



The 2nd APEC Oil & Gas Security Network (OGSN) Forum

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Energy Security Indexation

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Introduction

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 forums 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



Objective

Identify important issues that may pose a risk to the energy supply security, and to assess those issues relative to the level of risk they pose by establishing indicators and an indexes for analytical purposes.

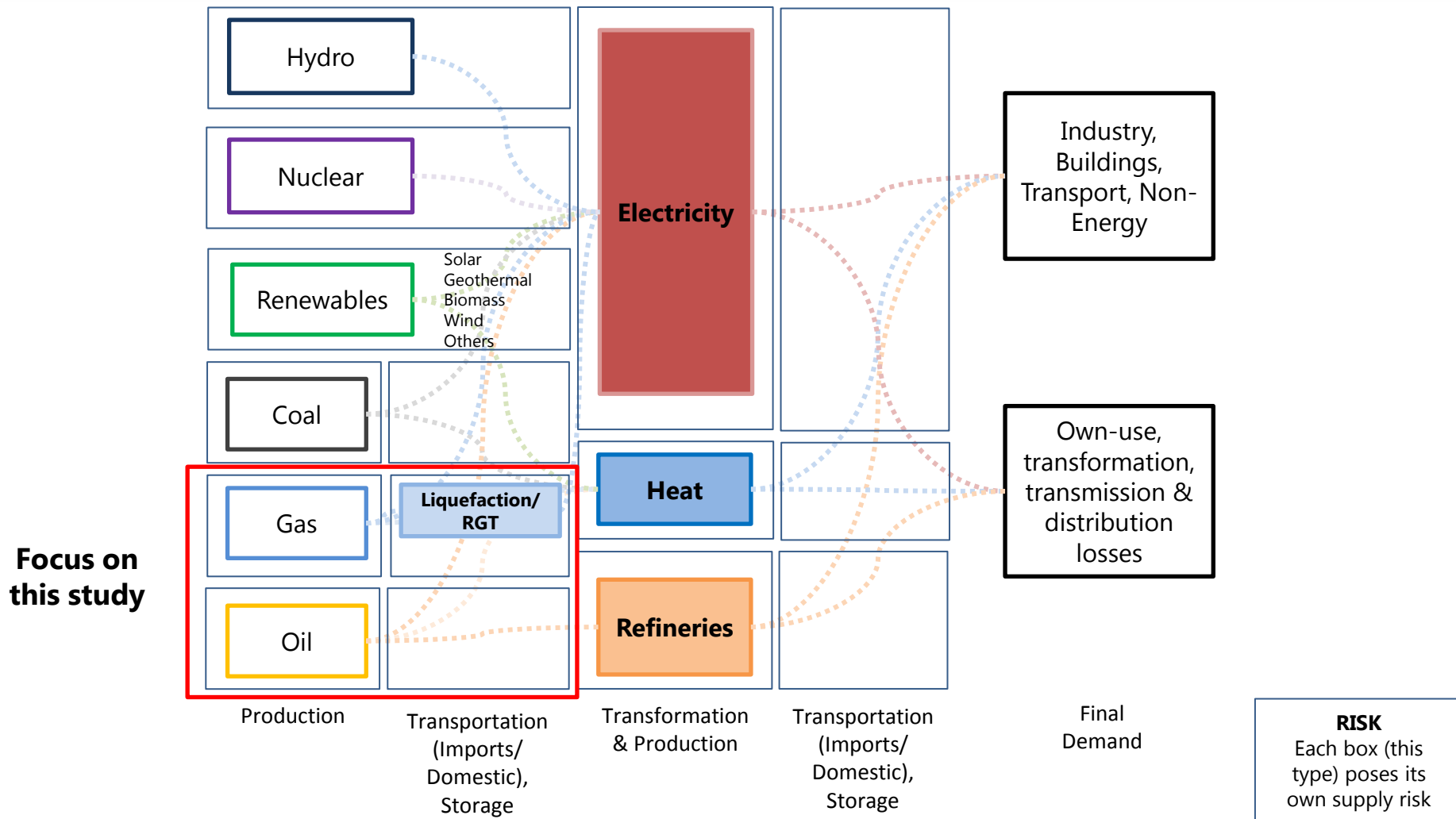
To achieve this objective, a few steps has been identified in establishing indicators and indexes:

