

# Japan's current Nuclear Energy Policy

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Deputy Director

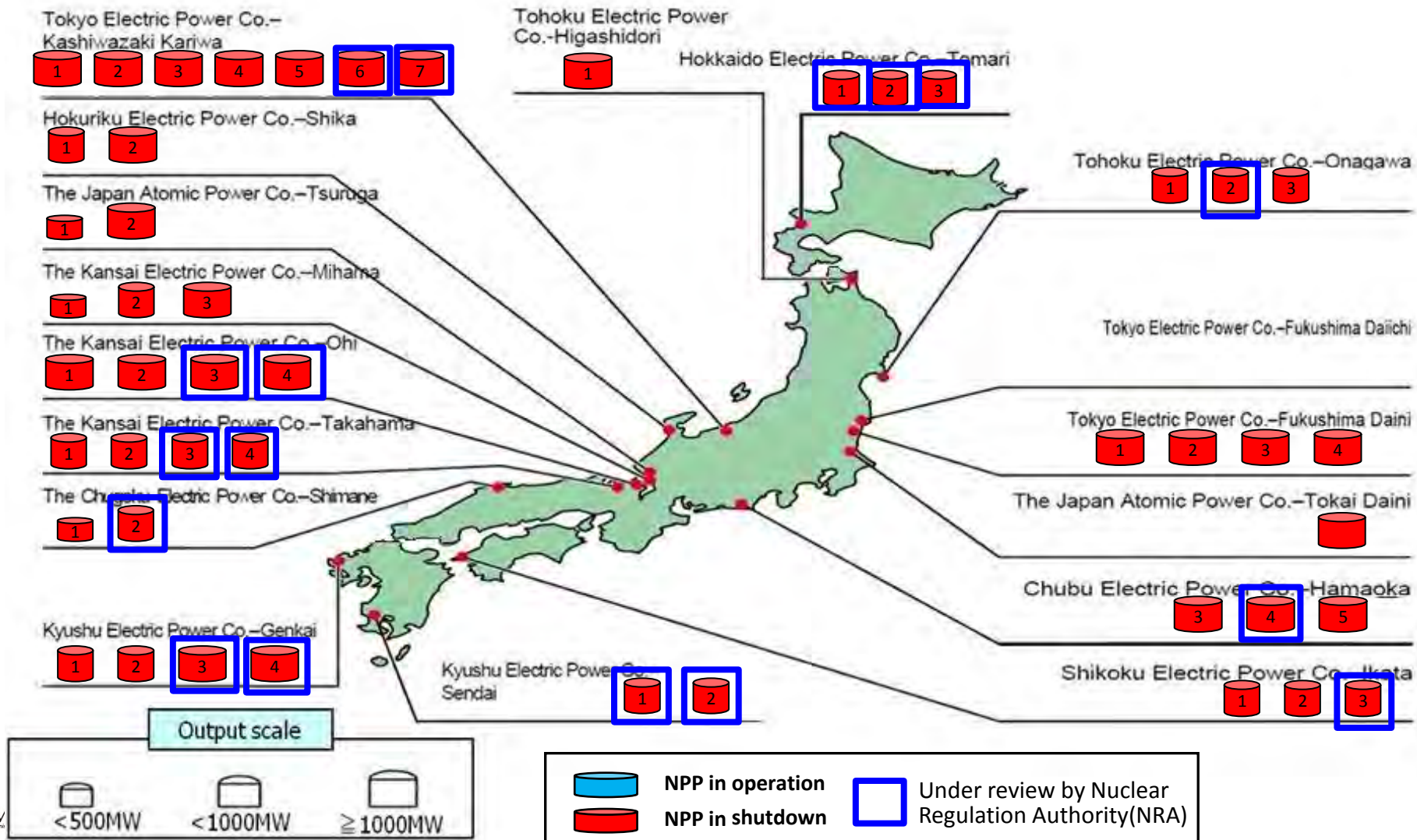
Nuclear Energy Policy Planning Division

Agency for Natural Resources and Energy, METI

March 2014

# Nuclear Power Plants in Japan

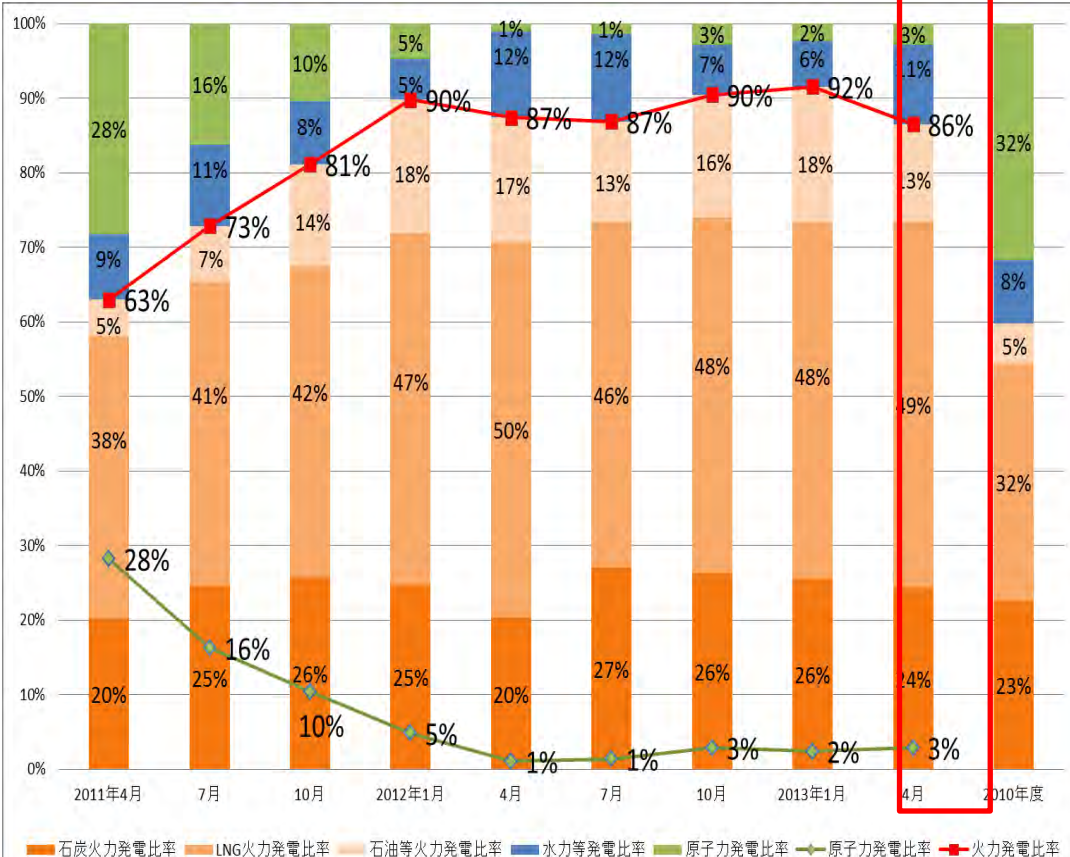
- There are 48 nuclear power plant units in Japan.
- **All units (in red)** are in a state of temporary shutdown as of March 3 2014.
- **17 units (in blue squares)** are under review for restart by the Nuclear Regulation Authority in accordance with its new safety regulations.



