation contributes about 40% to its total power generation;
 - Transportation: It accounts for 60% of Vietnam's petroleum product consumption;
 - Industry: This sector consumes 15% of the economy's petroleum products;
 - Other sectors (agriculture, commercial & service): They account for the rest of gas and oil product consumption along with the residential sector.

✓ **Basic Stance of the Government**

- Directing, supervising and supporting Vietnam oil and gas providers in maintaining the necessary supply of crude oil, natural gas and petroleum products;
- Considering the release of the commercial, production and national stockpiles of crude oil and petroleum products to reduce shortages;
- Supporting the national policy and setting priorities in the import and export procedures and financing (e.g. using the stabilization fund).

✓ **Energy Supply Measures**

- Increasing the domestic production (crude oil, natural gas and refining capacity) while decreasing crude oil exports;

- Switching to other energy sources:
 - Using coal for power generation and developing nuclear power plants (ongoing);
 - Developing renewable energy such as wind power, solar energy, and small hydro;
 - Increasing energy imports from abroad: electricity from neighbouring countries (China, Lao and Cambodia).
 - Strengthening power transmission capacity of 500KV North-South transmission line;
 - Releasing stockpiled oil;
 - Looking for other markets to import crude oil and LNG, for example, importing suitable crude oil from West Africa, and Russia/Far East;
 - Strengthening diplomatic cooperation to implement the required energy projects and the above-mentioned measures.
- ✓ **Energy Demand Measures**
- Promoting measures on energy saving and efficiency:
 - To ensure the target to save energy by 10% is met according to the National target program on energy saving and efficiency;
 - Decreasing electricity consumption by replacing incandescent light bulbs with fluorescent bulbs and encourage the use of solar water heaters;
 - Improving thermal efficiency of power plants in Vietnam (currently only at 28-38%, which is less than the world's average of 40%);
 - Promoting energy saving measures and energy efficiency in the high energy-consuming industry sector such as the steel and cement industries;
 - Strengthening the survey and exploration of energy resources;
 - Strengthening local capacity to provide energy products;
 - Enhancing the diversification of energy sources such as renewable energy.
- ✓ **Other Points for Consideration**
- The oil and gas supply reduction may bring oil and gas price spikes and general energy price hikes, prompting other product price hikes and destabilizing the financial market. In response to this emergency, the government will take certain actions as follows:
 - Trying to stabilize the market prices of the important goods such as food products (e.g., rice, vegetable, and meat);
 - Releasing the state reserve budget to help producers maintain the production.

2.3 The Second Stage of Oil and Gas Emergency Scenario

A second scenario was presented on the assumption that each economy's gas supply is cut by 20-30% over about two weeks due to difficulties in repairing its damaged gas facilities caused by a natural disaster such as a typhoon. The participating economies were requested to provide responses on spot to the 2nd stage of oil and gas emergency scenario which was presented to them only during the 2nd day of the exercise. The following reports the scenario unique for each economy and its respective response.

A. BRUNEI DARUSSALAM

2.1 Scenario

✓ Gas supply characteristics

- 55% of the domestic natural gas output is used for a gas thermal power station and the remaining 43% for industrial productions, including a methanol plant and a natural gas liquefaction facility, which are all in Lumut.

✓ Cause for gas supply disruption

- An accident in a pipeline from an offshore gas field to Lumut.

2.2 Response

✓ Government's response

- The government will activate the response Centre consisting of the Ministry of Home Affairs and the Ministry of Energy mandated with the following:
 - Data gathering and updates on the situation;
 - Determining the seriousness of the caused energy crisis (i.e. at what level/which category of emergency);
 - Calling up the relevant entity to implement the required measures to address the emergency situation.
- Inform the public about the measures being taken to keep the situation under control;
 - Instructing the Department of Electrical Services (DES) to optimise the production of the Tungku Gas Plant having back-up generators in Jerudong and Berakas that run on diesel.

✓ Economic and Social Impacts

- The gas crisis will have a minimal impact on the economy since Brunei only use 10% of its gas output for its domestic market and exports the remaining 90%;
- The immediate impact:
 - Power disruptions in the Belait District, including the LNG plant in Lumut;
 - Reduction in the economy's revenue from gas.
- Indirect Impact
 - The transportation sector will not be affected by the accident as it mostly uses diesel fuel.

✓ Energy Supply Measures

- Limiting natural gas exports through directives from the Energy Department of the Prime Minister's Office (EDPMO) to the Brunei LNG BLNG;
- Transporting diesel to the Berakas and Jerudong power generators to support the dual system (gas/diesel power generation) through the assistance of the Brunei Shell Marketing (BSM);
- Limiting the sale of diesel to vehicles through the BSM;
- Optimizing gas production from the onshore fields;
- Optimizing the solar power facility in Tenaga Suria (Belait);
- Activating APSA (ASEAN Petroleum Security Agreement) for the following purposes:

- To give priority to the government to allocate the gas surplus meant for exportation (10% for domestic usage and 90% for export), and
 - To ensure the government's ability to meet its contractual gas obligation with the importing countries, i.e. Japan and Korea.
- ✓ **Energy Demand Measures**
 - Encouraging the public to save energy, particularly electricity;
 - Reducing the operation of the vehicles especially those using diesel and encouraging car-pooling;
 - Limiting power to those in need through rationing
 - ✓ **Challenges and measures for improving the economy's emergency responses**
 - Looking into more systematic emergency responses by developing their respective manual and guidelines;
 - Conducting regular training and emergency exercises domestically, and regionally;
 - Working more on furthering regional cooperation on energy through the realization of the required projects such as the ASEAN Power Grid (APG) and the Trans-ASEAN Gas Pipeline (TAGP).

B. INDONESIA

2.1 Scenario

- ✓ Gas supply characteristics
 - The South Sumatra-West Java Pipeline with a transportation capacity of 10 bcm/year is in operation supplying about 40% of the domestic gas demand. There is a plan to expand its capacity.
- ✓ Cause for gas supply disruption
 - An explosion at one of the pipeline's eight compressors and receiving stations.

2.2 Response

- ✓ **Government's Initial Actions**
 - The Ministry of Energy will evaluate the Impact of disruption and carry out the following activities:
 - Coordinating the required meetings;
 - Proposing responses;
 - Communicating with the public.
- ✓ **Assessment of Direct Impact**
 - The most affected gas consumers will be the industry, the power generation sector and the households;
 - The main economic/social impact will be:
 - Reducing industrial output;
 - Laying off of workers.
- ✓ **Basic Stance of the Government**

- Determining the government of Indonesia's objectives, i.e. reducing the emergency impact on the economy's economic and social lives;
- Utilizing the Ministry Regulation No. 03/10 regarding priority gas allocation for allocating gas to its domestic customers based on a priority list, i.e. the power-generation and industry sectors;
- Prioritizing the major industrial consumers such as the industries using gas as raw material, and those with no substitute fuel and/or high manpower.
- ✓ **Energy Supply Measures**
 - Fuel diversification: using biofuel, and coal which are equivalent to 15 million standard cubic feet per day (MMSCFD) of natural gas;
 - Optimization of hydro power up to the maximum equivalent of 25 MMSCFD of natural gas.
- ✓ **Demand Side Measures**
 - Shifting working hours;
 - Conducting a public campaign to reduce electricity consumption.
- ✓ **Challenges to and Measures for Improving the Economy's Emergency Responses**
 - Conflicting interests of the gas stakeholders;
 - Coordinating the concerned entities (time intensive);
 - Gaining strong support from the media;
 - Having an underdeveloped gas/energy infrastructure;
 - Improving regional and international Cooperation.

C. MALAYSIA

2.1 Scenario

- ✓ Gas supply characteristics
 - Malaysia imports gas through a pipeline from Indonesia's West Natuna Gas Field (2.94 bcm in 2010 covering 10% of the economy's domestic demand);
 - It has provided for gas supply to Malaysia from Phase 1 A18 District Project of the Thailand-Malaysia Joint Gas Development Area (JDA) (with production capacity of about 5.1 bcm/year equal to about 18% of the economy's domestic demand). Gas is supplied through the Trans Thailand Malaysia Pipeline to the Peninsular Gas Utilization (PGU) Pipeline for highly populated areas, including Kuala Lumpur.
- ✓ Cause for gas supply disruption
 - An accident in an offshore pipeline from the West Natuna Gas Field.

2.2 Response

- ✓ **Government's Initial Actions**
 - The government will immediately activate the Emergency Gas Task Force;
 - The Emergency Gas Task Force will set up certain necessary entities as follows:
 - A steering committee to make decision on the situation;
 - A working committee that will handle the situation day-by-day;
 - A working committee to hold daily meetings to keep tab on the situation;

- A working committee to prepare daily reports for all the members of the working and steering committees;
 - A working committee to prepare a set of criteria for activating load shedding and curtailments;
 - A working committee to issue warnings on imminent power disruption based on the set criteria.
- ✓ **Assessment of Direct Impact**
 - If electricity load shedding cannot be avoided, manufacturing will be affected causing productivity drop, hence, an economic slowdown;
 - The emergency situation will likely result to blackouts, causing population uneasiness and potential social unrest;
 - The government image will be damaged as a result;
 - Investors' confidence will drastically drop to have a potential future economic impact.
- ✓ **Basic Stance of the Government**
 - The first priority of the government will be to keep the lights on at all cost to enable the industry and the population to function normally;
 - The next action will be to ensure that a priority list is in order as a guide during the supply-disruption incident;
 - The government will also have to minimize any potential increase in the prices of fuels and other commodities.
- ✓ **Energy Supply Measures**
 - The government could instruct/recommend the Tenaga Nasional Berhad, the largest Electric utility company in Malaysia and also the largest power company in Southeast Asia, to switch to alternative fuels for power generation;
 - The government could instruct/recommend PETRONAS to secure additional gas supply from the JDA and Vietnam;
 - The government could get alternative LNG supply arrangements;
 - The government could instruct switching to alternative modes of power generation as much as possible.
- ✓ **Demand Side Measures**
 - The government could limit the utilization of gas to a certain amount;
 - The government could curtail the supply of gas to designated users;
 - The government could curtail the supply of gas to the industry (last priority for the government);
 - The government could recommend time-shifting to industry.
- ✓ **Challenges to and Measures for Improving the Economy's Emergency Responses**
 - Achieving coordination among many agencies and departments;
 - Gathering information for the best response;
 - Overcoming a physical limitation in terms of alternative supply arrangements;

- Determining the measures to minimize the economic impact of using alternative arrangements.

D. THE PHILIPPINES

2.1 Scenario

- ✓ **Gas supply characteristics**
 - As the Malampaya Gas Field became operational in 1992, a submarine pipeline, a gas processing plant, an onshore pipeline and a gas thermal power station were constructed.
 - The Philippines has proceeded with Phases 2 and 3 of the Malampaya Gas Field Development Project while planning gas field development in the South China Sea. On the demand side, the government is promoting switching to natural gas for power generation and plans to introduce natural gas vehicles in the metropolitan region.
- ✓ **Cause for gas supply disruption**
 - A production halt at the Malampaya Gas Field because of a natural disaster such as a typhoon.

2.2 Response

- ✓ **Government's Initial Actions**
 - Regular coordination with the National Disaster Risk Reduction Management Council, an agency of the Philippine government under the Department of National Defence, responsible for ensuring the protection and welfare of the people during disasters or emergencies, on which the DOE Secretary sits as a member.
- ✓ **Assessment of Direct Impact**
 - There will be rotating brownouts in the country, particularly in Luzon, which is supplied with the gas power plants in Batangas;
 - All sectors of society will be affected. Prices of goods will become higher, which could result to social unrest, as such development affects the lower and middle income sectors.
- ✓ **Basic Stance of the Government**
 - The government will take certain measures to prevent public panic, to include the following:
 - Effectively communicating and coordinating with the concerned government agencies; conducting a public awareness campaign to inform the public about the real situation/problems and assuring the Filipinos that the government is looking for alternative sources of energy to meet their requirements, especially on power; and
 - Importing under-utilized electricity, if available, from the Visayas region which is mostly geothermal-based.
- ✓ **Energy Supply Measures**
 - Seeking the activation of APSA;
 - Beginning the Brunei-Philippines cooperation;
 - Talking to the oil producers in the ASEAN region for possible alternative source of oil supply;
 - Optimizing the use of alternative and renewable sources of energy.

- ✓ **Demand Side Measures**
 - Demanding the people to conserve energy as an austerity measure;
 - Limiting or shutting down the operation of the light rail transit;
 - Reducing work hours or workdays;
 - Encouraging car-pooling;
 - Implementing rotational brownouts.
- ✓ **Challenges to and Measures for Improving the Economy's Emergency Responses**
 - Conducting energy emergency simulation and exercises;
 - Seeking the private sector's participation in the remedial action;
 - Consolidating all the (portfolio of actions).

E. SINGAPORE

2.1 Scenario

- ✓ **Gas supply characteristics**
 - Singapore imports gas through a pipeline from Indonesia's West Natuna Gas Field, i.e. the West Natuna Transportation System which has a transportation capacity of 7.23 bcm/year, equal to 80% of the economy's domestic gas consumption in 2011.
- ✓ **Cause for gas supply disruption**
 - An accident at the production and shipment facilities of the West Natuna Gas Field.

2.2 Response

- ✓ **Government's Initial Actions**
 - The government will monitor the real-time security developments, through various entities such as the Risk Assessment Horizon Scanning (RAHS) programme office;
 - Depending on the risk level, an appropriate inter-agency government committee will be convened to manage the situation.
- ✓ **Assessment of Direct Impact**
 - **Economic impact**
 - The key impact will be from increased oil and gas prices;
 - Dampened economic activity in markets will reduce demand for Singapore's exports;
 - Some commercial and industrial activities may become unprofitable or lose their export competitiveness if high oil prices are sustained;
 - As prices of goods will rise, consumers will need to make the necessary adjustments (e.g. finding cheaper alternatives, and lifestyle changes).
 - **Power Sector Impact**
 - Over 80% of Singapore's electricity generation comes from natural gas (which is more efficient than other types of fossil fuels), with most of the remaining electricity generated using fuel oil;
 - A sustained increase in the price of crude oil, should it happen during the gas emergency situation, will lead to an increase in electricity prices as natural gas prices in Singapore are pegged to oil prices.

- **Petrochemicals Sector Impact**
 - Singapore is a global oil and gas hub with major oil refineries serving the international markets. Their daily production of fuel products such as Mogas, and diesel is sufficient to meet Singapore's needs;
 - A sharp decline in the supply of crude oil and petroleum products from the Middle East will adversely affect Singapore's petrochemical sector, which accounts for 11% of Singapore's manufacturing output in 2012.
- **Transport Sector Impact**
 - The land transport and the aviation sectors are heavily reliant on petroleum products for inputs. The increase in oil prices may lead to higher costs of production for such products which could in turn lead to higher domestic transportation costs.
- **Social Impact**
 - Singapore will anticipate a higher cost of living due to increase in electricity prices;
 - Energy-intensive businesses and cost-sensitive small businesses may face greater cost pressures. Jobs may be affected should these businesses close;
 - Government may face greater pressure to help lower income households and small and medium enterprises (SMEs).
- ✓ **Basic Stance of the Government**
 - Ensuring continued supply of energy to meet domestic demands;
 - Managing/mitigating sharp increases in energy/electricity prices for consumers, while maintaining the government's fundamental principle of pricing energy correctly and not subsidising fuel costs;
 - Assuring the public that the government will take the necessary actions to manage the impact of the disruption, for example, through the following:
 - Singapore will ensure availability of fuels to meet its domestic needs;
 - Targeted assistance can be offered to the needy families to help them cope with rising energy prices. Nonetheless, the government will not subsidise the cost of energy to avoid inefficient use of a scarce resource;
 - The government can work with business associations to manage the impact of higher business costs.
- ✓ **Energy Supply Measures**
 - The economy's gas supply is handled on a strictly commercial basis.
 - In the event of a gas supply disruption, the unaffected power generation companies will continue to use their undisrupted PNG/LNG sources, while the affected ones can continue power generation using their fuel reserves, either using diesel to power their gas-fired generation units, or fuel oil to power their steam generation units.
 - **Power Sector Response**
 - Singapore's power generation companies maintain a stockpile of fuel oil and diesel in line with the Energy Market Authority's licence requirements;

- Restoration of gas supply is important. However, in an emergency, the government can mitigate loss in gas supply by procuring LNG from other sources if an existing source for Singapore becomes unavailable;
- The government will also ensure that there is a sufficient generation capacity to meet forecasted electricity demand by minimising planned maintenance of generating plants during the curtailment periods;
- To further enhance its energy security in the longer term, Singapore is exploring how to facilitate the entry of alternative energy sources, such as solar photovoltaics.
- **Transport Sector Response**
 - There are commercially-driven arrangements to cope with the transport sector's needs.
- **Petrochemicals Sector Response**
 - Emergency response arrangements to oil and gas disruptions are commercially driven and dependent on the availability of feedstocks. Hence, if the major oil companies operating in Singapore foresee a shortage, they may take the initiative to increase the buffer stock.
- **Regional Response**
 - Singapore is a signatory to the APSA, which is a best endeavour agreement. Singapore is committed to implement the latter's short-term measures in the event of emergency situations/disruptions;
 - Singapore has also been working with the other ASEAN member states to augment regional energy security, so as to mitigate the impact of emergency situations/disruptions on energy supplies in the region. These will be taken up separately at the ASEAN tracks;
 - At the same time, Singapore will look into the fuel producers and the countries with fuel stockpiles to help raise regional supply.
- ✓ **Demand Side Measures**
 - **Petrochemicals Sector Response**
 - For the longer term, Singapore is working towards improving the energy efficiency of its refineries, crackers and processing plants. The government is also working with the industry players to explore alternative feedstock options.
 - **Power Sector Response**
 - The priority of the government is to ensure that essential services (e.g. water, and electricity) continue to function;
 - For the longer term, Singapore is exploring how a demand-response programme could allow consumers to make informed decisions in managing their energy consumptions and costs;
 - The government is also looking at promoting energy efficiency and conservation as a demand-side measure to boost energy security;

- Incentives, information and standards will be used to help promote wider deployment of assistance encourage energy innovation and lower the costs of adoption.

F. THAILAND

2.1 Scenario

✓ Gas supply characteristics

- The piped gas imports from Myanmar at 830 MMCFD accounts for 18% of Thailand's total demand (2011);
- Thailand has planned for gas supply to Thailand from Phase 2 A18 District Project of the Thailand-Malaysia Joint Gas Development Area (JDA) with the production capacity of about 9.2 bcm/year and the average output of 8.0 bcm/year and also from the JDA's B17 District Project (initial output of 1.4 bcm/year; final output of 3.5 bcm/year). The total supplied gas through the above-mentioned suppliers is equivalent to 36% of the economy's demand in 2011.

✓ Cause for gas supply disruption

- An accident in a JDA district (e.g., trouble may emerge at some point along a pipeline from an offshore location in the Gulf of Thailand to a destination in Songkla).

2.2 Response

✓ Government's Initial Actions

- The Ministry of Energy will call a meeting with the Fuel Management Committee (FMC);
- The FMC will serve as spokesman;
- The FMC will enhance fuel and electricity saving campaign;
- The FMC will have to monitor situation on a daily basis meaning that the affected gas pipeline's operator will evaluate and report daily situation to the FMC.

✓ Assessment of Direct Impact

- There will be inflation due to increased commodity prices;
- The Thai people will likely panic;
- The incident will most likely affect the Chana Power Plant which is fuelled with gas to cause its shutting down and also a shortage of NGV (Natural Gas Vehicles)-based transportation;

✓ Basic Stance of the Government

- To minimize the emergency's impact on the citizens to avoid their panic.

✓ Energy Supply Measures

- Oil supply prescribe
 - Stimulating domestic production;
 - Restricting crude oil and oil product exports;
 - Increasing alternative energy use (biofuel/CNG);
 - Reducing feedstocks to petrochemical plant; and

- Draw downing of the government-controlled oil stock in case of severe oil supply disruption;
- Restricting oil-field-maintenance projects.
- Gas Supply
 - Restricting gas-field-maintenance projects.
- ✓ **Demand Side Measures**
 - Oil Demand
 - Communicating with the people to avoid their panic and prevent their hoarding of fuels;
 - Restricting the use of private motor vehicles;
 - Enforcing a speed limit; and
 - Limiting the opening time of gas stations.
 - Electricity demand
 - Using alternative fuels for power generation;
 - Conducting an electricity-saving campaign; and,
 - Limiting the opening time of department stores/theatre.
- ✓ **Challenges to and Measures for Improving the Economy's Emergency Responses**
 - Diversifying fuels in power generation;
 - Improving the transmission line capacity;
 - Emergency response will be disseminated properly to ensure public acceptance;
 - Coordinating with ASEAN and working on its grid-pipeline connection (APG and TAGP);
 - Encouraging sustainable demand-side management.

G. VIET NAM

2.1 Scenario

- ✓ **Gas supply characteristics**
 - All Vietnam's domestic gas output is from its offshore gas fields;
 - Gas for thermal-power generation accounts for most of its gas demand. The gas transportation infrastructure facilities are to feed gas thermal power plants and their neighbouring fertilizer factories.
- ✓ **Cause for gas supply disruption**
 - An accident in a pipeline from the Bach Ho/Rong Gas Field.

2.2 Response

- ✓ **Government's Initial Actions**
 - The MOIT will have an emergency meeting with the concerned ministries and enterprises such as the gas suppliers, producers, and consumers, and the National Dispatch Centre to assess the emergency's effect and conduct the necessary response plan;
 - The MOIT will report to the Prime Minister to receive the required instructions;

- The MOIT will closely coordinate and instruct the concerned enterprises to implement a response plan, such as:
 - Fixing the pipeline;
 - Switching to other alternative fuels (ex. Diesel Oil) by the largest electric producer (Viet Nam Electricity Group) for power generation and also fertilizer production.
- Daily information collection on the emergency and its processing will be done by MOIT.
- ✓ **Assessment of Direct Impact**
 - The direct impacts caused by the gas disruption following the Bach Ho/Rong Gas Pipeline's incident will be as follows:
 - Electricity generation will decrease by 3% of the economy's total power generation;
 - Fertilizer production will decrease by 20% of the economy's total fertilizer production; and,
 - Other sectors such as the industry, transportation and residence will be affected by a decrease in Vietnam's domestically-produced LPG supply.
 - An increase in the gas price affecting other prices will most likely happen.
- ✓ **Basic Stance of the Government**
 - Supervising, instructing and supporting Vietnam's appropriate enterprises in fixing the encountering gas problem, and maintaining the economy's supply of natural gas;
 - Conducting the overall emergency response plan, through coordinating the concerned related ministries and enterprises. The plan will consider gas supply sharing for each sector of the economy, and implement the government policy to support the enterprises in ensuring supply and production;
 - Considering the release of the commercial stockpile of LPG, and fertilizer and electricity-capacity reserves to reduce shortages;
 - Supporting the national policy and give priorities to the affected sectors in the economy's import procedures and financing (i.e. taxes and fees).
- ✓ **Energy Supply Measures**
 - Increasing gas supply from other gas fields for power generation and producing fertilizers;
 - Using alternative power generation sources such as coal, hydro, renewable and imported electricity;
 - Fixing the pipeline as soon as possible;
 - Increasing the LPG supply from the economy's refinery and importing LPG for the residential sector;
 - Switching from gas to other fuels in the transport sector;
 - Strengthening the power transmission capacity of the 500KV North-South transmission line;
 - Releasing commercial stockpile of gas products (LPG, and fertilizer);
 - Looking for other markets to get LPG and LNG.
- ✓ **Demand Side Measures**

- Increasing other gas supplies to avoid the gas shortage;
 - Strengthening the local capacity to provide gas products;
 - Enhancing the diversification of energy sources by adding other sources such as renewable energy;
 - Promoting measures of energy saving and efficiency.
- ✓ **Challenges to and Measures for Improving the Economy's Emergency Responses**
- Developing the infrastructure for gas production (LNG terminal);
 - Pushing for the building of the economy's connecting gas pipeline to other ASEAN economies.