- Identifying the issues of potential risk on energy security
- Historical analysis and synthesis on energy trade, energy use etc
- Using survey to assess risk levels
- Identified appropriate indicators for indexation (composite index)

Defining Energy Security

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

Risk In Energy Supply Chain



Factors That May Influence Energy Supply Security

POLITICS

Geopolitics;
International agreement;
domestic and local politics;
political risk; subsidies

ECONOMICS

Extraction cost; commodity pricing; energy pricing; technology's efficiencies; capital & operational cost; lending rate; energy demand; economy openness; trades

SOCIAL

Behavioural change; rate of adaptation to law and technology; public perception; public engagement; social order, household spending on energy

TECHNOLOGICAL & TECHNICAL

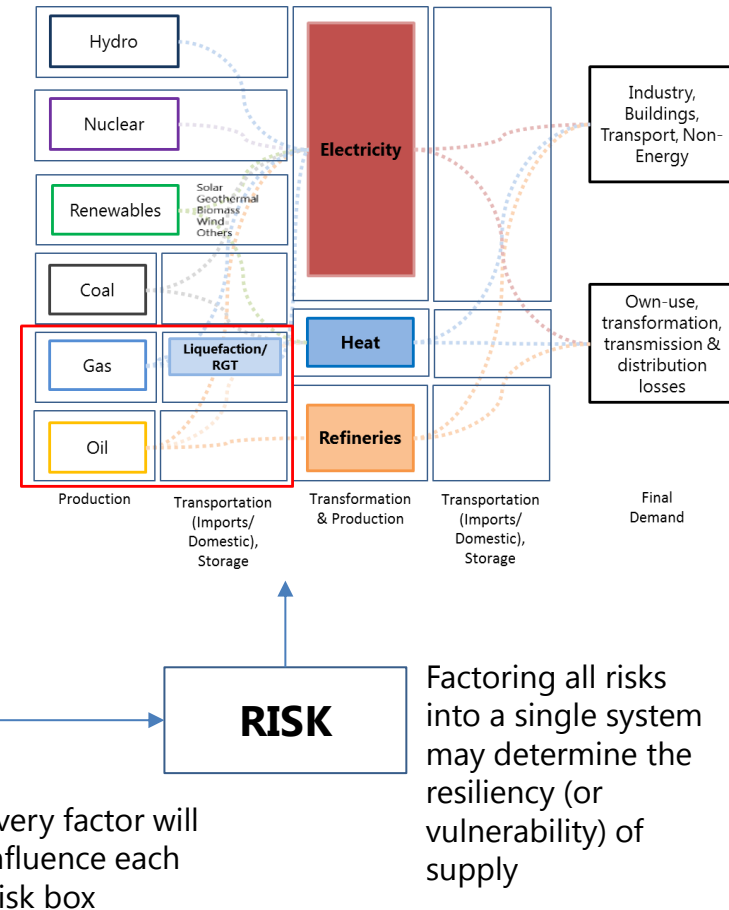
Rate of innovation vs implementation; Support infrastructure; Energy supply chain; Logistics efficiencies

LEGAL

Emergency preparedness; transparency; rule of law; domestic & cross border monitoring system (tax etc.), human capital, strategic stockpile, emergency preparedness

ENVIRONMENT

Seasonal weather; Climate change risk; cumulative environmental factor; access to modern energy



Non-exhaustive. Initial ideas in clustering energy supply risks

6th APEC Energy Demand And Supply Outlook

Several parameters of energy security indicators introduced in upcoming Outlook

Parameters	Methodologies
Primary energy supply diversity	Using Herfindahl–Hirschman Index (HHI) as basis
Primary energy supply self-sufficiency* (%)	Total indigenous primary energy production over demand
Coal self-sufficiency (%)	Indigenous coal production over demand
Oil self-sufficiency (%)	Indigenous oil production over demand
Gas self-sufficiency (%)	Indigenous gas production over demand
Electricity generation input fuel diversity	Using Herfindahl–Hirschman Index (HHI) as basis

APEC Energy Security Indicator : Historical

	1990	1995	2000	2005	2010	2013
Primary energy supply diversity (HHI)*	0.67	0.65	0.60	0.62	0.62	0.61
Primary energy supply self-sufficiency (%)	95	90	88	89	92	93
Coal self-sufficiency (%)	100	100	100	100	100	100
Oil self-sufficiency (%)	86	71	67	68	71	76
Gas self-sufficiency (%)	100	100	100	100	100	100
Electricity generation input fuel diversity (HHI)*	0.30	0.32	0.34	0.37	0.38	0.36

* Application of Herfindahl-Hirschman Index (HHI) to assess whether a given economy is particularly dependent on one particular fuel. Higher index values indicate lower diversity in the primary energy mix, and therefore, increased vulnerability to changes.

