



Asia-Pacific
Economic Cooperation

APEC Oil and Gas Security Studies

Oil and Gas Security Indexation 2017 Update

APEC Energy Working Group

Series **13**

September 2018





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Foreword

Following the publication of the Oil and Gas Security Indexation as one of the Oil and Gas Security Studies in 2017 under the ambit of the Oil and Gas Security Initiatives (OGSI), the Asia Pacific Energy Research Centre (APERC) decided to continuously improve the indexation methodology in assessing the supply security risk level of APEC members.

This report presents an update on the methodology, a simplified version of quantifying the security risk index. With this, APERC is hopeful that this report could provide valuable information to APEC members to evaluate and revisit their supply security policies and forge closer ties among them in enhancing energy trade and security.

APERC intends to have this report published and circulated on a regular basis during the annual conduct of Oil and Gas Security Network (OGSN) Forum. Having this report released on a yearly basis would reflect the changes (improvements or deterioration) in APEC members' security risk level, which could be influenced by unforeseen external events or new developments in their policy agenda and oil and gas security framework.

Allow me to deeply express my gratitude to the authors and contributors who spent their precious time to develop the Oil and Gas Security Indexation Study including this report as an update. However, I would like to stress that the contents and views in this report only reflect those of the authors and not necessarily of APERC. The information and analyses presented by the authors in this report may change as developments evolve in the global energy landscape, as well as in APEC members' domestic energy arena.

Lastly, APERC is committed to conducting oil and gas security studies/reports, such as this one. This is to provide insightful information for governments and policymakers in crafting strategic actions to address oil and gas security issues.

Dr. Kazutomo IRIE

President

Asia Pacific Energy Research Centre

A handwritten signature in black ink, reading "Kazutomo Irie". The signature is written in a cursive, flowing style.

Acknowledgments

We are grateful for the full support and insightful advice of Dr. Kazutomo Irie, President of APERC and Mr. James M. Kendell, Senior Vice President of APERC. We also wish to thank the administrative staff of APERC as this report could not have been completed without their assistance.

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Abbreviation and Acronyms

Abbreviation

Bcm	billion cubic metre
Bcm/y	billion cubic metre per year
Ktoe	kilotonne of oil equivalent
Mmbbl	million barrel
Mmbbl/d	million barrel per day
Mcm/d	million cubic metre per day
Mcm/y	million cubic metre per year
Mt	million tonnes
Mtoe	million tonnes of oil equivalent
Mtpa	million tonnes per annum
Kbbl/d	thousand barrel per day
Tcf	trillion cubic feet
Tcm	trillion cubic metre
Toe	tonne of oil equivalent
USD	US Dollar

Acronyms

APEC	Asia-Pacific Economic Cooperation
APEREC	Asia Pacific Energy Research Centre
APSA	ASEAN Petroleum Security Agreement
ASEAN	Association of Southeast Asian Nations
EIA	Energy Information Administration
EMM	Energy Ministerial Meeting
ESI	Energy Security Initiative
EWG	Energy Working Group
GDP	Gross Domestic Product
HHI	Herfindahl-Hirschman Index
IEA	International Energy Agency
IEP	International Energy Program
LNG	Liquefied Natural Gas
OECD	Organisation for Economic Co-operation and Development (OECD)
RGT	Regasification Terminals
R/P	Reserves-to-Production
TPES	Total Primary Energy Supply
UAE	United Arab Emirates
UN	United Nations
UN Comtrade	United Nations Commodity Trade Statistics Database
WB	World Bank
WGI	Worldwide Governance Indicator

1. Introduction

Background

The APEC region creates more than half of the world's real gross domestic product (GDP) and consumes about 60 percent of global energy. The region is characterised by economies that are major energy producers and consumers. Some are major energy exporters, while others sourced almost all of their energy supply abroad or are 100% dependent on imported energy such as oil and natural gas. The region faces challenges as energy demand is expected to keep on growing in the future because of increasing industrialization, rising income and expanding population.

Given this premise, energy security is at the forefront of government priorities in APEC. However, such a concept is still subject to various interpretations depending on the economy's energy situation, and thus creating a common and clear definition remains elusive. Typically, long-term energy security focuses on ensuring timely investments for a sustainable energy supply that supports economic development goals and environmental commitments. On the other hand, short-term energy security involves the ability of the energy system to react and recover promptly from sudden changes in the supply-demand balance.

Although APEC has recognised that any energy supply disruption can damage both economic and social development, a specific definition of energy security has not yet been agreed upon. In 2001, APEC Leaders endorsed the Energy Security Initiative (ESI) in order to strengthen regional energy security, emphasizing longer-term policy responses that address the broad challenges facing the region's energy supply by focusing on actions that are practical in a policy context and acceptable in a political context (EWG APEC, 2001). Over the years, the ESI evolved and expanded, and in 2008, already covered 13 on-going initiatives under the Energy Working Group (EWG). These include the Joint Organisations Data Initiative (JODI), the Real-Time Emergency Information Sharing Initiative (RTEIS) and a program for Energy Emergency Responses. In 2014, the 11th Energy Ministerial Meeting (EMM11) officially recognised four elements that are vital for energy security and sustainable development in this region – diversified energy supply and stable demand, safe energy transportation routes, innovation in energy technologies and effective fora to discuss energy policy. Further, the EMM11 stressed the importance of strengthening the capacities and systems for oil and gas emergency response, which led to the launching of the OGSi by APERC.

In an effort to quantify energy supply security, particularly for oil and gas, APERC published the Oil and Gas Security Indexation study in 2017 as part of the Oil and Gas Security Studies under OGSi, which covered a study period of 2000-13. This report is an update of the said study extending the period to 2015 (2000-15) with some modifications in the methodology. Security risk indicators

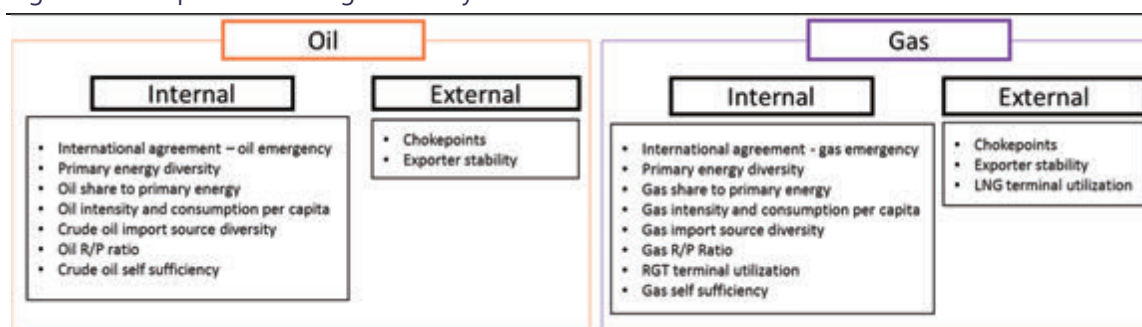
included in this report are compared with 2000 and 2013 levels (as revealed in the previous study) to determine improvement and/or deterioration in security risk level.

Methodology Updates

In the Oil and Gas Security Indexation Study in 2017, the authors used the PESTLE¹ methodology to have a multi-dimensional approach in assessing the risks affecting supply security. The said study identified 44 sub-indicators² for oil and natural gas and each of them was assigned to a corresponding PESTLE indicator with quantifiable measurement. These sub-indicators were also grouped into internal and external factors (APERC, 2017).

However, based on feedback received from APEC members and energy security experts, the authors reduced the number of sub-indicators to gauge the security index. Thus, in this report, the number of sub-indicators was reduced to 10 for oil and 12 for gas. These sub-indicators as shown in Figure 1.1 will be subject to annual tracking to be published (yearly basis) in the form of a report (such as this) to monitor the APEC region's supply security risks level, as well as for individual member economies.

Figure 1.1: Simplified oil and gas security index



Source: APERC analysis.

2. Oil and Gas Import Sources

APEC has very diverse members, be it on the economic or political spectrum. In terms of energy resource endowment, some APEC economies are among the largest energy producers in the world, while others are resource poor. In 2015, 2 of the top 10 crude oil net exporters were APEC members – Russia with 246 Mtoe (10.4 mmbbl/d) mainly delivered to Europe, and Canada with 116 Mt mostly

¹ An acronym that stands for of Political, Economic, Social, Technical/technologies, Legal/law and Environment.

² The total sub-indicators (44) include common sub-indicators used for both oil and gas. If treated separately, the total number of sub-indicators was 59.

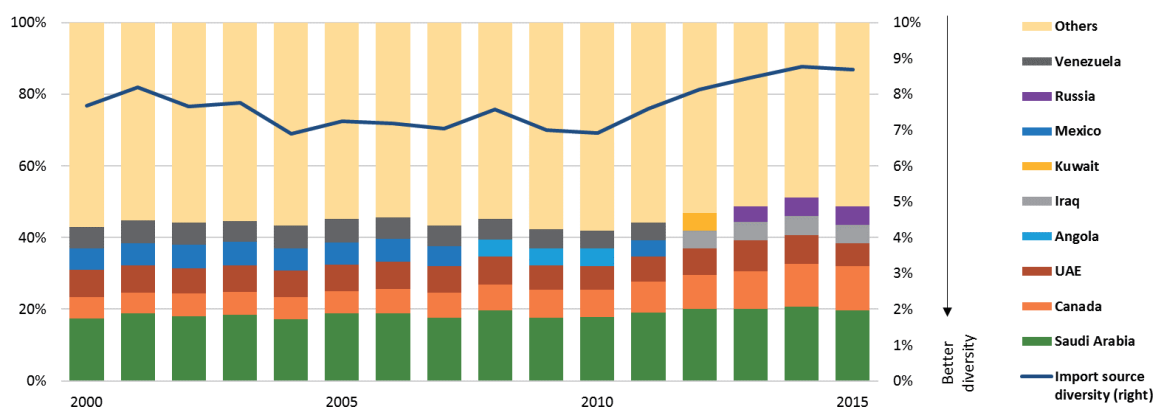
for the United States (US). On the other hand, 4 APEC members were among the top 10 net importers (the US with 348 Mt, China with 336 Mt, Japan with 165 Mt, and Korea with 139 Mt) (IEA, 2017).

