

# **Policies for a Sustainable Energy System - Japan**

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## Sammanfattning

I dagarna presenteras en ny plan för Japans energistrategi, med syfte att peka ut riktningen för landets framtida energisituation. Den presenterade planen förväntas inte ge svar på landets framtida energimix utan fokuserar på att steg för steg komma ut ur den besvärliga situationen på grund av avstängda kärnkraftverk, höga kostnader för importerad naturgas och låg andel inhemsk, förnybar energi. Planen medger en återstart av flera kärnkraftverk så snart det är säkert att göra så. En återstart kan möjligen hotas av en vilande opinion mot kärnkraft och frågetecken vid den säkerhetsbedömning som nu sker. En annan viktig fråga är möjligheten att minska kostnaderna för importerad naturgas, där internationellt samarbete och tillgången på skiffergas antas ge goda förutsättningar.

Förnybar energi ökar tack vare inmatningstariffer. En koldioxidskatt har också införts på låg nivå för att stegvis trappas upp under kommande 3–4 år, enligt nuvarande plan. Men en fortsatt ökning av förnybara och decentraliserade energislag behöver stödjas av insatser som utvecklar elnätet. Avreglering av energimarknaden och frikoppling av produktion och transmission/distribution är sådana nödvändiga reformer, som också är viktiga för att öka incitament till ”smarta” och efterfrågedrivna energisystem. Reformerna för energimarknaden pågår och väntas slutförda 2020.

Energieffektivisering är fortsatt en kapphäst för Japan, och landet är världsetta när det gäller energieffektivitet i allmänhet. Fastigheter har identifierats som ett eftersatt område med stor potential, och byggmaterial såsom fönster och isolering kommer nästa år att inkluderas i det så kallade ”Top Runner”-programmet för förbättrad energieffektivitet. Industrin behöver också effektiviseras för att behålla konkurrenskraften globalt på grund av förväntade ökande energipriser.

Teknik och innovation för att utveckla energisystemen ska bidra till en ny och växande industri i Japan. Att gynna företag inom smarta nät och produkter, lagringsbatterier och komponenter och delsystem för energiproduktion och -infrastruktur är ett viktigt inslag i Japans energistrategi. Utveckling av nya teknologier kan motiveras såväl av inrikes behov som av exportmöjligheter. CCS verkar vara ett exempel på det senare.

En stabil energiförsörjning är den viktigaste drivkraften för Japans policyutveckling. Klimatfrågan är lägre på agendan. Med de osäkerheter som finns kring kärnkraften vill man från regeringens sida fokusera mer på åtgärder och aktiviteter än på bindande mål.

## Summary

The report “Policies for a Sustainable Energy System” the current state for Japanese energy policy and strategy is presented.

Japan is working on a new energy plan where they will try to present an energy strategy for the coming five years. The draft of the plan is advocating a restart of nuclear power plants, as soon as the thorough safety checks are finalised. A pending anti-nuclear opinion and issues regarding safety can possibly jeopardize the restart in the near future. Furthermore, attention is given to reduce cost for imported natural gas. International collaboration and the shale gas revolution are viewed as positive signs. The plan does not give any clues towards the future energy mix, since the government is concentrating on action to get out of the difficult energy situation.

The installed capacity of renewable energy is increasing due to Feed-In-Tariffs. A carbon tax has also been introduced and is planned to increase step by step in the coming 3–4 years. But a continued progress on renewables must be accompanied by measures to develop the grid. Deregulation of the energy market and unbundling of production and transmission/distribution are also important reforms to increase the incentives to “smart” and demand-driven energy systems. The reforms have started and are expected to be finalised by 2020.

Energy efficiency is key in the Japanese energy strategy. Being world leading in efficiency in general, commercial and residential buildings are identified as the next target for the “Top Runner” program for efficiency best practice. The industry is also in need for improvements to keep its competitiveness in a global world with increasing cost of energy.

Besides dealing with the domestic energy strategy, technology and innovation are promoted as part of the overall growth strategy for Japan. In particular smart grid and intelligent appliances, storage batteries as well as systems for energy production and –infrastructure in particular are promoted. This means that technology development can be motivated both for domestic needs and for export opportunities. CCS is an example where the export opportunities seem to be driving.

Energy security is the strongest motivation for Japanese policy development. Climate and environmental issues are not as prioritised. With the current uncertainties fencing nuclear power, the government seem more eager to focus on measures than on measurements and binding targets.

# 1 Background

## 1.1 A review of the energy landscape in Japan

### 1.1.1 An energy poor country struggling for energy security

Stability and security in supply are the guiding energy principles for Japan. However, Japan is relying almost entirely on imported fuel for supply of energy. Except for some domestic hydropower, the country has been importing fossil and nuclear fuels to meet the demand for stable energy supply in industry, transportation and among households. Nuclear power was expanded as a response to the oil crises in early 1970s. At the time of the disaster in March 2011, nuclear power was a major source of power in Japan, providing around 30 per cent of the country's electricity, and the government was planning on expanding nuclear power to decrease reliance on expensive imports of fossil fuels. Ironically, in the wake of the Fukushima disaster, the opposite came true and the country is today trapped with no nuclear power supply and a costly import of liquefied natural gas (LNG) from a limited number of sourcing countries.