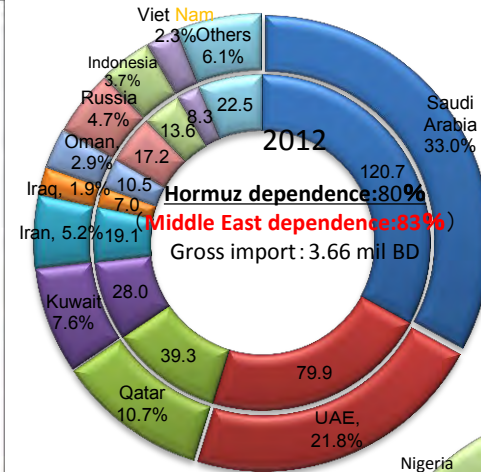
# (Ref.) Excessive dependence on thermal power may jeopardize the stable supply of electric power

1. Due to the shutdown of nuclear power plants, Japan's present dependence on thermal power (about 90%) is higher than that at the time of the oil crisis.
2. Dependence on petroleum decreased after then owing to energy saving efforts and the increase of nuclear power plants, but more than 80% is still imported from the Middle East even now.

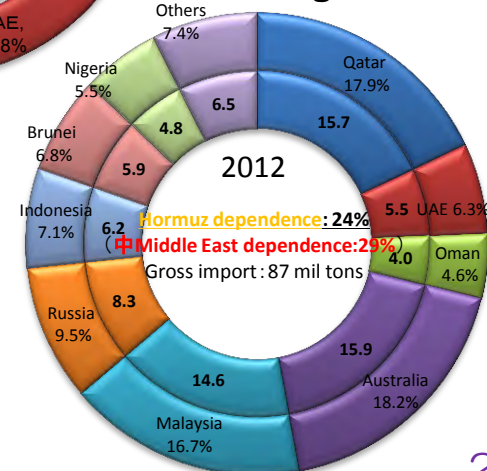
➤ Transition of power source composition in public / wholesale power industries after the earthquake



## Crude oil



## Natural gas



## (Ref.) Change in Power Formation and Fuel Costs after the Disaster

- With the shutdown of NPPs, additional fossil fuel costs for increased thermal generation are calculated as ¥3.1 trillion (from FY2010 to FY2012). In FY2013, it is estimated that the total fuel cost will increase ¥3.6 trillion over.

- Fossil Fuel Costs caused by the Nuclear Power Shutdown

Power Category	Fuel Cost (FY2012)	Cost Impact Amount	
		Calculation in FY2012	Estimation in FY2013
Nuclear	¥1/KWh	- 0.3 trillion ¥	- 0.3 Trillion ¥
Coal	¥4/KWh	+ 0.1 trillion ¥	+ 0.1 Trillion ¥
LNG	¥11/KWh	+ 1.4 trillion ¥	+ 1.7 Trillion ¥
Oil	¥16/KWh	+ 1.9 trillion ¥	+ 2.1 Trillion ¥
Total	—	<b>+ 3.1 trillion ¥</b>	<b>+ 3.6 Trillion ¥</b>

# (Ref.) Adverse Effects on the Trade Balance in Japan by an Increase in Fuel Costs

As a result of an increase in fuel costs, Japan recorded its first trade deficit in 2011 in the last 31 years. In addition, the trade deficit expanded to approximately **USD 115 billion** in 2013.