On natural gas, 5 members belong to top 10 net exporters. Russia had 205 billion cubic metrics (Bcm) transported to Europe via pipelines and increasingly to China. Canada exported 61 Bcm mainly destined for the United States. Australia with 41 Bcm in LNG form, exported their gas mainly to East Asia and India. Indonesia sold 34 Bcm to neighbouring economies, such as Malaysia and Singapore, via pipeline and a portion in LNG form to East Asia, while Malaysia's 24 Bcm (mostly LNG) was also bound for East Asian economies. Four members also top the list of largest natural gas importers led by Japan with 116 Bcm, China (69 Bcm), Korea (44 Bcm) and Mexico (43 Bcm).

Crude oil import

In total, the APEC region imported 1,271 million tonnes of oil equivalent (Mtoe) of crude oil in 2015, an increase of 4.4% from the 2014 level (IEA, 2017). Data from UN Comtrade showed that from 2000-15, about half of APEC's crude oil imports came from five main exporters. Saudi Arabia consistently supplied around one-fifth of total imports and continued to be a major oil exporter to APEC members contributing 14% of total import in 2015. However, this share was lower than its peak in 2013 at 20%.

Figure 2.1: Major crude oil import sources and import diversity index, 2000-15



Source: APERC analysis and UN Comtrade, 2016.

Canada gained a larger share, an increase from 11% in 2013 to nearly 13% in 2015. The economy exported most of its oil production to the US. Russia has been steadily increasing its oil exports to APEC members over the 2000-15 period and became one of the top five exporters to the region in 2011 (Figure 2.1). Venezuela was one of the major oil exporters to APEC members, particularly to the US, but its share deteriorated, thus dislodging it from among the top exporters since 2012. In 2015,

the region's import diversity index (HHI) showed slight improvement by 0.1 percentage point compared with 2013.

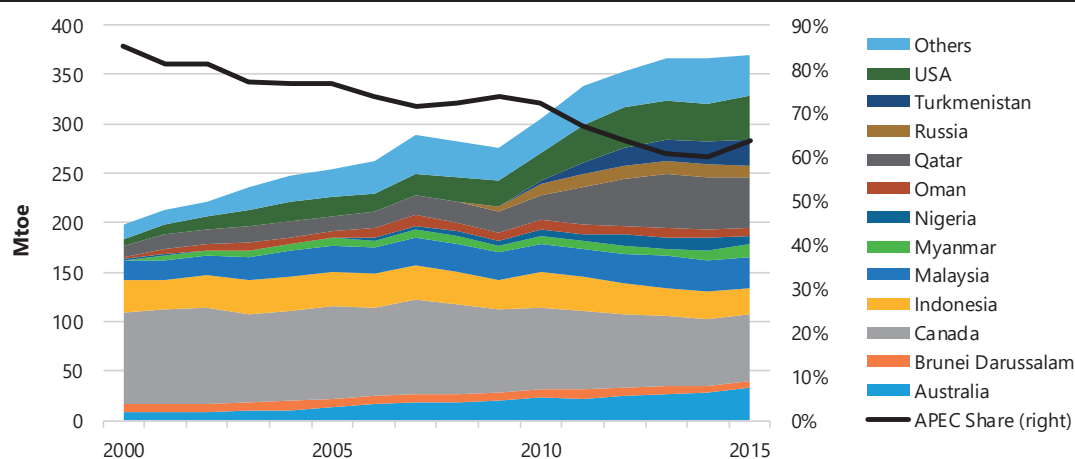
The external factor risks for crude oil exporters based on chokepoints and exporter's stability risk³ were derived from the World Governance Index (WGI) published by World Bank Group. A detailed explanation of the methodology can be found in previous APERC's publication – *Oil and Gas Security Indexation* – published in 2017 (APERC, 2017).

Natural gas import

In 2015, the APEC region imported 396 Bcm (357 Mtoe) of gas, a decrease of 0.2% from the 2014 level (IEA, 2017). Five economies recorded a decline in gas imports. Japan recorded a decrease of 6.6 Mtoe, Korea with 5.1 Mtoe, Canada with 1.7 Mtoe, Australia with 0.8 Mtoe, and Malaysia with 0.7 Mtoe.

On the other hand, almost all gas exporters to APEC (including some APEC economies) exhibited an increase in their gas exports. Russia expanded its exports by 9.2 Mtoe, the US by 5.8 Mtoe, Papua New Guinea by 5.7 Mtoe, Australia by 2.1 Mtoe, and Canada by 0.6 Mtoe (Figure 2.2).⁴

Figure 2.2: Natural gas import sources, 2000-15



Source: Cedigaz database (2017) and APERC analysis

³ The study adopted the Worldwide Governance Indicators (WGI) - Political Stability and Absence of Violence/Terrorism sub-index (published by the World Bank) in order to establish the exporter's stability sub-indicator and chokepoint risk. The study also used the WGI (the "Rule of Law" sub-index) to establish the exporter's "rule of law" sub-indicator (WB, 2016).

⁴ Cedigaz database was the reference information to determine the major sources of gas imports, which covered imports through pipelines and LNG form.

Most of the growth in demand in the region was recorded in the US with an increase of 3% (or an additional demand of 19 Mtoe), Chinese Taipei with 8.4% (1.1 Mtoe), Mexico with 6.8% (4.1 Mtoe) and China with 3.2% (4.9 Mtoe). As an increase in demand was registered by major gas importers in the region, except the US, gas imports likewise went up.

Pipeline gas import

Gas trade by pipeline continues to be one of the main sources of imports for some economies in the APEC region. Most of the piped gas imports transpired in North America, among Canada-US-Mexico, and in China where the economy started to import a huge amount of piped gas in the past decade. A moderate amount of piped gas imports occurred in Southeast Asia, between Thailand-Myanmar, and among Indonesia-Malaysia-Singapore.

Canada has been a major source of gas imports in the US. In 2015, the US imported 74 Bcm of gas from Canada, 6% lower than the 2013 level. In the same year, Canada imported 20 Bcm from the US, 23% lower than the 2013 level. Mexico's gas imports from the US increased to almost 30 Bcm from around 19 Bcm in 2013. Following the shale gas revolution, the US gas exports to the region went up, specifically to Canada and Mexico.

In China, the National Development and Reform Commission and the National Energy Administration announced an increase in the economy's pipeline networks to 169,000 kilometres (km) by 2020 composed of 32,000 km for crude oil, 33,000 km for petroleum products, and 104,000 km for gas. The networks will be further expanded to reach 240,000 km by 2025 (Xinhuanet, 2017). In 2015, the total gas imports through pipelines to China increased by 23% from the 2013 level. Such increases transpired when China started to import more gas from Turkmenistan, from 24 Bcm in 2013 to nearly 28 Bcm in 2015.

LNG import

Five economies almost constantly appeared as the top LNG import sources for the APEC region – Australia; Indonesia; Malaysia; Russia and Qatar. In 2000, these economies supplied 77% of total LNG imports to APEC members, but the share went down to 62% in 2002 as Qatar started to export LNG in massive ways. However, the share picked up again in 2015 to 71%. Intra-APEC trade showed a decline from as high as 74% in 2000 to 56% in 2015 as Qatar became the largest LNG exporter to the region.

Shares of LNG exports from Indonesia and Malaysia have been declining over the years because of increasing LNG production from Qatar and Australia and the entry of new LNG producers in the

market, such as Papua New Guinea. Indonesia and Malaysia provided an aggregate share of 26% to the region's total import demand in 2000 but dropped to 24% in 2015 with an increasing share of Qatar gas. The contribution from Qatar expanded to 25% of total LNG imports in 2015 from only 13% in 2000. Although not in the top LNG import sources for the APEC region, the US delivery of LNG to Asia has also been increasing.

Some APEC economies are expanding their liquefaction capacities. A new LNG train in Malaysia (Train 9) with a capacity of 3.6 million tonnes per annum (Mtpa) (PETRONAS, 2017a) and the successful completion of the world's first floating LNG (FLNG) production facility by PETRONAS with a processing capacity of 1.2 Mtpa in 2017 will help increase LNG production availability in the region (PETRONAS, 2017b).

3. APEC Oil and Gas Security Indexation

Oil Security Index

Table 3.1: Oil security indicators and supply risk index, in %, 2000-15

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	25	26	27	27	27	27
	International agreement – oil emergency	50	48	48	48	48	48
	Oil share to primary energy	35	33	28	28	28	29
	Oil intensity and consumption per capita	76	68	65	65	64	65
	Oil import source diversity	8	7	8	8	9	9
	Oil R/P ratio	49	3	6	6	10	11
	Oil self sufficiency	35	34	26	26	23	22
External	Chokepoints	41	41	39	39	37	35
	Exporter stability	51	55	54	54	52	55
Average		41%	35	34	33	33	33

Source: APERC analysis

Notes:

1. The first analysis was done for the 2000-13 period and published in Oil and Gas Security Indexation, which can be downloaded at http://aperc.iecej.or.jp/file/2017/5/16/Oil_and_Gas_Security_Indexation.pdf
2. The table shows the level of the risk index in percentage. A high index means higher vulnerability to supply security risk.