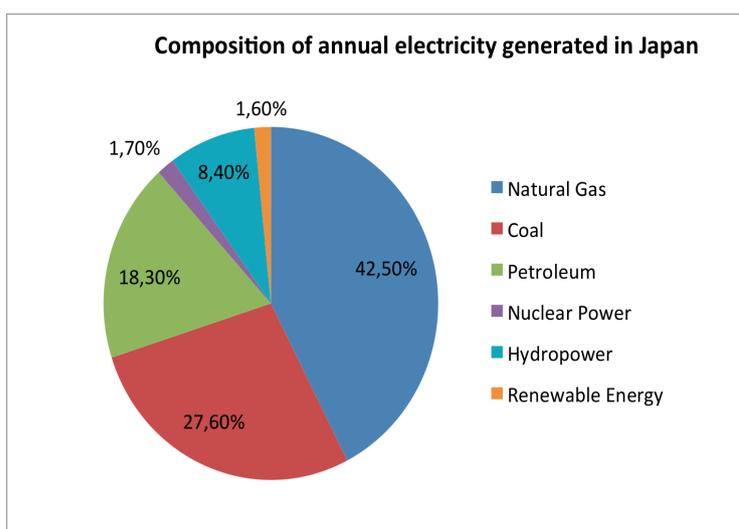


Figure 1 Composition of electricity sources in Japan 2012

Efforts are now made to restart nuclear power plants to halt the increasing energy cost. Japan is suffering from a major trade deficit, which partly can be explained by the high energy and electricity prices. Japan can today be described as an energy poor country<sup>1</sup>. Around 96 per cent of the energy supply is imported, and Japan is thus the second largest importer of fossil fuels (after China)<sup>2</sup>.

<sup>1</sup> METI interview

<sup>2</sup> <http://www.eia.gov/countries/cab.cfm?fips=JA>

### 1.1.2 Regional grid

Following the disaster in March 2011, the Japanese electricity system revealed its weaknesses. The electricity grid is managed by ten utility companies, each with practically regional monopoly. Despite some deregulation, most of the Japanese electricity system is in the hands of these vertically integrated utilities. Generally each of these monopolies is self-sufficient in terms of supply and demand. Furthermore, from historical reasons, the Japanese electricity grid is divided into two grids with different frequencies, western Japan using a 60Hz frequency while eastern Japan uses a 50Hz frequency. The regional structure of the system is an obstacle for transmission of electricity throughout different regions, and thus complicates the implementation and promotion of decentralised, renewable energy.

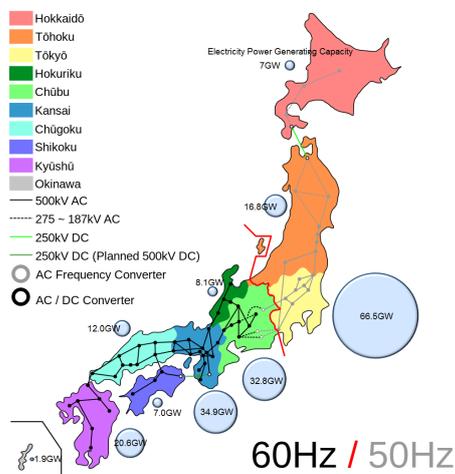


Figure 2 Japan's regional structure of the electricity grid

### 1.1.3 The world's largest gas importer

Gas is used extensively in Japan for residential heating, water heating and cooking. In addition to gas and electrical heating, kerosene is also frequently used. The Japanese gas networks center on large gas ports, and is even more scattered and decentralized than the electric grid. As in the electricity sector, vertical integration is very high, and most companies manage the whole supply chain from procurement to end-user sales. There is no national gas grid, or any direct connection to the mainland. LNG is the only type of gas that can be imported today, and Japan accounts for 30 per cent of the world's total demand. Qatar is their major exporter.

### 1.1.4 World leader in efficient means of transportation

The transportation sector in Japan is, as in most countries, heavily dependent on fossil fuel. Japan has the most stringent fuel economy standard in the world<sup>3</sup>. Coupled with a high population density and a lack of domestically available cheap fuel, this has led to a very efficient but expensive transportation sector. From a global perspective, quite a large part of the passenger transport sector is electrified, since the country has the world's largest share of passengers transported by rail (28 per cent of total domestic passenger transport) and a developed market for hybrid vehicles. The hybrid electric vehicles make up for

<sup>3</sup> (Lipsy, 2012)

27 per cent of new passenger cars in 2011. Although electrification brings energy efficient means of transportation, electricity is currently generated mainly (to 90%) by fossil fuel.

### 1.1.5 Energy efficiency high on the agenda

As a result of decades of energy dependence and government support for innovation, Japan has gained a worldwide reputation for energy efficiency, and the energy efficiency of the Japanese economy is well above OECD average. Japanese energy efficiency policy is outstanding in the world, which is a consequence of large attention from the bureaucrats<sup>4</sup>. Energy efficiency has been high on the Japanese energy agenda since the oil shocks of the 1970s, and it has come to be regarded as a key pillar of Japan's climate and energy policies. An example is the Top Runner Program, initiated in 1998, in which it set mandatory energy efficiency standards based on the most efficient products on the market. Currently, new emphasis is given to the energy efficiency as tool for energy security. It is mainly residential and commercial real estate sector that is subject for the coming efforts from the government (see section 2.3.1 below).

