Quantifying And Indexing Energy Security: Oil And Gas Security Indexation For APEC Members

Muhamad Izham Abd. Shukor, Asia Pacific Energy Research Centre, +81 3-5144-8541, muhamad.izham@aperc.ieej.or.jp
Michael Ochoada SINOCRUZ, Asia Pacific Energy Research Centre, +81 3-5144-8537, michael.sinocruz@aperc.ieej.or.jp
Dr. Kazutomo IRIE, Asia Pacific Energy Research Centre, Japan, +81 3-5547-0228, kazutomo.irie@ aperc.ieej.or.jp

Overview

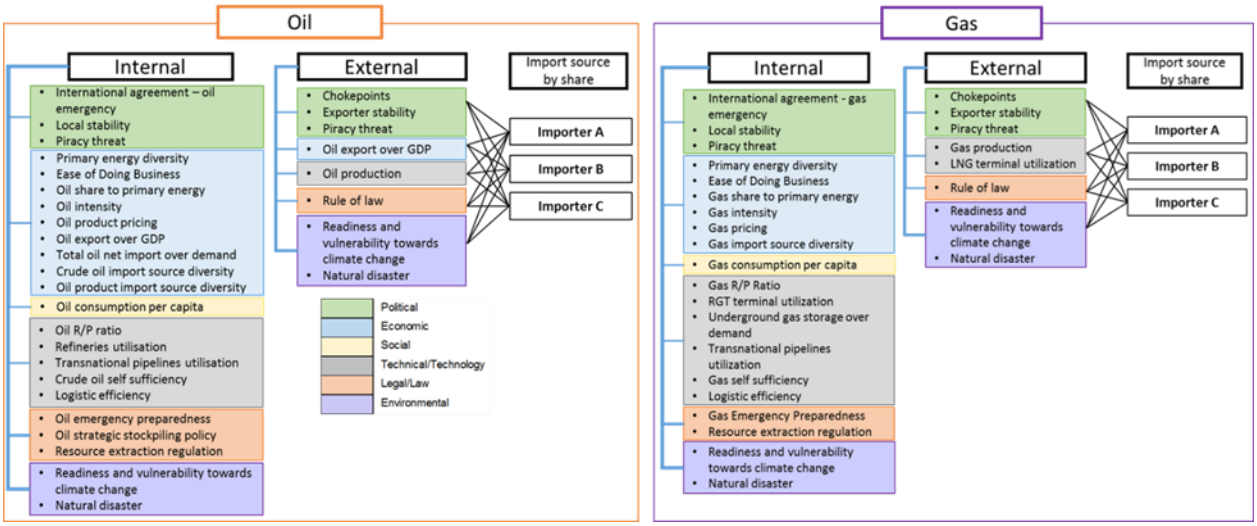
The energy security concept has been expanding: it no longer concentrate on import risks alone. All risk in the supply chain should be assessed in order to get the full picture of energy security. The energy supply chain is highly complex and its future is uncertain due to unexpected changes and contrasting values. The complexity of the system may be defined by, for example, changing politics, technologies, finance and demographics. As challenging as it may be, establishing an energy security indexation should be able to help the policy makers, industry players and people at large to understand better the situation of energy supply.

This study focuses on oil (crude oil and oil product) and gas supply security, covering production, reliability of import sources and energy trade, technical and infrastructure limitations, existing legal and law, diversity of import sources and fuel, emergency preparedness and many other issues than can turned into risk for 21 economies (APEC members) by using more than 5 million data points that spans from 2000-2013.

Methods

In order to have a better understanding of the underlying risk on oil and gas supply security supply, PESTLE analysis has been chosen so that the analysis would be able to cover almost all aspects of risk factors. The PESTLE acronym represents political, economic, social, technical, legal and environmental (each PESTLE element will be called indicator). Each indicator established under this study is made by several sub-indicators with a total combination of 44 sub-indicators for both oil and gas. To evaluate the risk further, this study divided the sub-indicators into two groups, the internal and external factors (Figure 1).