Generally, the oil security risk indicators assessed in this report maintained a steady index level over the historical period (2000-15). However, some indicators demonstrated a change in risk level, especially in oil self-sufficiency (exhibiting an improvement) and the oil reserves-to-production ratio (oil R/P ratio) (with increasing risk level) as shown in Table 3.1.

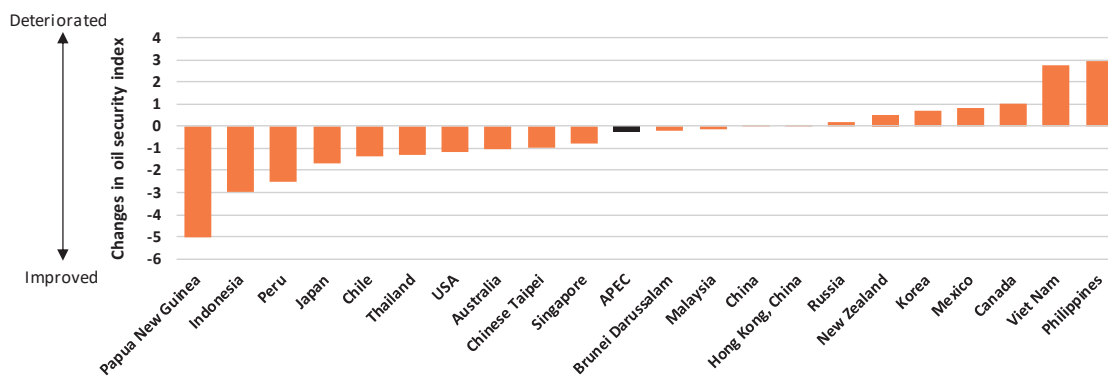
Among economies that contributed to the improvement in oil, self-sufficiency risk is the US with the production of unconventional oil, thus increasing its self-sufficiency level from 61% in 2013 to 73% in

2015. This subsequently reduced the risk on self-sufficiency indicator. Improvement in Malaysia's oil self-sufficiency, from 94% in 2013 to 100% also contributed to the lower risk for this indicator. On the reserves-to-production (R/P) ratio indicator, the risk level slightly increased because of a lower R/P ratio in Canada, from 154 years in 2013 to 136 years R/P in 2015.

Papua New Guinea recorded the highest improvement for the 2013-15 period. The improvement was mainly from the better primary energy diversity index and a lower oil share in primary energy. Such changes resulted from the operationalisation of a regasification terminal (RGT) terminal in the economy, which also triggered higher domestic gas consumption. Indonesia notched the second best improvement because of lower oil consumption per-capita, lower oil intensity and a lower oil share to primary energy supply.

On the other hand, the Philippines and Viet Nam, the two fast-growing economies, exhibited increasing oil supply security risk indices. The Philippines displayed a greater increase in the security risk index. Rapid growth in oil consumption per capita and a rise in oil intensity were the major contributors to the increase. On the other hand, since 2014, Viet Nam is no longer 100% crude oil self-sufficient. As the economy started to import oil, other indices, such as risks on exporters' stability and chokepoints, have begun to rise (Figure 3.1).

Figure 3.1: Oil security index changes by the economy, 2013-15



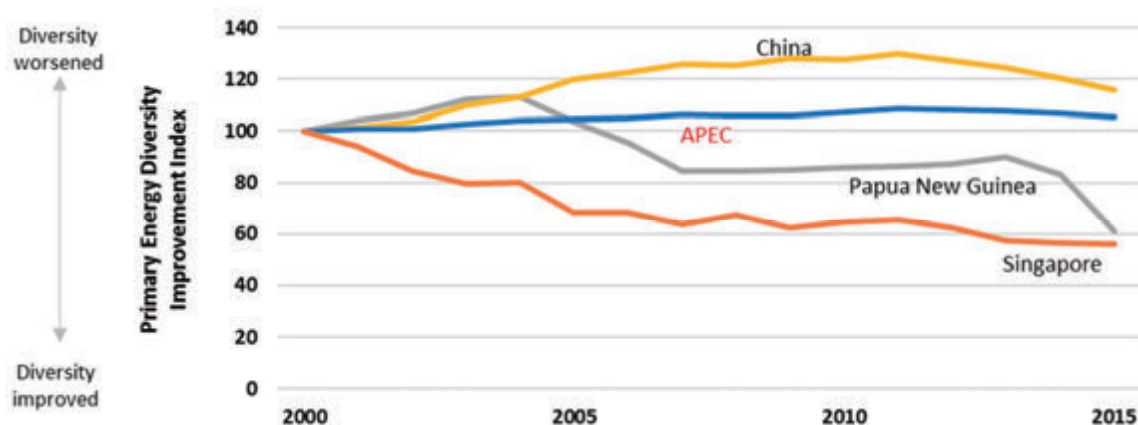
Source: APERC Analysis

Internal factors

The primary energy diversity index in most economies remained the same over the past two years (2013-15), with exception of few. Singapore's diversity in primary energy supply showed the best improvement over the 2000-15 period by nearly 40 percentage index points from the 2000 level. China's diversity in primary energy worsened over the years (Figure 3.2). However, some improvement started to be seen in the past two years as coal shares in primary energy decreased. Papua New

Guinea showed an impressive improvement in a short period because of massive use of gas post-2013, after the completion of an LNG terminal in the economy.

Figure 3.2: Primary energy diversity improvement index for selected economies, 2000-15



Source: IEA (2017), ESTO (2017) and APERC analysis

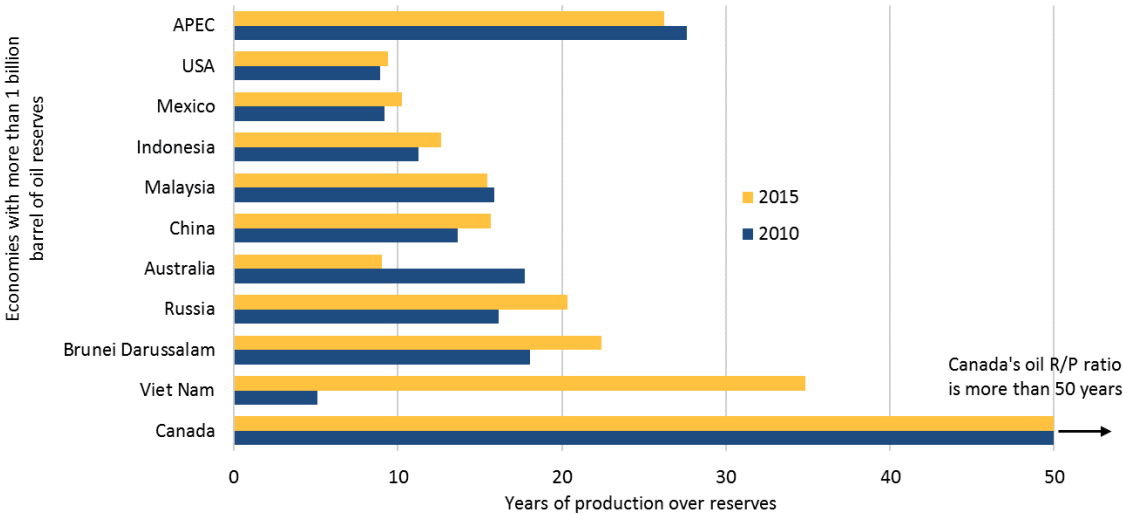
The international agreement for oil emergency supply indicator for the region showed no changes in the risk level. To date, only two regional agreements still exist – the International Energy Agency-International Energy Program (IEA-IEP) and the ASEAN Petroleum Security Agreement (APSA). Seven economies (Australia; Canada; Japan; Korea; Mexico; New Zealand; and the US) are members of the Organisation for Economic Co-operation and Development (OECD) and are covered by the oil emergency agreement/arrangement under the IEA-IEP. Furthermore, Chile is also an OECD member and a candidate for IEA membership.

As for APEC-ASEAN members (Brunei Darussalam; Indonesia; Malaysia; Singapore; Thailand; and Viet Nam), APSA includes a Coordinated Emergency Response Measure (CERM). Under this measure, all members endeavour to supply petroleum to the ASEAN Member State in Distress at an aggregate amount equal to 10 percent of the Normal Domestic Requirement of the said member state for a continuous period of at least 30 days. However, the ASEAN member in distress must first implement short-term measures to reduce oil demand before requesting assistance under CERM (ACE, 2015). ASEAN members are still working on the best mechanism for implementing APSA.

Overall APEC's oil share to primary energy showed a slight uptick, from 28% in 2013 to 29% in 2015. The increase happened because of growing oil demand in the US and China, which carries a huge weight in APEC. Despite such growth from these economies, some developing economies like Indonesia and Malaysia displayed a decrease in oil share in primary energy (both registered a decline in the index from 36% in 2013 to 32% in 2015).

The oil R/P ratio index for the APEC region went down from 28 years in 2013 to 26 years in 2015. In spite of additional barrels in the region's total oil reserve in the last two years, the production growth outpaced the new reserves discovery. Most of the major oil producers in the region showed an increase in oil production, particularly in Canada; China; Russia; and the US. The combined production of these four economies recorded a growth of 11% in 2015 compared with the 2013 level (Figure 3.3).