Increased fuel imports due to the shutdown of nuclear power plants

Increased LNG and crude oil prices

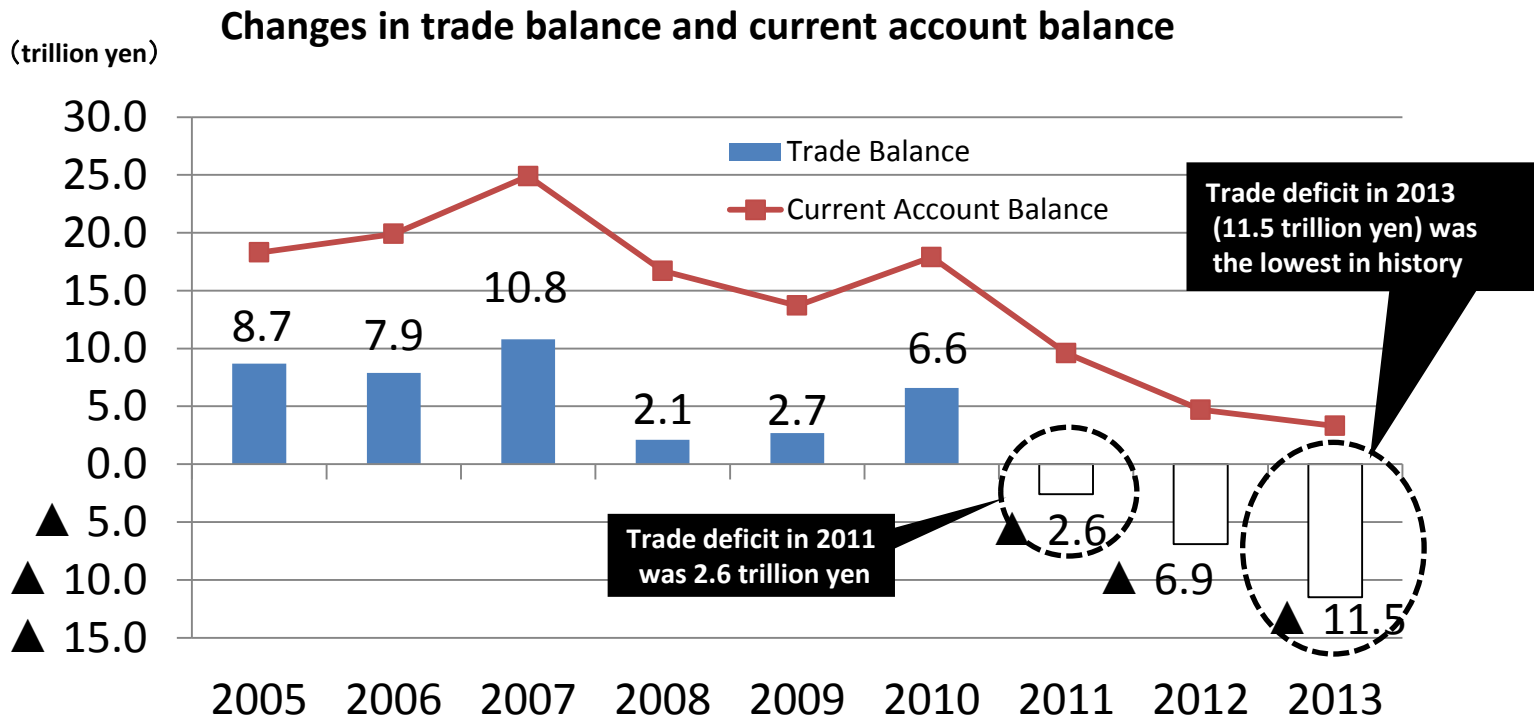
Rapid increase in fuel import costs

Increasing in trade deficit, change of current account balance structure, acceleration of the hollowing out of manufacturing industry

**Trade balance: ▲18.1 trillion yen (2010→2013)**

Increase in net imports of fossil fuels : **+10 trillion yen (17→27)**

➤ Due to NPP shutdown : **+3.6 trillion yen**



1. Six utilities have already raised electricity tariffs due to the increase in imports of fossil fuel
2. The utilities that raised the electricity tariff are to calculate their tariff level assuming the restart of the nuclear power plants.

		Increase		Date of application	Date of implementation
		Applied	Approved		
Tokyo Electric Power Company	Regulation division	10.28%	8.46% (▲1.82%)	May 11, 2012	September 1, 2012
	Liberalization division	(16.39%)	(14.90%) (▲1.49%)	-	After April 1, 2012
Kansai Electric Power Company	Regulation division	11.88%	9.75% (▲2.13%)	November 26, 2012	May 1, 2013
	Liberalization division	(19.23%)	(17.26%) (▲1.97%)	-	After April 1, 2013
Kyushu Electric Power Company	Regulation division	8.51%	6.23%(▲2.28%)	November 27, 2012	May 1, 2013
	Liberalization division	(14.22%)	(11.94%) (▲2.28%)	-	After April 1, 2013
Tohoku Electric Power Company	Regulation division	11.41%	8.94% (▲2.47%)	February 14, 2013	September 1, 2013
	Liberalization division	(17.74%)	(15.24%) (▲2.50%)	-	After September 1, 2013
Shikoku Electric Power Company	Regulation division	10.94%	7.80%(▲3.14%)	February 20, 2013	September 1, 2013
	Liberalization division	(17.50%)	(14.73%) (▲2.77%)	-	After July 1, 2013
Hokkaido Electric Power Company	Regulation division	10.20%	7.73% (▲2.47%)	April 24, 2013	September 1, 2013
	Liberalization division	(13.46%)	(11.00%) (▲2.46%)	-	After September 1, 2013

\* It indicates an increase rate at the liberalization division for cost calculation corresponding to the increase rate at the regulation division, and the electricity rate at the liberalization shall be determined through negotiations between the parties concerned in principle.

## 1. Restart of Nuclear Power Plants

“Japan Revitalization Strategy” and “Basic Policy for Economic and Fiscal Management and Reform”  
(Decided by the Cabinet on June 14, 2013)

- The government will leave the safety of nuclear power plants to the specialist judgment of the Nuclear Regulation Authority. When the Nuclear Regulation Authority admits the compliance to its (new) regulatory standards, the government will respect the judgment and will proceed with the restart of the nuclear plant. In this case, the government will make efforts to obtain the understanding and cooperation of relevant parties including municipalities hosting nuclear facility sites.

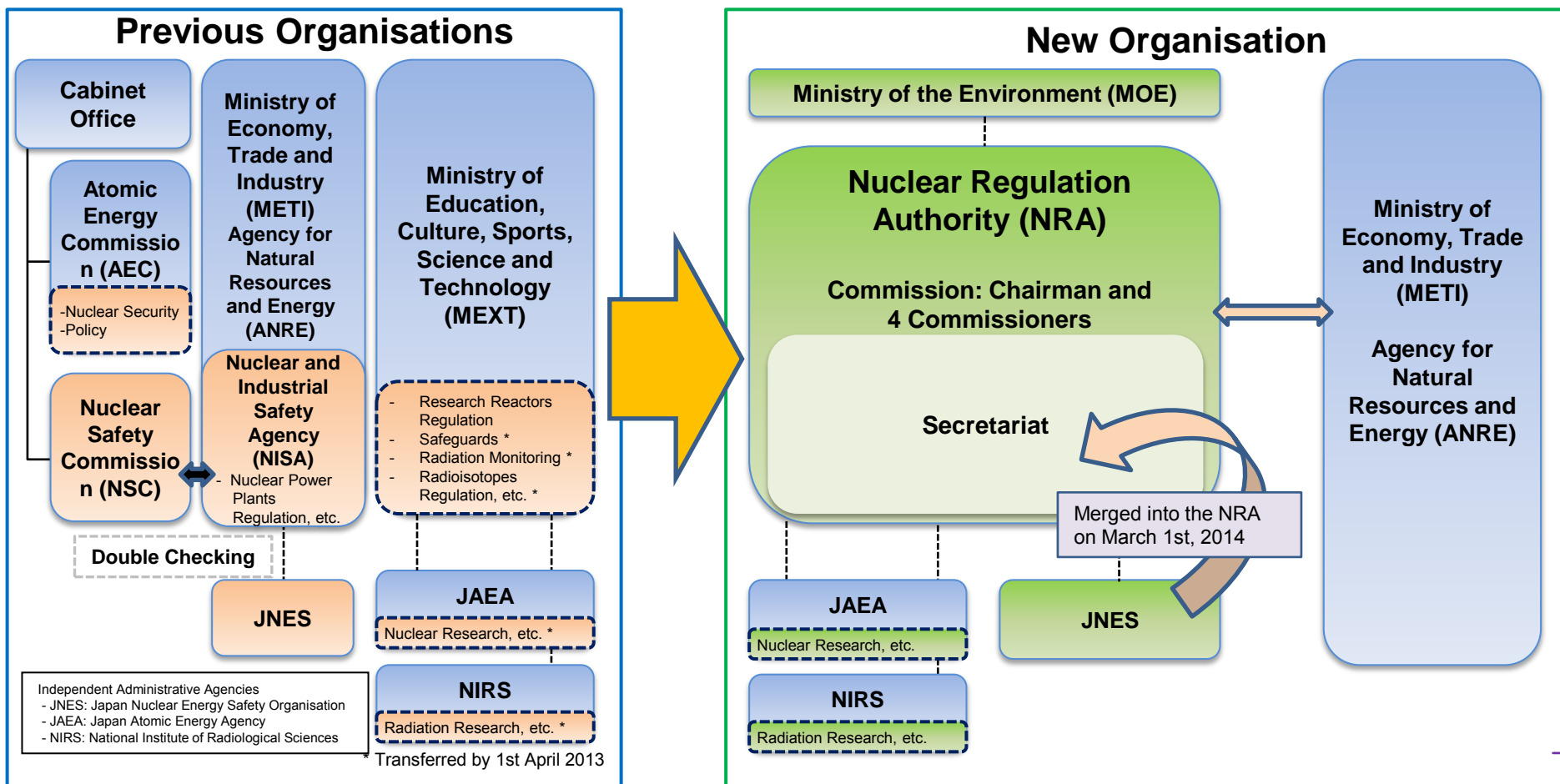
## 2. International Cooperation

Statement by Prime Minister Abe (Plenary Session of the House of Representatives on June 24, 2013)