## 1.2 Previous Governmental Strategies

### 1.2.1 Energy strategies 2010 – July 2013

Table 1 Overview of energy strategies in Japan, 2010 to July 2013

2010	2011	2012	2013
<i>DPJ government</i>	<i>Great Eastern Earthquake and Fukushima disaster (March)</i>		<i>Revisions of strategies Direction to reform Electricity System (Q1) Japan Revitalization Strategy – Japan is back (June)</i>
New Growth Strategy Strategic Energy Plan (June)	New Growth Strategy – Revision (June)	Comprehensive Strategy for the Rebirth of Japan (July)	<i>Upper house election. (July)</i>
	The Rebirth of Japan (Dec)	Innovative Strategy for Energy and the Environment (Sept) <i>New LDP government (Dec)</i>	

The Strategic Energy Plan in 2010 placed a new emphasis on restructuring the Japanese energy industry, aiming for Japan to “fundamentally change its energy supply and demand system by 2030”<sup>5</sup>. After the disaster in March 2011, a new growth strategy called “Rebirth of Japan” was formulated, decided upon by the cabinet in December. It emphasised the development of smart grid innovation as vehicle to increase disaster resilience and export business opportunities.<sup>6</sup> The follow-up in 2012, the “Comprehensive Strategy for the Rebirth of Japan”, gave more detailed targets and policy measures. It envisions Japan as

<sup>4</sup> (Lipsy, 2012)

<sup>5</sup> (Ministry of Economy, Trade and Industry, 2010)

<sup>6</sup> (National Policy Unit, 2011)

employing 1.4 million in the environmental industries, capturing 50% of the global electricity storage battery market, and becoming a major exporter of infrastructure<sup>7</sup>. To achieve this, the Comprehensive Strategy calls on the government to achieve 80% of total energy consumers to use smart meters by 2017, introduce dynamic pricing systems and work for international standardization of EMS technology and storage batteries<sup>8</sup>.

“Innovative Strategy for Energy and the Environment”<sup>9</sup> in 2012 aimed to decentralize the Japanese electricity system and better promote renewables. This strategy called for

- Introducing HEMS/BEMS and market mechanisms to reduce peak load
- Utilizing the outcome of demonstration projects to achieve energy-efficiency
- Government efforts to create opportunities and remove obstacles for renewables to connect to the electricity grid.

Until the March 11 disaster, the Japanese government decided in agreement with the 10 utility companies what energy mix would be suitable for Japan. The “Innovative Strategy” aims for the break-up of this pattern of governance to a more market-oriented process, in order to allow for renewable energy power generation companies to be able to become more competitive<sup>10</sup>.

On April 12, 2013, the Cabinet decided to approve the Bill for Partial Revision of the Electricity Business Act and submitted to this session of the Diet, as a follow up on the Grid Reform. The bill calls for the reform of the electricity system based on the following three pillars:

- Expanding operations of wide-area electrical grids (inter-connected grid, even between 50Hz and 60 Hz)
- Fully liberalizing the retail market and power generation
- Further securing neutrality of the power transmission/distribution sector through the legal structural separation method (some form of de-bundling)

The government published a new comprehensive strategy just in time before the upper house election (July). The document is called “Japan Revitalization Strategy – Japan is back” and in the second action plan *Strategic Market Creation Plan* (chapter II:2) the energy demand and supply is discussed. The envisioned Japanese society shall realize clean and economical energy by introducing strategic areas and by making decisions where diversification and networking is utilized. The strategic areas includes; renewable energy, low cost and highly efficient thermal power, storage batteries, next-generation devices, parts and materials, energy management systems, next-generation automobiles, fuel cells, products and services of energy-saving technology such as energy-saving appliances, energy-saving housing and buildings. They present their ideal situation in 2030 where clean, economical and wisely consumed energy is effectively distributed through competition.

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<sup>7</sup> (National Policy Unit, 2012)

<sup>8</sup> (National Policy Unit, 2012)

<sup>9</sup> (National Policy Unit, 2012)

<sup>10</sup> (National Policy Unit, 2012)

## 2 Energy policy priorities

### 2.1 Energy security top priority for anticipated policy

Energy security in wide terms is emphasized from policy level today, and has come to the fore again after the nuclear accident. It highlights the need for a stable supply, resilience to disasters, diverse geographically sources and resources, efficient energy use and nuclear safety. The Ministry of Economy, Trade and Industry (METI) is referring to the aftermath of the triple catastrophe that changed the Japanese energy situation drastically and adds the change of government as an influencing factor for the new scene.

#### Monthly generation by electric utilities in Japan, by source

(January 2007-January 2013)

terawatthours

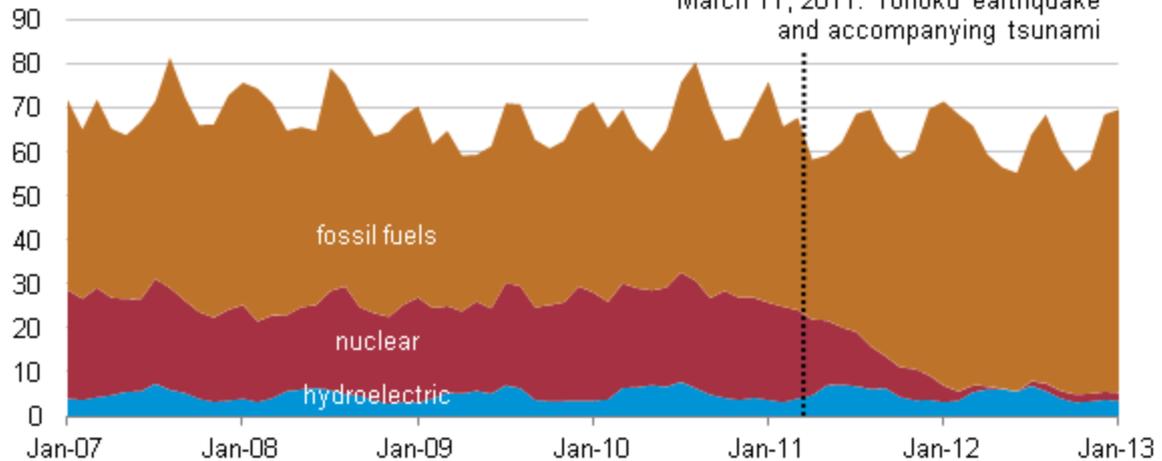


Figure 3 Electricity generation by source before and after triple catastrophe March 2011.