Figure 1: Oil and Gas Supply Security Indexation Building Blocks



Source: APERC analysis

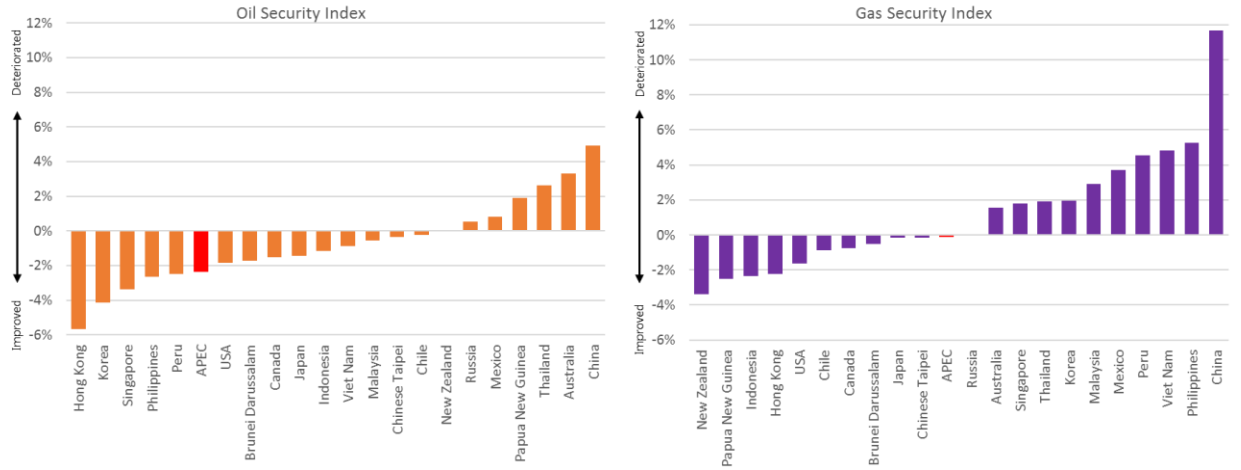
Results

Three indicators contributed to APEC's oil security index improvement – technical/technology, economic and environmental indicators. Among the major factors that triggered the improvement were: (1) the reclassification of oil reserves (2) reduction of the overall APEC oil intensity and (3) higher readiness and lower vulnerability towards climate change threats. However, the absence of an oil emergency supply agreement in some APEC members and

increased in APEC's oil consumption per capita prevented the supply security index score from going down further. Piracy incidents in the APEC region that recorded a sharp increase also added total supply risk.

APEC registered a better gas security index than oil, with a relatively stable index. The index recorded the lowest risk in 2009, partly because of weaker gas demand due to the global economic crisis that occurred in 2008-2009. Of the six indicators, only two of them – social and technical/technology indicators, displayed an upward security index (increasing risk). The rest of the indicators either improved or remained unchanged. A significant reduction on the risk was realised from a higher emergency preparedness level as more APEC members have already established policies as well as building more infrastructure to do so.

Figure 2: Oil and Gas Supply Security index changes, 2000 to 2013



Source: APERC analysis

Conclusions

APEC's overall results showed that oil and gas had low to moderate risk exposure to supply disruption over the 2000-2013 period. Oil used to have a higher supply disruption risk than gas in 2000 because of lack of oil reserves in some APEC members, but because of the reserves changes, it supply risk decrease. The results also revealed that the region held low levels of oil stockpiling since some economies only maintained small amounts of stock, except those APEC-IEA members with obligatory requirement to have at least 90 days stock based on net imports. Reducing oil demand or oil intensity will help improve supply security, as demonstrated by some of the APEC economies (such as New Zealand). Thus, APEC economies need to push further on energy efficiency agenda in their respective energy policies.

Although gas had better security than oil initially because of higher self-sufficiency levels, the supply security risk does not getting better over the years because of increasing demand recorded in most APEC members. Likewise, most economies have built or have plans to build new infrastructure providing option(s) to source imports either through pipelines or in the form of LNG, as well as gas storage, to meet growing gas demand. Such gas infrastructure is critical to enhancing the emergency preparedness of member economies. Future security indexation works should be expanded to coal and electricity supply system with updates on sub-indicators.

References

APERC (Asia Pacific Energy Research Centre) (2017), *Oil and Gas Security Indexation*, http://aperc.ieej.or.jp/file/2017/5/16/Oil_and_Gas_Security_Indexation.pdf

--------(2016), *APEC Energy Demand and Supply Outlook, 6th Edition*, http://aperc.ieej.or.jp/file/2016/5/10/APEC_Outlook6th_VolumeII_EconomyReviews.pdf

CEDIGAZ (2016), *Natural Gas Statistical Database*

FI (Fraser Institute) (2016), Global Petroleum Survey 2015, https://www.fraserinstitute.org/sites/default/files/global-petroleum-survey-2015-rev.pdf

IEA (International Energy Agency) (2015), *World Energy Statistics and Balances*.

ICC IMB (International Chamber of Commerce - International Maritime Bureau) (2015), *Piracy and Armed Robbery against Ships Report 2015*

IMF (International Monetary Fund) (2013), *World Economy Outlook 2013*

UN Comtrade (2016), *UN Comtrade Database*, http://comtrade.un.org/