- I strongly believe that it is our country's responsibility to contribute to the improvement of the world's nuclear safety by sharing lessons and experiences learnt from Tepco's Fukushima Daiichi Nuclear Power Plant accidents with the world through nuclear export cooperation.
- During my visits to Eastern Europe and the Middle East recently, each country showed high expectations about utilizing its accumulated nuclear technology and human resources for the peaceful use of nuclear energy from Japan. Taking into account the circumstances and intention of these partners, we will continue to provide technology of Japan through nuclear export cooperation.

# Administrative Reform of Nuclear Regulatory Organizations

- **Independence of NRA:** Separate from nuclear promotion function
- **Chairman and Commissioners:** Appointed by the Prime Minister after the approval of the National Diet.
- **Integration:** Integrate nuclear regulation functions, namely, nuclear safety, security, safeguards, radiation monitoring and radioisotope regulation, into the NRA.





# Revision of Regulatory Standards

- (1) Responding to the TEPCO's Fukushima Daiichi Nuclear Power Station accident, the Nuclear Reactor Establishment Act was revised to introduce new safety standards based on lessons learnt from the accident, latest technical knowledge, overseas regulation trends, etc. The new regulatory standards were enforced in July 2013.
- (2) Additional investments for safety enhancement became necessary due to introduction of the back-fit scheme. Reactor decommissioning earlier than expected may become necessary due to the "40 year lifespan rule."

## <Power reactors>

### (1) Reviewing conformity to the new regulatory requirements

New regulation standards have been enforced since July 8 of this year. Applications of 17 reactors in 10 nuclear power plants have been submitted and under review as of February 14, 2014.

### (2) 40 year lifespan rule of reactors

Application period is from April to July in 2015. Operation of aging reactors will be allowed until July 2016 (grace period: 3 years).

Utilities will be needed to perform special checkup of aging deterioration by the time of application, and establish maintenance and management policies.

The aging reactors are: Mihama 1, 2, Takahama 1,2, Shimane 1, Genkai 1, and Tsuruga 1.

## <Fuel Cycle facilities>

The new regulatory requirements have been enforced since December 2013.

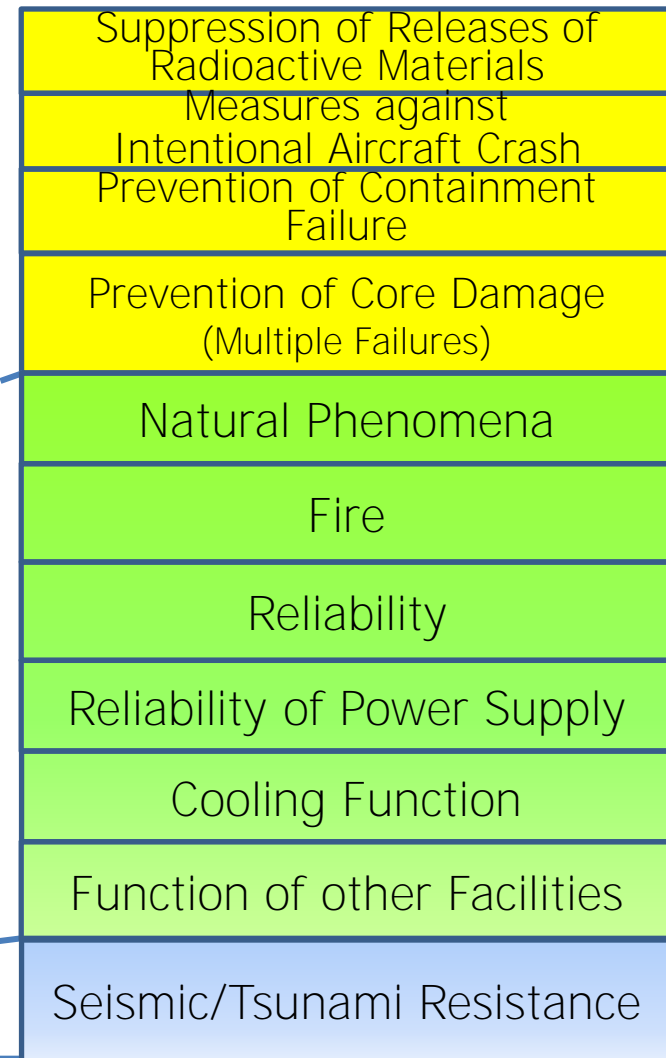
# Comparison between Previous and New Regulatory Requirements

The New Regulatory Requirements tighten measures to prevent or deal with severe accidents and acts of terrorism.

<Previous>

<New>

Design basis without postulating core damage  
(Based on single failure, etc.)



