3-3. Oil and Gas Security Indexation

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In 2001, APEC Leaders endorsed the Energy Security Initiative (ESI) in order to strengthen regional energy security, emphasizing on 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.

In 2014, the Energy Ministerial Meeting (EMM) 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.

In EWG 50 (14-18 December 2015), **Energy Security Indexation** was proposed as one of the topics under the Oil & Gas Security Studies (OGSS) research activities for 2016.
### Definitions of energy security by organization around the world

<table>
<thead>
<tr>
<th>Organization</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td><strong>International Energy Agency (IEA)</strong></td>
<td>Uninterrupted physical availability of energy at a price that is affordable, while respecting environmental concerns.</td>
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<tr>
<td><strong>Asia Pacific Energy Research Center (APERC)</strong></td>
<td>Adequate energy supplies at reasonable and stable prices to sustain economic performance and growth. APERC assess energy security in terms of <strong>availability, accessibility, acceptability and affordability</strong></td>
</tr>
<tr>
<td><strong>World Bank</strong></td>
<td>Sustainable production and use of energy at reasonable cost in order to facilitate economic growth and improve the quality of peoples’ lives</td>
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<tr>
<td><strong>United Nations Development Program (UNDP)</strong></td>
<td>Continuous availability of energy in varied forms, in sufficient quantities and at reasonable prices</td>
</tr>
<tr>
<td><strong>Institute of Energy Economics, Japan</strong></td>
<td>Adequate energy at reasonable prices for economic and industrial activities of the country</td>
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</tbody>
</table>

This study focusing on oil and gas sector, specifically in production and transportation, and to some extend, transformation

Source: APERC analysis
Many factors may contribute to supply interruptions

Identifying factors by using PESTLE methodology

<table>
<thead>
<tr>
<th>POLITICS</th>
<th>ECONOMICS</th>
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</thead>
<tbody>
<tr>
<td>Domestic and import source stability; International agreement; Chokepoints risk</td>
<td>Fuel diversity; Import source diversity; Energy pricing; Oil and gas intensity; Oil and gas share to primary energy; Doing business; Oil to GDP ratio;</td>
</tr>
</tbody>
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<tr>
<th>SOCIAL</th>
<th>TECHNOLOGICAL &amp; TECHNICAL</th>
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<tbody>
<tr>
<td>Oil and gas consumption per capita</td>
<td>Logistics efficiencies; Pipelines, LNG terminal and refinery utilization rate; R/P ratio for oil and gas; Oil and gas self sufficiency; Underground gas storage</td>
</tr>
</tbody>
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<tr>
<th>LEGAL</th>
<th>ENVIRONMENT</th>
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<tbody>
<tr>
<td>Emergency preparedness; Rule of law; Strategic stockpile; Resource extraction regulation</td>
<td>Vulnerability and preparedness facing climate change; Natural disaster</td>
</tr>
</tbody>
</table>

This study focuses on production, transportation and to some extent transformation in oil and gas. Each segment poses its own challenges and supply disruption risk.

Source: APERC analysis
Oil and gas security indexation sub-indicators

Each segment poses its own challenges and supply disruption risk.

Source: APERC analysis
Notes: Oil includes crude and product. However, external risk for crude and product is calculated separately. Each import source was calculated separately.
Although crude oil import among APEC members is low (~30%) because of limited resources, oil product import reached more than 50%.

Sources: UN Comtrade and APERC analysis.
In 2013, two-third of crude oil and one-third of LNG imports to APEC members passed through at least one of these chokepoints.

Sources: World Bank, ICC-IMB and APERC analysis.
Note: WGI consist of six sub-indices. The Study adopted the WGI’s “Political Stability and Absence of Violence/Terrorism indicator” published by the World Bank in order to establish the local stability indicator. ICC-IMB recorded incidents that occurred in economy and international waters. The study assume that there is no chokepoint risk for intra-APEC oil and LNG trade.
The average of APEC’s oil security index improved because of new oil reserves in Canada. However, social indicator is expected to increase as oil consumption in developing APEC members will continue to grow.

Source: APERC analysis

Note:
- In the oil security index (1.0% to 100.0%), a lower index means less vulnerability to any gas supply disruption/crisis. A security index of 20% and below is considered low exposure to supply disruption, 21%–40% is moderate-low exposure, 41%–60% mid-exposure, 61%–80% moderate-high exposure, and 81% and above is high exposure.
- Oil includes crude and product
Changes in average of oil security index, 2000-13

Most APEC members showed improvements because of lower oil consumption, improvement in oil reserves, lower risk from import sources and highly stable domestic situation.

Source: APERC analysis
Note: Oil includes crude and product
Most of gas import came from APEC members

Gas import source of APEC

- Share of intra-APEC imports reduced as importers trying to diversify their source (and subsequently the risk)

Source: Cedigaz and APERC analysis
Note: Gas import source covers pipelines and LNG
PESTLE analysis on gas supply security

Law indicator provides the highest risk followed by technical/technology indicator. There are 14 APEC members does not have regional gas emergency agreement. Gas consumption per capita continue to increase in developing and gas producing economies.

Source: APERC analysis

Note: In the gas security index (1.0% to 100.0%), a lower index means less vulnerability to any gas supply disruption/crisis. A security index of 20% and below is considered low exposure to supply disruption, 21%-40% is moderate-low exposure, 41%-60% mid-exposure, 61%-80% moderate-high exposure, and 81% and above is high exposure.
Changes in average gas security index, 2000-13

Nearly half of APEC members gas security index deteriorated because of the increase in gas consumption, higher dependency on imports and lack of infrastructure to meet demand.

Source: APERC analysis
APEC LNG import increased by more than double

Annual regasification terminal utilization rate, 2000 and 2013

More than half of APEC members owned RGT in 2013, up from only 4 economies in 2000. This trend will continue in the future with new RGT expected in the Philippines and Viet Nam soon.

Source: Cedigaz and APERC analysis
A regional agreement for emergency supply will help to improve supply security

International/regional emergency supply agreement

**International Energy Agency-International Energy Program**
(for oil emergency)
- Australia
- Canada
- Japan
- Korea
- New Zealand
- USA

**ASEAN Petroleum Security Agreement (APSA)**
(for oil and gas emergency)
- Brunei Darussalam
- Indonesia
- Malaysia
- Philippines
- Singapore
- Thailand
- Viet Nam

**APEC members without regional agreement**
- Chile*
- China
- Hong Kong, China
- Mexico*
- Papua New Guinea
- Peru
- Russia
- Chinese Taipei

**A region-wide agreement will be able to lower risk of supply of disruption by 2 percentage point for oil and 3.5 percentage for gas**

Source: IEA, ASCEAN and APERC analysis
Note: Chile and Mexico are currently candidate economies for IEA membership
Conclusions and policy implications

• APEC economies should try to expand intra-APEC energy trade as APEC members are politically stable

• Oil had a higher supply disruption risk than gas in 2013 because of lack of oil reserves in some APEC members with high oil share in their primary energy supply mix

• APEC could consider formulating a strategy for possible joint stockpiling among and between member economies, which could improve the region’s overall risk on supply disruptions

• Reducing oil demand or oil intensity will help improve supply security, as demonstrated by some of the APEC economies (such as New Zealand)

• APEC may consider developing its own oil and gas security framework agreement covering supply sharing in the event of domestic or regional supply emergencies.
Thank you for your kind attention

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