PART 3 IMPRESSION AND RECOMMENDATIONS OF THE EXPERTS

3.1 Impressions/Critique

The Experts commended the responses presented by the economies' representatives, especially on the second-stage scenarios, which were presented to them only during the day of the exercise. The event was well organised and showed that the participating economies are all aware of the need and the usefulness of having emergency policies and procedures ready in case of oil/gas supply disruptions. Their impressions were mostly comments and suggestions on the responses as summarized below.

There is ample scope for improving the decision-making structures in the region as few economies stated having dedicated organisations to deal with these emergencies. Therefore, most economies had problems stating how the decision-making process would actually work in practice during a crisis.

Most of the participating economies tackled with the panic reaction of their respective consumers. The responses, however, did not include measures to be undertaken by their oil producers and traders. There was lack of information regarding the possible cooperation the government should take together with the major oil and gas industry players during the emergency situation. Yet, the Experts commended the participating economies for the inclusion in their responses of the proper communication with the public through wide media campaigns.

Some of the participating economies such as Indonesia, Malaysia and Singapore already cooperate with and have trade agreements with their neighbouring countries. While each economy clearly presented the impact of its encountering emergency situation and the required measures to be undertaken for its respective economy, coordinated plans with its neighbours were absent in its response. Although the latter was not included in the guidelines for preparing a response, it might be noteworthy to include such coordinated action in it.

Fuel diversification is one of the effective measures to be undertaken in times of oil or gas shortages. Most of the economies which already have existing contingency plans included in their responses the use of alternative fuels or renewable energy (RE) for power generation or transportation. This measure could be an effective mitigation in the long term, but for an ongoing emergency situation such as oil disruptions due to civil wars, natural calamities and other developments, alternative fuels or RE may not be a feasible immediate solution. Except maybe for Indonesia and Malaysia whose palm oil sources have been widely consider for alternative fuel use in view of its immediate availability.

The participating economies have different economic policies and situations as demonstrated in the following examples. While some of them provide subsidies, others don't. Depending on the availability and the abundance of energy resources or their lack or insufficiency, most of them import energy whereas others export. Although the timing for preparing the responses was very limited, the participants were able to present the impact of oil and gas emergency situations on their economies' sectors. Lacking, though, in those responses are the specific effects of their respective emergency situation on their economies' subsidies and also on non-energy commodities, as energy is expected to be the prime mover of their economies. Likewise, specific tasks of the

concerned governments/entities which will be mobilized during their respective emergency situations are absent in the responses.

The exercise served as a venue to show how diversify an economy could be during emergency situations. The participating economies successfully showed the preparedness of their respective governments in responding to their respective oil and gas disruptions, but the level of their data monitoring and/or how they get the most recent information on their ongoing emergency situations from their industry players were not specifically identified in their responses.

The participating economies' oil stockpiling policy varies, i.e., some of them have 30-days and, the more affluent ones have 60-days of oil stocks. Nevertheless, the possibility of releasing their stockpiled oil as needed was clearly included in their measures. Although some countries have started building their own stocks (public and/or imposing obligation on industry), or place obligations, for instance, on their power generators to hold a certain number of days of alternative fuels, many still have no supply-side measures available to help them in an oil/gas supply crisis.

Meanwhile, the discussions from the different economies showed the potential for demand side measures to be deployed during a supply crisis (mainly for oil). What became apparent is that most economies do not actually have in place a demand-restraint programme that could be implemented in a supply disruption, but all recognised the benefits of demand management during a crisis.

Interestingly, as evident in their responses, most of the economies are positive on the implementation of the ASEAN Petroleum Security Agreement (APSA) as ASEAN is increasingly becoming more dependent on petroleum resources from outside the region. APSA is a covenant among member states that establishes a petroleum sharing scheme aimed at assisting member state(s) in time of emergencies due to petroleum supply shortages. To date, APSA has already been fully ratified by ten member states namely Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam (ASCOPE, 2013). While APSA is seen to be a potential vehicle for regional cooperation for oil and gas supply crises, it was still not clear enough, how APSA works. Nevertheless, there was a great deal of interest in exploring ways in which economies in the region could cooperate.

The exercise likewise affirms other regional cooperation such as the HAPUA or the Heads of ASEAN Power Utilities Authorities council. The HAPUA can assist the member economies in setting up plans for the integration of their electricity grid.

Clearly for gas emergency situations, there is much less knowledge of mechanisms/policies to deal with supply disruptions as compared to oil emergency situation.

Having assessed the economies' respective responses to the emergency scenarios, the Experts find some room for improving them for their respective economies' consideration as detailed in the following recommendations.

3.2 Recommendations

✓ On Government's Action

- There is a need to
 - show the possibility of integrating the emergency responses to the respective economies' Plans of Action;
 - identify further the possible institutions of the economies that could be involved in the future emergency exercises and their respective key priorities; and,
 - include human capability enhancement programs that could be used during oil and gas emergency situations.
- The participating economies' governments should continue to be
 - active and supportive of the APSA as well as HAPUA; and
 - enhance their data monitoring activities.

✓ On Assessment of Impact

- There is a need
 - to include some statistics to clearly show how a particular emergency situation could affect the economies' supply and demand situation;
 - to further analyse the effect of oil and gas emergency situations particularly on the demand side and the key measures to be implemented in this regard;
 - for a better understanding of effects, including the sectors of the economies other than the energy sector which would likely be affected by such situations;
 - to show the impact of such situations on the neighbouring SEA economies, especially those with which the participating economies have trade agreements, and are negotiating or considering synchronized joint-measures to be undertaken under emergency situations;
 - to identify further the strengths and weaknesses that an oil and gas emergency situation can bring to the participating economies;
 - to demonstrate the impact on the economies' respective energy/power mix of such situation; and,
 - to show further the impact of emergency situations on commodities and other sector of the affected economies, possibly through SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis.

✓ On Energy Supply and Demand Measures

- There is a need to
 - review further the energy measures that could be undertaken at once as most of the indicated measures in the responses cannot be implemented immediately when an emergency situation is unfolding, and include measures in emergency responses which could possibly stimulate oil/gas upstream development.

✓ Other Concerns

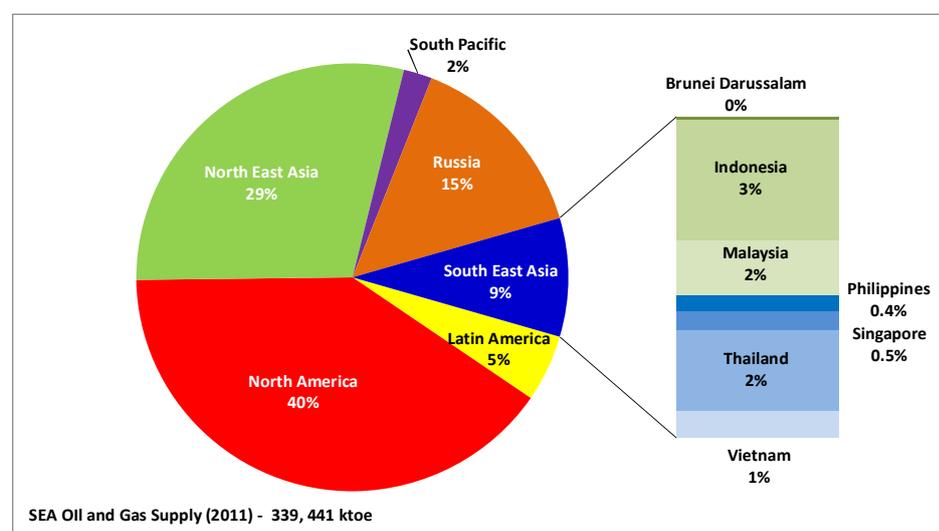
- The Experts and the APERC Secretariat recognized the confidential nature of the responses on the presented scenarios. Therefore, it was agreed that the respective economies would be

appropriately consulted as to which part of this report could be used for public dissemination before making such action;

- APERC Secretariat to consider fundamental reform of the RTEIS.

APPENDIX A: TABLES AND FIGURES

Figure 1 : SEA Oil and Gas Supply (2011)



Data Source: EDMC, 2013

Table 1: Key Data

Information	BD	IND	MAS	PH	SIN	THA	VN (2010)
Social and Economic Indicator							
Population (million)	0.41	243.8	28.76	95.05	5.18	66.58	87.84
GDP (USD billion) (2000 Price and PPP)	16.5	880.64	362.89	306.09	247.77	470.87	234.94
Proved Reserves							
Oil (billion barrels)	1.1	4.0	5.858	0.11		442	4.4
Gas (billion cubic meters)	390	3,070	2,510	53.87		300	600

Sources : (EDMC, 2013), (BP Statistics, 2013) and (US-EIA, 2012)

Table 2a: Oil Supply and Demand

OIL * (ktoe)	BD	IND	MAS	PH	SIN	THA	VN (2010)
Supply	773	81,773	29,127	12,753	13,862	45,222	20,203
Indigenous	8,876	51,322	31,311	313		19,259	16,053
Import	276	41,123	20,882	15,029	144,994	43,890	12,703
Export	(8,200)	(21,332)	(21,315)	1,420	(83,790)	(11,145)	(9,652)
Demand	624	64,519	23,903	11,296	8,766	37,472	18,131

Table 2b: Gas Supply and Demand

GAS * (ktoe)	BD	IND	MAS	PH	SIN	THA	VN (2010)
Supply	2,621	46,214	28,819	3,473	6,605	39,913	8,123
Indigenous	11,890	81,992	48,075	3,473	6,605	31,093	8,123
Import			5,977			8,820	
Export	(9,291)	(35,778)	(25,233)				
Demand	27	16,996	7,347	82	123	6,414	493

Source : EDMC, 2013

* details may not add up to total supply due to International marine bunkers and Stock Change

Notes

BD - *Brunei Darussalam*

IND - *Indonesia*

MAS - *Malaysia*

PH - *Philippines*

SIN - *Singapore*

THA - *Thailand*

VN - *Viet Nam*

SEA - *South East Asia*

Ktoe - *thousand tonnes of oil equivalent*

APPENDIX B: EXPERT REVIEW TEAM MEMBERS AND APERC SECRETARIAT

No.	Affiliation/Economy	Name	Position/Affiliation
1	ASCOPE	Mr. Victorino Salvaleon Bala	Secretary-in-charge
2	ERIA	Dr. Phoumin Han	Energy Economist
3	HAPUA	Dr. Eri Prabowo	Expert of HAPUA, Working Group 1 (Corporate Secretary, PT INDONESIA POWER)
4	IEA	Mr. Cuauhtemoc Lopez-Bassols	Senior Energy Analyst
5.	Indonesia	Dr. Ucok Welo Risma Siagian	Head, Petroleum Engineering Study Group, Institute Teknologi Bandung
6.	Japan	Ms. Junko Yada	Deputy Director, Petroleum Refining and Reserve Division, Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry
7.	Korea	Dr. Woonam Seok	Assistant Research Fellow, Korea Energy Economics Institute (KEEI)
8.	Thailand	Dr. Chatchawan Chaichana	Assistant Professor, Department of Mechanical Engineering, Chiang Mai University
9.	IEEJ	Dr. Ken Koyama	Managing Director, Chief Economist, Charge of Strategy Research Unit
10.	IEEJ	Mr. Koichiro Tanaka	Managing Director, Director of JIME Centre
11.	IEEJ	Mr. Hiroshi Hashimoto	Senior Coordinator, Gas Group, Fossil Fuels & Electric Power Industry Unit
12.	APERC	Mr. Takato Ojimi	President
13.	APERC	Dr. Kazutomo Irie	General Manager
14.	APERC	Mr. Goichi Komori	Senior Researcher
15.	APERC	Mrs. Elvira Torres Gelindon	Senior Researcher
16	APERC	Mr. Chrisnawan Anditya	Researcher

APPENDIX C: LIST OF PARTICIPANTS FROM EACH ECONOMY

No.	Economy	Name	Position/Affiliation
1	Brunei Darussalam	Ms. Hajah Maimunah binti Haji Najib.	Energy Department, Prime Minister Office
2	Brunei Darussalam	Ms. Noraisah Binti Bujang	Special Duties Officer, Grade 1 Energy Department, Prime Minister's Office
3	Indonesia	Mr. Dwi Kusumantoro	Head of Facilitation For Energy Crisis Mitigation Sub-division, National Energy Council
4	Indonesia	Mrs. Sri Sutjiati	Head of Energy Crisis Identification Sub-division, National Energy Council
5	Indonesia	Mr. I Gusti Suarnaya Sidemen	Deputy Director, Directorate General Oil and Gas Ministry of Energy and Mineral Resources
6	Indonesia	Mr. Fakhruddin	Head of Oil/Fuel Storage Section, Directorate General Oil and Gas Ministry of Energy and Mineral Resources
7	Malaysia	Mr. Ahmad Nornadzmi bin Zol Karnaini	Director, Gas Safety and Supply Department, Energy Commission
8	The Philippines	Engr. Melita V. Obillo	Chief Science Research Specialist, Oil Industry Competition & Monitoring Division, Oil Industry Management Bureau Department of Energy
9	The Philippines	Mr. Arnel C. Antonio	Senior Science Research Specialist, Policy Formulation Research Division, Energy Policy and Planning Bureau Department of Energy
10	Singapore	Ms. Yee Theng Ng	Asst. Director Energy Division, Ministry of Trade and Industry
11	Singapore	Ms. Puay Li Ivy Ng	Senior Asst. Director, Ministry of Trade and Industry
12	Thailand	Dr. Kurujit Nakornthap	Deputy Permanent Secretary, Ministry of Energy
13	Thailand	Mrs. Poonsub Sakunee	Inspector General, Ministry of Energy
14	Thailand	Dr. Sarawut Kaewtathip	Acting Director of Strategy and Management Office, Office of the Permanent Secretary Ministry of Energy
15	Thailand	Dr. Prasert Sinsukprasert	Director of International Energy Cooperation Office, Office of the Permanent Secretary Ministry of Energy
16	Thailand	Ms. Praewpanit Condee	Analyst, Office of Energy Regulatory Commission (ERC) Ministry of Energy
17	Thailand	Ms. Pimnipa Sepongam	Analyst, Office of Energy Regulatory Commission (ERC) Ministry of Energy

18	Thailand	Mr. Kumphon Kummerdsri	Geologist, Professional Level Department of Mineral Fuels Ministry of Energy
19	Thailand	Mr. Supawit Chai-Ngam	Petroleum Engineering, Senior Professional Level, Department of Mineral Fuels Ministry of Energy
20	Thailand	Mr. Sukitti Jadeevuti	Head of Security and Preparedness Division, Department of Energy Business Ministry of Energy
21	Thailand	Mr. Noppasan Mueansang	Engineer, Practitioner Level, Department of Energy Business Ministry of Energy
22	Thailand	Mr. Pisit Sanguantrakarnkul	Engineer, Professional Level, Department of Alternative Energy Development and Efficiency Ministry of Energy
23	Thailand	Mr. Mongkol Prongjuntuek	Engineer, Practitioner Level, Department of Alternative Energy Development and Efficiency Ministry of Energy
24	Thailand	Dr. Sompop Pattanariyankool	Head of Strategy Division, Office of the Permanent Secretary Ministry of Energy
25	Thailand	Mr. Chatchai Kunlohit	Plan and Policy Analyst, Professional Level, Office of the Permanent Secretary Ministry of Energy
26	Thailand	Mr. Woranon Chansiri	Plan and Policy Analyst, Professional Level , Office of the Permanent Secretary, Ministry of Energy
27	Thailand	Mr. Yongyooth Horthong	Plan and Policy Analyst, Professional Level, Office of the Permanent Secretary Ministry of Energy
28	Thailand	Ms. Chidchanok Choompalee	Plan and Policy Analyst, Practitioner Level , Office of the Permanent Secretary Ministry of Energy
29	Thailand	Ms. Nilubon Luangchosiri	Plan and Policy Analyst, Office of the Permanent Secretary Ministry of Energy
30	Thailand	Dr. Poonpat Leesombatpiboon	Plan and Policy Analyst, Senior Professional Level, Office of the Permanent Secretary Ministry of Energy
31	Thailand	Ms. Jitraporn Inchunjiw	Electricity Generating Authority of Thailand
32	Thailand	Mrs. Khalayakorn Suzuki	Electricity Generating Authority of Thailand
33	Thailand	Mr. Nirun Sahussukmankong	Electricity Generating Authority of Thailand
34	Thailand	Mr. Nattapon Rongsriyam	Electricity Generating Authority of Thailand

35	Thailand	Mrs. Malinee Suwanwisart	Petroleum Authority of Thailand (PTT)
36	Thailand	Mrs. Sucheela Suwan	Petroleum Authority of Thailand PTT
37	Thailand	Ms. Pimlapas Tangjitwatanakorn	Petroleum Authority of Thailand PTT
38	Thailand	Mr. Thitiwajkoon Kongwatanapapha	Petroleum Authority of Thailand PTT
39	Thailand	Mr. Tras Montralak	Petroleum Authority of Thailand PTT
40	Thailand	Ms. Tarinee Tadadusita	Petroleum Authority of Thailand PTT
41	Viet Nam	Ms. Le Nguyet Hang	Deputy Manager, Institute of Energy Ministry of Energy and Trade
42	Viet Nam	Ms. Ngo Thuy Quynh	Deputy Director, Oil and Gas Processing and Transportation Department, General Directorate of Energy, Ministry of Industry and Trade of SR.VIETNAM

APPENDIX D: REFERENCES

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Viet Nam, (2013), Ms. Ngo Thuy Quynh's presentation during the Oil and Gas Security Exercise in Bangkok, Thailand, 17 September 2013;

Maps and Globe: Specialist in Maps Solution and Power Oil and Gas for Oil and Gas Figures

APPENDIX E: USEFUL LINKS

Brunei Economic Development Board www.bedb.com.bn

Brunei LNG Sdn Bhd www.blng.com.bn

Brunei Shell Petroleum Company Sdn Bhd www.bsp.com.bn

BPH MIGAS www.bphmigas.go.id

Directorate General of Taxes (Pajak) www.pajak.go.id/eng/

Ministry of Energy and Mineral Resources (KESDM) www.esdm.go.id

Ministry of Energy and Mineral Resources (DIM) www.dim.esdm.go.id/English/

PT PLN (Persero) www.pln.co.id

SKKMIGAS, Satuan Kerja Khusus Pelaksana Kegiatan Usaha Hulu Minyak dan Gas Bumi
—www.skspmigas-esdm.go.id

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Economic Planning Unit, Prime Minister's Department www.epu.gov.my

Energy Commission www.st.gov.my

Ministry of Energy, Green Technology and Water www.kettha.gov.my

Ministry of Finance www.treasury.gov.my

Ministry of National Resources and Environment www.nre.gov.my

Petronas www.petronas.com.my

Tenaga Nasional Berhad www.tnb.com.my

Department of Energy, Republic of the Philippines (DOE) www.doe.gov.ph

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National Transmission Corporation (TransCO) www.transco.ph/

Philippine National Oil Company (PNOC) www.pnoc.com.ph/

Department of Statistics Singapore www.singstat.gov.sg

Economic Development Board www.edb.gov.sg/

Energy Market Authority www.ema.gov.sg

Department of Alternative Energy Development and Efficiency (DEDE) www.dede.go.th

Electricity Generating Authority of Thailand (EGAT) www.egat.co.th/en

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Ministry of Energy (MoEN) www.energy.go.th/en

Prime Minister's Office www.opm.go.th

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Trade www.moit.gov.vn
PetroVietnam www.pvn.com.vn

Chapter 4
APEC Oil and Gas Security Exercises:
Indonesia Exercise
(Jakarta, 22-24 October 2013)

PREFACE

Indonesia volunteered to undertake the second APEC Oil and Gas Security Exercise which focused on oil supply security in Indonesia and was held in Jakarta from 22 to 24 October 2013 after the first one, i.e., the Joint Southeast Asian Exercise, in Bangkok (17-19 September 2013). This Chapter details the Indonesia Exercise, including Indonesia's responses to three hypothetical emergency scenarios and the recommendations from the participating experts.

During the exercise, the Expert Review Team and the APERC Secretariat (see Appendix A) had comprehensive discussions on oil emergency responses and preparedness with Indonesia's stakeholder delegates from the government entities, energy companies, and energy associations (see Appendix B).

The Expert Review Team and the APERC Secretariat wish to thank all Indonesia's stakeholder delegates who engaged with the team for discussions, especially the representatives of the Directorate of Oil and Gas Downstream Business Development, the Directorate General of Oil and Gas, the Ministry of Energy and Mineral Resources which organized the event.

EXECUTIVE SUMMARY

Indonesia's oil production has declined significantly with the average declining rate of about 2.2% per year between 2006 and 2011. In 2011, Indonesia's oil production, which consisted of crude oil (88%) and condensates (12%), decreased 4.5% compared to that of 2010. Since oil production has declined significantly and some Indonesian oil refineries need a specific type of crude oil that cannot be produced domestically, the economy imported 265 thousand barrels of crude oil per day or 33% of its crude oil demand in 2011. The largest source of crude oil imports was Saudi Arabia accounting for about 37% of Indonesia's total crude oil imports followed by Nigeria (25%), Malaysia (21%), Brunei (9%) and others (8%). According to *Indonesia Energy Outlook 2011*, the economy's crude oil imports are projected to reach 523 million barrels of oil equivalent or 86% of its crude oil demand in 2030.

As well, Indonesia's fuel production has declined significantly while its fuel consumption has increased. This trend was evident in its annual declining rate of fuel production of about 1.4% between 2006 and 2011 when its fuel consumption increased at an average annual rate of about 2.0%. In 2011, for instance, Indonesia's fuel consumption was 1,132 thousand barrels per day, an increase of 6.4% from its 2010 consumption of 1,064 thousand barrels per-day.

To meet the resulting fuel shortages in 2011, the economy imported 481 thousand barrels of fuel products per day (equal to 42% of its total fuel-product demand) from Singapore. Based on *Indonesia Energy Outlook 2011*, Indonesia's fuel imports are projected to reach 752 million barrels of oil equivalent in 2030 equal to 52% of its total fuel consumption.