Source: U.S. Energy Information Administration (March 15<sup>th</sup> 2013)

### 2.2 Energy directions in New Energy Basic Plan

METI is coordinating the ongoing process to formulate a “responsible energy policy” aimed at ensuring stable energy supply at lower cost. The “Advisory Committee for Natural Resources and Energy”, an expert panel, has been meeting and discussing since March 2013, and based on their proposals, the government will establish the plan by the end of 2013.

Although not yet published, the main directions in the plan are presented<sup>11</sup>:

- *Nuclear energy* is considered to be an indigenous resource and is in the centre of the discussions around the future energy-mix. The decision to use nuclear energy will imply headlines when the energy strategy is being published. LDP’s major victory in the upper-house election was settled without giving any clear election promise on nuclear issues. In practice this means that the ruling power (LDP) is not necessarily going to have the people’s support for the future nuclear policy<sup>12</sup>. METI can reveal that there won’t be any numerical target for nuclear or renewable energy since the technical

<sup>11</sup> Interview METI

<sup>12</sup> Prof. Kikkawa, Nov 6<sup>th</sup> at FPCJ

problems remain. Without knowing the facts about the nuclear power plants they can't announce a target for the energy-mix. Instead they will present their philosophy, meaning what they think is important, and arguments on how much nuclear they want to use.

- *LNG* continues to play key role as fuel since it is considered clean and secure. The challenges will be to reduce the cost, and to diversify the sourcing to establish new suppliers, e.g. in North America and Russia.
- *Reformation of electricity system* will continue according to plan. It is confirmed as a central reform to secure stable supply of electricity, to suppress electricity rates and expand choices for consumers and new businesses. However, it is stressed that the reform has to follow a "realistic" schedule step by step not to jeopardise energy stability and the economy.
- *Renewable energy* implementation is viewed as important to diversify supply and create a resilient energy system. The Feed-In-Tariff scheme, launched in 2012, is known to be very favourable in a global perspective, i.e. high procurement prices. This was intentionally to give a kick-start to the expansion of renewables from very low levels. However, there is a concern not to make the same mistakes as in Germany and Spain, and the levels will be reviewed every third year, according to plan, to make an economically viable system.
- *Energy efficiency efforts* will be emphasised as means to secure energy supply. There will be a partial amendment of the Energy Conservation Law to expand the "Top runner program" to include also building materials, windows, insulation etcetera. Furthermore, measures on the demand side are expected. An important implication will be to use energy management systems (EMS), storage batteries etcetera to smooth demand and reduce peaks in demand.

## **2.3 Future key sources of energy in Japan**

### **2.3.1 Energy Efficiency**

Energy efficiency is a vital part of the growth strategy and in spite of weak resource assets; efficiency can be seen as a resource itself. It is a top prior policy for the government since saved energy or energy efficiency both give independence and saves money. It is described as a part of the Japanese mind-set and was introduced in a systematic fashion in the 1970s after the oil crisis. Since then Japan has improved the energy efficiency and have a remarkably low primary energy supply per GDP in comparison with other nations (see figures below).

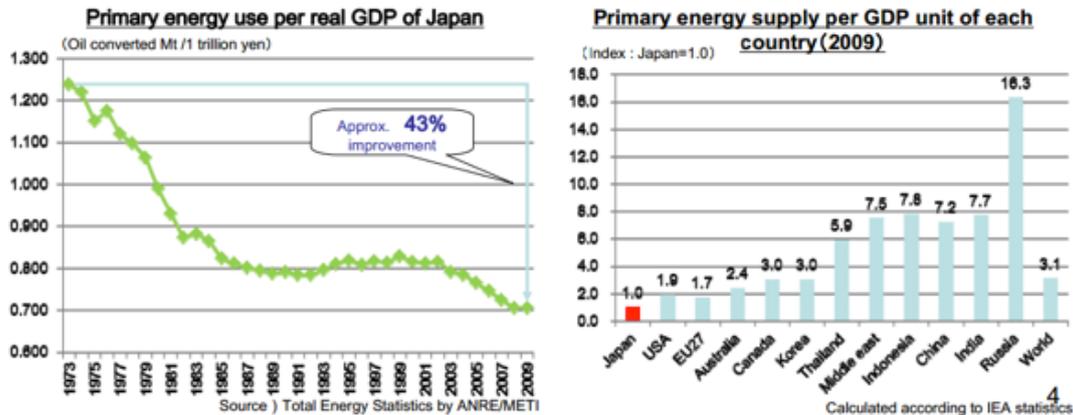


Figure 4 Energy efficiency in Japan, showing increase in efficiency vs GDP in Japan (left) and comparison with other countries (right).

Compared to the GDP growth 1973–2012 by a factor 2.4, energy demand in general has only grown with a factor of 1.3, seen as an evidence of decoupling of energy and GDP in Japan. The data shows that the industrial sector has only increased by a factor of 0.9, whereas residential and commercial sector have increased energy demand parallel to GDP growth, by a factor 2.4 during the same period. This is the reason behind the coming efforts to increase energy efficiency in real estate sector.