Figure 3.3: Oil reserves-to-production (R/P) ratio, 2010 and 2015



Source: EIA (2017), IEA (2017) and APERC analysis

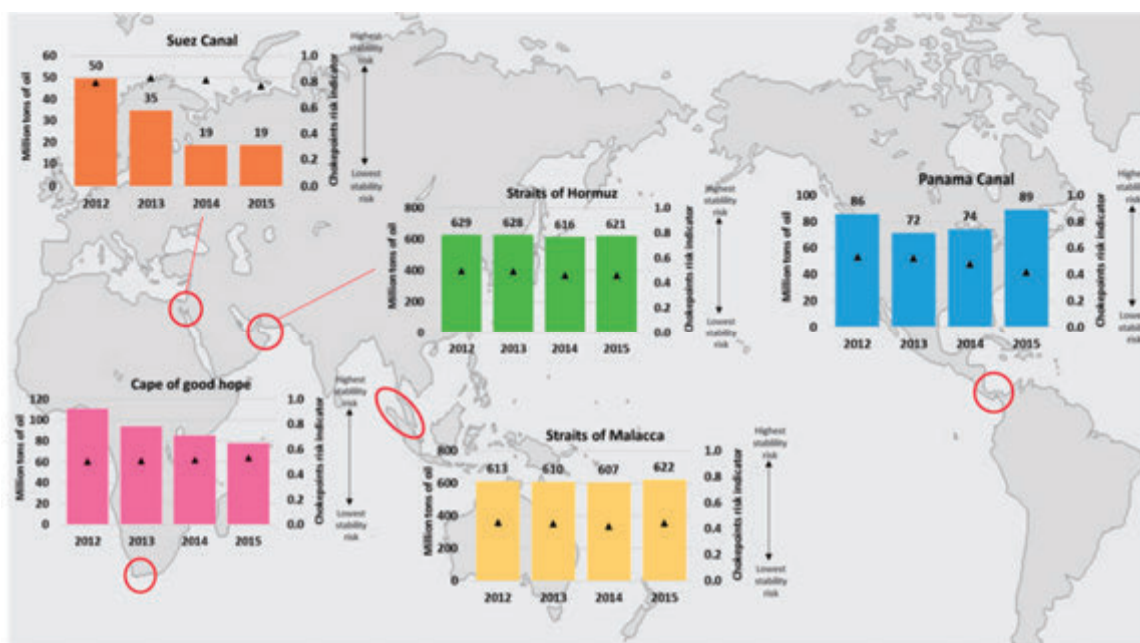
Oil intensity and consumption per capita did not display many changes as the indicator only showed a decrease by one percentage index point in 2014 from the 2013 level, but increased back to the same level in 2015 (at 65%). As shown in Figure 2.1, the diversity of crude oil import sources indicator decreased by one percentage index point as the US started to reduce oil imports from the Middle East because of the availability of shale oil in the economy. Further, the US also increased its oil imports from Canada through pipelines.

Notwithstanding the growth in crude oil production from major APEC economies, the region still continued to be a net importer but with a lesser degree of dependence on Middle East producers. Because of expanding crude oil production, the risk associated with the oil self-sufficiency indicator dropped to 22% in 2015 from 26% in 2013. With the production of more shale oil, the US decreased its imports from the Middle East.

External factors

For external factors, only two indicators were considered for risk assessment – chokepoint risk and exporter stability. Unlike the earlier study, piracy attack was not included among the external factors.

Figure 3.4: Crude oil import and risk for selected chokepoints, 2012 to 2015



Source: UN Comtrade and APERC analysis

Notes:

1. Although Bab-El Mandeb is considered in total supply risk analysis, the figure does not include the risk from that chokepoint.
2. The amount of crude oil imports that goes through each chokepoint is based on trade data by assuming that each exporter will send the cargo to the importer by using the possible shortest route.
3. The assessment only covered APEC members.
4. Some tankers may go through two or more of these chokepoints.

The chokepoint risk index was calculated based on the share of import source to APEC members total oil imports, which means that the calculation of risk used weights on the amount (share) of crude imports from one particular source. Likewise, the risk was measured from the assessment of the political stability of surrounding economies (using WGI) of the different chokepoints. Using this methodology, the chokepoints risk was reduced from 39% in 2013 to 34% in 2015 because of the improvement in the stability of economies that are exporting crude oil to APEC members. Three main chokepoints considered this study demonstrated a lower risk in 2015 as compared with 2013. These chokepoints are the Suez Canal, the Panama Canal and the Straits of Hormuz (Figure 3.4).

The exporters' stability risk index showed an upward risk trend, from 54% in 2013 to 55% in 2015. However, it should be noted that the stability of exporters improved in 2014 to 52%, partly from better

political stability of exporters in the Middle East, such as Saudi Arabia and Iran. But the trend did not continue in 2015.

Gas Security Index

On the average, the APEC region's security index for natural gas supply is slightly better than for oil, with relatively a stable overall index of around 32%-33% for most of the years (Table 3.2).

Table 3.2: Natural gas security indicators and supply risk index, in %, 2000-15

Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	25	26	27	27	27	27
	International agreement-gas emergency	60	60	60	60	60	60
	Gas share to primary energy	21	19	20	21	21	21
	Gas intensity and consumption/capita	51	50	51	54	53	53
	Gas import source diversity	26	18	12	10	9	10
	Gas R/P Ratio	2	4	5	5	6	9
	RGT terminal utilization	36	38	32	33	32	31
	Gas self sufficiency	0	0	0	0	0	0
External	Chokepoints	7	9	12	15	15	13
	Exporter stability	42	44	45	43	43	42
	LNG terminal utilization	83	83	85	90	89	96
Average		32	32	32	33	33	32

Source: APERC analysis

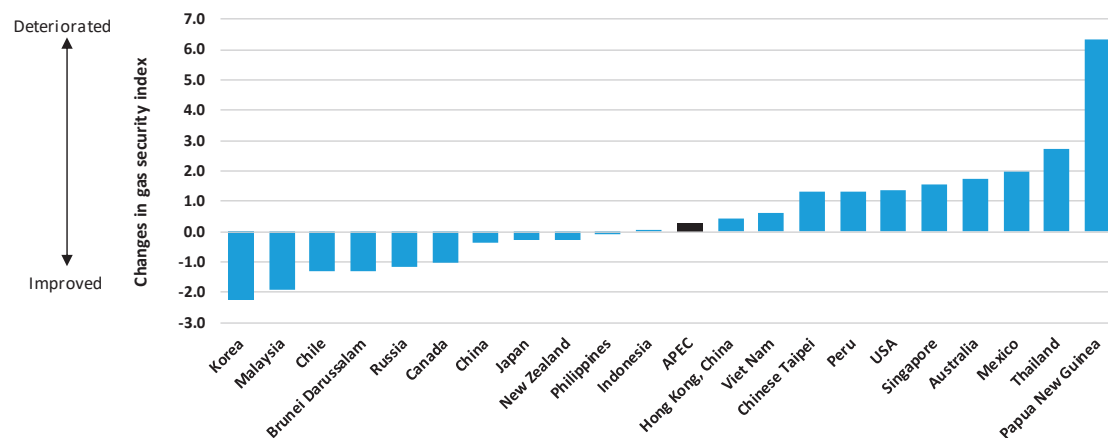
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2. The table shows the level of the risk index in percentage. A high index means higher vulnerability to supply security risk.

Korea showed the best improvements with lower risk indices in 2015 than 2013 owing to multiple factors – lower gas consumption per-capita, gas intensity, gas share to primary energy, and import sources diversity (Figure 3.4). For Malaysia, a better security index was triggered by the completion and operationalisation of the RGT in 2013, which subsequently improved the import source diversity for the economy.

Papua New Guinea recorded a deterioration in gas security with the completion of its LNG terminal. The economy obtained the best improvements in its oil security index from a lower oil share, as the gas share in its energy mix increased. However, this creates a constraint in gas supply, an inevitable trade-off.