Indonesia's oil and fuel production's downward trend and the resulting growth of dependency on vulnerable oil and fuel imports constitute a growing threat to the economy's sustainability of energy supply as such reality is increasing the potential of oil supply disruptions by foreign influences.

Against this background, the three-stage Indonesia exercise was conducted. At the 1st stage of the oil emergency scenario, an earthquake damaged Indonesia's Cilacap Refinery leading to the economy's loss of 10% of its Mogas production and 20% of its Diesel Oil production for three months affecting two Indonesian provinces. Categorizing the emergency at the Company Level, PERTAMINA's reaction to the incident included a range of supplementary and/or alternative measures to secure energy supply, namely storing the crude oil imports, which could not be refined to increase the economy's oil inventory level or, alternatively, reallocating those imports to other appropriate refineries if their contract could not be canceled; importing Mogas and Diesel Oil to meet the shortage of those fuels; and releasing fuel stocks to the domestic market while waiting for the mentioned imports.

Commenting on the mentioned measures, the Expert Review Team recommended the Indonesian Government's full support of PERTAMINA's measures by securing not only financial means for importing the required fuels, but also through policy and regulatory measures such as easing licensing for STS (Ship to Ship Transfers). Other recommendations included the following demand-side measures. The Government and PERTAMINA need to prepare a public communication plan in close cooperation with the stakeholders to avoid panic buying of fuels by the people. PERTAMINA should consider including a special clause in its long-term

oil-import contracts to enable it to decrease its oil imports in case of emergency when its refining capacity is negatively affected. It would also be helpful if the company could consider securing a proper spare capacity of its domestic refineries to uplift their fuel production in case of emergency in the near future since their current utilization rate reaches to 90-95%. The team questioned whether the total volume of fuels subsidized by the Government exceeded the determined quota by the Government and the Parliament.

The 2nd stage of the oil emergency scenario envisaged the worsening of the situation in the Cilacap Refinery because of a major aftershock resulting in the loss of 10% of the national Mogas production and 20% of the national Diesel Oil production and the refinery's inability to process 348 thousand barrels of oil per day for one year to affect the availability of such fuels in the entire economy.

In such case, the Indonesian Government's response to the incident categorized at the National Level included both supply-side and demand-side measures. Additional imports of Mogas and Diesel Oil, crude processing deals (CPDs) for refining crude oil in overseas refineries, and increasing alternative energy use (biofuel/CNG) are some of the supply-side measures. The demand-side measures include communicating with the public to prevent panic-buying of fuels for hoarding, and introducing car-pooling and oil-rationing to reduce oil consumption.

In reaction to Indonesia's emergency response, the Expert Review Team recommended that Indonesia should prepare for the real emergency situations in certain areas. Thus, to carry out CPDs, the Indonesian Government must obtain information about the suitable available refineries abroad, conclude refining-assignment contracts with their respective economies, and secure the required financial means. It should also be ready to repair damaged refineries as soon as possible and prepare a priority list for oil-rationing.

The 3rd stage of the oil emergency scenario considered the total shut down of the Cilacap Refinery and a short-term cut of crude oil supplies (30-40 thousand barrels per day) to the Dumai Refinery due to the local residents' action to decrease the latter's refining capacity by 25-35%.

Reacting to this situation, the Indonesian Government's responses involved supply- and demand-side measures. The supply-side measures consisted of temporary export restrictions, maximizing other domestic refineries' production, and increasing fuel imports. The demand-side measures included wider implementation of the existing demand-side measures. To end the mentioned crude oil supply's cut, the Indonesian Government would try to engage the local and spiritual leaders and NGOs to negotiate with the local residents.

Commenting on the Indonesian Government's emergency response, the Expert Review Team recommended that certain preparations to be done to make feasible those responses in emergency situations such as devising detailed regulations to implement energy export restrictions and car-pooling. Implementing work time shift, including work at home (telecommuting), is also useful for reducing fuel consumption.

Other recommendations to the Indonesian governments include conducting emergency scenario assessments on a regular basis; implementing oil stockpiling; addressing oil-distribution infrastructure shortcomings to cope with emergency situations; and making the government as the point of dissemination of information on emergency situations through various means, e.g., press releases.

PART 1 BACKGROUND INFORMATION

1. INTRODUCTION

Indonesia is a large archipelago located at the south-east of mainland Asia, between the Pacific Ocean and the Indian Ocean. Indonesia's territory encompasses 17,508 large and small islands and large bodies of water at the equator over an area of 7.9 million square kilometres (including Indonesia's exclusive economic zone). Indonesia's total land area (24.5% of its territory) is about 1.91 million square kilometres. Its population was 243.8 million in 2011.

Indonesia had a gross domestic product (GDP) of around US\$ 881 billion and a per capita GDP of US\$ 3,612 in 2011 (US\$ 2000 at PPP). Excluding the oil and gas sector, manufacturing accounted for the largest component of GDP in 2011 (25.7%) followed by retail, hotel and restaurant (17.7%); agriculture, livestock, forestry and fisheries (12.7%); transport and communications (9.8%); finance, leasing and corporate services (9.6%); other unspecified services (9.4%); mining and quarrying (7.7%); construction (6.6%); and electricity, gas and water supply (0.8%). In 2011, Indonesia attained economic growth of 6.5%, an increase of 0.3% from 2010 (BPS, 2012).

Domestic oil, gas and coal reserves have played an important role in Indonesia's economy as a source of energy, industrial raw material and foreign exchange. In 2011, oil and gas exports and coal exports accounted for 20.4% and 13.4% of Indonesia's total exports of about US\$ 203.5 billion, respectively (BPS, 2012). Overall, tax and non-tax revenues from oil, gas and minerals, including coal, accounted for 29.4% of the Indonesian Government's budget in 2011 (ESDM, 2011a).

Indonesia's proven fossil energy reserves at the end of 2011 comprised of 3.7 billion barrels of oil, 3 trillion cubic metres of natural gas and 5.5 billion tonnes (Bt) of coal (Table 1).

Table 1. Key data and economic profile, 2011

Key Data ^a		B. Energy Reserves ^b	
Area (million sq. km)	7.9	Oil (billion barrels)	3.7
Population (million)	243.8	Natural Gas (trillion cubic metres)	3.0
GDP (USD (2000) billion at PPP)	880.6	Coal (billion tonnes)	5.5
GDP (USD (2000) per capita at PPP)	3,612		

Source: a EDMC (2013)

b Proven reserves at the end of 2011 (BP, 2013)

2. ENERGY ECONOMIC CONDITIONS – CRUDE OIL AND FUEL PRODUCTS

Indonesia's oil dependency is high. According to *Indonesia Energy Outlook 2011*, oil will account for 32% of the Indonesian energy mix in 2015 as projected by both the Based case scenario and the Acceleration and Expansion of Indonesia Economic Development (MP3EI) case scenario. In 2030 its share of the energy mix will increase to 42% as per the Based case scenario or 43% according to the MP3EI case scenario. Most of oil-based fuels will be used in the transportation sector, and the rest in the electricity and household sectors (I Gusti, 2013).

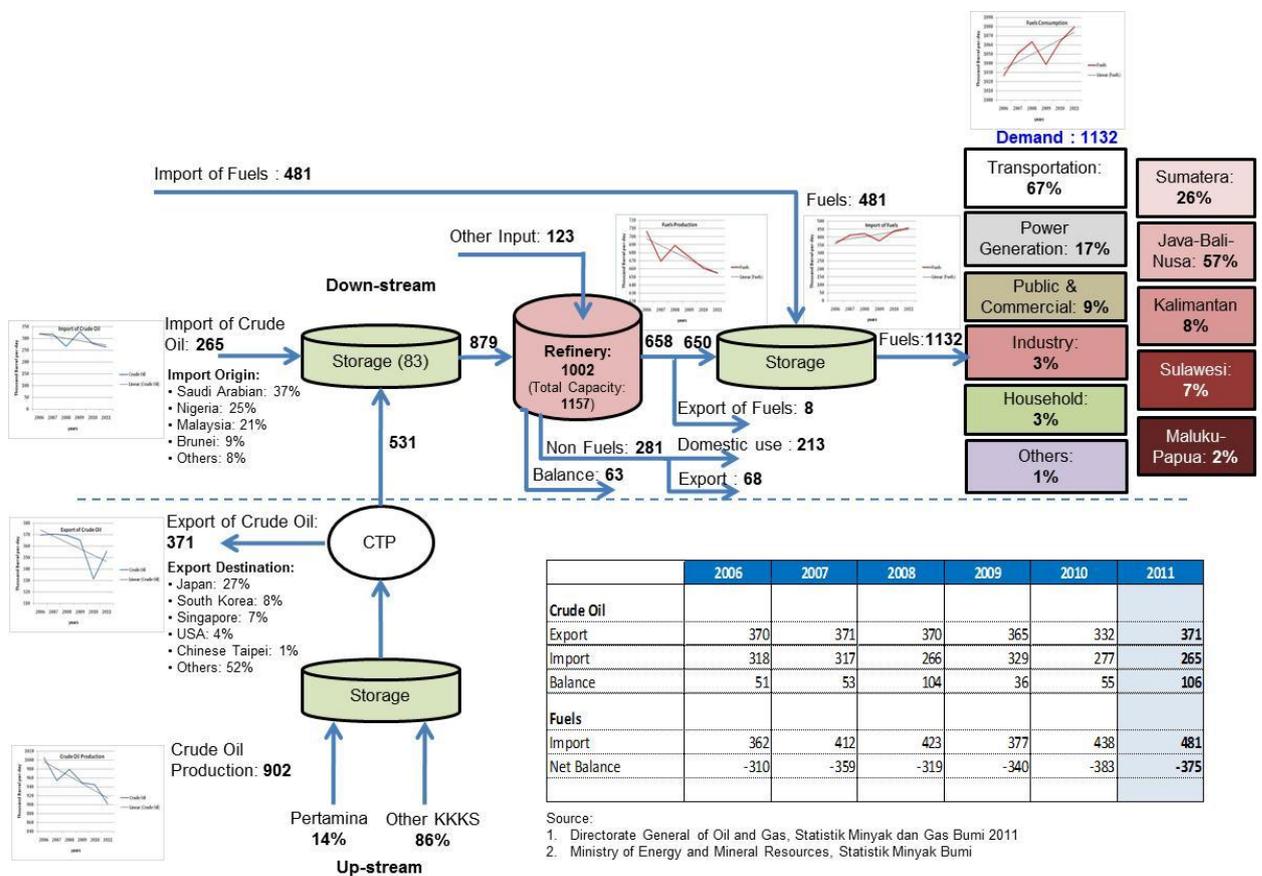


Figure 1. Indonesia's Oil/Fuels Balance in 2011 in Thousand Barrels per Day (ESDM, 2012a; ESDM, 2012b and DJMIGAS, 2011)

2.1. Supply Side

In 2011, Indonesia produced 902 thousand barrels of oil perday which consisted of crude oil (88%) and condensates (12%), a decrease of 4.5% from 945 thousand barrels of oil perday in 2010. Indonesia's oil production has declined significantly (Figure 1). The annual declining rate was about 2.2% between 2006

and 2011 (Figure 2).⁹⁷ Thus, the economy's oil production has been on a downward trend. Around 86% of Indonesia's oil production comes from *Production Sharing Contracts (Kontraktor Kontrak Kerja Sama-KKKS)* involving foreign energy companies operating in Indonesia and the rest comes from its state owned oil and gas company: PT PERTAMINA (Persero), hereafter PERTAMINA (Figure 1). Currently, there are 49 oil producers operating in Indonesia of which PT Chevron Pacific Indonesia is the largest accounting for 39% of the economy's total oil production. More than half of that production comes from two of Indonesia's largest onshore oil fields: the Minas and Duri oil fields in the Province of Riau on the eastern coast of central Sumatera.

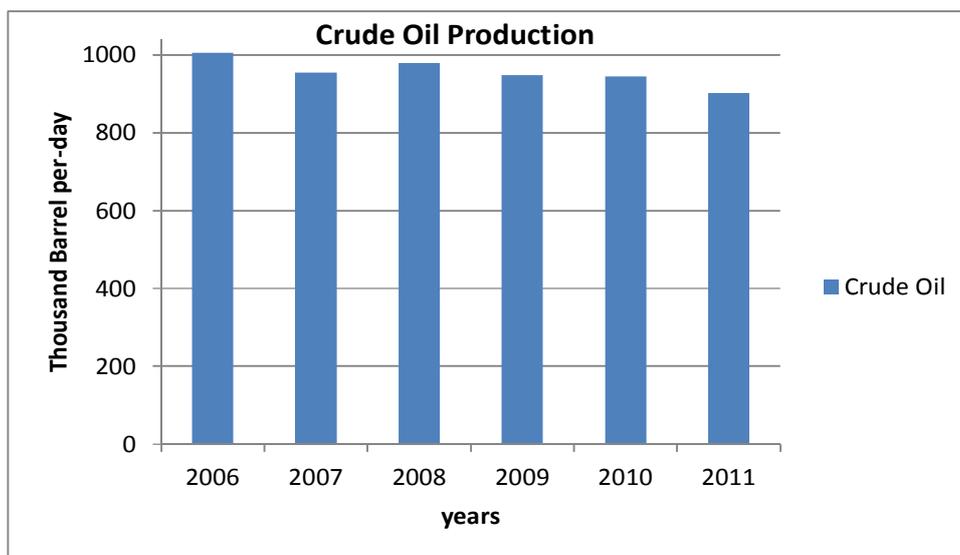


Figure 2. Indonesia's Crude Oil Production in 2006-2011

(ESDM, 2012b and DJMIGAS, 2011)

In 2011, 41% of Indonesia's total crude oil production was exported to other economies of which Japan was the largest destination of export (27% of the total crude oil export) followed by other APEC economies, namely South Korea (8%), Singapore (7%), the United States (4%) and Chinese Taipei (1%) and Others (52%) (Figure 1) (ESDM, 2012b). However, since Indonesia's oil production tends to decrease, its crude oil exports are expected to decrease as reflected in its declining exports between 2008 and 2011 (Figure 3).

⁹⁷ The rate has been calculated based on the data provided in Figure 2.

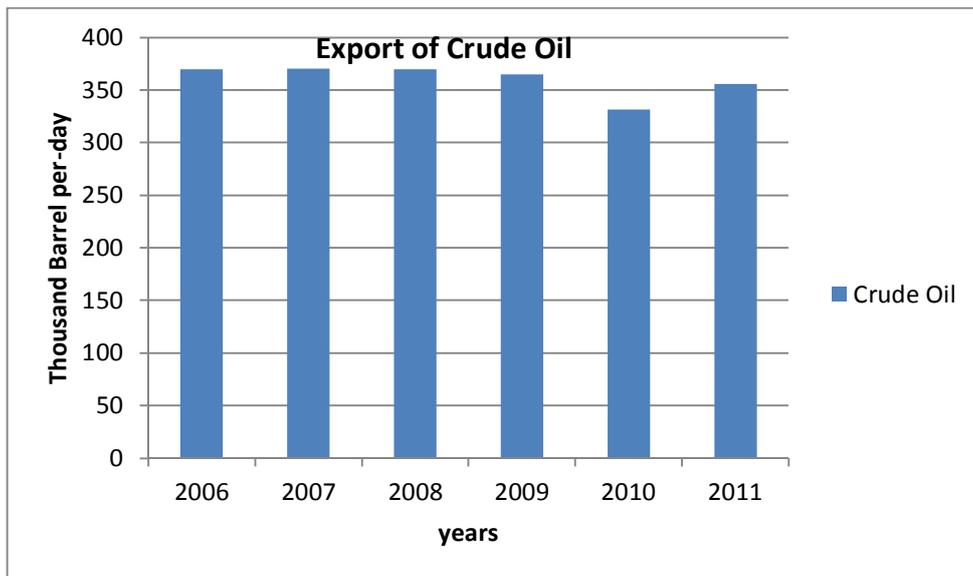


Figure 3. Indonesia’s Crude Oil Export in 2006-2011 (ESDM, 2012b)

To meet its domestic oil requirements while its oil production decreasing, the economy imported 265 thousand barrels of crude oil per day or 33% of its crude oil demand in 2011, a decrease of 4.2% from 2010 caused by a decline in the production of Kerosene due to the success of Kerosene to LPG conversion program as declared by the Ministry of Energy and Mineral Resources (MEMR) (Figure 4). The other reason for crude oil imports is meeting the specific crude oil needs of certain oil refineries that cannot be fulfilled domestically. The largest supplier of such imports in 2011 was Saudi Arabia whose share was about 37% of the total crude oil imports followed by Nigeria (25%), Malaysia (21%), Brunei (9%) and others (8%) (Figure 1) (DJMIGAS, 2011). Crude oil imports are refined at the Cilacap Refinery (71%) and the Balikpapan Refinery (29%) (DJMIGAS, 2011). Based on *Indonesia Energy Outlook 2011*, the economy’s crude oil imports are projected to reach 523 million barrels of oil equivalent (1,433 thousand barrels perday) or 86% of its crude oil demand in 2030 (I Gusti, 2013). In order to reduce dependency on such imports, the Indonesian Government has adopted a policy to increase the economy’s oil production by optimizing its conventional oil production and also exploring the economy’s unconventional oil resources.

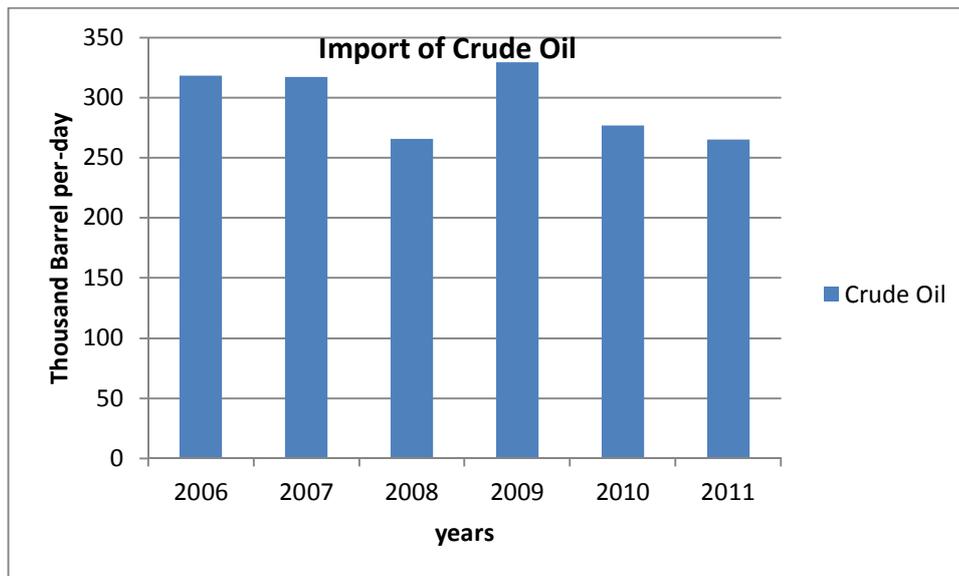


Figure 4. Indonesia’s Crude Oil Import in 2006-2011 (DJMIGAS, 2011)

Currently, there are 10 operational refineries in Indonesia with the total capacity of 1,157.1 thousand barrels per day of which eight are owned by PERTAMINA, and the remaining two are privately-owned (Figure 5). The biggest refinery is the Cilacap Refinery with the daily capacity of 348 thousand barrels or 30% of the economy’s total refinery capacity followed by the Balikpapan Refinery (260 thousand barrels per day or 22% of the total refinery capacity) and the Musi Refinery (127.3 thousand barrels per day or 11% of the total refinery capacity). Two refineries (total capacity of 10.8 thousand barrels per day) are being constructed while three additional ones have been planned (total capacity of 900 thousand barrels per day); one operating refinery is being upgraded.

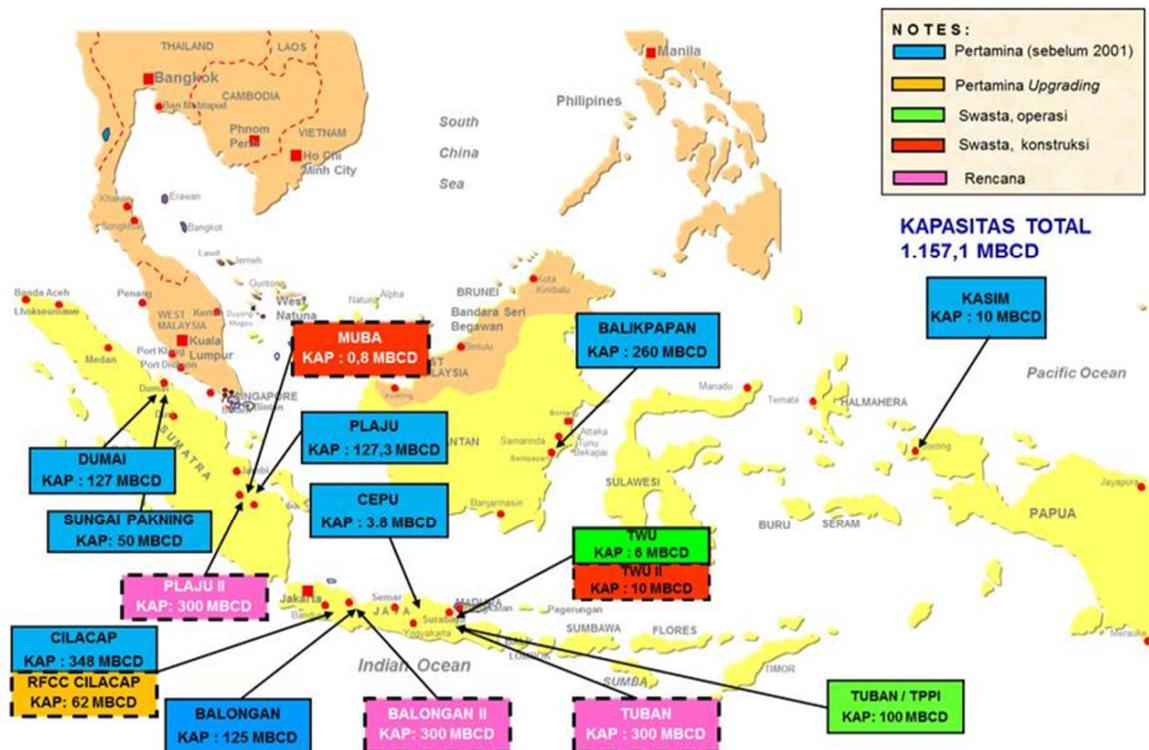


Figure 5. Indonesia's Oil Refineries (DJMIGAS, 2013a)

In 2011, Indonesia produced 658 thousand barrels of fuel products per day consisting of Gas Oil/ADO/HSD⁹⁸ (49.8%), Premium⁹⁹ (26.8%), FO/DCO/IFO/MFO¹⁰⁰ (8.4%), Avtur¹⁰¹ (7.1%), Kerosene¹⁰² (6.0%), and others (1.9%) of which 1% was exported to Timor Leste. Indonesia's refineries also produced LPG¹⁰³. Following the economy's oil production, Indonesia's fuel production has declined significantly as reflected in the annual declining rate of about 1.4% in the period 2006-2011 (Figure 6)¹⁰⁴.