### 2.3.2 Nuclear energy

Nuclear energy will play a role for foreseeable future in Japan, despite the reactions after the nuclear accident. In December 2012 Keidanren issued a policy proposal that reprimanded the DPJ government for using “excessively optimistic” calculations on the profitability and viability of renewable energy introduction and nuclear phase-out<sup>13</sup> The Ministry of Economy, Trade and Industry (METI) and Keidanren are probably pushing behind the scenes to allow restarts more quickly, and LDP has adopted the same track<sup>14</sup>. The new administration will restart the nuclear reactors “once safety of nuclear power plants is assured by the NRA” (Nuclear Regulatory Authority)<sup>15</sup>, according to Prime Minister Abe. 14 power plant units are currently under review for restart by NRA in accordance to the new safety regulations launched in July. Since the application and approval procedures are new to everyone involved, the first permissions are expected in beginning of next year.

With the present government, it is expected that the long term energy mix will be considered and contain both nuclear and renewables in a more “responsible” balance than the previous government<sup>16</sup>. However, as indicated in sec. 2.2, there will not be any set targets on percentage of the energy mix. The accountable ministry, METI, says that it, due to the many uncertainties in the current situation, is better to focus on measures and action rather than figures.

<sup>13</sup> (Keidanren, 2012)

<sup>14</sup> (Nakano, 2013)

<sup>15</sup> Statement by Prime Minister Abe in Plenary Session of the House of Councilors on March 6, 2013.

<sup>16</sup> [http://www.jetro.go.jp/en/reports/survey/pdf/2013\\_01\\_other.pdf](http://www.jetro.go.jp/en/reports/survey/pdf/2013_01_other.pdf) (s 6)

### 2.3.3 Fossil fuels; coal, oil and gas

*Liquefied Natural Gas (LNG)* will continue to be an important energy source for Japan. It is seen as a reliable and clean source of energy. The infrastructure exists and has made it possible for Japan to almost instantly replace the loss of nuclear power. The drawback is the fuel import costs that have hit the Japanese economy hard. Several measures are taken to deal with this situation and the government fight for greater leverage in price negotiations<sup>17</sup>. Currently, the search for new channels of LNG supply is on-going, and North America and Russia are strong candidates as exporters. Furthermore, the exploration of domestic resources in terms of offshore methane hydrate deposits is taking place, although it is only in test phase at present.

*Coal* has also regained interest in Japan, who was the world's largest importer of coal in 2011<sup>18</sup>. The government is encouraging export of Japanese technology for coal-fired thermal power, in particular the so called Super Critical or Ultra Super Critical coal-fired power plants. The technology has been developed during the years of fuel import dependency. According to data<sup>19</sup>, export of Japan's best practice coal power plants to countries with large coal-fired emissions could bring emission reduction of around 1,5 billion tons of carbon dioxide<sup>20</sup>. As per the recommendation by Keidanren and others, the Abe-government has streamlined the environmental impact assessment procedures for coal-powered thermal plants to make it cheaper and faster to deploy. Previously, the Ministry of Environment used the environmental impact assessment process to block any coal plants, as increased utilization of coal was seen as contrary to the pollution policy and emissions goals of the country<sup>21</sup>.

*Carbon Capture and Storage (CCS)* is not mentioned as part of the Japanese energy strategy. There are some R&D activities on CCS and there are also some demonstration projects in Hokkaido. Existing problems like underground space for storage is one reason for why the technique is not prioritized<sup>22</sup>. However, by developing the technology, Japan look for export opportunities of CCS technology to fossil dependent India and China where energy demand is accelerating.

### 2.3.4 Renewable energy

Renewable energy is regarded as an important contribution for the future energy supply. However, excluding hydropower, Japan starts from a very low level where renewables accounted for 1,6 per cent of total power production last year. The Feed In Tariffs (FIT) from 2012 have increased the installed capacity by 18 per cent, from 20,6 GW to 24,2 GW. Solar Photovoltaic (PV) and land based wind power are dominating, but attention is also directed towards off-shore wind, geothermal, biomass and small- and medium scale hydropower (<30 MW).

*Solar power* has attracted most investments due to the generous FIT scheme, and with 2 GW installed capacity, Japan was 5<sup>th</sup> nation in the world for solar installations 2012 and is

<sup>17</sup> The Nikkei, Dec 5<sup>th</sup> <http://asia.nikkei.com/Markets/Commodities/Asian-LNG-buyers-gaining-upper-hand-on-prices>

<sup>18</sup> (U.S. Energy Information Administration, 2013)

<sup>19</sup> IEA World Energy Outlook 2011, Ecofys International Comparison of Fossil Power Efficiency and CO2 Intensity 2012

<sup>20</sup> Prof. Kikkawa

<sup>21</sup> (British Embassy Tokyo, 2013)

<sup>22</sup> METI: Shinichi Kihara, Nov 26<sup>th</sup>

in some reports<sup>23</sup> forecasted to be the largest market in 2013. The FIT allows for so called “mega power facilities” with capacity of >1 MW, although residential installations (< 10 kW) still account for 73 percent of the installed capacity.

*Wind power* is regarded as a key to increase renewables due to its cost efficiency. However, the situation in Japan is complicated by the regional grid structure. Most of Japan’s wind resources (wind speed > 6,5 m/s) are found in the northern, sparsely populated parts of Japan, such as Hokkaido (45% of total) and Tohoku (21%). Only when the distribution of harvested energy in these areas to the crowded areas can be done smoothly, wind power will reach its full potential in Japan. In recent years floating *off-shore wind power* has become a credible alternative and the government expects off-shore wind to become a relevant component of the renewable energy portfolio. The first floating off-shore wind power was recently installed outside of Fukushima’s coast. The initiative might have been influenced by the fact that the FIT scheme earlier this year was nuanced to reflect the differences in cost for land based and off shore wind power plants. The tariffs were thus increased for off-shore wind and decreased for land-based facilities.

