

# IMPACT OF EARTHQUAKES AND TSUNAMIS ON ENERGY SECTORS IN JAPAN (IEA 15 March 2011)

## A. Electricity

### **Background: Electricity Sector in Japan**

Japanese power output in 2009 was 1046 Twh, made up of coal fired power (28%), nuclear (27%), gas (sourced almost entirely from LNG) 26%, oil 9%, and hydro 8%. The national electricity grid is split into two separate frequency areas and interconnected through three frequency converters. The split is just west and south-west of Tokyo, with Tokyo in the affected area.

### **Earthquake and Tsunami Impact**

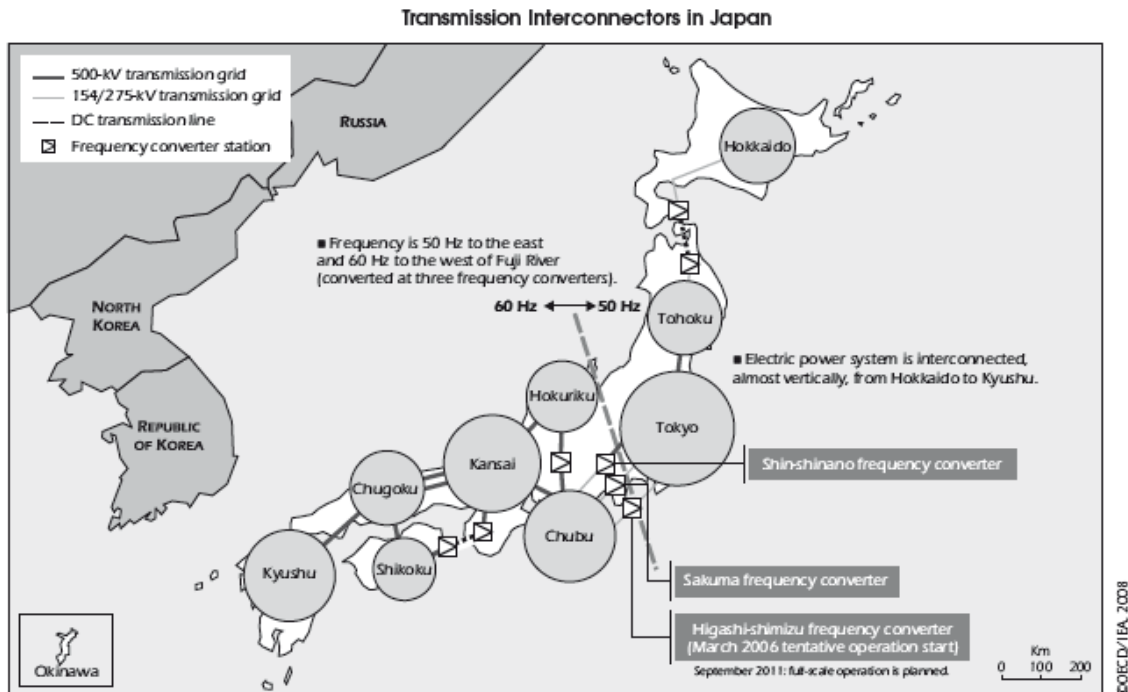
#### *Output Loss*

The damage and impact to the power sector has been greatest in the area of the Tokyo Electric Power Company (TEPCO) and that of Tohoku Electric Power Company (Tohoku-EPCO). TEPCO is the largest Japanese power utility, with an installed capacity of some 64 GW, and a yearly production of 280 TWh in 2009. TEPCO is amongst the largest power companies in the world; its output is in the range of that of Italy. As of 2008 IEA In-Depth Review, total capacity in the Kanto region (including Tokyo) was 78 GW.

Tohoku-EPCO is more to the north with an installed capacity of 17 GW. As of the 2008 IEA In-Depth Review, total capacity in the Tohoku region was 27 GW. While the interchange ability between the TEPCO and Tohoku-EPCO areas is strong, especially from Tohoku-EPCO to TEPCO, the ability to link these two areas with the rest of Japan to the west and south is 1 GW through frequency converters.