Figure 3.5: Natural gas security index changes by the economy, 2013-15



Source: APERC analysis

Internal factors

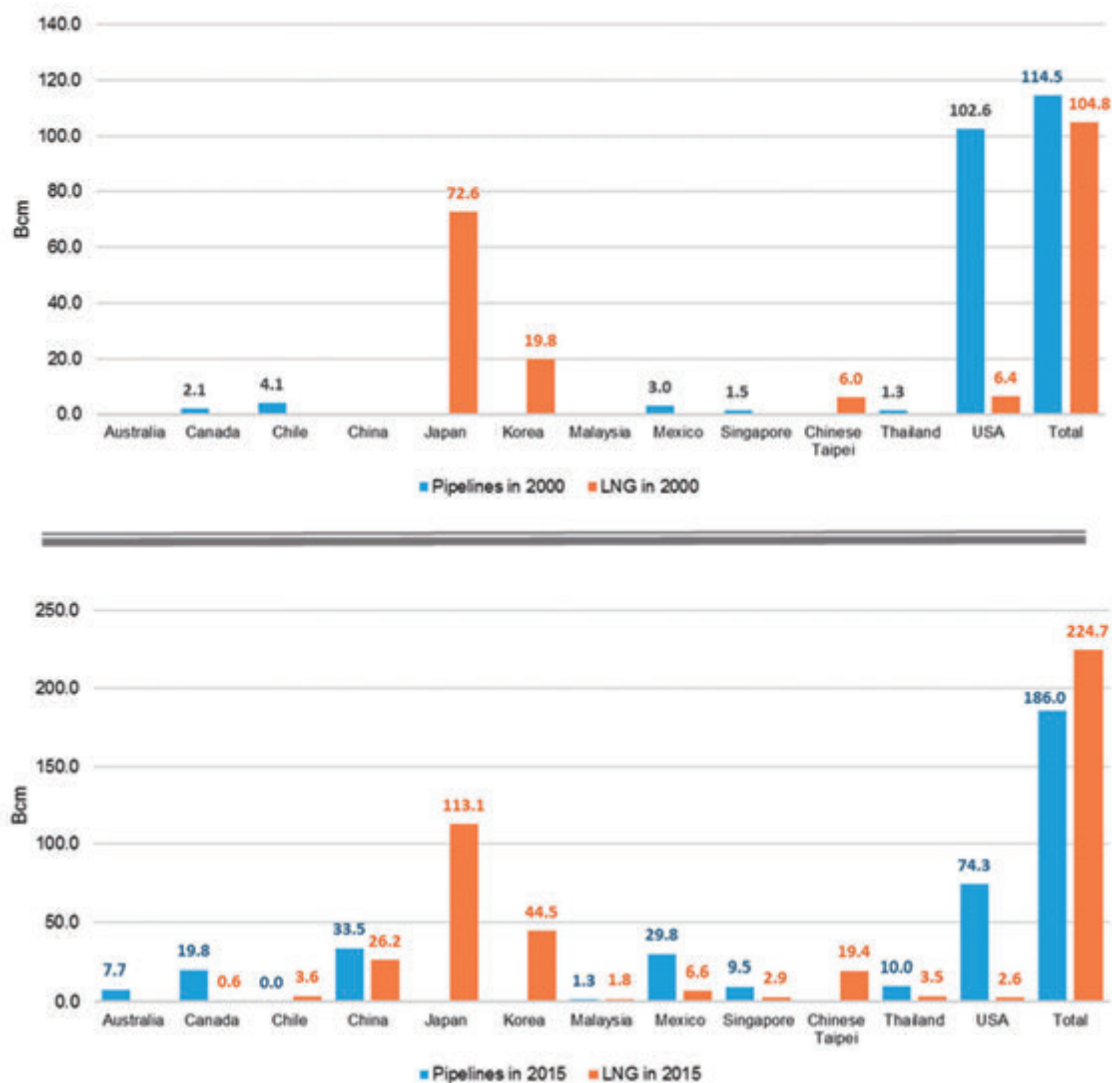
Although gas consumption in APEC grew from 1 809 Bcm in 2013 to 1 846 Bcm in 2015, the gas share to primary energy barely moved at 21%. A lower share of gas constitutes a lower supply risk, while a higher gas share may result in higher risk as it may involve more infrastructure investment. As in oil security, the diversity of the primary energy mix is also part of the assessment for gas security.⁵

The risk index for the diversity of gas import sources improved slightly from 10% in 2013 to 9% in 2014, indicating that the APEC members received gas imports from various points, and not concentrated to only a few exporters. The trend did not continue in 2015, but the risk index was far lower than the 2000 level, a high of 26%. This reveals there were more gas exporters (combined piped gas and LNG) in 2015 compared with 2000. Only 12 economies are importing gas and 8 of them have both piped gas and LNG imports (Figure 3.5).

With the region's abundant gas reserves, the supply risk for the gas reserves-to-production ratio remained low at 8% in 2015. As the region's gas reserves are not equally spread among APEC members, with some economies (like Japan; Korea and Singapore) having limited or no gas resources, facilitating better trade and coordination between APEC members can help to improve the gas supply in the region.

⁵ The index obtained in oil security for primary energy diversity also applied to gas security index assessment.

Figure 3.6: LNG and piped gas imports by economy, 2000 and 2015



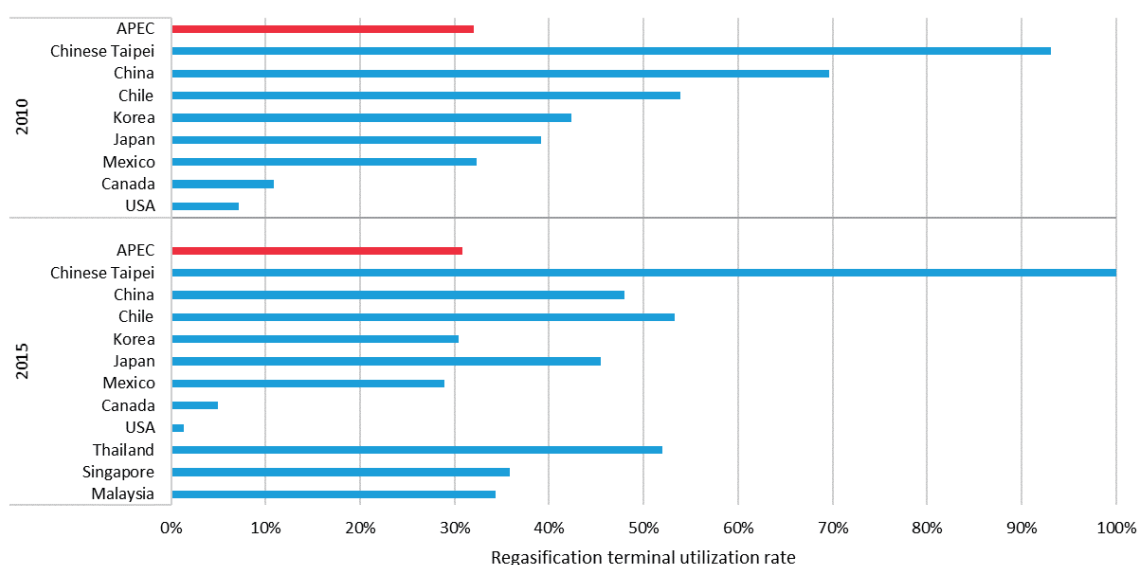
Source: APERC analysis and Cedigaz database.

The utilisation of RGT in the region is still considered low to medium.⁶ The risk of supply interruption in certain economies can still be low because of limited terminal availability throughout the year. However, continued growth in some economies, such as Chinese Taipei with more than 90% RGT utilisation and Chile and Thailand with utilisation above 50% in 2015, may lead to supply constraints

⁶ Only considered annualized data for the utilization rate of RGT terminal for risk calculation and did not take into account seasonal factor.

in the future if no additional terminals will be built. China made progress in reducing its RGT utilisation from a high of 96% in 2007 to about 40% in 2015 because of additional RGT facilities (Figure 3.6). Around 80% of RGTs in the region are located in Japan; Korea; and, the US. The availability of RGT capacity enhances supply security for an economy as it provides for an option to import LNG. But it must be noted that it may pose a security risk if the existing RGT facilities are operating at a high utilisation rate or near full capacity, as there will no spare capacity to be used to react to any unforeseen increase in domestic gas demand.

Figure 3.7: Regasification terminal utilization, 2010 and 2015



Source: Cedigaz (2017) and APERC analysis.

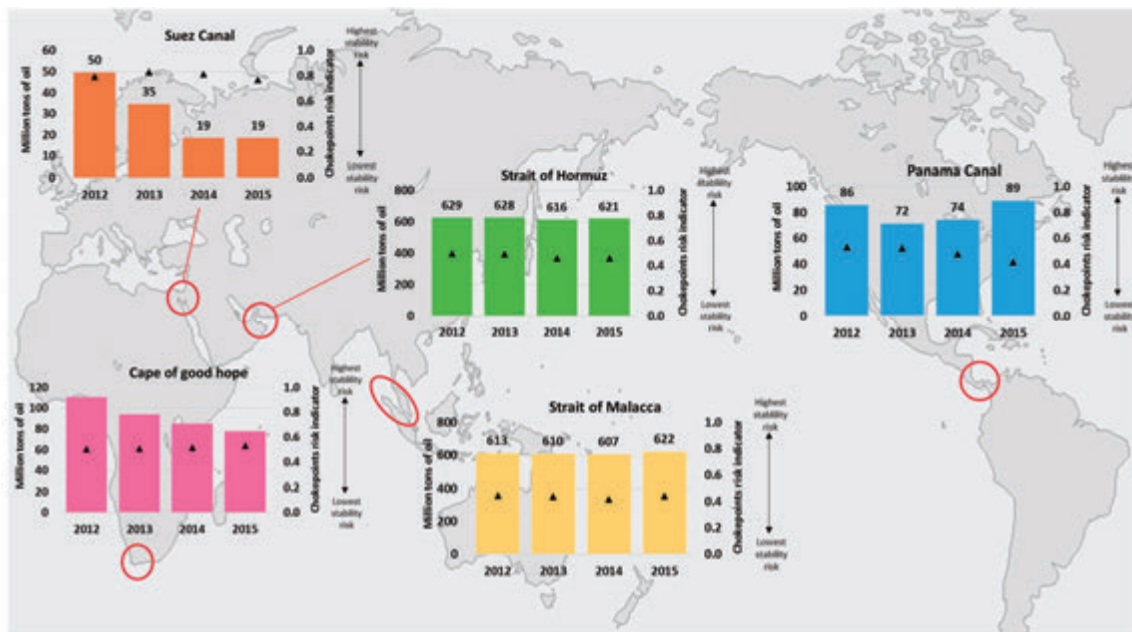
As mentioned above, APEC as a region is endowed with huge gas reserves, which make the region one of the major gas producers in the world. From a regional perspective, APEC is gas self-sufficient. However, further examination showed that seven economies are net gas exporters, having huge surplus gas production – Australia; Brunei Darussalam; Canada; Indonesia; Malaysia; Papua New Guinea; and, Russia. Four economies (New Zealand; Peru; Philippines; and, Viet Nam) have no imports as production is enough to meet domestic demand, while the rest are gas net importers. The US improved its gas self-sufficiency level through shale gas production.