*Geothermal power* is highlighted as an energy source with very high potential, since Japan hosts the world’s third largest resources. So far only 0,5 GW capacity is installed out of the 23 GW reserve. Geothermal energy is included in the FIT scheme, and the government has eased regulation on development of power facilities in designated national parks. The colliding interests of geothermal sources and leisure activities such as “onsen” (Japanese spa) and national park visits are still a reality that needs attention. Geothermal projects are on-going in Hokkaido, Tohoku and southern island Kyushu.

It can be mentioned that geopower, as well as wind and solar energy, are all areas where Japanese industry is very competitive globally. Three Japanese manufacturers, Mitsubishi, Toshiba and Fuji Electric, account for 70 per cent of the global market for geothermal turbines.

*Bio-fuels* is currently not seen as an important potential contributor to the energy mix in Japan. This might be somewhat surprising since there ought to be a lot of unutilised resources in terms of forests and organic waste from farmland and household. However, there is neither infrastructure nor incentives to build on biomass as a resource. “It doesn’t help about the resource issue”, as a METI bureaucrat expresses it. It is a well spread opinion that Japan is a resource poor country. Biomass is, however, included in the FIT-scheme but then as fuel for power generation. Biogas and wood-fired power plants are types that are mentioned, and there have been some interest since the FIT was introduced. Sumitomo Forestry, a major forestry company in Japan, announced plans in May 2013 to build biomass power plants in areas of business concentration<sup>24</sup>.

## **2.4 Ecology and climate consideration impact of energy policy and strategy**

Ecological sustainability is not the first priority related to energy and not the driver today for energy policy. However, there are indeed elements of sustainable solutions in the Japanese approach to energy issues. The Japanese specific long term thinking and concerns about resilience often leads back to sustainability, although it is not manifested in direct action.

<sup>23</sup> Bloomberg Estimates for 2013

<sup>24</sup> (Nikkei, 2013)

According to the polls, there is a clear majority of the population who is negative towards nuclear power. However, the main argument is safety, not directly sustainability. As an effect of the public discontent with nuclear power and the governmental actions, it has become difficult to discuss climate change. One reason might be, as we were told from initiated source, that if you bring up the subject, there might be a suspicion that you have a hidden agenda to promote nuclear power. Anyhow, fact is that the climate debate is lacking in Japan, and judging from both (lack of) media reporting and the response in interviews, climate change is a non-issue in Japan at the moment.

In the comprehensive growth strategy “Japan Revitalization Strategy – Japan is back”<sup>25</sup> there are discussions on how technology and market solutions should be realized through diversification and networking, to achieve clean and inexpensive energy. Clean energy is thus seen as a result of innovative and efficient technology development. The market is promoted as a vehicle to endorse the use of renewable energies. The technology and market focus indicates an anthropocentric (societal) approach and not an ecocentric (society as small part of nature) approach. Using the “ladder of sustainable development”<sup>26</sup> Japan can be considered as having *weak sustainable development* when discussing policy matters.

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<sup>25</sup> [http://www.kantei.go.jp/jp/singi/keizaisaisei/pdf/en\\_saikou\\_jpn\\_hon.pdf](http://www.kantei.go.jp/jp/singi/keizaisaisei/pdf/en_saikou_jpn_hon.pdf) (p 99)

<sup>26</sup> Susan Baker, *Sustainable Development* (2006:2)

## **3 Challenges ahead and important crossroads**

### **3.1 Challenges in implementing the energy strategy**

#### **3.1.1 Public opinion against nuclear power**

After the nuclear accident the public raised their voice to clarify their opposition against nuclear energy. Today, two years later, it is not as loud, although according to polls, there is still a vast majority of the population that are still against nuclear power. “They have given up”, as one person in a think tank expressed it. It is uncertain what will happen when the actual restart of nuclear power plants is taking place. It might trigger new protests from the sleeping opposition that needs to be dealt with from the government.

#### **3.1.2 Increasing renewables**

The implementation of renewables requires both reforms of the grid and economically viable support systems for FITs. Furthermore, there is a need to balance between easing of regulation to speed up permit process on one hand and deal with the public opinion of NIMBYs (Not In My Backyard). To seriously increase the proportion of renewables from current low levels will put high demand on decisiveness of the bureaucrats in the Japanese ministries in many different areas.

#### **3.1.3 Reduce cost for LNG**

After the shutdown of nuclear power, the Japanese demand for LNG has increased by 30 per cent. The LNG import price for Japan, linked to the crude oil import price, has soared. The international gas market is segmented, meaning different prices depending on where the country is located. Countries in the Asian gas market meet expensive gas prices in comparison with other parts of the world. The so called “shale gas revolution” is considered very important by the Japanese government as an opportunity towards diversified sourcing as well as a first step towards a global energy market with reduced, or at least more evenly distributed, price on LNG.

#### **3.1.4 Reform the electricity market**

No doubt, the liberalizing of the monopolized electricity market is a prerequisite for the implementation of a future energy system in Japan. It is necessary to fully realize the potential of the smart electricity management technology available on the Japanese market. A fully integrated national grid is needed to develop the vast renewable energy potential of the northern, rural part of Japan where the demand is limited and be able to keep resilience in face of electricity supply disruption (e.g. from natural disasters or plant disruptions) and to seize available energy locally without being limited to a regional market.

The reform of the electricity system in Japan includes interregional connection for the grid, unbundling (ending the vertical integration of utilities) and market liberalization. However, the development of this reform is a politically tricky area, with strong and powerful stakeholders (e.g. current regional monopoly utilities) that may not immediately gain from the reform, which makes it difficult to foresee. How to follow through the planned market system reform and to achieve stability and efficiency based on the present electricity supply and demand is of great importance.