⁹⁸ Gas Oil, ADO (Automotive Diesel Oil), and HSD (High Speed Diesel) are Diesel Oil types used as fuel for high speed diesel engine in Indonesia.

⁹⁹ Premium is one of Mogas-(Motor Gasoline) branded names in Indonesia's market which has an octane number of about 89 RON.

¹⁰⁰ Fuel Oil (FO) is the lowest type of refinery product used as fuel in industrial furnaces and electric power plants. In markets, FO is distinguished into Decanted Oil (DCO), Industrial Fuel Oil (IFO), and Marine Fuel Oil (MFO).

¹⁰¹ Avtur (Aviation turbine fuel) is a special fuel for turbines/jet aircraft.

¹⁰² Kerosene is a type of oil fuel produced from distillation process whose volatility lies between those of Mogas and Diesel Oil, used as fuel for lighting, kitchen stove, and outboard engines.

¹⁰³ Liquefied Petroleum Gas (LPG) is light gaseous hydrocarbon associated with crude oil produced mainly during oil extraction and refining processes and also purification process of natural gas, consisting of propane (C₃H₈) and butane (C₄H₁₀) or their mixture.

¹⁰⁴ The rate has been calculated based on the data provided in Figure 6.

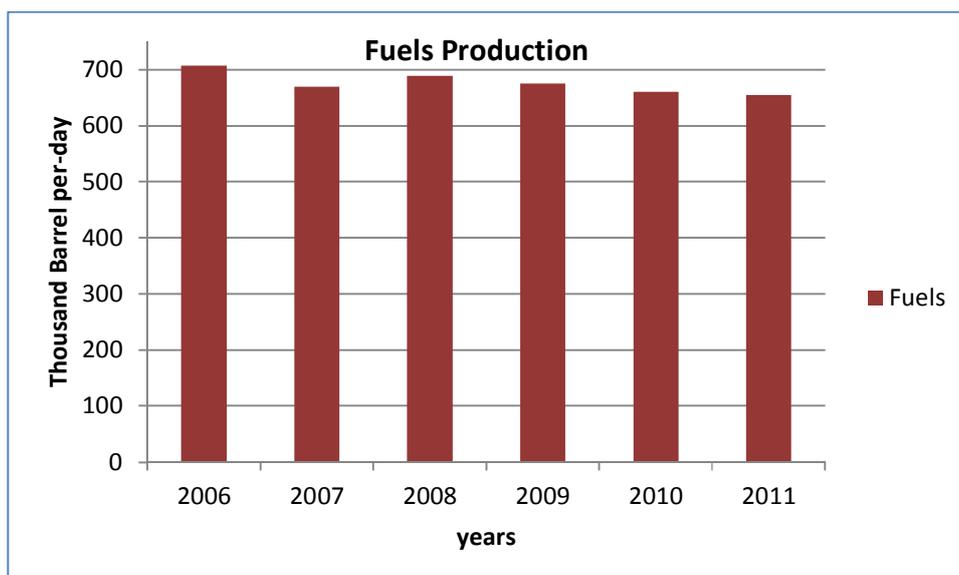


Figure 6. Indonesia’s Fuels Production in 2006-2011
(ESDM, 2012b and DJMIGAS, 2011)

Facing a declining fuel production while experiencing a growing demand for such production in 2011, the economy imported 481 thousand barrels of fuel products per day (42% of its total fuel products demand) from Singapore, an increase of 9.9% from 2010¹⁰⁵ (Figure 7). Premium accounted for the largest share of such imports (55.7%), followed by ADO (35.8%), Fuel Oil (3.6%), Avtur (3.0%), and others (1.9%).

According to *Indonesia Energy Outlook 2011*, fuel imports are projected to reach 752 million barrels of oil equivalent (2,060 thousand barrels perday) equal to 52% of the economy’s total fuel consumption in 2030 (I Gusti, 2013a). In order to reduce dependency on fuel imports, the Indonesian Government is implementing a policy for switching from Mogas (Motor Gasoline) to gas in the transportation sector, especially for buses, and government motor vehicles as well as another for mandatory utilization of biofuel up to 10% of the total liquid consumption of the transportation, industry, and electricity sectors.

¹⁰⁵ The rate has been calculated based on the data provided in Figure 7.

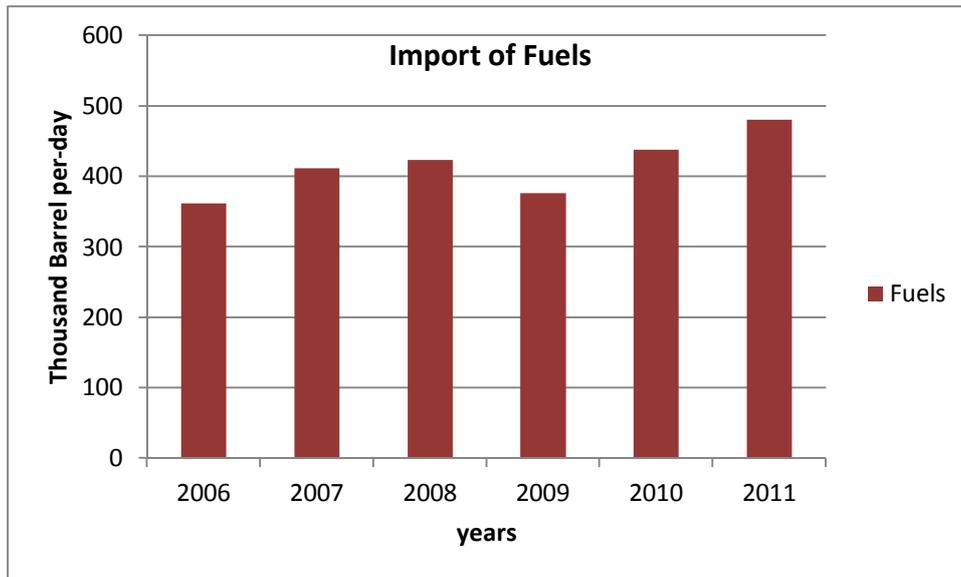


Figure 7. Indonesia’s Fuels Product Import in 2006-2011 (ESDM, 2012b)

2.2. Demand Side

In 2011, Indonesia’s fuel consumption was 1,132 thousand barrels per day, an increase of 6.4% from 1,064 thousand barrels per day in 2010¹⁰⁶. Indonesia’s fuel demand is expected to increase rapidly due to high growth demand, especially in the transportation sector, which has been a trend since the last decade. For instance, such demand increased at about 2.0% per year in the period 2006-2011 (Figure 8)¹⁰⁷.

¹⁰⁶ The rate has been calculated based on the data provided in Figure 8.

¹⁰⁷ The rate has been calculated based on the data provided in Figure 8.

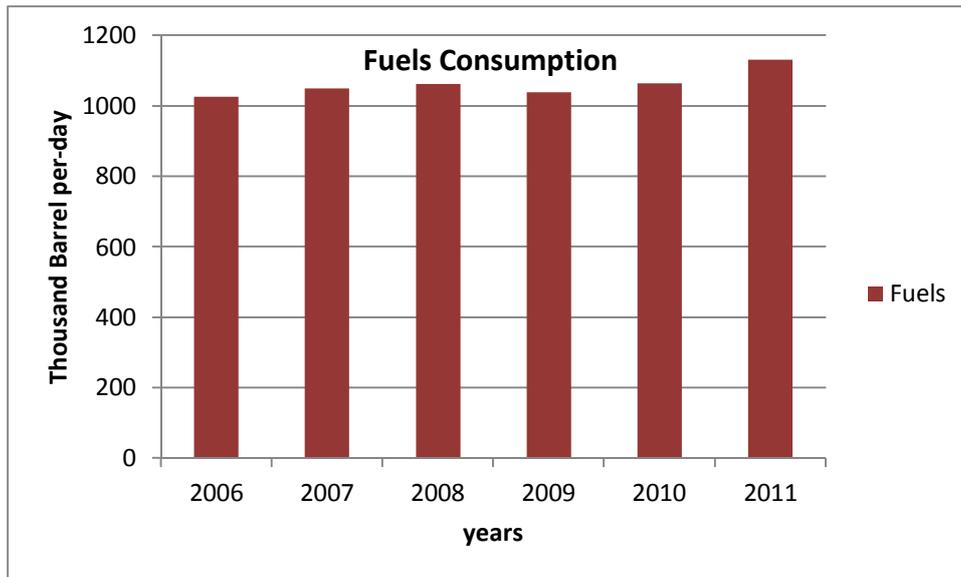


Figure 8. Indonesia’s Fuels Consumption in 2006-2011

(ESDM, 2012b and DJMIGAS, 2011)

Based on the most recent available statistics (2011), the transportation sector accounted for the largest consumer of fuels (67%) followed by the electricity sector (17%), the public & commercial sectors (9%), the industrial sector (3%) and other sectors (4%) (Figure 9). This is due to a large number of motor vehicles operating in Indonesia consisting of cars (about 9 million), trucks and buses (9 million), and motorbikes (81 million) served by 600 agents (whole-sellers) and 5,018 gas stations (I Gusti, 2013a). The largest consumer of fuels by region in the same year was Java-Bali-Nusa Tenggara (57%) followed by Sumatera (26%), Kalimantan (8%), Sulawesi (7%), and Maluku-Papua (2%) (Figure 10).

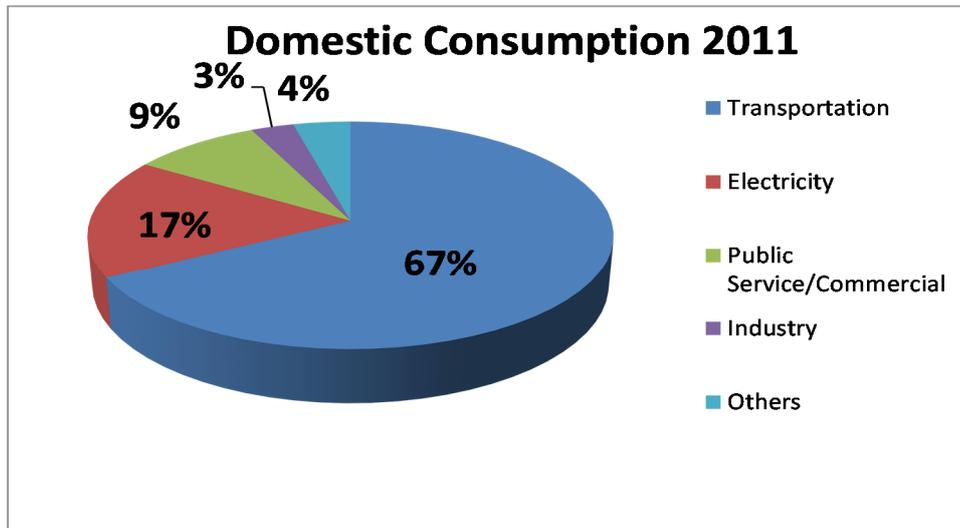


Figure 9. Indonesia's Domestic Consumption in 2011 (DJMIGAS, 2011)

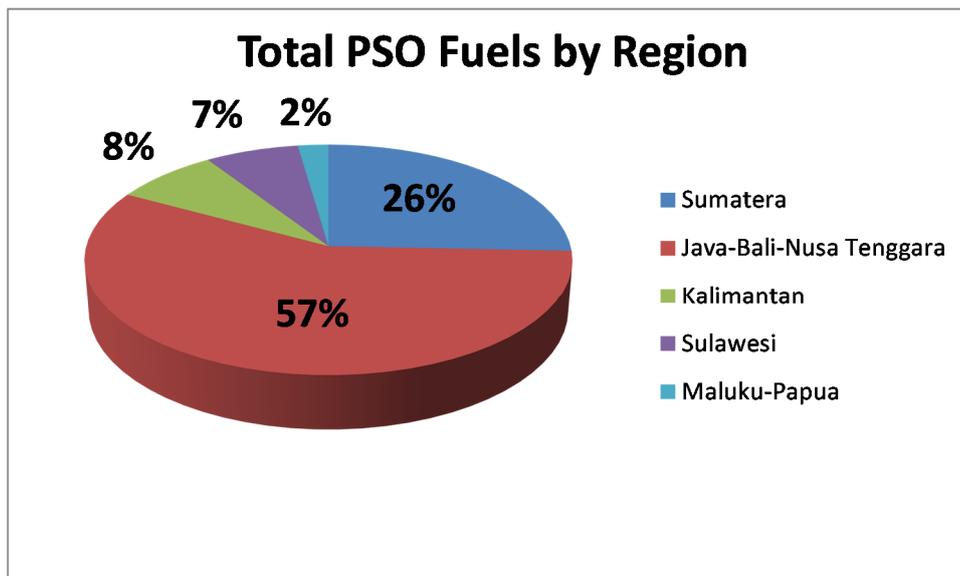


Figure 10. Total Public Service Obligation (PSO) Fuels by Region (DJMIGAS, 2013b)

Since Indonesia is an archipelago, fuels are mainly distributed by tankers, except for several areas on Java Island where pipelines are used (Figure 11).

Regarding fuel distribution system, Indonesia under PERTAMINA has envisaged a three-stage distribution plan for supplying fuels throughout the economy known as RAE (Regular, Alternative, and Emergency). Under the normal condition, PERTAMINA distributes fuels through an already determined specific route for supplying fuels from every refinery or fuel depot to each consuming area known as

“Regular” route. For example, Bali has a regular distribution route of fuels supplied by the Cilacap Refinery (Figure 11). If, due to some reason, the distribution of fuels under the regular route could reduce the stock acceptable level in some areas, the “Alternative” route will be implemented under which fuel supplies will be distributed from the nearby available supplies (refineries or fuel depots). For example, if fuels from the Cilacap Refinery cannot be supplied to Bali due to transportation problems, the alternative supplier of fuels for Bali will be the Balikpapan Refinery. Finally, if under the Regular and Alternative supply routes, fuels may not be sufficient to maintain the stock of security level condition in some areas, the “Emergency” route will be implemented under which any possible supply of fuels (e.g., refineries, fuels depots or imports) will be used for distribution with economic criteria as the last consideration.

Actually there is no written regulation that stated PERTAMINA or other oil companies to implement the RAE distribution system. However, under Oil Business License, there is a general requirement mentioning that all oil companies shall be securing fuel supplies in their own region.

Regarding the fuel inventory system, there is no regulation obliging the oil companies operating in Indonesia to have emergency reserves of fuels. However, PERTAMINA has a self-imposed policy of maintaining fuel reserves to secure its daily operation translated into an average of 17 to 25 days of reserves for subsidized fuels and 17 days of reserves for non-subsidized fuels.

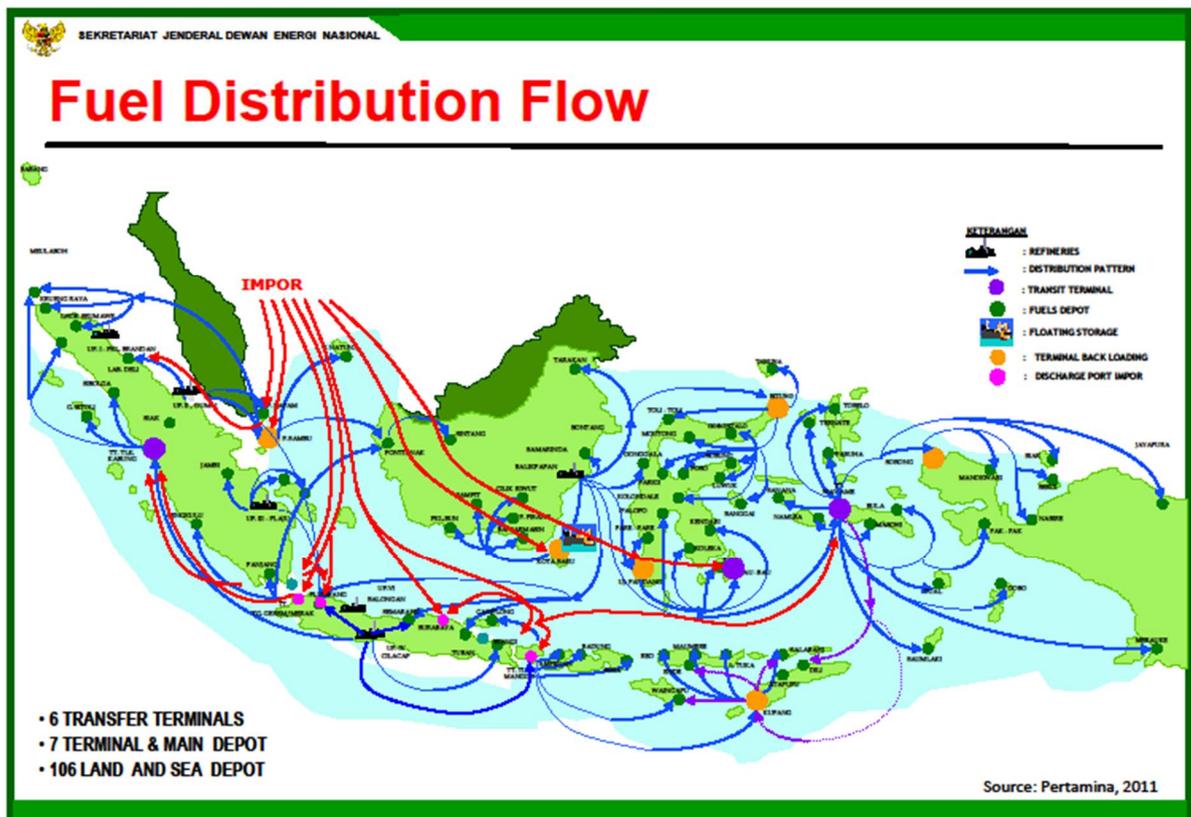


Figure 11. Indonesia’s Fuels Distribution Flow (DEN, 2013)

In 2011, Solar/ADO/HSD¹⁰⁸ accounted for the largest share of Indonesia's fuel consumption (39.27%) followed closely by Premium (39.26%), Bio-Solar¹⁰⁹ (10.93%), IFO (5.46%), Kerosene (3.02%), and others (2.06%) (Figure 12).

In Indonesia, some fuels like Premium, Solar, and Kerosene are still subsidized by the government, an important factor increasing their consumption with implications for emergency situations. In order to maintain the magnitude of the subsidy allocation, the volume of each subsidized fuel is determined by the government as quota which should be approved by the parliament every year. If, due to some reason, the volume of subsidized fuels exceeds the determined quotas, the government must discuss it with the parliament in order to get approval for the new quotas before additional subsidy budget can be allocated.

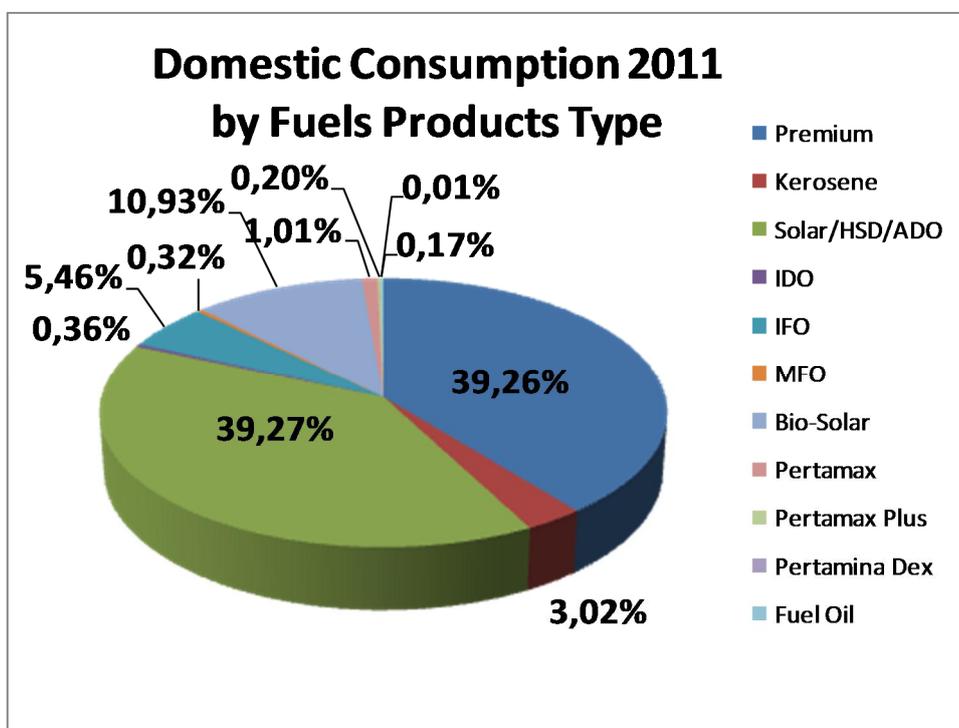


Figure 12. Indonesia's Domestic Consumption in 2011 by Fuels Product Type¹¹⁰
(DJMIGAS, 2011)

¹⁰⁸ Solar is one of Gas Oil-branded name in Indonesia's market which has a octane number of about 48 RON.

¹⁰⁹ Bio-Solar is also one of Gas Oil-branded name in Indonesia's market which is a mixture of Diesel Oil with vegetable oil and has the octane number of about 51-55 RON (higher than Solar).

¹¹⁰ Pertamina is one of Mogas- (Motor Gasoline) branded fuels in Indonesia's market which has an octane number of about 94 RON; Pertamina Plus is also one of Mogas- branded fuels in that market with an octane number of about 98 RON and it is lead free; and Pertamina Dex is one of Gas Oil- branded fuels in Indonesia market which has an octane number of at least 53 RON.

3. INDONESIA'S EMERGENCY RESPONSE

3.1. Regulation

The Government of Indonesia has certain regulations on energy emergency responses, especially regarding oil as follows:

- **The Energy Law Number 30.**

The Energy Law Number 30 emphasizes that, Indonesia shall aim to achieve independence in the management of energy and guarantee its availability both from domestic and overseas sources for certain reasons. These are supporting sustainable national development, improving national energy resilience through meeting the domestic energy requirements, providing raw materials for the domestic industries and increasing state revenues (ESDM, 2013a).

Regarding 'energy crisis' and 'energy emergency', the law defines 'energy crisis' as an energy shortage condition and 'energy emergency' as a condition in which the supply of energy is disturbed due to a disconnection between energy facilities and the country's infrastructure. If an energy crisis and/or an energy emergency results in disrupting government functions, community social life, and/or economic activities, the Government is obliged to take any necessary corrective measure (ESDM, 2013a).

Further, declaring measures to address an energy crisis and/or energy emergency will be the mandate of the National Energy Council (Dewan Energi Nasional, DEN), which is chaired by the President of the Republic of Indonesia. As an institution, the DEN is headed by the minister responsible for energy affairs. The DEN has 15 members: Seven ministers and high-ranking government officials responsible for the supply, transportation, distribution and use of energy; and eight stakeholder members from industries, academia, expert groups, environmental groups, and consumer groups (ESDM, 2013a).

