

Energy and Nuclear energy policy after 3/11: Issues and Challenges for Japan

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*Note: The views expressed here are of my own and do not necessarily reflect those of the
JAEC nor the government.*

Issues and Challenges

- Fukushima Daiichi Decommissioning and Restoring life in Fukushima area
- Restoring Public Trust in Nuclear Safety and Energy Policy
- Major Issues remain to be solved regardless of future of nuclear energy (with emphasis on nuclear safety and security)
 - Spent fuel management
 - Plutonium stockpile management



Japan Atomic Energy Commission (JAEC)

○The Role of Japan Atomic Energy Commission

The Japan Atomic Energy Commission is set up in the Cabinet Office and has five commissioners. Its mission is *to conduct planning, deliberations, and decision-making* regarding basic policy for research, development, and utilization of nuclear energy, including the formulation of the Framework for Nuclear Energy Policy *except matters related to nuclear safety regulation*. When the JAEC deems it necessary as a part of its assigned mandate, *JAEC can recommend and demand reports of the head of relevant administrative organization through the Prime Minister*.

Members: 5 (appointed by the Prime Minister with the consent of the House of Representatives and House of Councilors)



Chairman
Dr. Shunsuke KONDO



Vice Chairman
Dr. Tatsujiro SUZUKI



Commissioner
Ms. Etsuko AKIBA



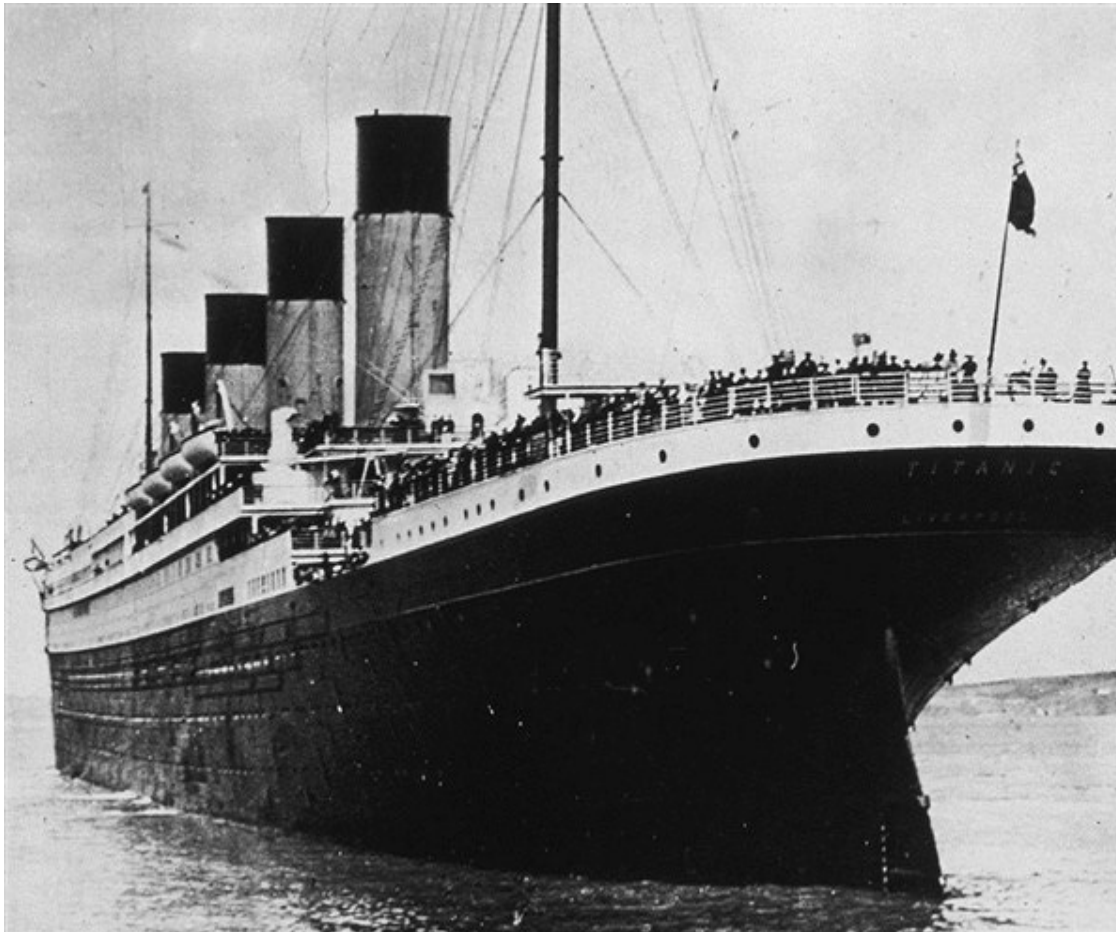
RESIGNED
Commissioner
Dr. Mie OBA



RESIGNED
Commissioner
Dr. Akira OMOTO

Role of JAEC (??)