### 3.1.5 Enhance Energy Efficiency for competitiveness

In their latest report<sup>27</sup>, International Energy Agency has identified energy cost as critical for competitiveness. In particular, this is most relevant for energy intensive industries. Based on their estimation of the changes in the energy landscape, they point out Japan and Europe as countries or regions that will lose markets for their energy intensive industry, whereas industry in US, India and China will gain. This recent news are worrying, according to METI, and will result in efforts to increase competitiveness. Even if the immediate reaction might be to protect domestic industry by lowering energy prices, it might also result in promotion of new, service and knowledge based industry even further, and/or to give incentives for current industry to be more efficient.

## 3.2 Critical decisions regarding implementation of future energy system

### 3.2.1 Restart of nuclear power plants

From our understanding of the current situation, there is no doubt that the restart of nuclear power plants will take place. This is according to the new government's intention to act "responsible" to secure energy supply at reduced cost. There are influential pro-nuclear actors, strongly linked to the government, that are pushing the government to pursue a balanced and diverse energy portfolio, even though the public opinion is lacking trust for nuclear energy.

To emphasise his responsibility, the prime minister has pushed hard for stricter safety conditions, resulting in the new safety standard by NRA. 14 out of 50 nuclear units have applied for a restart and are now under inspection by the NRA who assess whether or not they meet the new safety standards. Today it is uncertain when this assessment will be done and therefore it is not known how many nuclear reactors that will actually restart. The estimation is that the assessment might be completed in the beginning of next year.<sup>28</sup>

As mentioned in 2.2, the New Basic Energy Plan does not give any answers about the ambitions for nuclear energy in the future Japan. The government does not plan to include such measures in the forthcoming revision due to the uncertainties. The decision from NRA about the first 14 applications will be an important indication.

There are other aspects influencing the future for nuclear power in Japan. One aspect is the actual cost for the different paths and scenarios. In December 2011, the government through the Cost Estimation and Review Committee published a report on cost estimations on each energy production method, including nuclear power and renewable energy sources. This report confirmed that nuclear power is the cheapest form of energy production in Japan. The report has been discussed by think tanks and in media, and the models for calculations have been questioned. In particular, it is questioned how the cost for clean-up and storage of waste is calculated (or missing in the calculations), and who should pay.

Another aspect is the consequences of the liberalisation of the energy market. With a functioning market, there will be opportunities for new energy utilities, and the chance for the customers to choose among various energy sources. If the liberalisation is

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<sup>27</sup> IEA Energy Outlook 2013

<sup>28</sup> METI interview, Nov 26th

implemented, the power of the policy makers to decide on the future energy mix will be shared by/with the market.

### 3.2.2 Persistence in the electricity market system reform

The Diet enacted a law on November 13, 2013, that will be the beginning of the three-stage reform of the electricity sector. The law will provide a free and fully liberalized retail market and enable for a nationwide power grid operator in 2015 as a first step of the reform. Power generation and transmission is planned to be separated utilities around 2020. METI is investigating experiences from other countries and are weighing the pros and cons with different systems to create a compatible system for Japan. The biggest issue is to secure a stable supply and to realize a capacity that can cover 100 per cent of demand, and to create incitement for investment that will cover demand even at peak load<sup>29</sup>

### 3.2.3 Energy diplomacy and international collaboration

The global energy scene is changing, not the least by the shale gas revolution that have altered the roles of importers and exporters of energy, and made e.g. US more energy independent. Japan can leverage on the changing roles and power balance in the energy landscape. One way to secure the energy supply is through “energy diplomacy” with the Middle Eastern countries, Russia and resource-rich countries<sup>30</sup>. In addition to the unstable situation in the Middle East, Japan needs to consider the growing geopolitical tensions among Asian countries that might affect Asian cooperation. Japan can promote collaboration through diplomatic steering among Asian energy consuming countries to achieve competitive LNG prices by importing an integrated and large volume of natural assets from shale gas countries. According to METI, the development for shale gas creates an opportunity for Japan to get cheaper energy and the anticipated cost would be 30 per cent lower than the current LNG-price<sup>31</sup>.

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<sup>29</sup> METI interview, Nov 26<sup>th</sup>

<sup>30</sup> Dr. Koyama, <https://eneken.ieej.or.jp/data/4693.pdf>

<sup>31</sup> METI interview, Nov 26<sup>th</sup>

## 4 Governance and policy instruments

### 4.1 Underlying principles for governance

#### 4.1.1 3Es for balancing energy considerations

Historically Japan has been dealing with the challenge to manage and strive for a balance between Energy security, Environmental protection and Economic efficiency (the 3Es). Japan was trying to cope with global warming issues during 1990 by introducing the 3Es. Since the catastrophe a safety aspect has been added and the principle is now called 3Es + S, which means that the government needs to consider the safety challenge as well. Today, the Environmental protection is lower in priority on behalf of the remaining 2E + S, that is energy security, economic efficiency and safety.

#### 4.1.2 Technology optimism

The impression is that in Japan, there is a strong optimism about technology and innovation to solve global environmental and energy issues. The trust in new technology, sprung from research and development, is outspoken and permeate documentation and presentation from Japanese officials. It is also linked to economic growth and export opportunities for the domestic industry. The discussion about organisational and economical development, such as structural and market reforms, to accelerate change in energy systems are not as emphasised. The following quote from the New Low Carbon Technology Plan from the Cabinet Office can serve as an example:

*“What is the key to solve the global environmental and energy issues? That is “development and diffusion of innovative technologies”. Utilization of innovative technologies is essential in achieving both economic growth and reduction of GHG emissions, and Japan has to take initiative in the world in promoting development and diffusion of such technologies.”<sup>32</sup>*

#### 4.1.3 Moving slowly from top down control to deregulation

The link between the established governmental officials and the incumbent industry is very strong and has a long tradition in Japan. With a risk avert culture, the government with its ministries produce careful and often very detailed plans to drive change, including efforts in the energy sector. Although the bottom up approach is often mentioned, it often ends up in top down directives and plans. It is therefore interesting to see how the reforms and deregulations on the energy arena will be managed and how much the government, under influence of the strong industry and utilities, will let the market forces rule.