(SA Measures)  
NEW

Reinforced

Reinforced

## 1. Review Process (as of Feb. 2014)

### 1) NRA's review team (app. 80 staff)

Sub-team A: Ikata 3 Genkai 3, 4

Sub-team B: Ohi 3, 4 Tomari 1, 2 Sendai 1, 2

Sub-team C: Tomari 3 Takahama 3, 4

Sub-team D (in charge of BWR) : Kashiwazaki-Kariwa 6, 7 Shimane 2, Onagawa

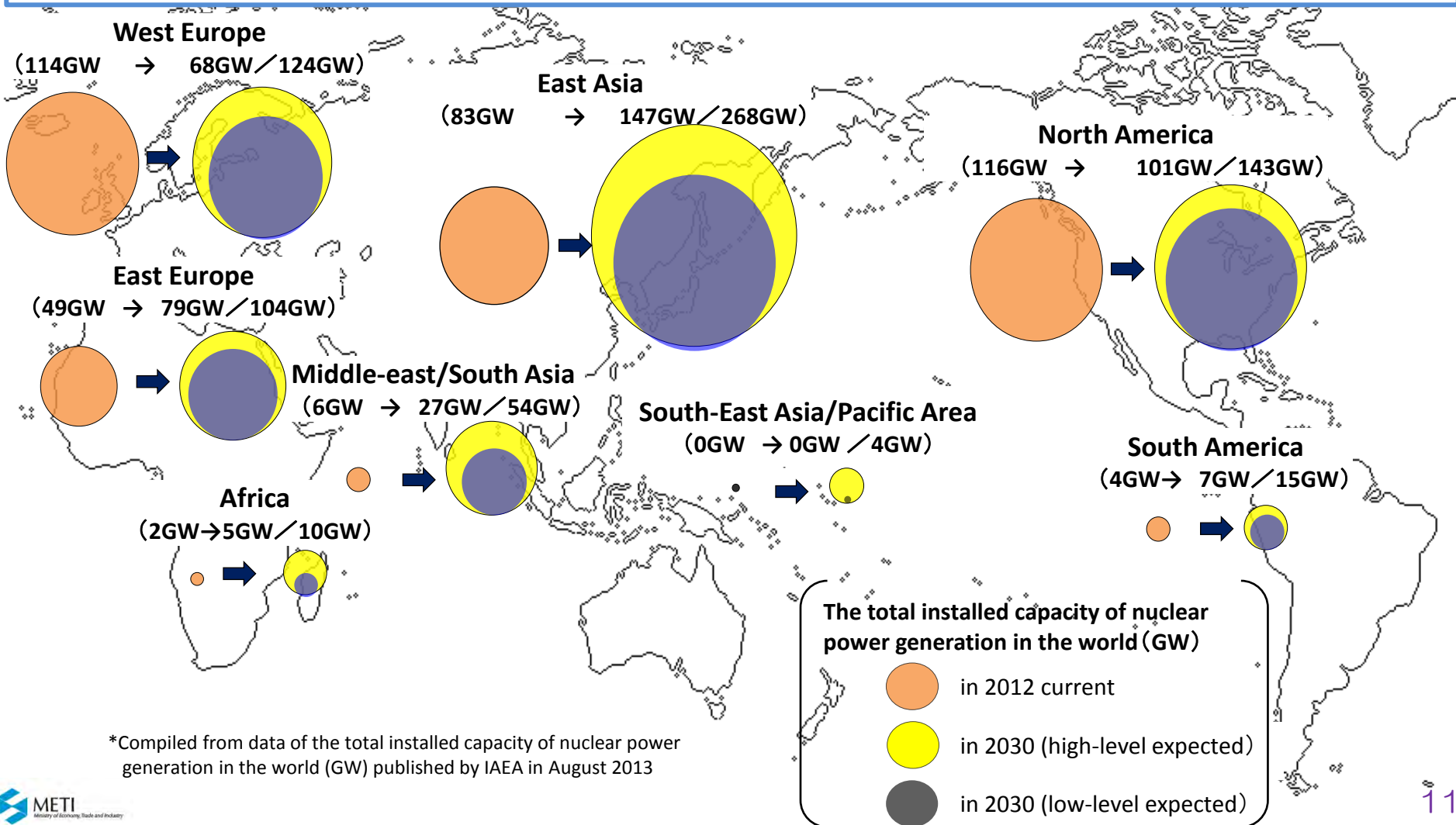
### 2) NRA's statements on reviewing conformity to the new regulatory requirements

- The new regulatory requirements should be applied to all power reactors without exception.
- The Chairman of the NRA noted about the period of reviewing conformity (as of 12 Feb 2014): "It is not finished by the end of March of this year "

## 2. Efforts for obtaining the understanding and cooperation from the relevant local municipalities after safety judgment is made by NRA

# Outlook for Major National and Regional Markets

- The total installed capacity of nuclear power generation in the world is expected to grow 1.2 - 1.9 times by 2030 by the IAEA.  
(Converted into the number of Plant- Unit, it's estimated to increase around 60 – 350 units (3 – 19 units per year) (expectation of METI))
- It is expected the large expansion in the area of East Asia, East Europe and the Middle East/South Asia.



\*Compiled from data of the total installed capacity of nuclear power generation in the world (GW) published by IAEA in August 2013

# Expectations for Japan's Nuclear Technology after Fukushima (1)

Country	Summary of comments
<p><b>Viet Nam</b> (Prime Minister)</p>	<p>The Prime Minister of Viet Nam mentioned about new NPP construction in Viet Nam in which Japan will be involved: "I have confidence in Japan's high-level technology and nuclear safety. I also believe that Japan will further develop its nuclear technology through lessons and experience learnt from the Fukushima accident." (April 21, 2012)</p>
<p><b>Turkey</b> (Minister of Foreign Affairs)</p>	<p>The Minister of Foreign Affairs of Turkey mentioned about the negotiation on NPP import from Japan: "I have confidence in Japanese nuclear safety and technology. I would like to promote cooperation with Japan for nuclear power plant construction in Turkey." (January 8, 2013)</p>
<p><b>Brazil</b> (Mines and Energy Minister)</p>	<p>The Mines and Energy Minister of Brazil responded to Minister Motegi, METI of Japan: "We would like to utilize high level nuclear technology of Japan", when Motegi expressed his willingness to support Brazil's plan of NPP construction. (May 2, 2013)</p>
<p><b>Lithuania</b> (Prime Minister)</p>	<p>The Prime Minister of Lithuania expressed his expectation for high level nuclear technology of Japan to Lithuania's new NPP construction plan at the Japan-Lithuania summit. (February 20, 2012)</p>
<p><b>United Kingdom</b> (Minister of State for Universities and Science) (First Minister of Wales)</p>	<p>The Minister of State for Universities and Science of UK expressed in the bilateral meeting with Minister Furukawa that he hoped to build a cooperative relationship with Japan based both on the accumulation of the knowledge and technology related to nuclear power in the UK and on lessons and experience learnt from the Fukushima Daiichi accident. (April 10, 2012)</p> <p>First Minister of Wales of UK mentioned: "I was very impressed with the nuclear power plants of Japan" when the Minister visited Oma NPP site. He also expressed his expectation that new Japanese-designed NPPs with enhanced safety based on the lessons and experience of the Fukushima Daiichi NPS accident, will be constructed in the UK. (April 10, 2013)</p>
<p><b>Poland</b> (Prime Minister)</p>	<p>The Prime Minister of Poland expressed his expectation that Poland will promote cooperation with Japan in the field of nuclear power, renewable energy, smart grids, etc. at the Japan-Poland summit. (June 16, 2013)</p>

## ●The 3rd Armitage-Nye Report issued by CSIS on August 15, 2012 (Excerpt)

- (i) A permanent shutdown will also stymie responsible international nuclear development, **as developing countries will continue to build nuclear reactors. --- China could eventually emerge as a significant international vendor. As China plans to join Russia, South Korea, and France in the major leagues of global development in civilian nuclear power, Japan cannot afford to fall behind** if the world is to benefit from efficient, reliable, and safe reactors and nuclear services.
- (ii) **Japan and the United States have common political and commercial interests in promoting safe and reliable civilian nuclear power domestically and internationally.**
- (iii) **Safe, clean, responsibly developed and utilized nuclear power constitutes an essential element in Japan's comprehensive security.** In this regard, U.S.-Japan cooperation on nuclear research and development is essential.