- A small tag-boat for a giant Titanic? -



Fukushima Daiichi Decommissioning and Restoring life in Fukushima area



Current Status

- It will take at least 30 years to clean up and decommission the Fukushima Dai-ichi site.
- Total liability (compensation) amount is estimated to be at least 6 trillion yen (\$60 billion) which is likely to grow further.
- Currently no (out of 50) nuclear plant is operating in Japan, but due to energy conservation/efficiency improvement efforts no power shortage occurred during this summer peak. Still about 3.5 trillion yen (\$35 billion) was paid more for fossil fuel than last year. All utilities except Hokuriku and Okinawa suffered largest loss (total of 1.3 trillion yen in FY 2012).
- Newly established Nuclear Regulatory Authority (NRA) has been working on new regulatory standards and published its draft. NRA published the standard for reactors in July and plans to publish the standard for nuclear fuel cycle facilities by December. Until its safety is confirmed in accordance of the standards, no reactors/facilities are not allowed to start up.



PM Abe's assuring speech on Fukushima at the International Olympic Committee (Sept. 7, 2013)

- *"Let me assure you the situation is under control... It has never done and will never do any damage to Tokyo. There are no health-related problems until now, and nor will there be in the future."*

-From Reuter, "Abe helps secure 2020 Games for Tokyo," Sept. 7, 2013

<http://uk.reuters.com/article/2013/09/07/uk-olympics-idUKBRE9860BO20130907>



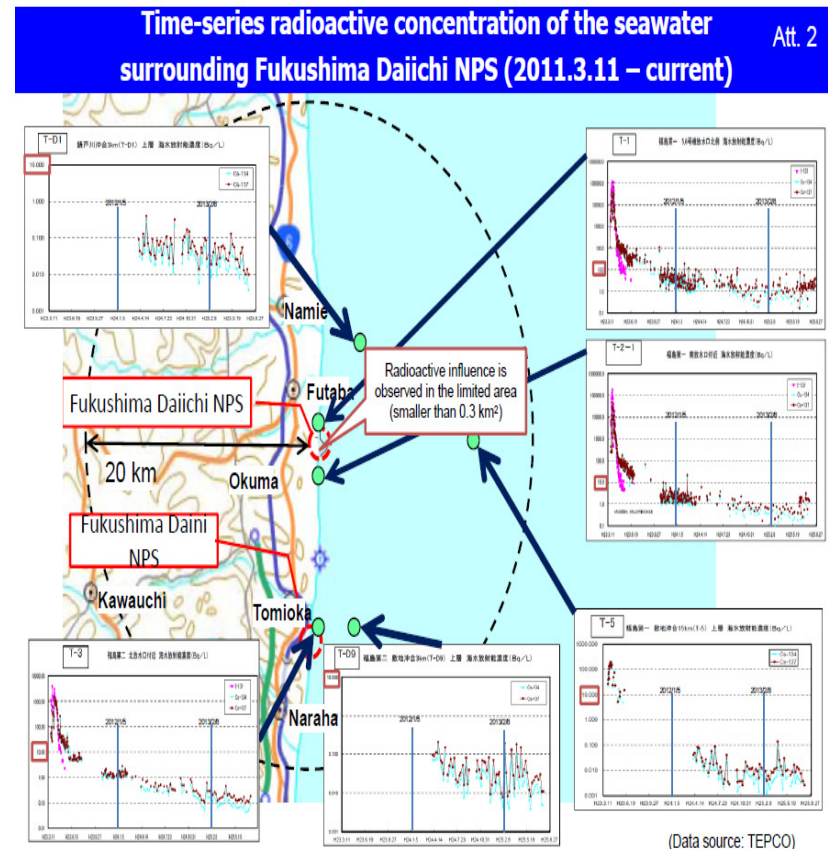
http://www.kantei.go.jp/jp/96_abe/actions/201309/07ioc_day2.html

Following up his statement...

..The technical basis of his statement is as follows:

- There are 32 radiation monitoring stations and 85 radiation monitoring points along the coast of the Fukushima, Ibaraki, and Chiba prefectures. The Nuclear Regulatory Authority reports that the seawater contains 0.021 becquerel per liter or less of cesium 134 and cesium 137—far below the acceptable standard of 10 becquerel per liter.
- The contaminated water is limited to the area around the port near the Fukushima Daiichi Nuclear Power Station—an area that is no larger than 0.3 square kilometers.
- The annual radiation exposure from food and water is estimated to be lower than 0.01 millisieverts.