- Further improvement can be done as renewables is only divided into two types: hydro power and other renewables.
- Assessing the import sources and indexing the risk of importation may help to understand better the security issues

OGSS Studies 2015: Oil Supply Security and Emergency Policy

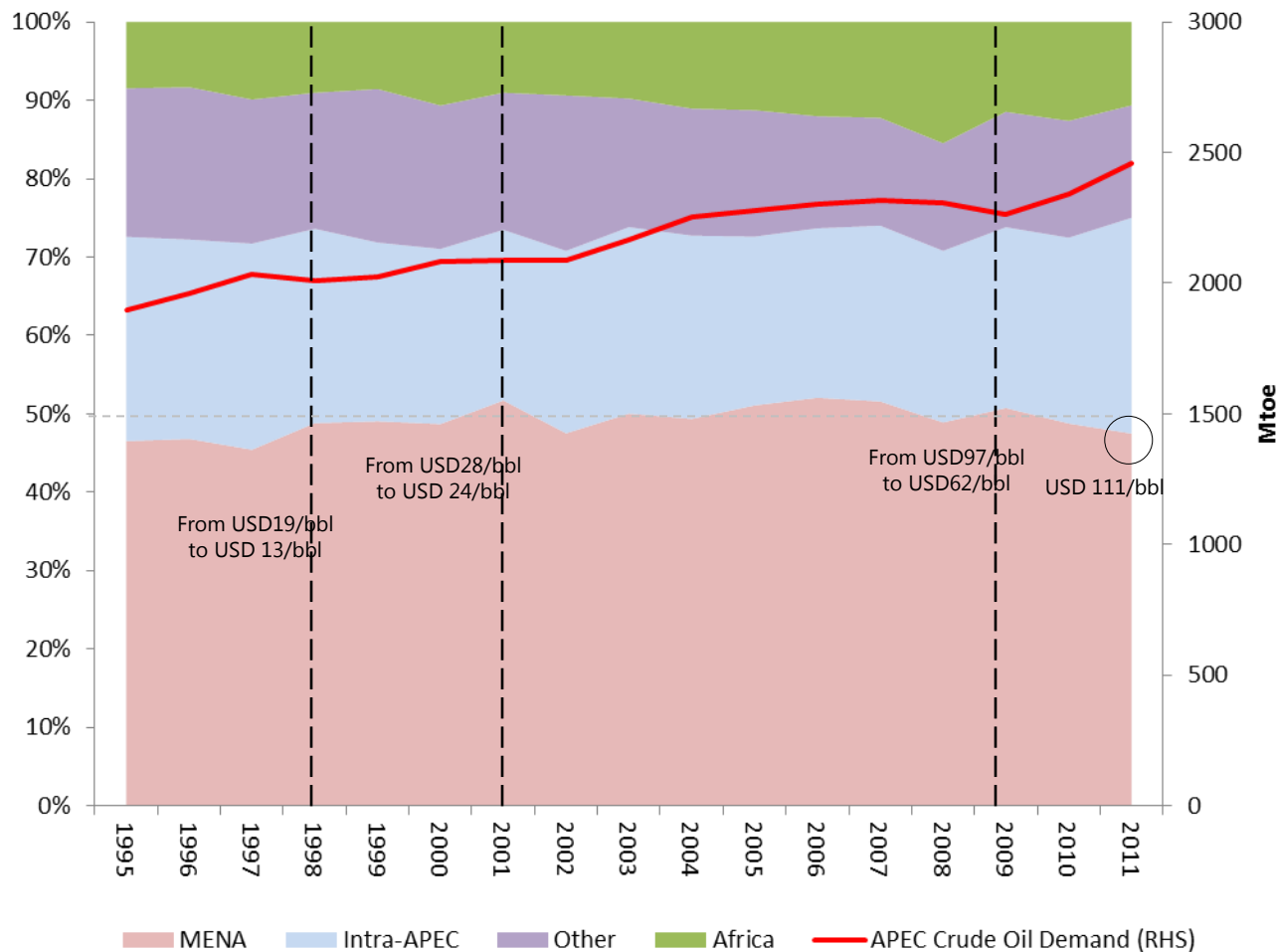
APERC published the *Oil Supply Security and Emergency Policy in the APEC Region*, which is one of the activity under the Oil & Gas Security Studies (OGSS) in November 2015.