On international agreement in case of a gas emergency, only APEC-ASEAN members have an agreement that could cover gas supply for emergency purposes under APSA. Since there are only seven APEC members in this agreement, it gives the region an opportunity to enhance the gas supply cooperation (potentially for emergency purposes), by testing the idea of having an agreement covering all economies

External factors

The same methodology as in the oil sector was applied to measure the gas supply risk of transiting chokepoints. As more LNG was imported from within the APEC region, particularly from Australia, the chokepoints risk index improved from 15% in 2013 to 13% in 2015. The Straits of Malacca and Hormuz remained the major chokepoints for exporters. In 2013, nearly half of the total LNG imports to APEC members went through the Strait of Malacca. However, the share dropped to 40% in 2015 as APEC members started to diversify their import sources from within the region.

Figure 3.8: LNG imports through selected chokepoints, 2012-15



Source: Cedigaz (2017) and APERC analysis.

Notes:

1. Although Bab-El Mandeb is considered in total supply risk analysis, the figure does not include the risk from that chokepoint.
2. The amount of LNG imports that goes through each chokepoint is based on trade data by assuming that each exporter will send the cargo to the importer by using the possible shortest route.
3. The assessment only covered APEC members.
4. Some tankers may go through two or more of these chokepoints

The exporters' stability risk for gas supply is far lower than oil, partly because there are more stable suppliers (politically stable) compared with oil. Since some of the major LNG exporters are APEC members (Australia; Brunei Darussalam; Indonesia; and, Malaysia), with relatively stable political environments, this contributed to reducing some of the supply risks.

As more than 50% of gas imports are in LNG form, the utilisation rate of liquefaction facilities of LNG exporters is included in the assessment of supply risk as an external factor. Liquefaction capacity had become more constrained as the utilisation rate increased from 80% in 2000 to 83% in 2015, which resulted in increased risk from 49% in 2000 to 61% in 2015. This implies that LNG exporters to the region may soon face limited capacity to deliver more LNG. Nonetheless, several LNG projects are expected to be operational by 2020, which could reduce the risk for this indicator. However, challenges arise post-2020 on whether there will be enough additional liquefaction capacity to cater to increasing gas demand globally and in the region.

4. Economy Data

As in the full version of the oil and gas security index published by APERC in 2017, this report will provide the index results for all economies based on the methodology the authors developed in the past publication/study, which can be downloaded at:

<http://apec.org/Publications/2017/04/Oil-and-Gas-Security-Indexation>

Australia

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	32%	34%	31%	30%	30%	30%
	International agreement – oil emergency	0%	0%	0%	0%	0%	0%
	Oil share to primary energy	33%	33%	33%	35%	35%	33%
	Oil intensity and consumption per capita	76%	71%	76%	81%	78%	75%
	Oil import source diversity	13%	15%	13%	11%	12%	15%
	Oil R/P ratio	37%	57%	4%	47%	45%	51%
	Oil self sufficiency	1%	30%	39%	55%	56%	57%
External	Chokepoints	17%	9%	14%	22%	15%	16%
	Exporter stability	50%	51%	49%	51%	48%	45%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	32%	34%	31%	30%	30%	30%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	19%	17%	22%	24%	25%	26%
	Gas intensity and consumption per capita	47%	42%	55%	56%	57%	59%
	Gas import source diversity	0%	0%	100%	100%	100%	100%
	Gas R/P Ratio	16%	15%	8%	21%	34%	38%
	RGT terminal utilization	0%	0%	0%	0%	0%	0%
	Gas self sufficiency	0%	0%	0%	0%	0%	0%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	30%	29%	27%	27%
	LNG terminal utilization	0%	0%	0%	0%	0%	0%

Brunei Darussalam

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	65%	72%	71%	69%	72%	66%
	International agreement – oil emergency	50%	50%	50%	50%	50%	50%
	Oil share to primary energy	22%	17%	17%	19%	17%	21%
	Oil intensity and consumption per capita	63%	40%	59%	62%	63%	62%
	Oil import source diversity	0%	0%	0%	100%	32%	100%
	Oil R/P ratio	24%	30%	24%	6%	0%	5%
	Oil self sufficiency	0%	0%	0%	0%	0%	0%
External	Chokepoints	0%	0%	0%	0%	31%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	65%	72%	71%	69%	72%	66%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	78%	83%	83%	81%	83%	79%
	Gas intensity and consumption per capita	72%	70%	89%	83%	95%	76%
	Gas import source diversity	0%	0%	0%	0%	0%	0%
	Gas R/P Ratio	0%	14%	24%	32%	31%	29%
	RGT terminal utilization	0%	0%	0%	0%	0%	0%
	Gas self sufficiency	0%	0%	0%	0%	0%	0%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
	LNG terminal utilization	0%	0%	0%	0%	0%	0%

Canada

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	24%	24%	25%	26%	25%	26%
	International agreement – oil emergency	0%	0%	0%	0%	0%	0%
	Oil share to primary energy	34%	35%	37%	35%	35%	35%
	Oil intensity and consumption per capita	90%	87%	91%	89%	91%	90%
	Oil import source diversity	20%	0%	8%	11%	31%	42%
	Oil R/P ratio	97%	3%	7%	25%	32%	34%
External	Oil self sufficiency	0%	0%	0%	0%	0%	0%
	Chokepoints	54%	0%	45%	40%	23%	19%
	Exporter stability	42%	0%	58%	57%	49%	46%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	24%	24%	25%	26%	25%	26%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	29%	30%	30%	32%	32%	32%
	Gas intensity and consumption per capita	66%	69%	61%	66%	65%	67%
	Gas import source diversity	100%	100%	88%	92%	95%	94%
	Gas R/P Ratio	35%	39%	26%	8%	5%	0%
	RGT terminal utilization	0%	0%	11%	9%	5%	5%
	Gas self sufficiency	0%	0%	0%	0%	0%	0%
External	Chokepoints	0%	0%	3%	2%	1%	1%
	Exporter stability	30%	52%	42%	37%	38%	36%
	LNG terminal utilization	0%	0%	5%	4%	2%	2%

Chile

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	27%	27%	31%	28%	28%	27%
	International agreement – oil emergency	100%	100%	100%	100%	100%	100%
	Oil share to primary energy	42%	41%	49%	41%	44%	42%
	Oil intensity and consumption per capita	61%	55%	68%	68%	65%	65%
	Oil import source diversity	0%	26%	21%	21%	34%	51%
	Oil R/P ratio	31%	17%	52%	45%	32%	0%
	Oil self sufficiency	96%	97%	96%	97%	97%	98%
External	Chokepoints	0%	47%	37%	25%	26%	26%
	Exporter stability	0%	61%	57%	52%	50%	56%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	27%	27%	31%	28%	28%	27%
	International agreement - gas emergency	100%	100%	100%	100%	100%	100%
	Gas share to primary energy	21%	24%	14%	10%	10%	11%
	Gas intensity and consumption per capita	46%	53%	31%	26%	23%	25%
	Gas import source diversity	100%	100%	26%	72%	85%	84%
	Gas R/P Ratio	0%	28%	51%	21%	10%	36%
	RGT terminal utilization	0%	0%	54%	64%	52%	53%
	Gas self sufficiency	69%	76%	65%	80%	82%	79%
External	Chokepoints	0%	0%	49%	54%	49%	42%
	Exporter stability	49%	50%	52%	53%	45%	45%
	LNG terminal utilization	0%	0%	80%	92%	85%	83%

China

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	42%	50%	53%	52%	50%	48%
	International agreement – oil emergency	100%	100%	100%	100%	100%	100%
	Oil share to primary energy	20%	18%	17%	17%	17%	18%
	Oil intensity and consumption per capita	56%	53%	54%	55%	55%	57%
	Oil import source diversity	10%	9%	9%	9%	9%	9%
	Oil R/P ratio	0%	32%	32%	23%	22%	22%
	Oil self sufficiency	26%	43%	53%	57%	58%	60%
External	Chokepoints	44%	42%	44%	45%	43%	42%
	Exporter stability	54%	58%	56%	61%	61%	63%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	42%	50%	53%	52%	50%	48%
	International agreement - gas emergency	100%	100%	100%	100%	100%	100%
	Gas share to primary energy	2%	2%	4%	5%	5%	5%
	Gas intensity and consumption per capita	17%	22%	36%	49%	52%	51%
	Gas import source diversity	0%	0%	20%	27%	24%	26%
	Gas R/P Ratio	0%	27%	50%	58%	60%	58%
	RGT terminal utilization	0%	0%	70%	50%	48%	48%
	Gas self sufficiency	0%	0%	10%	28%	29%	29%
External	Chokepoints	0%	0%	11%	14%	13%	8%
	Exporter stability	0%	0%	46%	46%	47%	50%
	LNG terminal utilization	0%	0%	67%	41%	41%	43%

Hong Kong, China

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	35%	37%	33%	40%	42%	34%
	International agreement – oil emergency	100%	100%	100%	100%	100%	100%
	Oil share to primary energy	48%	25%	25%	21%	19%	24%
	Oil intensity and consumption per capita	65%	27%	28%	23%	21%	26%
	Oil import source diversity	0%	0%	0%	0%	0%	0%
	Oil R/P ratio	100%	100%	100%	100%	100%	100%
	Oil self sufficiency	100%	100%	100%	100%	100%	100%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	35%	37%	33%	40%	42%	34%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	18%	17%	23%	16%	15%	19%
	Gas intensity and consumption per capita	48%	39%	50%	33%	31%	39%
	Gas import source diversity	100%	100%	100%	100%	100%	100%
	Gas R/P Ratio	100%	100%	100%	100%	100%	100%
	RGT terminal utilization	0%	0%	0%	0%	0%	0%
	Gas self sufficiency	100%	100%	100%	100%	100%	100%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
	LNG terminal utilization	0%	0%	0%	0%	0%	0%