- **The Oil and Gas Law Number 22.**

The Oil and Gas Law Number 22 holds that the Government shall ensure the availability and distribution of fuels throughout the economy, including remote areas, and also keep a national reserve of fuels in sufficient quantities for a certain period (ESDM, 2013b). However there is no regulation elaborating any further on the national fuel reserve system (how much and for how long fuels should be reserved) in Indonesia, currently.

In the areas experiencing shortages of fuels and in remote areas, the law stipulates that the government's transport and storage facilities, including supporting facilities, can be used together with other parties. In such case, the use of those facilities will be governed by the regulatory body, i.e., Badan Pengatur Hilir Minyak dan Gas Bumi-BPH Migas (Downstream Oil and Gas Regulatory Body) taking into account technical and economic aspects of such usage (ESDM, 2013b).

- **The Presidential Regulation Number 7 regarding ASEAN Petroleum Security Agreement Ratification.**

Indonesia ratified ASEAN Petroleum Security Agreement (APSA) on 10 January 2013. Under the APSA, "Critical Shortage" refers to the situation when an ASEAN Member State in Distress is experiencing a shortfall of at least 10% of its Normal Domestic Requirement of petroleum for a continuous period of at least 30 days; "Emergency Situation" refers to a situation when an ASEAN Member State is faced with a Critical Shortage in its petroleum supply due to natural calamities (such as earthquake and tsunami), explosion of facilities or war. "Normal Domestic Requirement" refers to the daily average domestic petroleum consumption over 12 months period immediately preceding the occurrence of the emergency situation (ESDM, 2013c).

In order to enhance petroleum security, the APSA specifies the short, medium and long-term measures to minimize the exposure of the ASEAN states to emergency situations. Demand restraint, fuel switching, surge protection, information sharing and e-trading are examples of the short-term measures. The medium-and long-term measures include exploring for new petroleum resources (particularly in deep water and new frontier areas), energy diversification and improving energy efficiency, fuel switching to alternative energy, joint research development and demonstration (RD & D) in renewable energy, energy efficiency and new energy technologies, oil and gas markets liberalisation, and oil stockpiling (ESDM, 2013c).

The APSA also provides that "All ASEAN member States shall, subject to their domestic needs, contractual obligations, capabilities and resources, endeavour to supply petroleum to the ASEAN Member State in Distress at the aggregate amount equal to ten percent (10%) of the Normal Domestic Requirement of the ASEAN Member State in Distress" (ESDM, 2013c).

3.2. Emergency Response System

Based on the past experiences, there are three circumstances under which Indonesia may experience oil/fuel emergency situations of varying natures and magnitudes which require different types of responses, namely:

1. **Peak season or seasonal (during Eid Mubarak or Christmas and New Year):** It happens every year when more than three-five million cars are on the road to make suddenly an excessive demand for fuels;
2. **Natural disasters such as tsunamis, earthquakes, and volcanic eruptions:** They may damage the infrastructure of oil and fuels to different extents;
3. **Market and industry emergencies:** They may cause fuel supply shortages for a while.

In order to respond to these emergency situations, Indonesia has a three-level emergency response system as follows:

- **The Company Level**

An oil/fuel emergency affecting an oil company's facility is categorized as a "Company Level" one. Every oil company in Indonesia, including PERTAMINA, has an internally-designed plan setting a standard operating procedure for responding to oil emergency situations within its facilities for which it regularly conducts exercises. Emergency response system at the company level is quite good as evident in the following example.

When the High Octane Mogas Component (HOMC) tank in PERTAMINA's Cilacap Refinery was on fire on 2 April 2011, the company itself was capable of handling the incident under Government supervision. Based on PERTAMINA's standard operating procedure, the company's alternative and emergency distribution plan for supplying fuels was activated instantly as a result of which there was no significant impact on fuel distribution.

- **The Regional Level**

If an oil/fuel emergency covers a region or province, it is categorized as a "Regional Level" one. In such case, all concerned agencies such as the National Energy Council, the Directorate of Oil and Gas, and the Local Government agencies will coordinate their activities to address it together.

- **The National Level**

An oil/fuel emergency covering more than one region or province is categorized as a "National Level" one. In this case, the National Energy Council, which has the authority to stipulate measures in energy emergency and crisis situations, will call all the concerned agencies and stakeholders to meet to discuss the required mitigation action (Figure 13). Once a National Level emergency is declared, all necessary mitigation actions will be implemented on the supply and demand sides. Monitoring and assessment of the ongoing emergency situation for the purpose of ensuring progress in reducing or eliminating its impact will be carried out continuously by establishing a task force team and a command centre (Figure 14). If necessary, the police and the army could be deployed to prevent social unrest, criminal activities and panic buying of fuels.

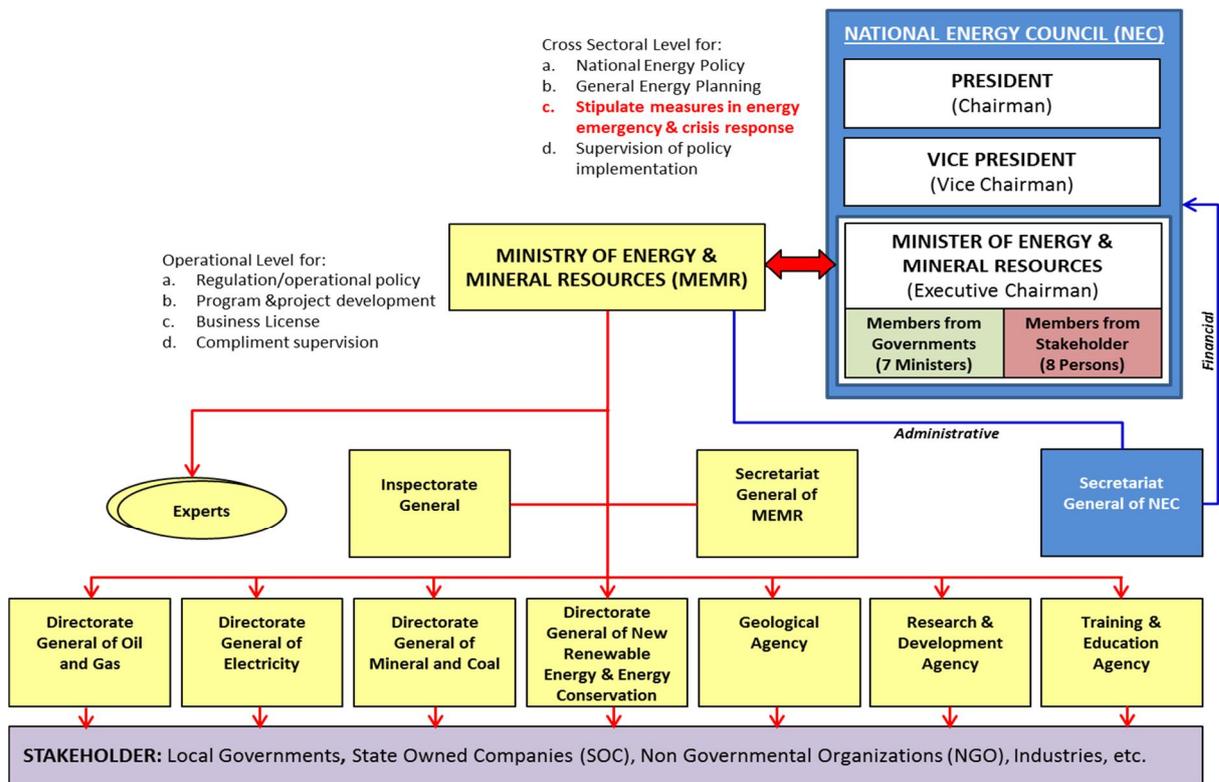


Figure 13. Indonesia's Emergency Responses System (I Gusti, 2013a)

The authorized official to declare an emergency situation at the regional and national levels in Indonesia is yet to be determined. In addition, quantitative criteria for determining the level of emergency at the regional or national level is also not clear. Currently, the Indonesian Government is working on these issues.

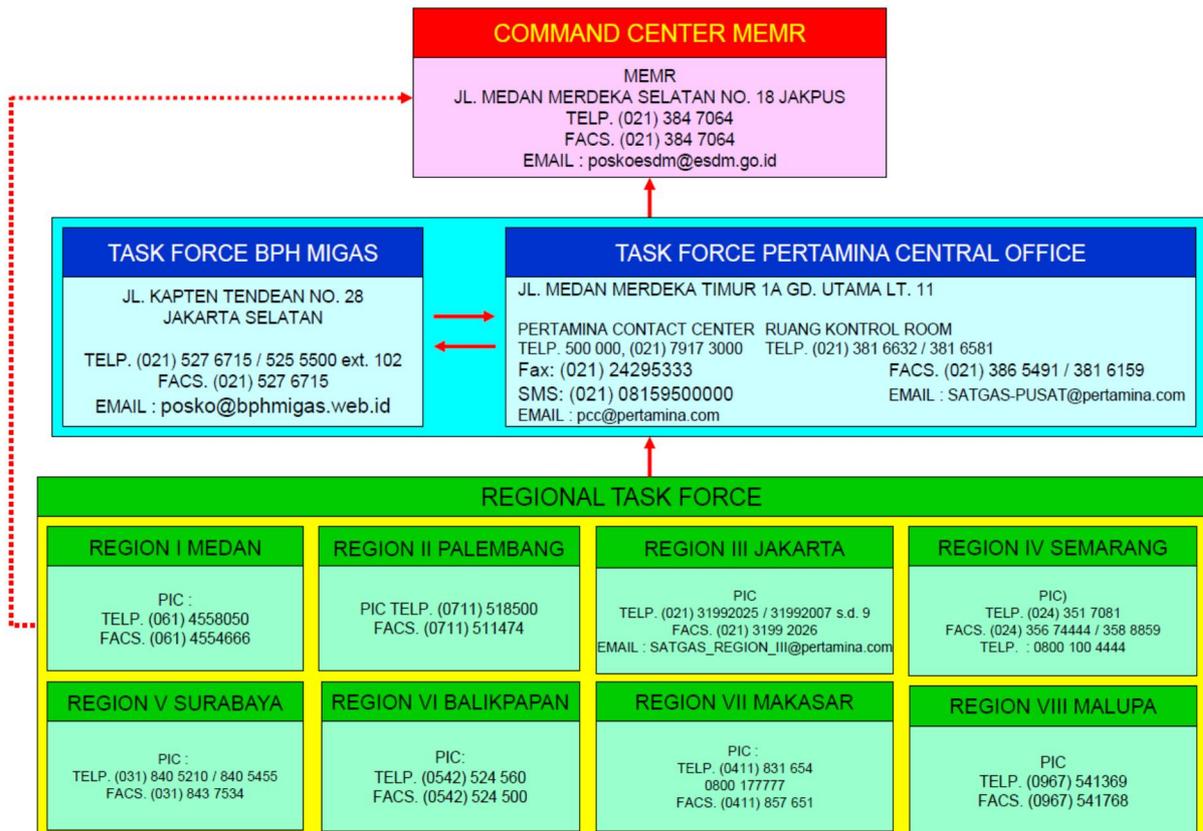


Figure 14. Typical Fuel and LPG Monitoring Scheme (I Gusti, 2013a)

3.3. Emergency Response Mitigation

With regard to responding to energy emergency situations specially the oil ones, the Government of Indonesia has already prepared the mitigation actions for short- and long-term periods, including managing the respective supply and demand, as follows (I Gusti, 2013a) :

- **Short-term**
 - Implementing certain supply and demand measures
 - Promoting public understanding on the emergency situation in order to avoid panic
- **Long-term**
 - Increasing domestic production and reducing dependency on oil imports
 - Stockpiling to increase oil reserves
 - Diversifying fuel for transportation and power generation
 - Developing new and renewable energy supplies

- **Supply Side Management**

- Activating alternative and emergency supply distribution
- Maximizing domestic production
- Restricting crude oil and oil-product exports
- Increasing alternative energy use (biofuel/CNG)
- Reducing feedstock to the petrochemical plants
- Drawdowning of oil stock
- Rescheduling/postponing oil and gas field maintenance

- **Demand Side Management**

- Oil Demand
 - Conducting public communication in order to avoid public panic and prevent hoarding of fuels
 - Restricting private motor vehicle use
 - Limiting opening time of gas stations
 - Rationing oil (when necessary)
- Electricity Demand
 - Encouraging switching to alternative fuel usage for power generation
 - Initiating an electricity saving campaign
 - Limiting opening time of department stores/theatres
 - Shifting working hour

PART 2 OIL SECURITY EXERCISE

This part presents the three oil emergency scenarios which were prepared by a number of experts, the responses to the scenarios by Indonesia and the recommendations from the experts regarding these responses

1. THE 1ST STAGE OF THE OIL EMERGENCY

1.1 The Scenario

Background of Emergency Situation

The Cilacap Refinery is the biggest refinery in Indonesia owned and operated by PERTAMINA. It is located in Cilacap, a district in Central Java Province close to the Indian Ocean (Figure 15).

The refinery consists of the following three facilities: Fuel Oil Complex (FOC) I and Lube Oil Complex (LOC) I; Fuel Oil Complex (FOC) II, Lube Oil Complex (LOC) II, and Lube Oil Complex (LOC) III; and Refineries Paraxylene (Pertamina, 2013). Its total capacity is about 348,000 barrels per day (30% of the national capacity) which accounts for a significant portion of the national fuel production, i.e., Avtur (49%), Premium (33%), Kerosene (23%), Gas Oil/ADO/HSD (25%), Diesel Oil/IDO/MDF¹¹¹ (63%), and Fuel Oil/DCO/IFO/MFO (79%); the refinery also produces LPG (14%) (DJMIGAS, 2011).

Some parts of the Cilacap Refinery installations were on fire in 2008, 2009 and 2011. The refinery is also vulnerable to natural disasters such as earthquakes and tsunamis, although it has not been damaged by such disasters up to this date (Figure 15).

¹¹¹ Marine Diesel Fuel (MDF) is a type of Diesel Oil used as fuel in low or medium speed marine diesel engine.



Figure 15. Fire and Natural Disaster around Cilacap Refinery

(Chrisnawan, 2013a)

Emergency Situation

An 8-magnitude earthquake strikes the Cilacap area and causes damages to the Cilacap Refinery. FOC I's installations are on fire resulting in the total loss of its production of fuel products. Though FOC II's installations are not affected by fire, they are also somewhat damaged.

Based on the results of an inspection, repairing FOC I's damage is expected to take at least three months and that of FOC II at least two weeks.

1.2 The Response

Indonesia's response is based on the following assumptions:

- The affected FOC I and FOC II cannot produce fuel products for three months and two weeks, respectively.

- Since the feedstock for FOC I is 100% crude oil imports, 1.8 million Barrels of Arabian Light Crude (ALC) equal to six times shipping of crude oil from Saudi Arabian cannot be fed to FOC I.
- 30% of the crude oil imports and 70% of the domestic crude oil production cannot be fed to FOC II.
- FOC I and FOC II cannot produce 1,500 thousand barrels of Mogas per month (50 thousand barrels per day) equal to 10% of the national production, and 2,500 thousand barrels of Diesel Oil per month (83 thousand barrels per day) equal to 20% of the national production.
- The affected areas are in the Provinces of West Java and Central Java.

Given the incident can be categorized as emergency at the Company Level, PERTAMINA's measures to secure energy supply in response to the emergency situation include the following:

- Regarding the ALC imports (FOC I's feedstock) already delivered or committed and cannot be canceled, the imported ALC will be stored in the Lohmanis Terminal (Cilacap, Province of Central Java) to increase the company's inventory level.
- Concerning the imported crude oil which is the feedstock for FOC II and cannot be canceled, it will be reallocated to other refineries capable of refining crude oil with such specification to increase fuel production. They include the Balikpapan Refinery in the Province of East Kalimantan, the Dumai Refinery in the Province of Riau and the Plaju Refinery in the Province of South Sumatera.
- PERTAMINA will import Mogas (1,500 thousand barrel per month or 50 thousand barrels per day) and Diesel Oil (2,500 thousand barrel per month or 83 thousand barrels per day) from Singapore if possible under the existing contract's quota or buy it from spot markets if the imports exceeds the quota.
- While waiting for the fuels from Singapore to take 10 days expectedly, PERTAMINA will release its fuel stock into the domestic market. The imported fuels from Singapore will be discharged at the Teluk Semangka Port in the Province of Lampung or the Balongan Port in the Province of West Java if sea waves prevent their respective sea tankers from docking to the Cilacap Port. From the two mentioned ports, the imported fuels will be distributed in the Provinces of West Java and Central Java by land tankers.

Although the incident is a Company Level one, the Ministry of Energy and Mineral Resources (MEMR) will also take certain measures to include evaluating the incident's disruptive impact on the company's oil security and monitoring the measures carried out by PERTAMINA to minimize as much as possible such disruption's negative economic and social effects. Its involvement is also necessary for certain measures, including for increasing imports of fuel products, which require its recommendation to get approval from the Parliament.

Moreover, the MEMR will organize coordination meetings with the concerned ministries and stakeholders since their cooperation is needed for certain activities such as that of the Ministry of Trade

and the Ministry of Transportation for issuing Ship to Ship (STS) transfer licenses.

These meetings also enable the MEMR to come up with strategies as to how to inform the people about the incident in order to avoid public panic and prevent hoarding of fuels as well as how to persuade people to reduce their energy consumption (e.g., through a public campaign or introduction of car-pooling).

1.3 Recommendations

- Since the emergency, which can be handled by PERTAMINA requires additional imports of fuel products mostly from Singapore, but also from other suppliers such as Kuwait, Republic of Korea and China, the Indonesian Government should fully support PERTAMINA's measures by securing financial means for importing fuels, and also through its policy and regulatory support such as easing the issuance of licenses for STS, and making recommendations for expanding the volume of subsidized fuels if the total volume of such fuels exceeds the quota which has been determined by the Government and the Parliament.
- Every long-term oil contract between PERTAMINA and other oil companies should include a special clause to give flexibility to PERTAMINA to enable it to decrease its oil imports in case of emergency when its refining capacity is negatively affected.
- It would also be helpful if PERTAMINA could consider securing a proper spare capacity of its domestic refineries to uplift fuel production in case of emergency in the near future since the utilization rate of its refineries is already 90-95%.
- Even though the magnitude of the incident or emergency is small and the required approach is mostly on the supply side, the Government and PERTAMINA need to prepare a public communication plan in close cooperation with the stakeholders, such as the local governments to avoid people's panic-buying. Otherwise, in reaction to such incident or emergency, people will likely try to buy fuels beyond their needs to stimulate a fuel demand hike only to increase the magnitude of incident or emergency.

2. THE 2nd STAGE OF THE OIL EMERGENCY

2.1 The Scenario

Emergency Situation

Three weeks after the earthquake affecting the Cilacap Refinery, a 7-magnitude aftershock hits the Cilacap area. It causes fire in FOC II and further damages the entire plant. Based on a damage assessment report, the Cilacap Refinery now needs at least one year for restoration.

In addition, the aftershock damages the refinery's other oil-related facilities (e.g., pipelines, oil import installations, and distribution depots). It is not certain how long it will take to restore their normal operation.

2.2 The Response

The following assumptions form the basis of Indonesia's response:

According to the assessment report, the Cilacap Refinery's FOC I and FOC II will be shut down for one year. PERTAMINA assumes that it can repair all other damaged facilities (e.g., storages and jetty) within 6 months. The impact of the mentioned damages on the refinery's operation is as follows:

- 1,500 thousand barrels of Mogas per month (50 thousand barrels per day) equal to 10% of the national production cannot be produced.
- 2,500 thousand barrels of Diesel Oil per month (83 thousand barrels per day) equal to 20% of the national production cannot be produced.
- 348 thousand barrels of crude oil per day cannot be processed.

The incident has affected the entire country. Given the incident can be categorized as emergency at the National Level, PERTAMINA will report to the MEMR in its response to the emergency situation. Based on the PERTAMINA's report, the MEMR will monitor and evaluate the impact of disruption caused by the incident and coordinate the required meetings with all the concerned agencies and stakeholders. The resulting proposed emergency response will be implemented by the National Energy Council which has the authority to enforce the determined measures to minimize the incident's economic and social effects.

As part of its response to the emergency situation, the Indonesian Government will take certain measures, including the following:

- Supply side:
 - Importing an additional amount of Mogas (1,500 thousand barrels per month or 50 thousand barrels per day) and Diesel Oil (2,500 thousand barrels per month or 83 thousand barrels per day) from Singapore provided the import quota in the existing contract is still available otherwise buying the fuels from spot markets;
 - Conducting Crude Processing Deals (CPD) for refining 348 thousand barrels of oil per day which cannot be processed domestically with overseas refineries (e.g., refineries in Singapore, Republic of Korea, and China) having the capability to refine crude oil with Indonesia's crude oil specifications;
 - Increasing alternative energy use (biofuel/CNG).

- Demand side:
 - Communicating with the public in order to prevent public panic and hoarding of fuels.
 - Introducing car-pooling and oil-rationing to reduce oil consumption. The police and the military could be deployed to guard gas stations when oil-rationing is enforced.

2.3 Recommendations

- Indonesia should prepare its concrete emergency response plans to be ready for real emergency situations for which certain issues need to be addressed. They include identifying the authorized officials to declare an emergency situation or crisis situation at the company, regional and national levels; determining the required mechanism for making such declarations at those levels and changing a declared level to another one; identifying the official who can organize coordination meetings involving all the concerned agencies/institutions and take measures to secure energy; prioritizing the sectors for the sake of securing their fuel requirements; deciding about the share of dealing with the energy disruption in case of emergency by the supply and demand sides management; and preparing the process for communicating with the public.
- The Indonesian Government's resort to CPDs is a good measure to cope with emergency situations after maximizing Indonesia's domestic refineries' capacity; CPDs are a common practice in the oil industry. However, toward that end, the Indonesian Government must have information about the available capacity of the potential refineries abroad and their refining specifications; it also needs refining contracts with them and their respective economies.
- The Indonesian Government needs securing a budget for CPDs and importing fuels to meet their high costs.
- Although increasing biofuel consumption is a good option in general, the Indonesian Government should keep into consideration that it may not be a practical option in emergency situations as biofuel production is a long process from farms to manufacturing plants while those situations require instant actions.
- The Cilacap Refinery's and its facilities' recovery from the incident as soon as possible is important for which special regulations/laws regarding taxation, customs, etc. may also be needed apart from the mentioned measures.
- The environmental impact of the incident should be investigated by the Government.
- Since the Cilacap Refinery also produces non-fuel products such as lubricants which are beneficial to the national economy, the Indonesian Government should consider assessing the disruptive impact of emergencies on non-fuel products as well.

- Oil rationing as a measure suggested by the Indonesian Government is a good one. However, the Indonesian Government should prepare an implementation plan beforehand, including the way of allocation of fuels and its priority list.