Economy	Oil Share to TPES (%)	Oil Import Dependency (%)	Crude Oil Import Sources HHI (0 – 1.0)	Oil Intensity (FED) (toe/million USD)	Oil Stockpiling (Days)	Composite Index
Australia	33	51	0.42	45.00	52/d of net imports	0.43
Brunei	19	0	No Imports	23.00	31/d of oil demand (industry)	0.32
Canada	34	0	0.25	66.70	53/d of oil demand (industry)	0.29
Chile	48	98	0.83	36.10	25/d of sales	0.79
China	17	53	0.32	29.60	30-60 of domestic demand	0.57
Hong Kong	27	100	No Imports	9.10	30/d of retained imports	0.62
Indonesia	34	42	0.26	32.30	22/d of domestic demand	0.50
Japan	44	100	0.71	37.50	151/d of net imports	0.40
Korea	38	100	0.75	52.90	233/d of net imports	0.42
Malaysia	35	0	0.43	40.30	No Information	0.33
Mexico	55	0	No Imports	39.30	No Information	0.46
New Zealand	34	68	0.48	41.60	96/d of net imports	0.35
PNG	76	59	No Information	73.60	No Information	0.84
Peru	44	30	0.65	26.41	15/d of domestic supply	0.64
Philippines	32	95	0.63	20.40	30/d for refiners & 15/d for marketers	0.63
Russia	17	0	No Imports	37.20	No Information	0.36
Singapore	69	100	0.48	28.46	50/d (refiners); 90/d (power generation)	0.62
Chinese Taipei	38	100	0.70	45.90	90/d of net imports	0.63
Thailand	39	70	0.59	53.20	50/d of domestic demand	0.56
United States	37	53	0.23	45.90	251/d of net imports	0.28
Viet Nam	31	15	No Imports	44.20	47/d of domestic demand	0.37

* Application of Herfindahl-Hirschman Index (HHI) to assess the import sources diversity. Full report can be downloaded at: http://aperc.ieej.or.jp/file/2016/2/17/Oil_Supply_Security_and_Emergency_Policy_in_the_APEC_Region.pdf

Based on 5 criteria, a composite index was established, where lower value indicates lower vulnerability of the economy towards oil supply disruption

APEC Crude Oil Import Source (1995-2011)



APEC reliance on MENA has been consistently above 45% and reaches 50% if the oil price decrease

Middle East and North Africa (MENA) Economies: Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Yemen, United Arab Emirates, Libya, Morocco, Oman, Palestine, Israel, Qatar, Saudi Arabia, Syria, Tunisia

Source: Trade data from UN Comtrade, demand data from IEA Statistic 2015, oil price (Brent) from BP Statistical Review 2015



Next step (1)

- Research will focus on oil & gas supply in APEC
 - Import sources
 - Stockpiling – SPR and CPR
 - Gas Power Plant: Oil back-up storage
 - Refineries efficiency, capabilities and capacity
 - Future developments on refineries expansion, oil & gas exploration and production
 - Fuel switching in case of short term disruption
- Surveys – EWG or/and OGSN members
 - Survey to be sent to OGSN members tentatively in 1-2 months from now
 - Results from the survey will be used to indicate risk priorities and determine weightage of risk



Next step (2)

- Establish a composite index by using historical data, survey results and by benchmarking risk using other global indexes
 - Among notable global index are The Global Competitiveness Report 2015-2016, Ease Of Doing Business Index, Global Peace Index
 - Explore the trade correlation with energy security by utilizing UN Trade data, and come up with indicators if possible/needed.
- Possibilities of having workshop(s) to gather and validate information



Suggestions and comments are welcome

THANK YOU