Indonesia

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	28%	26%	24%	25%	24%	23%
	International agreement – oil emergency	50%	50%	50%	50%	50%	50%
	Oil share to primary energy	37%	37%	34%	36%	33%	32%
	Oil intensity and consumption per capita	79%	68%	67%	66%	63%	59%
	Oil import source diversity	24%	19%	25%	18%	21%	16%
	Oil R/P ratio	27%	8%	14%	0%	4%	3%
External	Oil self sufficiency	0%	18%	33%	45%	46%	43%
	Chokepoints	38%	27%	29%	39%	37%	31%
	Exporter stability	54%	52%	54%	65%	64%	60%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	28%	26%	24%	25%	24%	23%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	17%	16%	18%	17%	16%	17%
	Gas intensity and consumption per capita	49%	47%	53%	45%	44%	45%
	Gas import source diversity	0%	0%	0%	0%	0%	0%
	Gas R/P Ratio	16%	21%	20%	16%	17%	19%
	RGT terminal utilization	0%	0%	0%	0%	0%	0%
	Gas self sufficiency	0%	0%	0%	0%	0%	0%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
	LNG terminal utilization	0%	0%	0%	0%	0%	0%

Japan

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	32%	31%	27%	33%	32%	32%
	International agreement – oil emergency	0%	0%	0%	0%	0%	0%
	Oil share to primary energy	49%	47%	41%	44%	43%	43%
	Oil intensity and consumption per capita	83%	73%	65%	67%	64%	63%
	Oil import source diversity	16%	19%	17%	18%	20%	21%
	Oil R/P ratio	4%	18%	34%	16%	10%	3%
	Oil self sufficiency	100%	100%	100%	100%	100%	100%
External	Chokepoints	50%	52%	52%	49%	48%	49%
	Exporter stability	45%	47%	50%	49%	48%	51%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	32%	31%	27%	33%	32%	32%
	International agreement - gas emergency	100%	100%	100%	100%	100%	100%
	Gas share to primary energy	13%	14%	17%	23%	24%	23%
	Gas intensity and consumption per capita	37%	39%	46%	57%	57%	54%
	Gas import source diversity	20%	17%	14%	13%	13%	14%
	Gas R/P Ratio	1%	23%	34%	32%	25%	27%
	RGT terminal utilization	33%	34%	39%	47%	47%	45%
	Gas self sufficiency	97%	96%	96%	97%	98%	98%
External	Chokepoints	11%	12%	14%	21%	20%	19%
	Exporter stability	53%	45%	45%	43%	43%	45%
	LNG terminal utilization	84%	85%	88%	92%	92%	100%

Korea

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	36%	30%	28%	27%	27%	28%
	International agreement – oil emergency	50%	0%	0%	0%	0%	0%
	Oil share to primary energy	53%	44%	38%	37%	36%	38%
	Oil intensity and consumption per capita	96%	73%	73%	75%	73%	79%
	Oil import source diversity	15%	16%	17%	18%	17%	16%
	Oil R/P ratio	100%	100%	100%	100%	100%	100%
	Oil self sufficiency	100%	100%	100%	100%	100%	100%
External	Chokepoints	48%	49%	49%	52%	51%	51%
	Exporter stability	49%	50%	54%	54%	52%	58%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	36%	30%	28%	27%	27%	28%
	International agreement - gas emergency	100%	100%	100%	100%	100%	100%
	Gas share to primary energy	9%	13%	15%	18%	16%	14%
	Gas intensity and consumption per capita	28%	40%	50%	59%	52%	47%
	Gas import source diversity	27%	22%	14%	17%	18%	19%
	Gas R/P Ratio	100%	34%	80%	72%	60%	31%
	RGT terminal utilization	42%	36%	42%	40%	34%	30%
	Gas self sufficiency	100%	98%	99%	99%	99%	100%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	58%	45%	50%	50%	50%	44%
	LNG terminal utilization	77%	79%	82%	87%	86%	91%

Malaysia

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	42%	39%	34%	35%	35%	34%
	International agreement – oil emergency	50%	50%	50%	50%	50%	50%
	Oil share to primary energy	40%	38%	35%	36%	37%	32%
	Oil intensity and consumption per capita	69%	68%	64%	74%	75%	62%
	Oil import source diversity	22%	17%	12%	11%	13%	12%
	Oil R/P ratio	10%	40%	14%	0%	3%	16%
	Oil self sufficiency	0%	0%	0%	6%	7%	0%
External	Chokepoints	46%	42%	42%	37%	35%	39%
	Exporter stability	42%	48%	51%	52%	51%	54%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	42%	39%	34%	27%	27%	28%
	International agreement - gas emergency	50%	50%	50%	100%	100%	100%
	Gas share to primary energy	51%	48%	42%	18%	16%	14%
	Gas intensity and consumption per capita	58%	66%	54%	59%	52%	47%
	Gas import source diversity	0%	100%	100%	17%	18%	19%
	Gas R/P Ratio	8%	24%	18%	100%	100%	100%
	RGT terminal utilization	0%	0%	0%	40%	34%	30%
	Gas self sufficiency	0%	0%	0%	99%	99%	100%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	80%	67%	50%	50%	44%
	LNG terminal utilization	0%	0%	0%	87%	86%	91%

Mexico

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	41%	39%	38%	38%	37%	36%
	International agreement – oil emergency	50%	50%	50%	50%	50%	50%
	Oil share to primary energy	59%	57%	53%	51%	51%	48%
	Oil intensity and consumption per capita	75%	74%	68%	70%	67%	63%
	Oil import source diversity	0%	0%	100%	51%	48%	63%
	Oil R/P ratio	0%	55%	60%	59%	58%	55%
External	Oil self sufficiency	0%	0%	0%	0%	0%	0%
	Chokepoints	0%	0%	0%	0%	2%	0%
	Exporter stability	0%	0%	41%	22%	33%	33%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	41%	39%	38%	38%	37%	36%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	24%	26%	30%	32%	32%	35%
	Gas intensity and consumption per capita	39%	49%	53%	57%	55%	58%
	Gas import source diversity	100%	100%	43%	55%	53%	68%
	Gas R/P Ratio	0%	57%	67%	66%	65%	70%
	RGT terminal utilization	0%	0%	32%	30%	36%	29%
	Gas self sufficiency	6%	17%	21%	35%	38%	47%
External	Chokepoints	0%	0%	13%	10%	7%	4%
	Exporter stability	30%	52%	53%	43%	45%	41%
	LNG terminal utilization	0%	0%	21%	14%	21%	14%

New Zealand

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	24%	22%	22%	22%	22%	23%
	International agreement – oil emergency	0%	0%	0%	0%	0%	0%
	Oil share to primary energy	33%	36%	34%	33%	32%	33%
	Oil intensity and consumption per capita	78%	69%	71%	73%	73%	76%
	Oil import source diversity	15%	9%	13%	12%	14%	15%
	Oil R/P ratio	54%	67%	85%	69%	74%	78%
External	Oil self sufficiency	66%	82%	56%	71%	68%	68%
	Chokepoints	45%	32%	33%	33%	29%	26%
	Exporter stability	41%	47%	40%	45%	43%	44%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	24%	22%	22%	22%	22%	23%
	International agreement - gas emergency	0%	0%	0%	0%	0%	0%
	Gas share to primary energy	30%	19%	20%	21%	21%	20%
	Gas intensity and consumption per capita	60%	35%	38%	39%	41%	39%
	Gas import source diversity	0%	0%	0%	0%	0%	0%
	Gas R/P Ratio	43%	3%	32%	33%	27%	29%
	RGT terminal utilization	0%	0%	0%	0%	0%	0%
	Gas self sufficiency	0%	0%	0%	0%	0%	1%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
	LNG terminal utilization	0%	0%	0%	0%	0%	0%

Papua New Guinea

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	67%	70%	58%	61%	56%	41%
	International agreement – oil emergency	100%	100%	100%	100%	100%	100%
	Oil share to primary energy	81%	83%	73%	75%	72%	49%
	Oil intensity and consumption per capita	61%	79%	71%	71%	72%	71%
	Oil import source diversity	100%	0%	0%	0%	0%	0%
	Oil R/P ratio	100%	100%	100%	100%	100%	100%
	Oil self sufficiency	100%	100%	100%	100%	100%	100%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	25%	0%	0%	0%	0%	0%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	67%	70%	58%	61%	56%	41%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	11%	7%	6%	5%	11%	39%
	Gas intensity and consumption per capita	8%	8%	6%	6%	12%	62%
	Gas import source diversity	0%	0%	0%	0%	0%	0%
	Gas R/P Ratio	100%	100%	100%	0%	0%	0%
	RGT terminal utilization	0%	0%	0%	0%	0%	0%
	Gas self sufficiency	100%	100%	100%	0%	0%	0%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
	LNG terminal utilization	0%	0%	0%	0%	0%	0%