Some 9.7 GW of TEPCO, Tohoku-EPCO, and Japan Atomic Power nuclear plant capacity was automatically shut-down because of the earthquake (Fukushima Dai-Ichi, Fukushima Daini, Onagawa and Tokai Daini). Also some 9.5 GW of coal, gas and oil fired capacity was shut down. In normal operating conditions (70% average utilisation rate) the nuclear plants would generate some 60 TWh annually.

Rolling blackouts of 3 hours in 5 areas have been announced by TEPCO. They have been implemented from Monday 14 March depending on the actual demand/supply balance. Tohoku-EPCO has also announced rolling blackouts in 8 areas which will be implemented as of Wednesday 16 March.



## **B. Oil**

### **Earthquake and Tsunami Impact**

Regarding the refining sector in Japan, 6 refineries with a total refining capacity of 1.4 mb/d (around 30% of Japan's total refining capacity) are shut down<sup>1</sup>. The closure of these refineries is expected to last for at least a week. It is not known yet if the utilization rate of other refineries in operation has been increased, following the closure of 6 refineries. Several LPG tanks at two refineries were damaged and burnt.

One of the 10 governmental oil stockpiling sites, located at Kuji, was affected by the tsunami. This site, which has underground storage facilities, is currently out of operation. Some 11 mb of government stocks (crude) are stored at this site, which accounts for merely 3% of the total Japan's public stocks.

<sup>1</sup> The six refineries include JX Nippon Oil & Energy (Sendai, Kashima and Negishi), Cosmo Oil (Chiba), Kyokuto (Chiba) and TonenGeneral (Kawasaki).

The Japanese government has been closely coordinating with the domestic industry to facilitate the distribution of oil products required in the affected areas from non-damaged regions. As Japan holds ample amounts of oil stocks, some of these stocks could be used for this purpose. The Japanese Government announced on 14 March that they have lowered the obligation for industry to hold emergency stocks by 3 days, from 70 days to 67 days, freeing up 8 mb of oil products for distribution.

## Basic Oil Information on Japan

### Key Oil Data

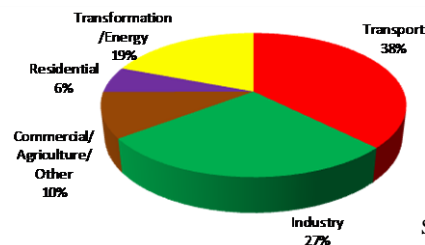
	1985	1990	1995	2000	2005	2008	2009	2010
<b>Production (kb/d)</b>	13.7	13.3	18.7	17.5	18.5	20.5	19.2	17.9
<b>Demand (kb/d)</b>	4 436.0	5 315.4	5 693.1	5 515.5	5 328.0	4 788.4	4 367.2	4 417.9
<i>Motor gasoline</i>	569.5	738.5	879.0	998.9	1 045.6	982.4	988.4	1 003.6
<i>Gas/diesel oil</i>	798.9	1 112.3	1 271.1	1 241.3	1 149.8	924.4	843.7	837.8
<i>Residual fuel oil</i>	950.9	898.3	795.6	653.2	581.5	535.7	401.9	391.6
<i>Others</i>	2 116.6	2 566.3	2 747.3	2 622.0	2 551.2	2 345.9	2 133.2	2 185.0
<b>Net imports (kb/d)</b>	4 422.3	5 302.1	5 674.4	5 498.0	5 309.5	4 767.9	4 348.0	4 400.0
<b>Import dependency</b>	99.7%	99.7%	99.7%	99.7%	99.7%	99.6%	99.6%	99.6%
<b>Refining capacity (kb/d)</b>	4 966	4 198	4 847	4 998	4 707	4 651	4 691	4 896
<b>Oil in TPES</b>	55.3%	57.0%	53.4%	49.2%	46.7%	43.2%	42.7%	-

(Source: IEA)

### Oil Demand

Japan's oil demand gradually decreased from 5.5 mb/d in 2000 to 4.4 mb/d in 2010. The transport sector accounted for around 40% of the total oil consumption in Japan in 2008.