## ●John J. Hamre, President and CEO of the CSIS (Former Deputy Secretary of Defense)

**"Japan is one of the strongest countries in the world in the field of commercial nuclear energy use. However, if Japan abandons domestic use of nuclear power, the country must lose its position."**

**"Should that ever happen, nuclear power plants would be constructed mainly in China, India, Persian Gulf states and Russia, in future. However, none of these countries is the one to take the lead in promoting non-proliferation regime. When the present three-polar system should collapse, countries that do not necessarily share the goal of non-proliferation would come to have a larger influence. Then, the world would be exposed to a larger proliferation threat."**

**"The United States needs to have partners to support non-proliferation. Japan has been ever the strongest partner of the United States."**

(Interview by *Asahi Shimbun* on October 24, 2012)

# Ref.) Nuclear Power Projects which Japan's been highly interested in

<b>Vietnam</b>	<ul style="list-style-type: none"> <li>- Two 1,000 MW class reactors are planned at each of 2 sites in Ninh Thuan Province.</li> <li>- Vietnam contracted with Russia for the first site and selected Japan as a partner for the second site.</li> </ul>
<b>Turkey</b>	<ul style="list-style-type: none"> <li>- Construction is planned at two sites: Akkuyu site (four 1,200 MW class reactors) and Sinop site (four reactors : scale undecided).</li> <li>- <b><u>Turkey granted to Japan the Exclusive Right for negotiating on Sinop site project</u></b> (regarding the Akkuyu site project, granted to Russia).</li> </ul>
<b>India</b>	<ul style="list-style-type: none"> <li>- Assigned site: Two U.S. sites (max: 12 reactors), two Russian sites (max: 12 reactors? ), one French site (max: 6 reactors? )</li> <li>→ <b>Japan is still negotiating the Nuclear energy co-operation agreement with India.</b></li> </ul>
<b>UAE</b>	<ul style="list-style-type: none"> <li>- Some reactors are to be constructed. (South Korea will cover 4 of them.) Japanese reactor vendors are highly interested in cooperating with UAE.</li> </ul>
<b>Saudi Arabia</b>	<ul style="list-style-type: none"> <li>- 16 reactors are to be constructed by 2030. The feasibility study for site section is on going from 2011.</li> <li>→ <b>The Nuclear energy co-operation agreement are required.</b></li> </ul>
<b>Finland</b>	<ul style="list-style-type: none"> <li>- <b><u>Several Japanese companies, French company and Korea compete</u></b> in the plan of TVO.</li> <li>- In February 2013, Toshiba was identified as preferred strategic investor for large-sized reactor in the plan of Fennovoima and on the other hand, in June 2013, Russian company was identified as proffered investor and negotiating for middle-sized reactor.</li> </ul>
<b>Czech</b>	<ul style="list-style-type: none"> <li>- Two reactors are planned at Temelin site. (The first reactor is planned to start operation in 2020.)</li> </ul>
<b>Bulgaria</b>	<ul style="list-style-type: none"> <li>- Toshiba/WEC entered into Strategic Investor Agreement with Bulgaria Energy. Under the Agreement, <b><u>it was agreed that AP1000 will be deployed.</u></b></li> </ul>
<b>U.K.</b>	<ul style="list-style-type: none"> <li>- 11-13 reactors are to be constructed in 2020's (4 reactors: AREVA).</li> <li>- <b><u>Horizon (wholly owned by Hitachi) will deploy Hitachi's ABWR (UK's first BWR).</u></b></li> <li>- <b><u>Nu Generation (60% owned by Toshiba/WEC) will deploy AP1000.</u></b></li> </ul>
<b>U.S.</b>	<ul style="list-style-type: none"> <li>- Two reactors are approved for Combined Construction and Operation License (COL). There are applicants for other 16 reactors.</li> <li>→ <b>New construction is slumping by the shale gas revolution, stagnation of DOE's loan guarantee issuance, etc.</b></li> </ul>

# Strong points of Japanese Nuclear Technology

## ● Proven Generation III Technology

- World top class safety enhanced feature.....Inherent safety feature plus lessons learned from Fukushima
- Construction Experience.....provides reliable schedule and cost control
- Operation Record....provides proven operability and reliable planning

## ● EPC Capability

- Overall project management
- Key Component Manufacturing .....Key Safety Equipment made in Japan
- Construction Technology .....World Top Class Construction Technology



## 1. Human resources development;

- Regulatory Cooperation (nuclear safety regulation, nuclear liability regulation etc.)
- Cooperation in training (regarding operation and maintenance of NPPs)

## 2. Financial support;

- JBIC (Japan Bank for International Cooperation): Export Loans, Investment Loans
- NEXI (Nippon Export and Investment Insurance): Buyer's Credit Insurance, Overseas Investment Insurance

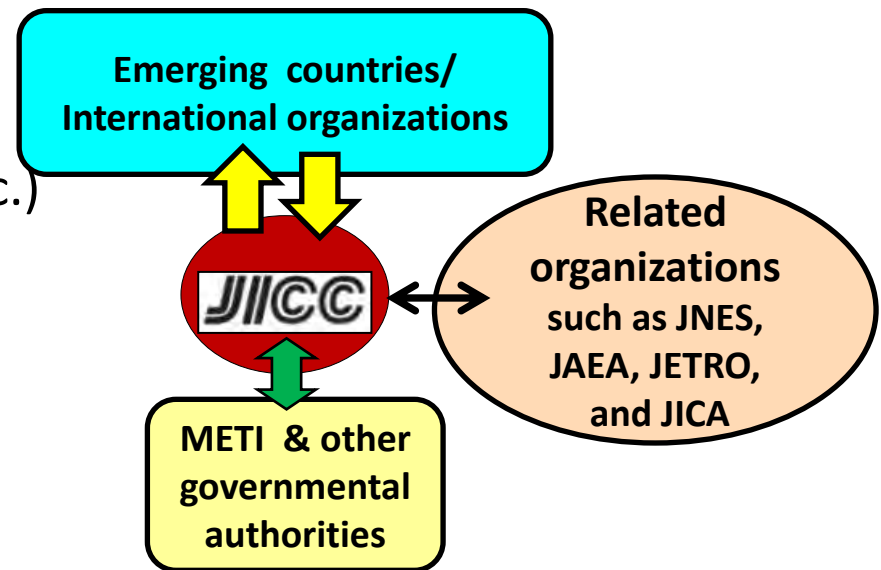
## 3. Lessons Learned from Fukushima Accident

- Sharing experiences and lessons learned from Fukushima accident (workshops on safety measures / emergency preparedness etc.)

