Energy Security and Sustainability in N.E. Asia

November 20th, 2014
Asian Super Grid and RES Workshop at KPMG

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Asian Growth & Shale Revolution
The engine of energy demand growth moves to Asia with resulting problems.

**Primary energy demand, 2035 (Mtoe)**

- **China**: 4,060 Mtoe
- **India**: 1,000 Mtoe
- **Southeast Asia**: 4,060 Mtoe
- **Middle East**: 1,000 Mtoe
- **Europe**: 1,370 Mtoe
- **Brazil**: 480 Mtoe
- **Japan**: 440 Mtoe
- **United States**: 2,240 Mtoe

**Share of global growth 2012-2035**

- **Non-OECD Asia**: 65%
- **OECD**: 4%
- **Europe**: 10%
- **Latin America**: 8%
- **Middle East**: 8%
- **Africa**: 5%
- **Eurasia**: 4%
- **China**: 480 Mtoe
- **Brazil**: 1,540 Mtoe
- **India**: 1,030 Mtoe
- **Southeast Asia**: 4,060 Mtoe
- **Middle East**: 1,050 Mtoe
- **United States**: 440 Mtoe
- **Japan**: 71 Mtoe

**China is the main driver of increasing energy demand in the current decade, but India takes over in the 2020s as the principal source of growth.**
Shale Revolution and Geopolitics of Oil/Gas exporters and importers

Figure 2.12 ➢ Net oil and gas import/export shares in selected regions in the New Policies Scenario

- Net gas importer, net oil exporter
- Net gas and oil importer
- 2011
- 2035

Countries and regions: Brazil, Middle East, Russia, Caspian, Africa, United States, Japan and Korea, European Union, China, India, Southeast Asia, Indonesia, WEO2013
What has happened in the Shale revolution of the US: US aims to further reduce CO2 by 30% towards 2030 in the Power sector.

From 2006-2011, United States CO₂ emissions went down by 7% due to coal-to-gas fuel switching, power generation efficiency gains & increased renewables output.
Cop21 in Paris: Optimism (US China deal) and Pessimism (2°C ?)
Carbon Budget

515Gt had been emitted by 2011. 2°C scenario needs to stop at 790Gt (66%).

790-515=275Gt budget left.

Annual 2012 = 9.7Gt

275/9.7=Only 28 years to go!
The political will to make meaningful progress at a global scale has yet to be demonstrated.
A transformation is needed...

..and we to have the tools to develop a strategy and be proactive.
Three issues to achieve 450ppm:
no.1 How to use more Renewables
2DS of ETP 2014: Optimistic or Pessimistic?
It needs changing places of Fossil and Renewables

• Generation today:
  – Fossil fuels: 68%
  – Renewables: 20%

• Generation 2DS 2050:
  • Renewables: 65%
  • Fossil fuels: 20%
Still on track in Renewables...

Total renewable power generation

Emerging economies step up clean energy ambition, but momentum stalls in OECD countries

ETP2014
Almost half of the global electricity demand growth is met by renewables, pushed by growing subsidies that reach $223 billion in 2035 from $101 billion in 2012.
Power Sector needs Investment in additional flexibility

Four sources of flexibility ...

- Grid infrastructure
- Dispatchable generation
- Storage
- Demand side integration
A sustainable electricity system is a smarter, multidirectional and integrated energy system that requires long-term planning for services delivery.
A decline in nuclear is compensated by a 3-4 fold increase in electricity from renewables, a continued high reliance on LNG imports & improvements in efficiency. Japan’s Power Mix: Serious problem with nuclear shutdown. Japan electricity generation by source and CO2 intensity. Renewables, a continued high reliance on LNG imports & improvements in efficiency.
Reform in Japan

The third arrow

Shinzo Abe has the best chance in decades of changing Japan for the better. He seems poised to take it (June 28th 2014)

Abenomics needs the fourth arrow = Nuclear restarting.
Not only Feed-in-tariffs but Grid integration!

Snapshot of present penetration potentials

“Harnessing Variable Renewables” by IEA

<table>
<thead>
<tr>
<th>Country</th>
<th>PVP (present VRE Penetration Potential of gross electricity demand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>63%</td>
</tr>
<tr>
<td>Nordic market</td>
<td>48%</td>
</tr>
<tr>
<td>United States West (2017)</td>
<td>45%</td>
</tr>
<tr>
<td>NBSO area (of Canada)</td>
<td>37%</td>
</tr>
<tr>
<td>Great Britain and Ireland</td>
<td>31%</td>
</tr>
<tr>
<td>Mexico</td>
<td>29%</td>
</tr>
<tr>
<td>Spain and Portugal</td>
<td>27%</td>
</tr>
<tr>
<td>Japan</td>
<td>19%</td>
</tr>
</tbody>
</table>

Grid

Market

Score:  
- High  
- Medium  
- Low
Power grid in Japan

Japan’s Case Study: Cost-effective integration means transformation of power system

- Large shares of VRE can be integrated cost-effectively
- But adding VRE rapidly without adapting the system is bound to increase costs

The Power of Transformation, 2014 by IEA
Issue No.2: Coal use will continue.
Global coal demand levels off but needs CCS

Global coal demand growth slows rapidly due to more stringent environmental policies, underlining the importance of high-efficiency plant & CCS to coal’s future.
“Pandora’s Promise”, a movie directed by Robert Stone, is a documentary of some environmentalists who changed their views about Nuclear Power.

Issue No.3: Nuclear power after the Fukushima
Eu model as Collective Energy
security and sustainability
Collective Energy Security and Sustainability by Diversity, Connectivity and Nuclear: European Model can be applied to Asia?

Energy self-sufficiency* by fuel in 2011

* Self-sufficiency = domestic production / total primary energy supply

Source: Energy Data Center, IEA.
Power Grid Connection in Europe

Physical energy flows between European countries, 2008 (GWh)

Total: 334658 GWh
UCTE: 285182 GWh

Source: ENTSO-E
Connecting MENA and Europe: "Desertec" as visionary "Energy for Peace"
ASEAN power grid connection

The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.
“Energy for Peace in Asia” New Vision?

Demand Leveling (Time Zone & Climate Difference)
Stable Supply (through regional interdependence)
Fair Electricity Price

Phase 3
Asia Super Grid
Total 36,000km

Presentation by Mr. Masayoshi SON
Development of Natural Gas Pipelines in Europe

*Europe has begun upgrading its natural gas transmission pipeline in the wake of domestic gas fields development between 1940 and 1960.
*Cross border gas pipelines have been built along with gas imports from Russia.
*In order to promote the security by diversification of supply sources, on the occasion of the supply dispute between Russia and Ukraine in 2006 was arose, gas import pipelines which won’t depend on Russian Supply has begun building new international pipeline systems.

Source: OG • May 25, 2009
Russian Gas Pipelines Will Extend to the East: Recent China Deal

Russian Gas Infrastructure

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Source: IEA

Mid-Term Oil & Gas Market 2010, IEA
China’s Oil and Gas Import Transit Routes

(UC) China’s Import Transit Routes/Critical Chokepoints and Proposed/Under Construction SLOC Bypass Routes

UNCLASSIFIED

China’s Oil and Gas Import Transit Routes
ASEAN is working on Gas Pipeline System.

**Figure 15.16** The Trans-ASEAN Gas Pipeline (TAGP)

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Source: ASCOPE Secretariat

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Source: ASCOPE Secretariat
Role of the Energy Charter Treaty: Ukraine Gas Disruption could have been avoided.