### Japan's oil consumption, by sector

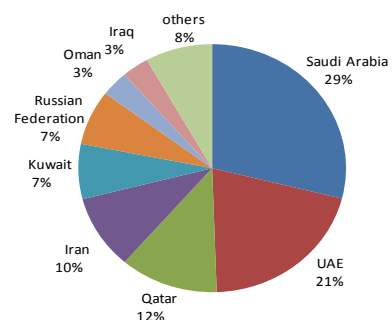


Source: IEA

### Oil Imports

Japan is entirely dependent on oil imports and the sources of these imports are currently concentrated in one region, the Middle East. Japan's oil imports in 2010 were some 4.7 mb/d, consisting of 3.7 mb/d crude oil (including NGLs and feedstocks) and 1 mb/d refined products. Japan's exports of refined products stood at some 350 kb/d in 2010.

### Japan's crude imports, by source (2010)

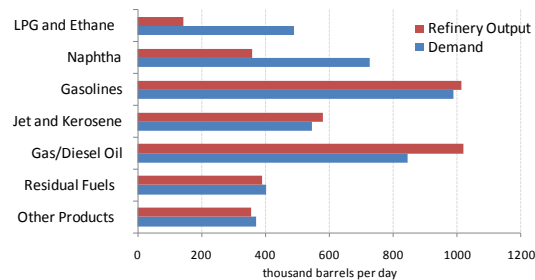


Source: IEA

## Refineries

Japan has 27 oil refineries, situated primarily in coastal areas. As of January 2011, total refining capacity was about 4.5 mb/d.

Japan refinery output and demand, by product (2010)



Source: IEA

## Oil Stocks

Japan holds government stocks and places a minimum stockholding obligation on industry. As of December 2010, Japan held some 590 mb of oil stocks, equivalent to 169 days of net imports. Japan's emergency oil reserves consist of about 320 mb of government oil stocks (94 days of net imports) and some 270 mb of industry stocks (75 days). Government stocks are almost all in crude oil form.

## Oil Infrastructure Map of Japan



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

## C. Natural Gas

### Earthquake and Tsunami Impact

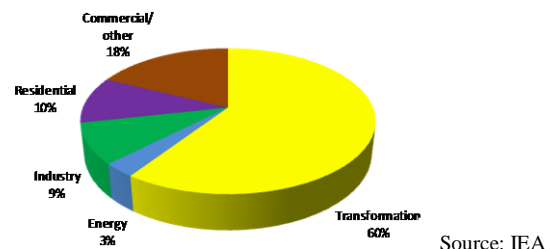
No damages to LNG terminals and key gas pipeline systems were reported.

### Basic Gas Information on Japan

#### *Gas Demand*

Gas demand steadily increased from 83 BCM (some 230 MCM/d) in 2000 to 100 BCM (about 275 MCM/d) in 2009, and increased an estimated further 5% in 2010. The transformation sector represented 60% of total gas consumption in Japan in 2008.

Japan's gas consumption, by sector (2008)

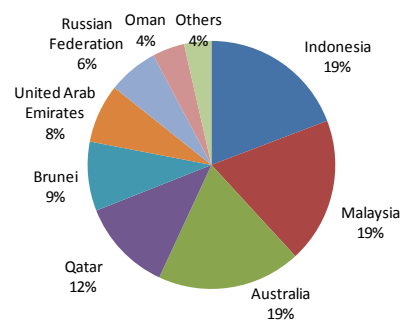


#### *Gas Imports*

With little domestic production, Japan relies almost entirely on imports to meet its gas demand. Due to the lack of international pipelines, all of the gas imports are in the form of LNG.

In 2009 Japan imported some 93 BCM (some 255 MCM/d) of gas. Australia, Qatar and ASEAN gas producers (Indonesia, Malaysia and Brunei) are the main import sources of gas for Japan.

Japan's gas imports, by source (2009)



#### *LNG Terminals*

Japan has 28 importing LNG terminals in operation, with a total import capacity of around 260 BCM (about 720 MCM/d) of natural gas. Japan also has some 15 MCM storage capacity for LNG (equivalent to 9 BCM of natural gas) held at the LNG regasification terminals. This overcapacity provides a high degree of flexibility to respond to potential demand increases, or to effectively move gas around the country.