# Cooperation through JICC

In Japan, JICC (JAIF International Cooperation Center) was established in March 2009 to provide “one-stop” services for countries which are planning to introduce nuclear energy.

- Purpose: JICC plays a core role, acting as a contact point, in providing cooperation to the countries introducing NPPs in an effective and efficient way.
- Role of JICC: JICC coordinates various programs of cooperative activities conducted by different organizations, through providing “one-stop” and “tailor-made” services to each country.
- Major Activities (in 2009 – 2012):
  - Dispatching experts (Vietnam, Indonesia, and Jordan etc.)
  - Workshop and training in Japan and abroad (Vietnam, Indonesia, and Kazakhstan etc.)





- JBIC (Japan Bank for International Cooperation)
- Supervised by: Ministry of Finance of Japan
- Missions: To contribute to the sound development of Japan and international economy and society by providing loans and equity participations etc...
- Capital (wholly owned by the Japanese Government): USD 13.6 billion\* (\*JPY100/USD)
- Total Assets: USD 154.5 billion\* (as of the end of Sep. 2013)
- Principal Operations:
  - Export & Import Loans
  - Investment Loans
  - Untied Loans
  - Equity Participations
- etc...

- NEXI (Nippon Export and Invest Insurance)
- Supervised by: **Ministry of Economy, Trade and Industry of Japan**
- Missions: To efficiently and effectively conduct insurance business of covering risks which arise in foreign transactions and which are not covered by commercial insurance
- Capital (Wholly owned by the Japanese Government): USD 1.0 billion\* (\*JPY100/USD)
- Total Assets: USD 3.7 billion\* (as of the end of Mar. 2013)
- Type of Insurance:
  - Buyer's Credit Insurance
  - Overseas Investment Insurance
  - Untied Loan Insurance



# Current Status of Bilateral Nuclear Cooperation Agreement

## Current Status of conclusion and negotiation of Japan's Bilateral Nuclear Cooperation Agreement

- 11 Countries and 1 International Organization (Euratom (joined by 28 EU countries)) are concluded.
- 2 countries are signed but uncompleted (Turkey and UAE)
- 4 countries are Under negotiation (India South Africa, Brazil and Mexico)

### Concluded

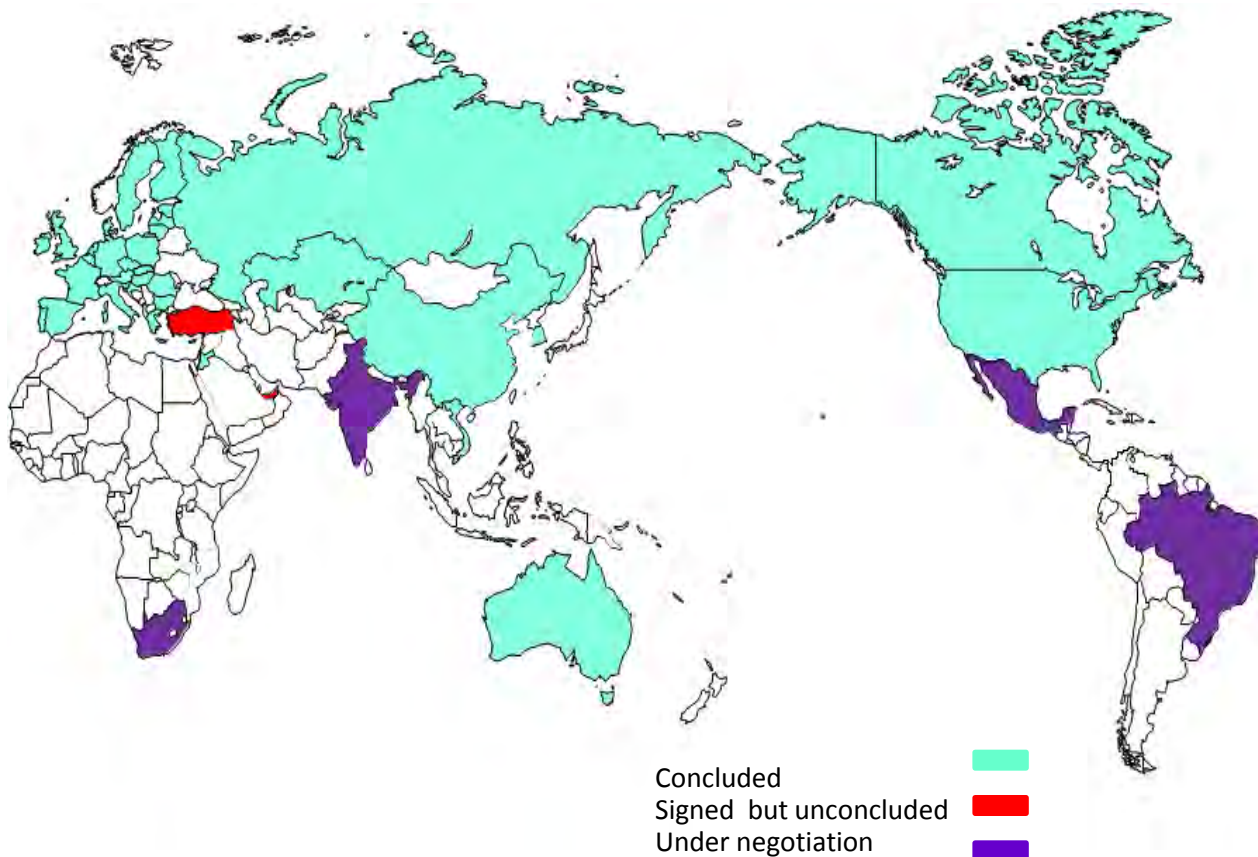
1. Canada (1980(amended))
2. Australia (1982)
3. China (1986)
4. U.S.A. (1988)
5. France (1990)
6. U.K. (1998)
7. Euratom (2006)
8. Kazakhstan (2011)
9. Korea (2012)
10. Vietnam (2012)
11. Jordan (2012)
12. Russia (2012)

### Signed but uncompleted

- Turkey (May 2013)
- UAE (May 2013)

### Under negotiation

- India
- South Africa
- Brazil
- Mexico



# **Outline of the new Energy Basic Plan**

**The final draft by METI  
announced on February 25, 2014  
(to be decided by the cabinet in this month)**

## (1) Evaluation of Nuclear Power and its Future Course

METI's provisional translation

Nuclear power is an important base load power source contributing to stability of energy supply-demand structure, on the major premise that the safety assurance should be prioritized before everything else, because of the following perspectives; 1)superiority in stable energy supply and energy efficiency, 2)low and stable operational cost and 3)free from emission of GHG during operation.