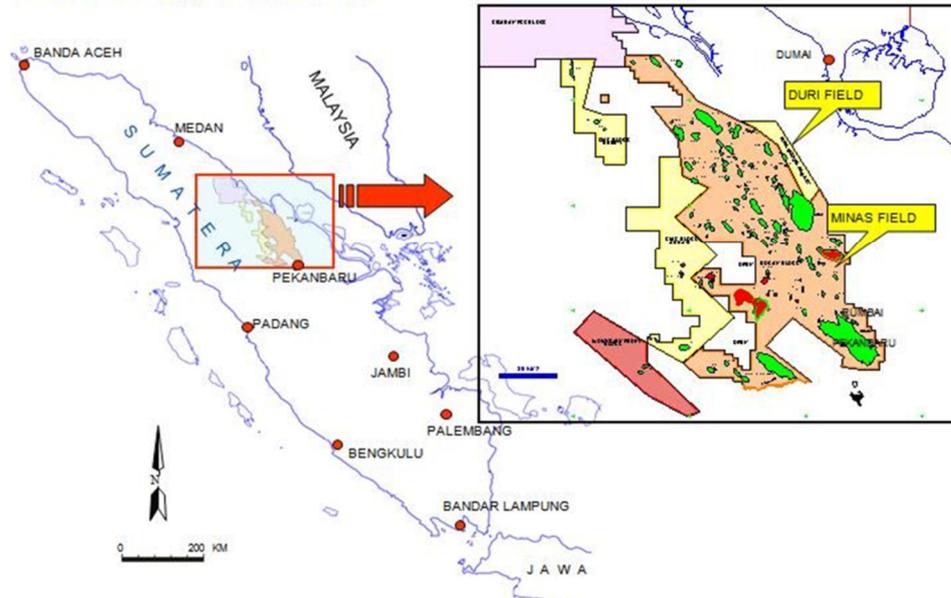
3. THE 3rd STAGE OF THE OIL EMERGENCY

3.1 The Scenario

Background of Emergency Situation

PT Chevron Pacific Indonesia (CPI) is a subsidiary company of Chevron Corporation, a US multinational energy corporation in charge of exploring oil in Riau Province, Sumatera Island. CPI is the biggest oil producer in Indonesia whose share of the total national production of crude oil and condensate is about 39%. It operates 90 fields in Sumatra, among which Duri and Minas are the two major ones (Figure 16). In addition, CPI manages the Port of Dumai, one of the largest oil terminals in Indonesia as it can load four tankers simultaneously. The bulk of CPI's Sumatra production in 2011 came from fields in the Rokan production sharing contract (Chevron, 2013).

CPI (Chevron Pacific Indonesia) Area of Operations



**Figure 16. Area of Operation PT Chevron Pacific Indonesia
in Riau Province (Yusnan, et.al., 2010)**

Crude oil from CPI's Sumatra production fields is transported to Dumai through a pipeline system which extends to some 550 km (Minas to Dumai and Bangko to Dumai), and reaches a collecting terminal (tank farm) with a storage capacity of 5.1 million barrels. The collecting terminal is needed for temporary storage of CPI crude oil since the oil company does not have an oil refinery in Indonesia. From the collecting terminal, oil is pumped to PERTAMINA's refinery (Dumai Refinery) and oil tankers at the Dumai Port (Chevron, 2013).

Illegal tapping/oil theft has been rife in Riau Province over the last two years, and an earthquake struck the province in 2012 (Figure 17).

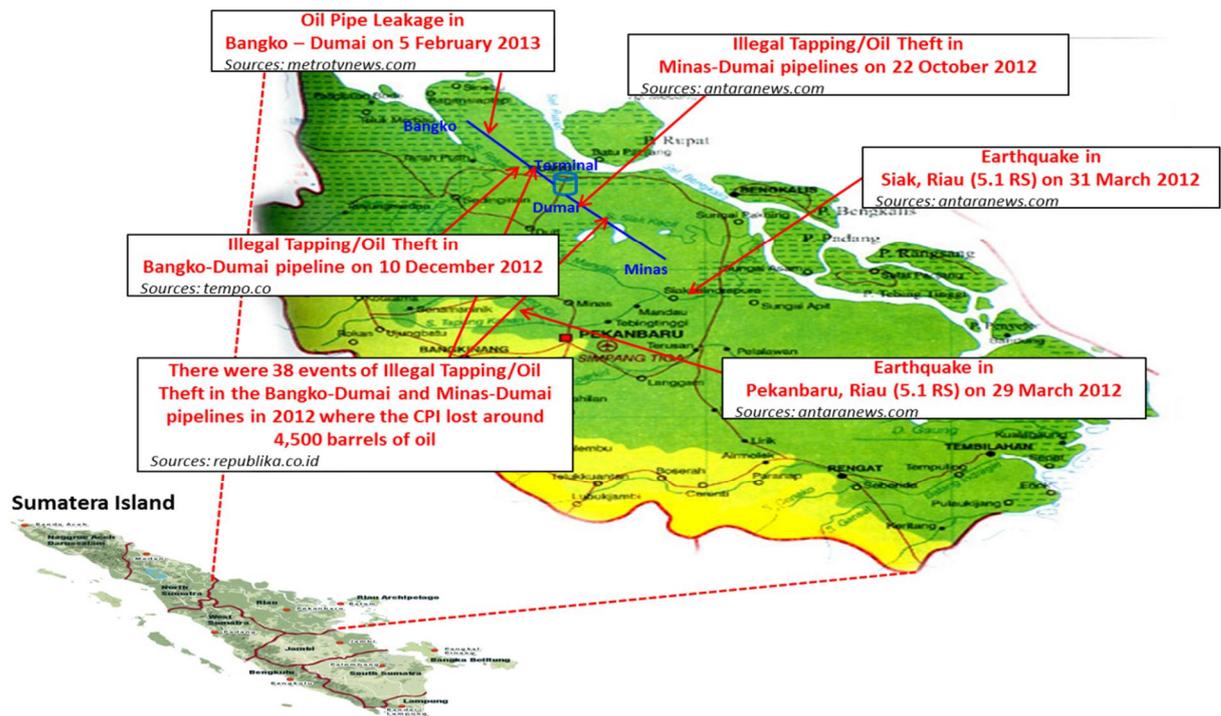


Figure 17. Accident and Natural Disaster around PT Chevron Pacific Indonesia in Riau Province (Chrisnawan, 2013c)

Emergency Situation

Six months after the aftershock completely shut down the operation of the Cilacap Refinery, some local residents cut off the oil pipeline from Bangko to Dumai to protest against the government measures to increase fuel prices and to demand for improving the welfare of the people living around the CPI facilities.

Even though CPI's oil production is not affected, the development causes a problem for the distribution of its oil. Thus, the entire CPI oil production from Duri Field cannot be delivered to the collecting station in Dumai through the Bangko-Dumai Pipeline.

Based on the assessment results, the damaged pipeline can be repaired in one week, but CPI needs some time to persuade the local residents to end their protest and let it start the required repair. The negotiation between CPI and the local residents is scheduled in a week, but it is quite uncertain whether they can reach an agreement at that time.

3.2 The Response

According to an assessment report, the rupture of the Bangko-Dumai Pipeline has stopped its operation. CPI assumes that it can repair the pipeline in two weeks as it needs a week for persuading the local

residents to end their protest and another week for the actual repair work.

Against this background, the following is the impact of the mentioned rupture on the movement of oil through the pipeline:

- The production of 30-40 thousand barrels of crude oil per day in the Bangko Field is unaffected. However, as the Bangko-Dumai Pipeline cannot transport crude oil, the CPI could store this oil in the slop tanks used for crude oil washing and other storages available around the CPI field instead of refining it in overseas refineries.
- 30-40 thousand barrels of crude oil per day of the Bangko Field cannot be fed to the Dumai Refinery equal to 25-35% of its capacity.
- The affected areas are local, namely Dumai and Siak, which have no alternative supplier of fuels to the Dumai Refinery.
- This incident has decreased the national fuel production such as Mogas, Diesel Oil, Avtur, Kerosene and Lube Oil and it might reduce the inventory limit level at several depots since the Cilacap Refinery is still fully inoperational. It is a critical situation for Indonesia's fuel security having a negative psychological effect on the Government.

Given the Bangko Field is owned and operated by CPI, but it feeds the Dumai Refinery owned and operated by PERTAMINA, both companies will report the incident to the MEMR. Following their report, the MEMR will monitor and evaluate the impact of the resulting oil disruption and coordinate meetings with all the concerned agencies and stakeholders. Being authorized to enforce measures in energy emergencies, the National Energy Council will enforce the required emergency response aimed at reducing negative socio-economic impact of the incident. The Indonesian Government will try to engage the local leaders, including the spiritual ones, and the local NGOs in its negotiations with the local residents to end their blockade of the ruptured-pipeline area and thus let CPI repair the pipeline. The local media centre owned by the Ministry of Communication and Information will be utilized to support the negotiation process. The Government involves itself in this process as it may be difficult for CPI to deal with the local residents and that it seeks a quick resolution to the incident as a means to prevent the occurrence of such incidents. Since this incident has triggered an emergency situation affecting the Indonesian economy, the Government will take all the necessary actions to secure the proper and safe operation of the affected vital infrastructures, including the CPI pipeline. Towards this end, the measures that may be taken by the Indonesian Government to secure adequate energy supplies in the affected areas include the following:

- Supply side:
 - Imposing a temporary export restriction on CPI's Sumatera Light Crude (SLC) and prioritizing the Dumai Refinery for the available crude oil.

- Maximizing other domestic refineries' production.
- Increasing fuel imports.
- Demand side:
 - Implementing more widely the existing demand-side measures enforced in the post Cilacap Refinery incident such as car-pooling.

3.3 Recommendation

- Even though the Indonesian Government has established some laws such as the Energy Law and the Oil and Gas Law prioritizing domestic needs for the available energy supplies, the Government still needs detailed regulations to implement the required action (i.e., energy export restriction), especially in case of domestic supply disruptions.
- Car-pooling as part of the Indonesian Government's emergency response is a good measure for coping with emergency situation. However, its implementation especially at the national scale requires the Government's mandating the Ministry of Transportation to provide the necessary detailed regulations.
- Besides car pooling, the Indonesian Government could implement work time shift, including work at home (telecommuting), in order to reduce the number of motor vehicles on the road at any given time to avoid energy-consuming traffic congestions. It could reduce the consumption of fuels as well.

4. GENERAL RECOMMENDATION

Besides the mentioned specific recommendations related to their respective situations, there are other recommendations, which may help Indonesia improve its emergency response as detailed below should the need arise. In case of an emergency situation, the Indonesian Government should first consider how to collect accurate information on it and how to assess its resulting disruptive impact on the economy's energy security before taking any measure.

- It is also necessary for the Indonesian Government to require situation assessments from the affected region on a regular basis.
- Supply-side recommendations:
 - Indonesia should consider emergency oil stockpiling as a very important means in dealing with emergency situations as releasing stockpiled oil could help the economy immediately cope with shortages caused by such situations.
 - Distribution of oil could be very challenging in emergency situations for Indonesia which consists of many islands. The Indonesian Government should therefore consider tackling

with the shortcomings of its domestic oil distribution infrastructure to cope with emergency situations.

- Demand-side recommendations:
 - It is very important that the Indonesian Government to be the point of dissemination of information to the public on emergency situations through various means such as press releases.
- Since the ASEAN Petroleum Security Agreement (APSA) has been ratified by the ASEAN member states, in case of emergency, if Indonesia still experiences petroleum shortages after implementing short-term measures to reduce the demand on a best endeavor basis, Indonesia can seek help from other ASEAN member states for their supplying petroleum according to the terms and conditions to be negotiated among the appropriate parties in the spirit of assistance. In this case, no undue advantage shall be taken by the concerned ASEAN member states. However, in order to realize the implementation of the APSA, support from the Indonesian Government for establishing Coordinated Emergency Response Measures (CERM) is needed.

APPENDIX A: EXPERT REVIEW TEAM MEMBERS AND APERC SECRETARIAT

The Expert Review Team attended the Indonesia Exercise made up of the following experts from certain energy-concerned regional and international organizations, the APEC Economies and the APERC Secretariat:

No.	Affiliation/Economy	Name	Position
1	International Energy Agency (IEA)	Mr. Yuichiro Nishida	Energy Analyst, Emergency Policy Division
2	ASEAN Centre for Energy (ACE)	Dr. Hardiv H. Situmeang	Executive Director
3	ASEAN Council On Petroleum (ASCOPE)	Mr. Victorino Salvaleon Bala	Secretary-in-Charge
4	Heads of ASEAN Power Utilities/Authorities Council (HAPUA),	Mrs. Chairani Rachmatullah	Expert Working Group 1 HAPUA
5	Economic Research Institute for ASEAN and East Asia (ERIA)	Dr. Phoumin Han	Energy Economist,
6	Indonesia	Dr. Ucok Welo Risma Siagian	Head, Petroleum Engineering Study Group, Bandung Institute of Technology (ITB)
7	Japan	Mr. Yoshinori Satake,	Deputy Director, Petroleum Refining and Reserve Division, Ministry of Economy, Trade and Industry (METI), Japan Expert
8	Korea	Dr. Woonam Seok,	Assistant Research Fellow, Korea Energy Economics

			Institute (KEEI), Korean Expert
9	IEEJ	Dr. Ken Koyama	Managing Director, Chief Economist, In Charge of Strategy Research Unit,
10	IEEJ	Mr. Yoshikazu Kobayashi,	Senior Economist, Manager, Oil Group, Oil Subunit, Fossil Fuels and Electric Power Industry Unit,
11	APERC	Mr. Takato Ojimi	Expert Review Team Leader, President,
12	APERC	Dr. Kazutomo Irie	General Manager
13	APERC	Dr. Hooman Peimani	Research Fellow
14	APERC	Mr. Goichi Komori	Senior Researcher
15	APERC	Mrs. Elvira Torres Gelindon	Senior Researcher
16	APERC	Mr. Chrisnawan Anditya	Researcher

APPENDIX B: INDONESIA'S STAKEHOLDER DELEGATES

INDONESIAN GOVERNMENT OFFICIALS

No.	Affiliation	Name	Position
1	National Energy Council (NEC)	Mr. Bambang Priambodo	Division Head of Energy Crisis Response, Secretariat General of NEC
2	National Energy Council (NEC)	Mr. Dwi Kusumantoro	Head of Facilitation for Energy Crisis Mitigation Sub Division, Secretariat General of NEC
3	National Energy Council (NEC)	Mrs. Sri Sutjiati	Head of Energy Crisis Identification Sub Division, Secretariat General of NEC
4	Coordinating Ministry of Economic Affairs	Mr. Krisna Rahardjo	Head of the Upstream Oil and Gas Division
5	Coordinating Ministry of Economic Affairs	Mr. Hendy Kurnia Perdana	Assistant Deputy Staff member of Oil and Gas
6	Coordinating Ministry of Economic Affairs	Mr. Iwan Niswanto	Assistant Deputy Staff member of Oil and Gas
7	Directorate General of Oil and Gas (DGOG), Ministry of Energy and Mineral Resources	Mr. Heri Poernomo	Secretary
8	Directorate General of Oil and Gas (DGOG), Ministry of Energy and Mineral Resources	Mr. I Gusti Suarnaya Sidemen	Deputy Director of State Revenue of Oil and Gas
9	Directorate General of Oil and Gas (DGOG), Ministry of Energy and Mineral Resources	Mr. Isnaini,	Deputy Director of Transportation of Oil and Gas
10	Directorate General of Oil and Gas (DGOG), Ministry of Energy and	Mr. Fakhruddin,	Section Head of Oil Storage

	Mineral Resources		
11	Directorate General of Oil and Gas (DGOG), Ministry of Energy and Mineral Resources	Mr. Wijayanto	Section Head of Gas Commercial
12	Directorate General of Oil and Gas (DGOG), Ministry of Energy and Mineral Resources	Mr. Ramos	Section Head of Natural Gas Transportation
13	Directorate General of Oil and Gas (DGOG), Ministry of Energy and Mineral Resources	Mr. Sugiarto	Staff member
14	Directorate General of Oil and Gas (DGOG), Ministry of Energy and Mineral Resources	Mr. Agung Kuswardono	Staff member
15	Directorate General of Oil and Gas (DGOG), Ministry of Energy and Mineral Resources	Mr. A. Hermawan,	Staff member
16	Directorate General of Electricity (DGE), Ministry of Energy and Mineral Resources	Mr. Husni Safruddin	Deputy Director of Electricity Supporting Business, Directorate of Electricity Technique and Environment
17	Directorate General of Electricity (DGE), Ministry of Energy and Mineral Resources	Mr. Junifer Simanjuntak	Staff of Directorate of Electricity Technique and Environment
18	Directorate General of New Renewable Energy and Energy Conservation (DGNREEC) Ministry of Energy and Mineral Resources	Mr. Qatro Romandhi	Section Head of Energy Demand Forecast
19	Directorate General of New Renewable Energy and Energy Conservation (DGNREEC) Ministry of Energy and Mineral Resources	Mr. Hudha Wijayanto	Staff of Directorate of Energy Conservation
20	Data and Information Centre of Energy and Mineral Resources Ministry of Energy and Mineral Resources	Mr. Agus Supriadi	Staff of Energy Data and Information

21	Ministry of Transportation	Mr. Abdul Majid	Staff of Maintenance Transportation Means Supervision Section
22	Ministry of Finance	Mr. T. Supriadi. S	Staff of Directorate General of Budget
23	Ministry of Interior	Mr. Sudiyanto	Head of Administration Sub Division, Directorate General of Public Administration
24	Special Task Force for Upstream Oil and Gas Business Activities (SKKMIGAS)	Mr. Yogi Arsianto	Data Administrator
25	Regulatory Agency for Downstream Oil and Gas Business Activities (BPH MIGAS)	Mr. Sandi Asmarajaya	Tariff Analyst

ENERGY COMPANIES

No.	Affiliation	Name	Position
1	State Owned Oil and Gas Company (PT PERTAMINA (Persero))	Mrs. Lyrana Sosro Husodo	Assistant Manager Crude Import
2	State Owned Oil and Gas Company (PT PERTAMINA (Persero))	Mr. Kiagus Muhammad Syahid Nurhaznan	Assistant Fuel Demand and Import Planning
3	State Owned Oil and Gas Company (PT PERTAMINA (Persero))	Mr. Suhendar Wijaya	Fire Protection Expert, Vice President of Health, Safety and Environment (HSE)
4	State Owned Oil and Gas Company (PT PERTAMINA (Persero))	Mr. Bengki Astono N	Manager of Port Management and Regulation
5	State Owned Oil and Gas Company (PT PERTAMINA (Persero))	Mr. Zahrizal Zaili	Integrated Supply Planning, Long-term Downstream Analyst
6	State Owned Oil and Gas Company (PT PERTAMINA (Persero))	Mr. Bagus Indarto	Head of Health, Safety and Environment (HSE), Area Manager of

			Maluku and Papua
7	State Owned Oil and Gas Company (PT PERTAMINA (Persero))	Mr. Alfian Nasution	Vice President of Supply and Distribution
8	State Owned Oil and Gas Company (PT PERTAMINA (Persero))	Mr. Firmano SK	Assistant Manager Sea Supply, Department of Supply Chain Manager
9	State Owned Oil and Gas Company (PT PERTAMINA (Persero))	Mr. Surya Gumawan	
10	State Owned Oil and Gas Company (PT PERTAMINA (Persero))	Mr. Setiawan	
11	State Owned Oil and Gas Company (PT PERTAMINA (Persero))	Mr. Ekwanto	
12	State Owned National Gas Company (PT PGN)	Mr. Cahyo Triyogo	Coordinator of Vice President Infrastructure
13	State Owned National Gas Company (PT PGN)	Mrs. Ivanna Syahrial	Vice President Gas Supply
14	State Owned National Gas Company (PT PGN)	Mr. Listio Sambon,	Assistant Vice President of Gas Supply Planning
15	State Owned National Gas Company (PT PGN)	Mrs. Patricia Dwi Putri	Assistant Vice President of Gas Supply
16	PT. Chevron Pacific Indonesia	Mr. Yong Ardinal	Manager Safety & OH
17	Santos	Mr. Gunadi	Security Manager
18	Premier Oil Indonesia	Mr. J. Agung Seno	HSE MS Coordinator & Emergency Response Technical Authority
19	PT Medco Sarana Kalibaru	Mr. Nasri	

ENERGY ASSOCIATIONS

No.	Affiliation	Name	Position
1	Indonesia Entrepreneur Association for Oil and Gas Downstream (HISWANA MIGAS)	Mr. Heddy	Central Board Member of HISWANA MIGAS
2	Indonesia Oil and Gas Community (KMI)	Mr. Herry Putranto	Executive Director

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APPENDIX D: USEFUL LINKS

- Chevron Pacific Indonesia (CPI) ó www.chevron.com/countries/indonesia
- Coordinating Ministry of Economic Affairs (Kemenkoperek) ó www.ekon.go.id
- Data and Information Centre of Energy and Mineral Resources (Pusdatin ESDM) ó pti.pusdatin.esdm.go.id
- Directorate General of Electricity (DJK) ó www.djlpe.esdm.go.id
- Directorate General of New Renewable Energy and Energy Conservation (DJEBTKE) ó www.ebtke.esdm.go.id
- Directorate General of Oil and Gas (DJMIGAS) ó www.migas.esdm.go.id
- Ministry of Energy and Mineral Resources (KESDM) ó www.esdm.go.id
- Ministry of Finance (Kemenkeu) ó www.kemenkeu.go.id
- Ministry of Home Affairs (Kemendagri) ó www.kemendagri.go.id
- Ministry of Transportation (Kemhub) ó www.dephub.go.id
- National Energy Council (DEN) ó www.den.go.id
- Premier Oil Indonesia ó www.premier-oil.com/premieroil/operations/indonesia
- Regulatory Agency for Downstream Oil and Gas Business Activities (BPH MIGAS)
- Special Task Force for Upstream Oil and Gas Business Activities (SKK MIGAS) ó www.skkmigas.go.id
- State Owned Oil and Gas Company (PT PERTAMINA (Persero)) ó www.pertamina.com
- State Owned National Gas Company (PT PGN) ó www.pgn.co.id
- Santos ó www.santos.com/exploration-acreage/production-processing/indonesia.aspx

Chapter 5
Major Challenge to Oil and Gas
Security in the APEC Region

There are certain energy-related issues in the APEC region posing different types of challenges to oil and gas security of the regional economies. Some of them are existent and thus require immediate attention while others are potential and therefore should be given consideration by the APEC economies. Given there is a variety of differences between the APEC economies in terms of their energy requirements, energy mixes, means of supply of energy, geographical locations and financial/economic resources, for instance, these challenges may or may not affect all the economies at any given time and their impact may vary from one economy to another. Examples of major conceivable challenges are as follows.

1. Potential impact of instability in the Middle East on APEC's oil and gas security

The Middle East houses the world's major oil and gas-producing countries of which the majority are in the Persian Gulf (Iran, Iraq, Kuwait, Oman, Saudi Arabia, Qatar, UAE and Bahrain¹¹²) and the rest are in North Africa (Algeria, Egypt, Libya, and Sudan/South Sudan). It is the APEC region's largest supplier of oil and gas (LNG) as evident in its oil and LNG exports to the region, 8.173 million barrels per day (mbpd)¹¹³ in 2011 and 57.69 million tons (mt)¹¹⁴ in 2012, respectively.¹¹⁵

The region is the single major oil and LNG-supplier to many APEC economies, including its largest ones (China, Japan, Republic of Korea, United States and Chinese Taipei). Based on the 2012 statistics, the region's vast oil reserves, 807.7 billion barrels (bb),¹¹⁶ and gas deposits, 80.8 trillion cubic metres (tcm),¹¹⁷ will ensure that it will outlive other oil and gas-producing regions as a major exporter of these fuels and thus will remain the major supplier of oil and gas (LNG) to the APEC economies. However, there are certain factors, which raise questions about the region's ability to continue its supplying role in a sustainable and predictable manner as follows.