<sup>32</sup> [http://www8.cao.go.jp/cstp/english/doc/new\\_low\\_carbon\\_tec\\_plan/nlctp\\_text.pdf#page=9](http://www8.cao.go.jp/cstp/english/doc/new_low_carbon_tec_plan/nlctp_text.pdf#page=9)

## 4.2 Policy instruments to implement the basic energy plan

### 4.2.1 Deregulation and liberalization – a market approach

Through the deregulation of the electricity system, the Japanese government use the market forces to construct a more robust and cost efficient supply of electricity.

### 4.2.2 Feed-In Tariff System

The government have shifted their measures to increase the use of renewable energy from subsidies and “green tariff” RPS scheme to Feed-in-Tariffs. The Feed-in tariff Scheme was introduced in July 2012, designed to kick-start introduction and production of renewables and it is famous for its generous tariffs. Today it is said that Japan has the biggest PV market and the FIT-system has favoured solar power that has steadily increased. There’s been a total increase in the renewable energy capacity of 18 per cent.

The FIT-system will be used even after the planned liberalization of the electricity market. The generous tariffs are of course a cost for society that can’t be kept forever. Every third year there will be a total reassessment and there is also an annual review that is based on costs.

The first 6 months of the feed-in tariff only produced some plans for off-shore wind parks. Unhappy with this pace, METI announced a split of the feed-in tariff of wind power into one for on-shore wind, staying at the same level, and one for off-shore, which recently was increased to offset for the high capital cost of construction<sup>33</sup>.

### 4.2.3 Carbon tax

The Japanese government is now raising the carbon tax and using it as a policy instrument to drive change of the energy system. The tax was introduced at a low level in October 2012, with the ambition to make a stepwise increase until fully implemented in 2016. The final level will be about 20 SEK/ton (289 JPY). The tax is expected to bring 3 billion SEK (39,1 billion JPY) during the first year and eventually 18 billion SEK (262 billion JPY) when fully implemented. In Japan, as contrary to Sweden, the tax income is dedicated for climate mitigation measures. Ministry of Environment (MoE) is the responsible entity, and the income is distributed between them and METI. 10 per cent of the income so far has been allocated to projects that give Japan favours in accordance to the Joint Credit Mechanisms (JCM), i.e. by initiatives in developing countries to reduce climate impact. The JCM is popular in Japan since it also promotes Japanese industry.

The conservative enterprise organisation Keidanren is negative towards the carbon tax. There is a possibility that they will delay or hinder the escalation of the tax with arguments about its threat to competitiveness of the Japanese industry.

### 4.2.4 Legal instruments

Laws have been used for energy governance and in particular when it comes to measures for energy efficiency and conservation. “The Energy Conservation Law” covers the industry, transportation, commercial & residential sector. The framework is designed with regulatory measures that use effective methodologies to improve the energy efficiency in Japan. Appropriate experts work as energy managers and the law has generated results in

<sup>33</sup> (Nikkei, 2013)

more than 12,000 business operators.<sup>34</sup> All factories are required by law to improve energy efficiency yearly by at least 1 per cent, and to report plans on how to achieve a comparable efficiency rate as their most efficient competitors<sup>35</sup>.

#### 4.2.5 Standards and best practice

Japan became the first country in the world to introduce “fuel economy standards” for heavy-duty vehicles in 2006<sup>36</sup>.

Top Runner Program for promoting energy efficiency is an important standardization tool for energy efficiency in Japan. For selected appliances, the highest performing product of the market is taken as the standard, which other appliances need to adhere to within a couple of years. There are 26 items in total that must answer to the top runner standards and they account for about 70 per cent of household energy consumption.<sup>37</sup> In March 2013, METI decided to expand the Top Runner program to include not only machinery and equipment, but also building materials. On October 22<sup>nd</sup> the Cabinet Office decided to define the additional equipment that also should be subject to the Top Runner Program under the Energy Saving Act.

The Energy Management System (EMS) is based on the energy conservation law and is thus a regulated policy instrument. The system is using “energy efficiency standards” for buildings and houses that are bigger than 300m<sup>2</sup>.<sup>38</sup>

#### 4.2.6 Information

Under the Kyoto Protocol Target Achievement Plan, the Japanese government has also been promoting energy efficiency in industry on a voluntary basis, a system which both Keidanren, the Japanese business organization, and METI, expresses great satisfaction with<sup>39</sup>.

After the triple catastrophe in March 2011 the government (DPJ) introduced “Setsuden”, which was a power saving campaign that lowered demand by 10 per cent over all. Today the government is working with complementary tools that manage the demand side, since it’s a challenge to keep consumers’ efforts of energy conservation in the long term. However, the Setsuden concept seems to be established with an effect on the behaviour at many work places and households.

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<sup>34</sup> METI compendium

<sup>35</sup> (Institute for Industrial Productivity)

<sup>36</sup> (International Energy Agency, 2010)

<sup>37</sup> (Kimura, 2013)

<sup>38</sup> METI compendium

<sup>39</sup> (Suzuki, 2013) (Keidanren, 2013)