Stormy Energy Future and Security Strategy for Asia

2016-9-9 Renewable Energy Institute

Former Executive Director, IEA
President, the Sasakawa Peace Foundation
Nobuo TANAKA
Demand growth in Asia – the sequel

Change in energy demand in selected regions, 2014-2040

By 2040, India’s energy demand closes in on that of the United States, even though demand per capita remains 40% below the world average.
Instability in the Middle East a major risk to oil markets

The short-term picture of a well-supplied market should not obscure future risks as demand rises to 104 mb/d & reliance grows on Iraq & the rest of the Middle East that will become less stable with lower oil revenue.
Geopolitics of the Shale Revolution: Strategic Positioning of Oil / Gas exporters and importers.
By 2035, almost 90% of Middle Eastern oil exports go to Asia; North America’s emergence as a net exporter accelerates the eastward shift in trade.
China’s Oil and Gas Import Transit Routes: One Belt and One Road (一带一路)

-China’s Import Transit Routes/Critical Chokepoints and Proposed/Under Construction SLOC Bypass Routes

China-Kazakhstan Crude Oil Pipeline 400,000 barrels/day
Kazakhstan-China Gas Pipeline 10 billion cubic meters/year
Kazakhstan 4%

Turkmenistan-China Gas Pipeline 40 billion cubic meters/year
Turkmenistan/Central Asia 53%

Suez Canal, via Red Sea (not pictured)
Bitarlyk

Russia-China Gas Pipelines 38 billion cubic meters/year
Russia 5%

Russia-China Crude Oil Pipeline 300,000 barrels/day
(Currently under expansion to 600,000 barrels per day)

Russia-China Crude Oil Pipeline 440,000 barrels/day

Burma-China Crude Oil Pipeline 12 billion cubic meters/year

NOTE: All figures are based on 2013 data. Transit numbers will not total 100% as many shipments transit multiple shipping routes/chokepoints. Pipeline volumes represent designed capacity, not current flow rates.
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.
A 2°C pathway is still some further efforts away away.

A peak in emissions by around 2020 is possible using existing policies & technologies; technology innovation and RD&D will be key to achieving the longer-term goal.
Driven by continued policy support, renewables account for half of additional global generation, overtaking coal around 2030 to become the largest power source.
Figure 1.7  Global electricity generation mix in the 2DS, 2013-50


Key point  
Today fossil fuels dominate electricity generation with 68% of the generation mix; by 2050 in the 2DS, renewables reach a similar share of 67%.

- 2013 Generation share
  - Fossil fuels: 68%
  - Renewables: 22%
  - Nuclear: 11%

- 2DS 2050
  - Renewables: 67%
  - Fossil fuels: 17% (CCS12%)
  - Nuclear: 16%
Collective Energy Security and Sustainability by Diversity, Connectivity and Nuclear

Energy self-sufficiency* by fuel in 2011

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

Source: Energy Data Center, IEA.

Note: Does not include fuels not in the fossil fuels, renewables and nuclear categories.
Power Grid Connection in Europe: Collective Energy Security and Sustainability

Physical energy flows between European countries, 2008 (GWh)

Source: ENTSO-E
Natural Gas Import Infrastructure in Europe
Russian Gas Pipelines Will Extend to the East: Recent China Deal

Russian Gas Infrastructure

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.

Source: IEA

Mid-Term Oil & Gas Market 2010, IEA
Possible Pipeline Project from Russia to Japan

Figure 1. Proposed Subsea Pipeline Route*

Estimated volume of 8bcm pa

* Only the Ishikari-Tomakomai section has onshore PL.
### Key Events in the Russian Part of the Project

#### Stage I (2020)
- The construction of the 2-3 stages of the Sakhalin GRES-2 with the increase of installed capacity up to 360 MW
- The construction of grid infrastructure (additional OL, OL/CL converter station Gornozavodskaya)

#### Stage II (2022)
- The construction of a large export-oriented generation "Dolinskaya TPP" (up to 660 MW)
- Further expansion of the network infrastructure

#### Stage III (2025)
- The connection of the Sakhalin energy system with the United Energy System of the East by underwater DC cable

Total cost for 3 stages in the Russian part of the Project is estimated at USD 5.7 billion, excluding costs for the construction of additional generation in the UES of the East to increase exports volumes.

* - depends on the choice of connection point in Japan

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**Power Bridge Project by Roshydro**

- **Amur TPP**
- **Nikolaev TPP**
- **Sakhalin GRES**
- **Nokliki GTES**
- **Mayskaya GRES**
- **Sovgyavan TPP**
- **Yuzhno-Sakhalin TPP**
- **Comsomol TPP 1-3**
- **Tokyo**

**Legend:**
- **P/S, OL 110 kV**
- **P/S, OL 220 kV**
- **New OL**
- **TP OL/CL – transition point of OL/CL, CL – cable line**
Blue Print for North East Asia Gas & Pipeline Infrastructure: Dr. Hirata’s Concept

Natural Gas Infrastructure Vision (As of September 2013)

[Legend]
- Gas Field
- Existing LNG Receiving Terminal
- LNG Receiving Terminal Planned or Under Construction
- Existing LNG Export Plant
- Planned LNG Export Plant
- Capital City
- Major Existing Pipeline
- Major Planned Pipeline
- Major Possible Pipeline

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GOBITECH Initiative

Renewable Energy in Asia through Sun and Wind
“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
Global Energy Interconnection
Lack of Grid connectivity in Japan

Asian Super Grid in SPIEF