Safety is the highest priority before everything else and the government makes its best efforts to sweep away concerns about safety among the Japanese public.

Based on this premise, as to safety issues of nuclear power plants, the Government will defer to the expert judgment by the Nuclear Regulation Authority. When the Nuclear Regulation Authority admits the conformity of a nuclear plant with its (new) regulatory standards which has the world highest level of safety, the government will respect the judgment and will proceed with the restart of the nuclear plant.

In this case, the government will make efforts to obtain the understanding and cooperation of relevant parties including municipalities hosting nuclear facility sites.

The dependency on nuclear power generation will be lowered as much as possible by energy saving and introducing renewable energy as well as improving the efficiency of thermal power generation, etc.

Under this policy, the target volume of electricity to be secured by nuclear power generation will be judged taking Japan's energy constraints into consideration from the viewpoint of stable energy supply, cost reduction, global warming and maintaining nuclear technologies and human resources.

In addition, the Government will take necessary measures to strengthen international nuclear security and non-proliferation taking account of the international moves such as the Nuclear Security Summit and the adoption of the revised Convention on the Physical Protection of Nuclear Material.

## (2) Efforts towards restoration and reconstruction of Fukushima

METI's provisional translation

Efforts towards restoration and reconstruction of Fukushima should be placed at the starting point in order to rebuild the energy policy.

The decommissioning of the TEPCO's Fukushima Daiichi NPPs and countermeasures for the contaminated water issue are unprecedented difficult tasks. Therefore, the Government plays a more proactive role, and undertakes each measure steadily with the unwavering resolve.

The Government has reinforced its organizational structure by uniting various governmental functions of accelerating the decommissioning of the TEPCO's Fukushima Daiichi NPPs and the contaminated water issue.

Also the Government reinforced its supporting function from technical perspectives by bringing together and utilizing domestic and overseas wisdom in order to steadily proceed with preventive and multi-layered measures against the decommissioning and the contaminated water issue.

The Government has officially announced its policy that the government would play a more proactive role for compensation, decontamination and operations of intermediate storage facilities by the Cabinet decision for "For Accelerating the Reconstruction of Fukushima from the Nuclear Disaster" on Dec 20 2013.

Based on the policy, the Government as well as TEPCO will tackle with all the challenges necessary for the earliest completion of the reconstruction of Fukushima.

In addition, the Government will conduct necessary studies for the establishment of R&D center for the decommissioning and manufacturing center for the related component fabrication or maintenance, which will be required towards the decommissioning around the Fukushima Daiichi NPPs site, based on opinions of local communities.



## **(3) Final Disposal of High-Level Radioactive Waste**

METI's provisional translation

The Government will take leadership and strengthen its effort to find proper solutions of the final disposal of high-level radioactive waste without putting this issue to the next generation. At present, geological disposal is recognized as a possible solution with accumulated scientific knowledge among various options.

It is important for the Government to proceed with studies on geological disposal securing reversibility and retrievability so that the future generation will be able to select the best disposal method when a better solution will be found in the future.

The Government will hold the "Inter-Ministerial Council for the Final Disposal of High-Level Radioactive Waste" and revise "Basic Policies on the final disposal of Specified Radioactive Waste" (Decided by the Cabinet in March 2008)" based on the discussions in an advisory committee of METI.

## **(4) Nuclear Fuel Cycle / Monju**

<Promotion of Nuclear Fuel Cycle>

The Government will stick to nuclear fuel cycle policy including reprocessing and plutonium use in LWR obtaining the understanding and cooperation of municipalities hosting nuclear fuel facility sites and international community, taking into account lessons learnt from the previous situations. Also the Government will hold flexibility to find better solutions for mid-to-long term issues on nuclear fuel cycle policy.

<Monju>

The government will reform any aspects of Monju R&D drastically taking into account lessons learnt from previous efforts and aim to compile the research results expected in the Monju R&D plan. In doing this, the Government and JAEA will carefully consider issues which needs to be overcome, such as restructure of the operations and conformity to the new regulatory requirements.

## **(5) Plutonium management**

The Government remains committed to the principle of not possessing reserves of plutonium of which use is undermined on the premise of peaceful use of plutonium, in order to contribute to global nonproliferation and to forward steadily the peaceful use of plutonium while obtaining understanding from international community. In order to achieve this, the Government will conduct an appropriate management and utilization of plutonium by implementing plutonium use in LWR and will promote R&D of fast reactors through international cooperation with US and France etc. while considering an appropriate balance between separation and utilization of plutonium.

## **(6) International cooperation**

It is our country's responsibility and expectations from the world to contribute to the improvement of the world's nuclear safety, peaceful use of nuclear energy, and ensuring international nuclear security and non-proliferation while sharing lessons and experiences learnt from TEPCO's Fukushima Daiichi Nuclear Power Plant accidents with the world.

Japan will contribute to global nuclear safety by providing our nuclear technology with enhanced safety based on lessons from the accident and will support countries which are planning to deploy NPPs in human resource development and institutional development.

## 1. Nuclear Power

- Important base-load power source contributing to stability of energy supply-demand structure on the major premise that the safety assurance should be prioritized before all, for the following perspective; 1)superiority in stable energy supply and energy efficiency, 2)low and stable operational cost, and 3)free from GHG emissions during operation

## 2. Renewable Energy

- Promising and diverse domestic energy source free from GHG emissions
- Accelerating the introduction to the utmost for the next three years starting from 2014, and promoting continuously even after the period
  - Geothermal power and hydro-electric power belong to base load power sources.
  - Solar power and wind power need to be combined with other matching electricity supply sources such as petroleum and LNG because power generation from solar and wind is not stabilized.

## 3. Coal

- Important base load power source to be re-evaluated as excellent in stability and economic efficiency
- Energy source to be utilized with reducing environmental impacts by effective usage of high-efficiency thermal power generation

## 4. LNG

- Energy source playing a core role as an intermediate-load power source supplementary to base load power
- Important energy source expanding its role in the future

## 5. Petroleum

- Important energy source to be utilized continuously
- Playing important role as a peak load power source and as a resource supporting transportation and consumer sectors

## 6. LPG

- Clean energy source which will contribute to emergency situations and which can be utilized as an intermediate-load power source supplementary to base load power

**Thank you for your attention !**