Being prone to instability in different forms, the region has experienced major upheavals to affect its oil and gas exports especially since 2010. The so-called Arab Spring has so far engulfed two North

¹¹² Bahrain is no longer a major oil exporter as its oil reserves have significantly reduced to decrease its oil exports substantially.

¹¹³ APERC (2013), "APEC Oil Supply 2011," *Preliminary Survey on Oil and Gas Security in the APEC Region*, Presentation by APERC Researcher Dmitry Sokolov, *The 1st APEC Oil and Gas Security Forum*, 18 April 2013, Tokyo, Japan, p. 10.

¹¹⁴ *Ibid.*, APEC LNG Supply Matrix (2012), p. 18.

¹¹⁵ Statistics on the Middle East's both oil and gas exports to the APEC region for 2011 or 2012 are unavailable.

¹¹⁶ BP (2013), "Oil: Proved Reserves," *BP Statistical Review of World Energy June 2013*, p. 6, http://www.bp.com/content/dam/bp/pdf/statistical-review/statistical_review_of_world_energy_2013.pdf

¹¹⁷ *Ibid.*, "Natural Gas: Proved Reserves," p. 20, http://www.bp.com/content/dam/bp/pdf/statistical-review/statistical_review_of_world_energy_2013.pdf

African oil and gas/LNG producers, namely Egypt and Libya, and Yemen (an oil/LNG-exporting country in close proximity of the Persian Gulf) which have resulted in disruptions in their oil and LNG exports. For example, Libya's oil and gas exports substantially decreased in 2011 owing to a phenomenal reduction in its oil production from 1.659 mbpd in 2010 to 0.479 mbpd 2011.¹¹⁸ This situation will likely last in the foreseeable future given the continuity of political unrests and armed conflicts in these countries. However, the 'Arab Spring' could well expand to the Arab oil/gas-producing countries of the Persian Gulf thanks to the existence of a suitable ground for such expansion as evident in the rise of various types of political dissent in 2011 in Saudi Arabia¹¹⁹, the UAE,¹²⁰ Kuwait and Bahrain¹²¹ all of which were suppressed by force. In Kuwait, for example, the mass protests escalated to the storming of the parliament in November 2011, which led to the Kuwaiti prime minister's resignation.¹²² Yet, such dissent has survived up to this date in different forms in Bahrain,¹²³ which hints at the possibility of the re-emergence of the 'Arab Spring' in the Arab Persian Gulf-oil and gas exporters.

The 'Arab Spring' has so far spared another Arab Persian Gulf major oil-producer, Iraq. However, the country experienced a sharp drop in its oil production and exports in the aftermath of the 2003 allied invasion of Iraq, which lasted for about a decade due to many factors, especially the continued armed conflict in that country. Today, Iraq has restored its pre-conflict production (3.115 mbpd in 2012 from 0.144 mbpd bpd in 2003)¹²⁴ and export capabilities (2.423 mbpd in 2012)¹²⁵ but its ongoing armed conflict whose end is simply unpredictable has raised doubts about the sustainability of such realized capabilities. Additionally, civil war in its neighbouring Syria whose end is not insight in the foreseeable future could well expand to Iraq to worsen its security situation and damage its export capability.

¹¹⁸ BP (2013), 'Oil: Production', p. 8,

http://www.bp.com/content/dam/bp/pdf/statistical-review/statistical_review_of_world_energy_2013.pdf

¹¹⁹ Robert Fisk, 'Saudis Mobilise Thousands of Troops to Quell Growing Revolt', *The Independent*, 5 May 2011, <http://www.independent.co.uk/news/world/middle-east/saudis-mobilise-thousands-of-troops-to- quell-growing-revolt-2232928.html>

¹²⁰ 'Arrested UAE blogger accused of possessing alcohol', *Reuters*, 12 April 2011, <http://www.reuters.com/article/2011/04/12/us-emirates-activists-idUSTRE73B2EP20110412>

¹²¹ 'Bahrain Mourners Call for End to Monarchy', *The Guardian*, 18 February 2011, <http://www.theguardian.com/world/2011/feb/18/bahrain-mourners-call-downfall-monarchy>

¹²² BBC, 'Kuwait Prime Minister Resigns after Protests', 28 November 2011, <http://www.bbc.co.uk/news/world-middle-east-15931526>

¹²³ For recent manifestations of the 'Arab Spring' in Bahrain, see, for example: 'Bahrain News-The Protests', *The New York Times*, 10 February 2014, <http://topics.nytimes.com/top/news/international/countriesandterritories/bahrain/>

¹²⁴ BP (2013), 'Oil: Production', p. 8, http://www.bp.com/content/dam/bp/pdf/statistical-review/statistical_review_of_world_energy_2013.pdf

¹²⁵ OPEC (2013), 'Table 13.8: Oil and Gas Data -World Crude Oil Exports by Country (1000 b/d)', *Annual Statistical Bulletin 2013*, p. 49, http://www.opec.org/opec_web/static_files_project/media/downloads/publications/ASB2013.pdf

Having the world's third largest conventional oil and first largest gas reserves, Iran's dispute with the Western countries over its nuclear energy program has sharply decreased its production and exports of crude oil especially because of certain sanctions imposed by the United States and the European Union on Iran targeting its oil and gas industries, among others. The November 2013 preliminary agreement between Iran and the 5+1 group has decreased the possibility of a military conflict in the Persian Gulf geared to its nuclear program. Nevertheless, it is still uncertain whether the agreement will lead to settling its disputes with the Western countries once for ever, the removal of all the sanctions affecting its oil and gas industries and the elimination of the possibility of a major armed conflict in the Persian Gulf. As well, it is uncertain whether Iran can restore its pre-sanction export capability in a short period of time once the sanctions are lifted. Given its current major oil importers are exclusively Asian and mainly APEC economies (China, Japan, South Korea, Taiwan and India; 700,000 bpd in June 2013,¹²⁶ about one third of its 2.102 mbpd exports in 2012)¹²⁷ thanks to the European Union countries ending their imports from Iran in 2013, major fluctuations in its oil export capability will have a direct significant impact on the APEC region.

After years of civil war, Sudan was divided in two countries (Sudan and South Sudan) in July of 2011. The development has not yet brought peace and stability to the two countries as both are facing various types of armed conflicts. This is especially true for South Sudan containing the bulk of former Sudan's oil reserves. The two Sudan's ability to honour their energy-export commitments to their APEC consumers is simply uncertain today and will remain so in the predictable future. Pitting forces loyal to South Sudanese President Salvar Kiir against those loyal to ex-Vice President Reik Machar, the ongoing civil war in South Sudan, which started in December 2013, could seriously affect its piped oil exports via Sudan's Red Sea ports.¹²⁸ This development provides grounds for the mentioned uncertainty.

In short, the Middle East is vital for APEC's oil and gas security and will remain so in the foreseeable future. However, the mentioned factors may result in major fluctuations in the region's oil and gas-export capability to affect the availability of such supplies in the APEC economies depending on Middle Eastern oil and LNG imports.

¹²⁶ 'Sanctions Push Iran's Oil Exports to Lowest in Decades,' *Reuters*, 5 June 2013,

<http://www.reuters.com/article/2013/06/05/us-asia-iran-oil-idUSBRE9540FV20130605>

¹²⁷ OPEC, 'Table 13.8: Oil and Gas Data -World Crude Oil Exports by Country (1000 b/d),'

http://www.opec.org/opec_web/static_files_project/media/downloads/publications/ASB2013.pdf

¹²⁸ BBC, 'South Sudan Conflict Spreading around the Country,' 24 December 2013,

<http://www.bbc.co.uk/news/world-africa-25504554>; BBC, 'South Sudan Conflict: 3.7m in Need of Food,' Says UN, 1 February 2014, <http://www.bbc.co.uk/news/world-africa-26004268>

2. Depletion of the regional fossil energy reserves and resource nationalism (threat to the intra-regional oil/gas supplies): threat to APEC's objective of cross border energy networks and interconnections

The APEC region is still heavily dependent on fossil energy despite significant efforts to decrease such reliance. The bulk of the regional demand in especially oil and gas, respectively, 1,893 million tons of oil equivalent (mtoe) and 667 mtoe in 2010,¹²⁹ is met through imports from other regions while the rest is satisfied by the regional oil/gas-producing economies (Australia, Canada, Brunei, Indonesia, Malaysia and Russia) supplying other APEC economies to a varying extent after meeting their own energy needs. Yet, their resources have been depleting rapidly to the extent that some of these economies have become dependent to different extents on imports to meet their energy needs (e.g., Indonesia on oil and Malaysia on coal and oil).

Resource nationalism could well be a challenge to oil and gas security in the APEC region. In this case, real or perceived concerns about loss of energy resources of a regional energy exporting-economy through exports to other regional economies when those resources are needed at home could kindle nationalist sentiments to result in ending or limiting such exports. This could take the form of a governmental decision out of concern for oil/gas shortages in a predictable period of time or a popular act to stop oil/gas exports, which could then lead to a governmental decision to that effect.

Apart from damaging inter-state relations between the concerned energy-exporting and energy-importing economies with a potential of escalation to conflicts, this would have a negative impact on the importing economies' energy security, in general, and oil and gas security, in particular. The following incident revealed its potential in the region.

In 2008, the regional assembly of Batam, Indonesia, threatened to cut gas exports through the ConocoPhillips pipeline to Singapore routed via Batam.¹³⁰ The source of the Batam Authority's ire was that they felt that the Indonesian central government had been increasing its natural gas supplies to Singapore at the expense of Batam when it should have given priority to it rather than Singapore.

Briefly, nationalistic fervours geared to energy may hinder the APEC energy-exporting economies from honouring any regional and/or bilateral energy agreements that have been made in the APEC region.

¹²⁹ APERC (2013), *APEC Energy Supply and Demand Outlook - Fifth Edition*, Tokyo, Japan, p. 16, http://aperc.iej.or.jp/publications/reports/outlook/5th/volume1/EDSO5_V1_C2_Overview.pdf

¹³⁰ "Batam Threatens to Block Indonesian Gas Flow to Singapore," *AsiaPulse News*, 6 May 2008. (<http://www.highbeam.com/doc/1G1-178663116.html>)

3. Potential of unconventional oil and gas: Challenges and opportunities

The ongoing development of certain unconventional oil and gas resources has significantly increased the volume of the recoverable oil and gas. Three APEC economies have pioneered large-scale shale gas (United States), oil sands (Canada) and coal-bed methane (Australia) production with an impact on both availability and pricing of oil and gas to a varying extent. This development has been especially significant in the first two cases as the United States and Canada are currently the only large-scale producer of shale gas (127.88 mtoe in 2010)¹³¹ and oil sands (1.6 mbpd in 2010),¹³² respectively. The 'shale gas revolution' has changed the status of the United States from a major importer of gas (piped and LNG) to a large economy nearing self-sufficiency in gas production; it will soon become fully self-sufficient and may well develop a capability to export gas significantly according to various projections. In the case of Canada, oil sands have increased its oil reserves phenomenally (from 4 bb to 173bb based on the 2010 statistics)¹³³, and their production has enabled the economy to become a major oil-exporter targeting the American market.

While the 'unconventional oil and gas revolution' has helped the mentioned economies achieve oil and gas security and develop (Australia and Canada) or potentially develop (USA) capabilities to export oil and gas from their unconventional oil and gas reserves, there are questions about the sustainability of shale gas and oil sands production arising from environmental and financial concerns among others.¹³⁴ Hence, identifying such concerns and testing their validity could well reveal whether large-scale shale gas and oil sands production could continue as a means to address the concerned economies' oil and gas security and whether other economies with untapped unconventional oil and gas reserves could develop them to that end as well.

¹³¹ This amount is calculated based on the data provided in the following source indicating the share of the shale gas of the total American gas production in 2010 (556 mtoe) to be 23%. APERC (2012), 'The United States', *APEC Energy Overview 2012*, Tokyo, Japan, p. 225,

http://aperc.iecej.or.jp/file/2013/6/28/APEC_Energy_Overview_2012.pdf

¹³² APERC (2012), 'Canada', *APEC Energy Overview 2012*, Tokyo, Japan, p. 29,

http://aperc.iecej.or.jp/file/2013/6/28/APEC_Energy_Overview_2012.pdf

¹³³ Ibid.

¹³⁴ For example, various arguments questioning the sustainability of shale gas production include concerns about the negative impact of fracking (Hydraulic fracturing) on depleting water resources. See, for example: Suzanne Goldenberg, 'Fracking Is Depleting Water Supplies in America's Driest Areas, Report Shows', *The Guardian*, 5 February 2014,

<http://www.theguardian.com/environment/2014/feb/05/fracking-water-america-drought-oil-gas>

4. Central Asia's growing role as an energy supplier to China and potential threats to its supplying role

Central Asia has emerged as a major oil and particularly gas-supplying region to APEC due to its large and growing exports to its neighboring China. Three of its five forming countries have large oil and/or gas resources to enable them to supply China while honoring their oil and gas exports to non-APEC countries. Having large oil reserves (30 bb),¹³⁵ Kazakhstan has been exporting oil to China (currently 14 mt a year)¹³⁶ via the Kazakhstan-China Oil Pipeline since 2006. Turkmenistan, which has the region's largest gas reserves (17.5 tcm), along with Uzbekistan (1.1 tcm) and Kazakhstan (1.3 tcm)¹³⁷ have been exporting gas to China since 2009 as part of their joint project through a pipeline passing through Uzbekistan and Kazakhstan (Central Asian Gas Pipeline also known as Central Asia-China Gas Pipeline). Once its Line C goes on line in 2014, the pipeline will have the capacity to supply up to 65 bcm of gas to China annually.¹³⁸ The three Central Asian countries have other agreements with China to increase their gas exports to it.

Briefly, Central Asia's continued ability to supply China in a sustainable manner is crucial for China's oil and gas security as the region is a major supplier to that APEC economy. The region's supplying role will become even more significant in the near future owing to the mentioned agreements. However, there are certain political, economic, social and military/security factors, which could undermine the region's ability to honour its oil and gas export commitments to China. Identifying these factors are important for the affected economy to help prevent them or, at least, have contingency plans should the need arise.

¹³⁵ BP (2013), "Oil: Proved Reserves," p. 6,

http://www.bp.com/content/dam/bp/pdf/statistical-review/statistical_review_of_world_energy_2013.pdf

¹³⁶ Energy Global (2012), *Kazakhstan-China oil pipeline could start operating at its full capacity by 2014*, 9 November 2012,

http://www.energyglobal.com/news/pipelines/articles/Kazakhstan_to_China_oil_pipeline_could_start_operating_at_its_full_capacity_by_2014.aspx

¹³⁷ Ibid., "Natural Gas: Proved Reserves," p. 20,

http://www.bp.com/content/dam/bp/pdf/statistical-review/statistical_review_of_world_energy_2013.pdf

¹³⁸ Consisting of three lines (A, B and C), the first two lines were completed in 2009 and 2010, respectively, to provide for 40 bcm of gas exports to China.

"Central Asia-China Gas Pipeline, Turkmenistan to China," *Hydrocarbons.com*,

<http://www.hydrocarbons-technology.com/projects/centralasiachinagasp/>

Line C whose construction started in 2012 will increase the pipeline's capacity by 25 bcm. Pipelines International (March 2012), *Construction on third line begins for Central Asia-China Gas Pipeline*,

http://pipelinesinternational.com/news/construction_on_third_line_begins_for_central_asia-china_gas_pipeline/066998/

5. The Arctic's melting impact on APEC's oil and gas security: Challenges and opportunities

The Arctic ice has been melting because of global warming caused by greenhouse gases (GHG), particularly CO₂, whose main source of emission has been heavy consumption of CO₂-emitting fossil energy (oil, gas and coal) for over two centuries. The phenomenon, if it continues, will have a wide range of devastating environmental impact on the entire planet, including rising sea-levels to affect all the countries sharing a coastline with open seas, including all the APEC economies, and worsening global warming. Yet, this environmentally-disastrous phenomenon may unlock vast oil and gas reserves of the region estimated at 13% (90 bb) of the world's undiscovered conventional oil resources and 30% (47.289 tcm) of its undiscovered conventional natural gas reserves by making oil/gas exploration in certain areas feasible.¹³⁹ While extensive oil/gas exploration will likely contribute to the worsening of the Arctic's fragile environment, it will turn the Arctic region into a major supplier of oil and gas to increase the global supply of such fuels and affect their prices. This development will certainly have a significant impact on the APEC region for certain reasons. They include some APEC economies sharing borders with the Arctic region (Canada, Russia and USA) have existing oil/gas extraction in the region to a varying extent (Russia and USA) and have or could have plans to increase such operations in other parts of the Arctic within their special economic zone (SEZ), e.g., Russia; many APEC economies are large consumer of such energy and/or import large and growing amount of them.

Opportunities: Extensive extraction of the Arctic's oil and gas will increase the global supply of these fuels and increase the availability of such supplies for the APEC economies depending on oil and gas (LNG) imports, especially those with large and growing imports. Provided the realization of the latter, it will decrease dependency on the Middle East to some extent determined by the volume and the sustainability of the Arctic-produced oil and gas (LNG) to the APEC economies and help sustain oil and gas (LNG) prices (by preventing drastic price hikes) or decrease oil and gas prices to some extent.

Challenges: Efforts to extract oil and gas at a large-scale in the Arctic region could give rise to certain challenges as follows. They could contribute to competition between and among the APEC economies sharing borders with the Arctic and have proven or potential oil/gas reserves in their SEZ (Canada, Russia and USA). As well, they could contribute to competition between the latter and other Arctic countries sharing border with the region (Norway and Denmark through its autonomous Greenland) and also

¹³⁹ EIA (2012), "Arctic Oil and Natural Gas Resources," *Today in Energy*, 20 January 2012, <http://www.eia.gov/todayinenergy/detail.cfm?id=4650>; Christian Larson, "The Great Arctic Energy Grab," *Bloomberg*, 13 December 2013, <http://www.businessweek.com/articles/2013-12-13/the-great-arctic-energy-grab>

The amount of gas in tcm has been calculated by converting the source's provided figure in cubic feet (1,670 t cubic feet) into tcm.

Iceland, Sweden and Finland located in the Arctic's close proximity all of which (excluding Iceland and Norway) are the European Union members.

Territorial disputes (claims to parts of the Arctic region) have been settled partly between some of the Arctic countries (e.g., Norway and Russia). However, there are unsettled overlapping claims to parts of the region with potential or proved oil gas reserves,¹⁴⁰ which could escalate to inter-state disputes or prevent, slow down or limit the development of certain oil/gas reserves to which there are unsettled multiple territorial claims. The latter could deprive the APEC economies from the mentioned energy benefits.

Extensive oil/gas extraction in the Arctic whose environment is fragile would worsen its fragility and speed up its melting with the mentioned global and regional (APEC) challenges. Such environmental challenges could affect oil/gas security of those APEC economies depending on oil/gas imports, e.g., rising sea levels, if continued, would likely affect oil and gas import/export ports/terminals to interrupt or disrupt their operation and/or increase their operational cost by requiring major modifications to make them immune to rising sea-levels.

6. Potential impact of the security-challenged economies on the TAGP (Trans-ASEAN Gas Project) project and energy security of APEC's seven ASEAN economies (threat to APEC's objective of the regional cross border energy networks and interconnections)

Some of the APEC economies are facing security challenges (e.g., terrorist activities and armed insurgencies) to a varying extent (Indonesia, Philippines and Thailand) with a major potential impact on their oil and gas security and that of other APEC economies depending on oil and gas imports from or through them. This is especially evident in the ASEAN region housing seven APEC economies. The governments of three non-APEC economies, namely the Lao PDR, Cambodia and Myanmar, as well as those of four APEC economies, i.e., Malaysia, Thailand, Indonesia and the Philippines, are facing challenges to a differing extent to their sovereignty over their entire territories due to periodic and/or continued cross-border military clashes with their neighbours, armed insurgencies, terrorist activities and/or separatist movements in their countries.¹⁴¹ In case of their failing to maintain control over parts of their territories, the affected regional economies' governments will likely be unable to honour their foreign trade agreements, including those on cross border energy exports with their neighbours. This

¹⁴⁰ EIA (2012), 'Arctic Oil and Natural Gas Resources', *Today in Energy*, 20 January 2012, <http://www.eia.gov/todayinenergy/detail.cfm?id=4650>

¹⁴¹ For example, both the Philippines and Thailand have been facing armed separatist movements (*The Moros of Southern Philippines and the Malays of Southern Thailand, respectively*) while Malaysia and Indonesia have suffered from terrorist activities.

could inevitably result in the energy insecurity of the APEC economies depending on imports from the affected economies.

As an important Southeast Asian gas project, the TAGP (Trans óASEAN Gas Pipeline) could be affected because of the mentioned development. Among other reasons, the project is necessary for the development of the regional gas infrastructure to secure supplies to the existing gas-fired power plants. By helping the availability of gas supplies beyond the region's immediate requirements, it is also necessary to help accelerate the construction of new ones that can be useful during oil emergency situations affecting the regional oil-fired power plants.

The TAGP project passes through certain ASEAN countries (e.g., Thailand, Indonesia, the Lao PDR, Cambodia, Vietnam, Singapore and Malaysia) of which five are APEC members and the future projects will connect the rest to the ASEAN region's gas network. Of course, the TAGP will face a host of non-security challenges during its life span, e.g., long-term security, availability and reliability of gas supply under increasing demand, including from unconventional sources, technical (standards and codes), institutional and regulatory frameworks, financial, including long-term investment, access/use of transit rights, health and safety and environmental issues.

Apart from these challenges, as a possibility, future internal or cross-border conflicts affecting the mentioned economies could potentially stop the flow of gas through the TAGP to negatively affect the regional energy security, particularly gas security.

7. Threats to oil/gas pipeline safety/security as the North-East Asian APEC economies are becoming increasingly dependent on piped oil and especially gas imports

The APEC region has relied on its fossil energy resources to meet a declining portion of its energy requirements in especially oil and gas as the regional resources are depleting. The growing portion of the regional oil and gas needs has been satisfied by imports mainly by sea (oil and LNG tankers). However, pipelines have been growing importance in meeting the regional needs especially for the APEC region's largest energy consumer, China. Three major gas pipeline lines of which two are in use and the third one will go on line in 2014 will enable China to import annually up to 65 billion cubic metres (bcm) of gas from Kazakhstan, Uzbekistan and, primarily, Turkmenistan through the Central Asian Gas Pipeline, as mentioned earlier. China has also been importing since 2006 a significant amount of oil from

Kazakhstan (14 mt a year) via the Kazakhstan-China Oil Pipeline.¹⁴² Such large imports, which may well further increase due to China's growing need for imported oil and gas will increase the importance of pipelines for China's oil and gas security.