Peru

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	42%	34%	30%	32%	31%	32%
	International agreement – oil emergency	100%	100%	100%	100%	100%	100%
	Oil share to primary energy	61%	53%	43%	46%	42%	44%
	Oil intensity and consumption per capita	63%	49%	48%	56%	53%	57%
	Oil import source diversity	30%	31%	28%	35%	38%	32%
	Oil R/P ratio	61%	0%	71%	65%	62%	47%
	Oil self sufficiency	30%	25%	0%	11%	6%	27%
External	Chokepoints	18%	23%	18%	19%	20%	14%
	Exporter stability	69%	69%	68%	66%	56%	53%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	42%	34%	30%	32%	31%	32%
	International agreement - gas emergency	100%	100%	100%	100%	100%	100%
	Gas share to primary energy	4%	12%	28%	28%	34%	32%
	Gas intensity and consumption per capita	5%	16%	43%	45%	55%	53%
	Gas import source diversity	0%	0%	0%	0%	0%	0%
	Gas R/P Ratio	0%	0%	58%	69%	72%	72%
	RGT terminal utilization	0%	0%	0%	0%	0%	0%
	Gas self sufficiency	0%	0%	0%	0%	0%	0%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
	LNG terminal utilization	0%	0%	0%	0%	0%	0%

Philippines

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	28%	24%	23%	22%	23%	24%
	International agreement – oil emergency	50%	50%	50%	50%	50%	50%
	Oil share to primary energy	40%	36%	34%	31%	32%	34%
	Oil intensity and consumption per capita	74%	49%	43%	40%	42%	49%
	Oil import source diversity	23%	39%	27%	26%	32%	28%
	Oil R/P ratio	0%	96%	97%	96%	97%	96%
External	Oil self sufficiency	100%	94%	93%	95%	94%	96%
	Chokepoints	54%	52%	44%	42%	41%	48%
	Exporter stability	46%	54%	47%	50%	50%	53%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	28%	24%	23%	22%	23%	24%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	0%	7%	8%	6%	6%	6%
	Gas intensity and consumption per capita	0%	49%	46%	40%	40%	37%
	Gas import source diversity	0%	0%	0%	0%	0%	0%
	Gas R/P Ratio	0%	73%	80%	82%	84%	83%
	RGT terminal utilization	0%	0%	0%	0%	0%	0%
	Gas self sufficiency	0%	0%	0%	0%	0%	0%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
	LNG terminal utilization	0%	0%	0%	0%	0%	0%

Russia

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	35%	36%	38%	36%	36%	34%
	International agreement – oil emergency	0%	0%	0%	0%	0%	0%
	Oil share to primary energy	20%	20%	20%	22%	23%	22%
	Oil intensity and consumption per capita	78%	61%	65%	74%	78%	75%
	Oil import source diversity	0%	0%	0%	0%	0%	0%
	Oil R/P ratio	2%	16%	22%	0%	1%	2%
	Oil self sufficiency	0%	0%	0%	0%	0%	0%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	35%	36%	38%	36%	36%	34%
	International agreement - gas emergency	0%	0%	0%	0%	0%	0%
	Gas share to primary energy	51%	54%	56%	54%	53%	51%
	Gas intensity and consumption per capita	79%	80%	79%	79%	77%	78%
	Gas import source diversity	0%	0%	0%	0%	0%	0%
	Gas R/P Ratio	3%	10%	12%	8%	2%	0%
	RGT terminal utilization	0%	0%	0%	0%	0%	0%
	Gas self sufficiency	0%	0%	0%	0%	0%	0%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
	LNG terminal utilization	0%	0%	0%	0%	0%	0%

Singapore

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	87%	59%	56%	50%	49%	49%
	International agreement – oil emergency	50%	50%	50%	50%	50%	50%
	Oil share to primary energy	93%	72%	69%	61%	61%	60%
	Oil intensity and consumption per capita	99%	73%	71%	63%	63%	62%
	Oil import source diversity	16%	19%	18%	18%	18%	16%
	Oil R/P ratio	100%	100%	100%	100%	100%	100%
	Oil self sufficiency	100%	100%	100%	100%	100%	100%
External	Chokepoints	46%	42%	48%	52%	48%	48%
	Exporter stability	43%	42%	41%	45%	46%	49%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	87%	59%	56%	50%	49%	49%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	6%	26%	28%	35%	35%	36%
	Gas intensity and consumption per capita	12%	54%	53%	60%	60%	62%
	Gas import source diversity	100%	71%	71%	54%	47%	49%
	Gas R/P Ratio	100%	100%	100%	100%	100%	100%
	RGT terminal utilization	0%	0%	0%	27%	32%	36%
	Gas self sufficiency	100%	100%	100%	100%	100%	100%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	49%	72%	64%	56%	55%	56%
	LNG terminal utilization	0%	0%	0%	10%	18%	23%

Chinese Taipei

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	35%	34%	32%	31%	31%	31%
	International agreement – oil emergency	100%	100%	100%	100%	100%	100%
	Oil share to primary energy	45%	42%	40%	38%	38%	39%
	Oil intensity and consumption per capita	77%	74%	73%	69%	70%	71%
	Oil import source diversity	12%	19%	23%	25%	23%	22%
	Oil R/P ratio	59%	54%	38%	11%	0%	0%
	Oil self sufficiency	100%	100%	100%	100%	100%	100%
External	Chokepoints	39%	43%	44%	43%	41%	44%
	Exporter stability	41%	41%	39%	39%	35%	40%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	35%	34%	32%	31%	31%	31%
	International agreement - gas emergency	100%	100%	100%	100%	100%	100%
	Gas share to primary energy	7%	9%	12%	12%	12%	14%
	Gas intensity and consumption per capita	27%	39%	52%	49%	50%	55%
	Gas import source diversity	52%	45%	17%	32%	28%	30%
	Gas R/P Ratio	36%	35%	0%	24%	27%	29%
	RGT terminal utilization	60%	80%	93%	100%	100%	100%
	Gas self sufficiency	89%	95%	98%	98%	98%	98%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	74%	60%	49%	42%	41%	42%
	LNG terminal utilization	85%	83%	85%	89%	88%	94%

Thailand

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	30%	31%	28%	29%	29%	29%
	International agreement – oil emergency	50%	50%	50%	50%	50%	50%
	Oil share to primary energy	44%	44%	38%	40%	40%	40%
	Oil intensity and consumption per capita	69%	70%	69%	80%	79%	79%
	Oil import source diversity	13%	18%	18%	21%	16%	18%
	Oil R/P ratio	32%	17%	54%	57%	56%	57%
External	Oil self sufficiency	75%	70%	61%	64%	65%	63%
	Chokepoints	49%	46%	42%	43%	40%	38%
	Exporter stability	44%	43%	45%	45%	47%	46%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	30%	31%	28%	29%	29%	29%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	24%	26%	28%	28%	28%	28%
	Gas intensity and consumption per capita	39%	51%	56%	61%	60%	60%
	Gas import source diversity	100%	100%	100%	69%	70%	59%
	Gas R/P Ratio	16%	40%	56%	69%	72%	71%
	RGT terminal utilization	0%	0%	0%	28%	26%	52%
	Gas self sufficiency	10%	29%	25%	25%	23%	32%
External	Chokepoints	0%	0%	0%	10%	9%	13%
	Exporter stability	84%	69%	76%	67%	66%	64%
	LNG terminal utilization	0%	0%	0%	16%	16%	26%

USA

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	27%	28%	26%	25%	25%	26%
	International agreement – oil emergency	0%	0%	0%	0%	0%	0%
	Oil share to primary energy	38%	40%	36%	35%	35%	36%
	Oil intensity and consumption per capita	91%	86%	77%	76%	76%	78%
	Oil import source diversity	11%	10%	10%	17%	21%	23%
	Oil R/P ratio	12%	4%	11%	3%	10%	7%
	Oil self sufficiency	59%	66%	58%	39%	30%	27%
External	Chokepoints	35%	35%	31%	25%	22%	19%
	Exporter stability	56%	61%	61%	53%	49%	48%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	27%	28%	26%	25%	25%	26%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	24%	22%	25%	28%	28%	30%
	Gas intensity and consumption per capita	63%	55%	56%	60%	60%	64%
	Gas import source diversity	88%	74%	77%	93%	96%	93%
	Gas R/P Ratio	37%	23%	2%	5%	3%	24%
	RGT terminal utilization	63%	52%	7%	1%	1%	1%
	Gas self sufficiency	18%	17%	11%	7%	3%	2%
External	Chokepoints	3%	8%	6%	2%	1%	2%
	Exporter stability	29%	37%	35%	30%	27%	26%
	LNG terminal utilization	5%	11%	9%	3%	2%	3%

Viet Nam

Oil security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	34%	27%	25%	23%	23%	24%
	International agreement – oil emergency	50%	50%	50%	50%	50%	50%
	Oil share to primary energy	27%	29%	32%	26%	26%	25%
	Oil intensity and consumption per capita	50%	54%	73%	58%	59%	64%
	Oil import source diversity	0%	0%	83%	40%	43%	37%
	Oil R/P ratio	87%	89%	86%	9%	0%	6%
External	Oil self sufficiency	0%	0%	14%	0%	6%	8%
	Chokepoints	0%	0%	0%	1%	8%	8%
	Exporter stability	0%	0%	48%	41%	51%	48%
Gas security index		2000	2005	2010	2013	2014	2015
Internal	Primary energy diversity	34%	27%	25%	23%	23%	24%
	International agreement - gas emergency	50%	50%	50%	50%	50%	50%
	Gas share to primary energy	4%	11%	14%	14%	14%	13%
	Gas intensity and consumption per capita	11%	37%	52%	50%	51%	53%
	Gas import source diversity	0%	0%	0%	0%	0%	0%
	Gas R/P Ratio	0%	67%	75%	77%	79%	80%
	RGT terminal utilization	0%	0%	0%	0%	0%	0%
	Gas self sufficiency	0%	0%	0%	0%	0%	0%
External	Chokepoints	0%	0%	0%	0%	0%	0%
	Exporter stability	0%	0%	0%	0%	0%	0%
	LNG terminal utilization	0%	0%	0%	0%	0%	0%

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