Certain ongoing projects increase or will further increase the importance of land imports of oil and gas via pipelines for China. These are China's ongoing imports of Russian oil (300,000 bpd) via a branch pipeline of the East Siberia-Pacific Ocean Pipeline (ESPO),¹⁴³ as well as its piped gas imports from Myanmar and its partial imports of its large Middle Eastern and African oil imports via a pipeline passing through Myanmar both since October 2013.¹⁴⁴ The Myanmar oil pipeline is meant to bypass the Strait of Malacca for Chinese oil imports, which could be partially or completely blocked due to different types of hostilities (e.g., military conflicts, terrorist activities and piracy).

Other large APEC economies (Japan and South Korea) do not import fuels via pipelines due to their geographical situation. However, they are also stakeholders in pipeline security as they import part of their oil requirements via the ESPO, which feeds oil tankers supplying them.¹⁴⁵

Under certain circumstances, these pipelines could become non-operational due to natural (e.g., extremely cold weather) and/or human-made (e.g., sabotage and accidents) threats to affect the oil and gas security of the APEC economies depending on oil and gas imports.

Based on the above-mentioned challenges, emergency scenarios in the APEC region could be developed.

¹⁴² Energy Global (2012), *Kazakhstan-China oil pipeline could start operating at its full capacity by 2014*, 9 November 2012, http://www.energyglobal.com/news/pipelines/articles/Kazakhstan_to_China_oil_pipeline_could_start_operating_at_its_full_capacity_by_2014.aspx

¹⁴³ "Russia in Milestone Oil Pipeline Supply to China," *Asharq Al-Awsat*, 1 January 2011, <http://www.aawsat.net/2011/01/article55248059>

¹⁴⁴ Aung Shin, "Conventional Pipeline Now Fully Operational," *The Myanmar Times*, 27 October 2013, <http://www.mmtimes.com/index.php/business/8583-controversial-pipeline-now-fully-operational.html>

¹⁴⁵ The pipeline meant to supply the Asia-Pacific region by feeding tankers destined for the major regional oil importers (e.g., Japan and South Korea) became operational in 2012.

Chapter 6

Possible Future Activities for Oil and Gas Security in APEC

– Proposal of APEC Oil and Gas Security Initiative (OGSI) –

Given the existing and emerging challenges to oil and gas security in the APEC region, activities for oil and gas security by APEC should be continued in the future. **The APEC Oil and Gas Security Initiative (OGSI)** should succeed the APEC Oil and Gas Security Exercises (OGSE). The OGSI will address various issues relating to APEC oil and gas security and will consist of three overarching activities:

1. Voluntary Implementation of Oil and Gas Security Exercise (OGSE) by APEC Economies

1) APEC Economies (especially developing Economies) demand for energy, - oil and natural gas in particular continues to rapidly grow. However, the international energy situation is not so stable and no one can be optimistic about improved stability. Additionally, increasingly frequent natural disasters can cause sudden disruptions to energy supply. Accordingly, APEC Economies should continue to carry out security exercises in order to improve their emergency preparedness.

2) Based on APERC's experience in APEC Oil and Gas Security Exercises in Bangkok and Jakarta, such exercises are often difficult to organize for international organizations like APERC, as they inevitably involve sensitive information related to national security.

3) Therefore, APEC should strongly encourage APEC Economies to **implement the Oil and Gas Security Exercise (OGSE) voluntarily.**

4) In order to facilitate this voluntary Exercise, APERC will **establish an "Oil and Gas Security Exercise Model Procedure (EMP)"** based upon its experience with the APEC Oil and Gas Security Exercises, and supply the EMP to each Economy.

5) APERC will also **dispatch APERC researchers and/or registered experts from IEA, ASEAN institutions, IEEJ, etc.** upon the request of each Economy, as far as APERC budget allows, in order to assist the voluntary Exercise.

2. Establish the APEC Oil and Gas Security Network (OGSN)

1) In order to improve oil and gas security, information exchange among APEC Economies is very useful, particularly in emergency situations. However, there are certain constraints due to national security considerations.

2) While the Real-Time Emergency Information Sharing System (RTEIS) still exists, it needs

fundamental reforms. For example, information on petroleum prices supplied by RTEIS is easily available through other media. A chat system of RTEIS has not been utilized, partly due to the busy schedules of APEC Economies' senior officials, who are expected to use the chat system.

3) Therefore, instead of RTEIS, it is better to establish an APEC Oil and Gas Security Network (OGSN) in order to encourage information sharing and transmission through a mailing list. In principle, members of OGSN are government officials responsible for policy related to oil and gas security in each Economy. They will be nominated by the member of Energy Working Group (EWG) of respective Economy.

4) APERC undertakes the secretariat role for the OGSN. APERC will maintain the mailing list of OGSN once a month, and publish the OGSN Newsletter monthly for OGSN members and EWG members in order to transmit updated information on oil and gas security. A special issue of OGSN Newsletter may be published when any urgent topic for stable supply of oil and natural gas arises.

5) APERC will hold the OGSN Forum in principle once a year by funding from its budget. During the Forum, delegates from each Economy will share information and exchange views on oil and gas security and also jointly discuss how to improve emergency preparedness. For the time being, the Forum will be held in Japan, but other Economies are welcome to volunteer to host it.

3. Publish the Oil and Gas Security Studies (OGSS)

1) APERC will research issues related to oil and gas security and publish one or two reports per year as part of the Oil and Gas Security Studies (OGSS) series. The OGSS series will be presented at OGSN Forum and uploaded to APERC's homepage. A limited number of prints will be distributed to APEC EWG members.

2) Examples of research themes for the OGSS Series will include:

[Resources issues]

The potential impact of political and social instability in the Middle East on APEC's oil and gas security;

The depletion of conventional oil and gas resources in the APEC region and the danger of 'resource nationalism';

The amendment of the Mexican Constitution and its impact on upstream development of oil and gas;

The challenge and potential of unconventional oil and gas resources;

[Distribution issues]

The contribution to energy security by the ASEAN Gas Pipelines;

The increase in natural gas utilization in China by gas pipelines with the Central Asia;

The supply disruption risk of oil and gas in sea lanes and the possible responding measures;

The impact of Arctic melting on new opportunities for oil and gas resources and trade routes;

The contribution to energy security from an internationally connected power grid;

[Stockpiling and interchange issues]

The current situation of oil and gas storage in the APEC region and the possibility of building a stockpile system;

The Implementation of ASEAN Petroleum Security Agreement (APSA) and the possibility to expand it to the whole APEC region;

The possibility of LNG interchanging system for gas supply security in ASEAN countries;

[Alternative energy issues]

The current situation and problems of nuclear energy development in the APEC region as an alternative power source to oil and gas thermal power;

The feasibility of Integrated Fast Reactor (IFR) and its impact on the supply and demand situation of oil and gas;

APPENDIX A
The List of Participants in the 1st Oil and Gas Security Forum
(18-19 April 2013, Tokyo, Japan)

Experts

No.	Affiliation/Economy	Name	Position
1	International Energy Agency (IEA)	Mr. Keisuke Sadamori	Director, Directorate of Energy Markets and Security
2	International Energy Agency (IEA)	Mr. Cuauhtemoc Lopez-Bassols	Senior Energy Analyst, Energy Policy Division
3	ASEAN Centre for Energy (ACE)	Dr. Hardiv Harris Situmeang	Executive Director
4	ASEAN Council on Petroleum (ASCOPE)	Mr. Victorino Salvaleon Bala	Secretary-In-charge
5	Heads of ASEAN Power Utilities/Authorities(HAPUA)	Mr. Mustiko Bawono	Chairman of Working Group I
6	Economic Research Institute for ASEAN and East Asia (ERIA)	Dr. Phoumin Han	Energy Economist
7	Indonesia	Mr. I Gusti Suarnaya Sidemen	Deputy Director, Directorate General Oil and Gas Ministry of Energy and Mineral Resources
8	Japan	Mr. Ken Watanabe	Director, Petroleum Refining and Reserve Division, Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry (METI)
9	Thailand	Dr. Sarawut Kaewtathip	Acting Executive Director, Policy and Strategy Management Office, Ministry of Energy,
10	U.S.	Mr. David Johnson	Senior Advisor for Global Energy Security, Department of Energy, Fossil Energy

Delegates

No.	Economy	Name	Position/Affiliation
1	Australia	Ms. Robyn Gai Casey	Director, Liquid Fuel Security, Department of Resources, Energy and Tourism
2	Chile	Mr. Francisco Javier Peralta Cortes	Coordinator of the Oil and Gas Security of Supply Division, Ministry of Energy
3	Chile	Mr. Yamal Soto	Senior Engineer Hydrocarbon Area, Comision Nacional de Energia
4	China	Mr. Xiangyi Liu	Director, National Oil Reserve Centre of China (NORC)
5	China	Mr. Bo Li	Program Officer, National Oil Reserve Centre of China (NORC)
6	Hong Kong, China	Ir. Hing-Man Mok	Senior Engineer, Electrical and Mechanical Services Department, Government of HKSAR
7	Indonesia	Mr. Mohammad Alfansyah	Head of Regulation Formulation Sub Section, Directorate General Oil and Gas
8	Indonesia	Ms. Yeni Puspitasari	Officer of Oil and Gas Storage Sub Directorate, Directorate General Oil and Gas
9	Indonesia	Dr. Ucock Welo Risma Siagian	Lecturer/Expert, Institut Teknologi Bandung
10	Japan	Mr. Shinji Kakuno	Director, International Affairs Division Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI), Japan
11	Japan	Mr. Koji Yamashita	Deputy Director, International Affairs Division Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI), Japan"
12	Japan	Mr. Tomoyuki In	Senior Policy Advisor, International Affairs Division Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI), Japan"
13	Japan	Mr. Masato Fujii	Assistant Director, International Affairs Division, Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI), Japan

14	Japan	Mr. Taisuke Imaizumi	Assistant Director, International Affairs Division, Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI), Japan"
15	Japan	Ms. Terumi Munekane	Assistant Director, International Affairs Division Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI), Japan"
16	Japan	Mr. Hiroyuki Yamagata	Assistant Director, International Affairs Division Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI), Japan
17	Japan	Mr. Daisuke Asano	Deputy Director, Petroleum Refining and Reserve Division Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI), Japan
18	Japan	Mr. Noboru Aoki	Deputy Director, Petroleum Refining and Reserve Division Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI), Japan
19	Japan	Mr. Sho Inokuchi	Deputy Director, Petroleum Refining and Reserve Division Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI), Japan
20	Japan	Ms. Junko Yada	Deputy Director, Petroleum Refining and Reserve Division Agency for Natural Resources and Energy (ANRE), Ministry of Economy, Trade and Industry (METI), Japan
21	Malaysia	Ir. Roslee Esman	Head, Energy Commission
22	Papua New Guinea	Mr. Steven Enomb Kilanda	Trade Officer, Department of Foreign Affairs and Trade
23	Philippines	Engr. Melita V. Obillo	Chief Science Research Specialist, Oil Industry Competition & Monitoring Division Oil Industry Management Bureau
24	Singapore	Mr. Eng Poh Tee	Deputy Director, Energy Market Authority
25	Chinese	Mr. Jui-Hsiang Yao	Executive Secretary, Bureau of Energy,

	Taipei		Ministry of Economic Affairs
26	Chinese Taipei	Ms. Hsiao-Chuan Li	Section Chief, Bureau of Energy, Ministry of Economic Affairs
27	Thailand	Mr. Yongyooth Horthong	Plan and Policy Analyst, Ministry of Energy of Kingdom of Thailand
28	Thailand	Mr. Woranon Chansiri	Plan and Policy Analyst, Ministry of Energy of Kingdom of Thailand
29	Thailand	Dr. Chatchawan Chaichana "	Deputy Director, Science and Technology Research Institute, Chiang Mai University
30	Viet Nam	Ms. Ngo Thuy Quynh	Official, General Directorate of Energy, Ministry of Energy and Trade of Vietnam
31	Viet Nam	Ms. Le Nguyet Hang	Deputy Manager, Institute of Energy, Ministry of Energy and Trade

APERC & IEEJ (Institute of Energy Economics, Japan)

No.	Affiliation	Name	Position
1	APERC	Mr. Takato Ojimi	President
2	APERC	Dr. Kazutomo Irie	General Manager
3	APERC	Mr. Kensuke Kanekiyo	Councilor
4	APERC	Dr. Tran Thanh Lien	Team Leader
5	APERC	Mr. Goichi Komori	Senior Researcher
6	APERC	Ms. Elvira Torress Gelindon	Senior Researcher
7	APERC	Mr. Dmitry Sokolov	Researcher
8	APERC	Mr. Juan Roberto Lozano Maya	Researcher
9	APERC	Dr. Du Bing	Researcher
10	APERC	Mr. Chrisnawan Anditya	Researcher
11	APERC	Mr. Takashi Otsuki	Researcher
12	APERC	Ms. Kaori Najima	Administrative Assistant
13	APERC	Ms. Tomoyo Kawamura	Administrative Assistant
14	APERC	Ms. Kayo Sayama	Administrative Assistant
15	IEEJ	Dr Ken Koyama	Managing Director, Chief Economist
16	IEEJ	Mr. Koichiro Tanaka	Director of JIME Center & Managing Director of IEEJ
17	IEEJ	Mr. Shoichi Itoh	Manager, Senior Analyst
18	IEEJ	Mr. Yoshikazu Kobayashi	Manager

19	IEEJ	Ms. Ayako Sugino	Senior Researcher
20	IEEJ	Ms. Tomoko Matsumoto	Senior Researcher
21	IEEJ	Mr. Yasuhiko Nagata	Senior Economist & Assistant Director of JIME Center
22	IEEJ	Ms. Sachi Sakanashi	Senior Analyst of JIME Center
23	IEEJ	Dr Koj Horinuki i	Research Fellow of JIME Center

APPENDIX B
The List of Participants in the 2nd Oil and Gas Security Forum
(25 March 2014, Tokyo, Japan)

Experts

No.	Affiliation/Economy	Name	Position
1	International Energy Agency (IEA)	Mr. Keisuke Sadamori	Director, Directorate of Energy Markets and Security,
2	International Energy Agency (IEA)	Mr. Cuauhtemoc Lopez-Bassols	Senior Analyst, Emergency Policy Division
3	International Energy Agency (IEA)	Mr. Yuichiro Nishida	Senior Analyst, Emergency Policy Division
4	ASEAN Centre for Energy (ACE)	Dr. Hardiv Harris Situmeang	Executive Director
5	ASEAN Council on Petroleum (ASCOPE)	Mr. Victorino Salvaleon Bala	Secretary-in-charge
6	Heads of ASEAN Power Utilities/Authorities (HAPUA)	Dr Eri Prabowo	Chairman, Working Group 1
7	Economic Research Institute for ASEAN and East Asia (ERIA)	Dr Phoumin Han	Energy Economist
8	Indonesia	Mr. I Gusti Suarnaya Sidemen	Deputy Director, Directorate General of Oil and Gas, Ministry of Energy and Mineral Resources, Indonesia
9	Indonesia	Dr. Ucok Welo Risma Siagian	Head, Petroleum Engineering Study Group, Institute Teknologi Bandung
10	Japan	Mr. Atsushi Taketani	Director, Petroleum Refining and Reserve Division, Ministry of Economy, Trade and Industry, Japan
11	Japan	Ms. Junko Yada	Senior Deputy Director, Petroleum Refining and Reserve Division, Ministry of Economy,

			Trade and Industry, Japan
12	Japan	Mr. Yoshinori Satake	Deputy Director, Petroleum Refining and Reserve Division, Ministry of Economy, Trade and Industry, Japan
13	Thailand	Dr Sarawut Kaewtathip	Executive Director, Office of the Permanent Secretary, Ministry of Energy, Thailand
14	Thailand	Dr Chatchawan Chaichana	Assistant Professor, Department of Mechanical Engineering, Chiang Mai University
15	United States	Mr. Kenneth Vincent	Economist, Office of Petroleum Reserve, US Department of Energy
16	IEEJ	Dr. Ken Koyama	Managing Director, Chief Economist, Charge of Strategy Research Unit, IEEJ
17	IEEJ	Mr. Koichiro Tanaka	Managing Director of IEEJ & Director of JIME Center
18	IEEJ	Mr. Yoshikazu Kobayashi	Senior Economist, Manager, Oil Group, Oil Subunit, Fossil Fuels & Electric Power Industry Unit, IEEJ

Delegates

No.	Economy	Name	Affiliation/Position
1	Australia	Ms. Carolyn Barton	Resource Counsellor, Australian Embassy in Tokyo
2	Brunei Darussalam	Ms. Masitah Hj, Hassan	Head of Downstream Unit, Energy Business Division
3	Brunei Darussalam	Ms. Siti Nursakinah Hj. Damit	Geophysics Officer, Development Unit, Energy Business Division
4	Canada	Mr. Jean-Francois Renaud	Second Secretary, Economic Section, Embassy of Canada, Japan

5	Chile	Ms. Maria de los Angeles Valenzuela	Representative of the Ministry of Energy's Hydrocarbon Security and Markets Division
6	Hong Kong, China	Ir Hing-Man Mok	Senior Engineer, Electrical and Mechanical Services Department
7	Indonesia	Mr. Bambang Priyambodo	Head of Division for Emergency Response, National Energy Council
8	Indonesia	Mr. M. Donny Andi Mias	Junior Energy Analyst, National Energy Council
9	Indonesia	Mr. Syahrul Pratama	Staff Member of Transportation of Oil and Gas Sub Directorate, Directorate General of Oil and Gas
10	Indonesia	Mr. Ruli Nugraha	Junior Energy Analyst, National Energy Council
11	Indonesia	Ms. Wenny Mustakaweny	Staff Member of Transportation of Oil and Gas Sub Directorate, Directorate General of Oil and Gas
12	Japan	Mr. Takayuki Sumita	Director-General. Natural Resources and Fuel Department, Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry, Japan
13	Japan	Mr. Shin'ichi Kihara	Director, International Affairs Division, Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry, Japan
14	Japan	Mr. Shobu Nagatani	Director for Natural Resources and Energy Research, International Affairs Division Agency for Natural Resources and Energy Ministry of

			Economy, Trade and Industry, Japan
15	Japan	Mr. Atsushi Taketani	Director, Petroleum Refining and Reserve Division, Agency for Natural Resources and Energy Ministry of Economy, Trade and Industry, Japan
16	Japan	Ms. Terumi Munekane	Assistant Director, International Affairs Division, Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry, Japan
17	Japan	Ms. Junko Yada	Senior Deputy Director, Petroleum Refining and Reserve Division, Ministry of Economy, Trade and Industry, Japan
18	Japan	Mr. Yoshinori Satake	Deputy Director, Petroleum Refining and Reserve Division, Ministry of Economy, Trade and Industry, Japan
19	Japan	Ms. Nozomi Yamasaki	Specialist, Petroleum Refining and Reserve Division, Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry, Japan
20	Japan	Mr. Kentaro Ozaki	Assistant Director, Petroleum Refining and Reserve Division Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry, Japan
21	Korea	Dr. Gue Jae Jeong	Director, Korea Energy Economics Institute (KEEI)
22	Papua New Guinea	Mr. Warea Undi	Senior Petroleum Engineer, Petroleum Division, Department of Petroleum and Energy

23	Peru	Mr. Carlos Palacios	Natural Gas Manager, OSINERGMIN
24	Peru	Mr. Brayan Palma	Legal Adviser, Ministry of Energy and Mines of Peru
25	Philippines	Engr. Melita V. Obillo	Chief Science Research Specialist, Oil Industry Competition & Monitoring Division, Oil Management Bureau, Department of Energy, Philippines
26	Philippines	Mr. Arnel C. Antonio	Senior Science Research Specialist, Policy Formulation and Research Division, Energy Policy and Planning Bureau, Department of Energy, Philippines
27	Singapore	Mr. Eng Poh Tee	Deputy Director. Energy Market Authority
28	Singapore	Mr. Kwang Hwee Seah	Manager, Energy Market Authority
29	Chinese Taipei	Dr. Jyuung-Shiauu Chern	Chief, Bureau of Energy
30	Chinese Taipei	Ms. Pei-Shan Ho	Division of Oil and Gas, Bureau of Energy
31	Thailand	Dr. Prasert Sinsukprasert	Executive Director, International Energy Cooperation Bureau, Ministry of Energy, Thailand
32	Thailand	Dr. SompopPattanariyankool	Head of Energy Division, Policy and Strategy Management Office, Office of Permanent Secretary. Ministry of Energy, Thailand
33	Thailand	Dr. Veerapat Kiatfuengfoo	Energy Planning and Policy Office, Thailand
34	Thailand	Ms. Krittima Shoosanglertwijit	Officer, Department of Energy Business, Ministry of Energy, Thailand

35	Thailand	Mr. Anuchit Limsuwat	Policy and Planning Officer, Department of Mineral Fuels, Ministry of Energy, Thailand
36	Thailand	Mr. Supattanapon Punmeechaow	Senior Executive Vice President, PTT Public Company Limited
37	Thailand	Ms Thitiwan Rungruangpattana	Analyst, PTT Public Company Limited
38	United States	Mr. Jeffrey Miller	DOE Representative. US Embassy in Tokyo
39	Viet Nam	Mr. Tang The Hung	Deputy Director of Energy Planning Department
40	Viet Nam	Ms. Ngo Thuy Quynh	Official of Oil and Gas Transportation and Processing Department

APERC & IEEJ (Institute of Energy Economics, Japan)

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1	APERC	Mr. Takato Ojimi	President
2	APERC	Dr Kazutomo Irie	General Manager
3	APERC	Dr Hooman Peimani	Research Fellow
4	APERC	Mr. Goichi Komori	Senior Researcher
5	APERC	Ms. Elvira Torress Gelindon	Senior Researcher
6	APERC	Mr. Dmitry Sokolov	Researcher
7	APERC	Mr. Juan Roberto Lozano Maya	Researcher
-8	APERC	Dr Aishah Mohd Isa	Researcher
9	APERC	Mr. Chrisnawan Anditya	Researcher
10	APERC	Mr. Takashi Otsuki	Researcher
11	APERC	Ms. Naomi Wynn	Researcher
12	APERC	Dr Atit Tippicahi	Researcher
13	APERC	Ms. Parminder Raeewal	Research Associate
14	APERC	Ms. Tomoyo Kawamura	Administrative Assistant
15	APERC	Ms. Kayo Sayama	Administrative Assistant
16	APERC	Ms. Chie Matsubayashi	Administrative Assistant
17	IEEJ	Dr Ken Koyama	Managing Director, Chief Economist

18	IEEJ	Mr. Koichiro Tanaka	Director of JIME Center & Managing Director of IEEJ
19	IEEJ	Mr. Yuji Morita	Senior Research Fellow, Director, Oil Subunit, Fossil Fuels & Electric Power Industry Unit
20	IEEJ	Mr. Yoshikazu Kobayashi	Manager
21	IEEJ	Mr. Thomas Kearns	Researcher