From: “Suzuki’s Fukushima updates,” The Bulletin of the Atomic Scientists, Sept. 9, 2013.
<http://thebulletin.org/suzukis-fukushima-updates>



http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20130904_01b.pdf

Struggling with contaminated water...during the recent typhoon (Sept. 15, 2013)



http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130917_01-j.pdf

"I think the current situation is that it is not under control," by a TEPCO official.

-Fukushima 'not under control' – TEPCO official refutes PM's assurances, Reuter, Sept. 13, 2013

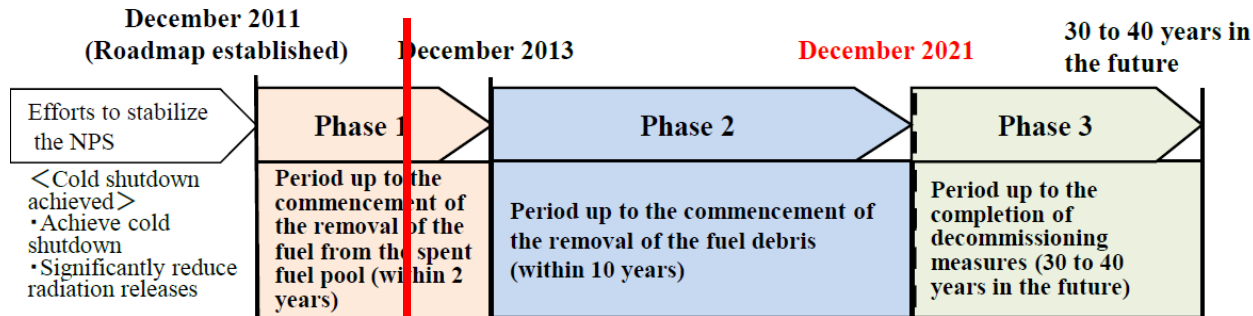
<http://rt.com/news/fukushima-under-control-tepco-819/>



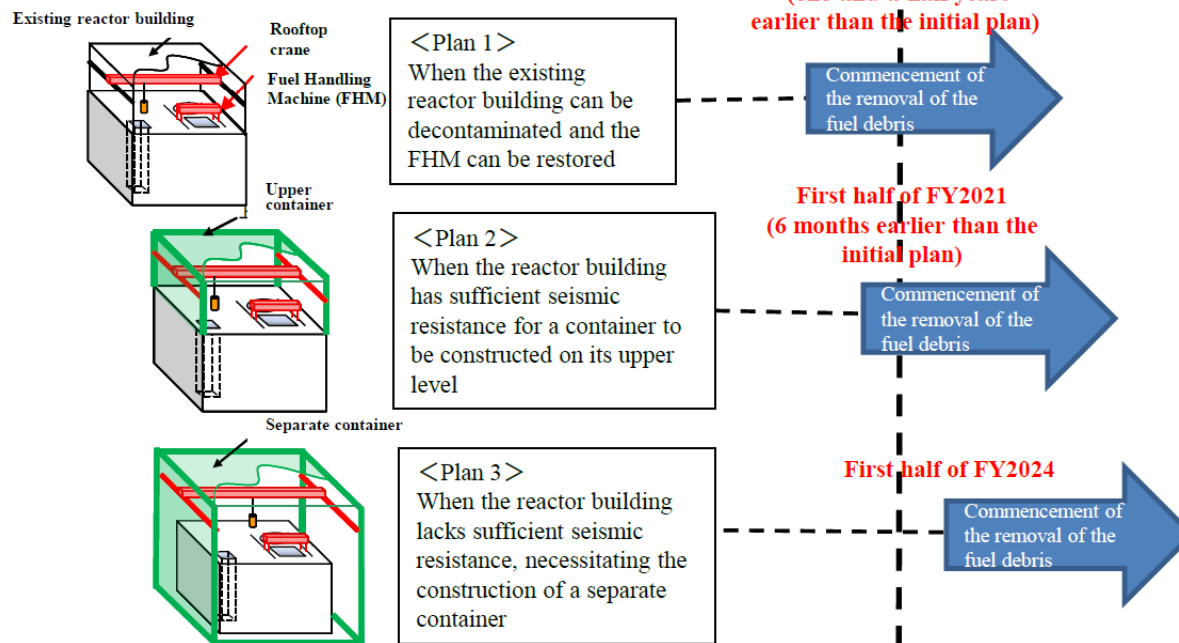
http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20130903_01a.pdf

Mid-Long Term Roadmap for Fukushima Dai-ichi

Targets under the Initial Roadmap



Plan under the Revised Roadmap (example: Unit 2)



Source: Agency for Natural Resources and Energy, Announcement of the Revised Version of the Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4, June 2013

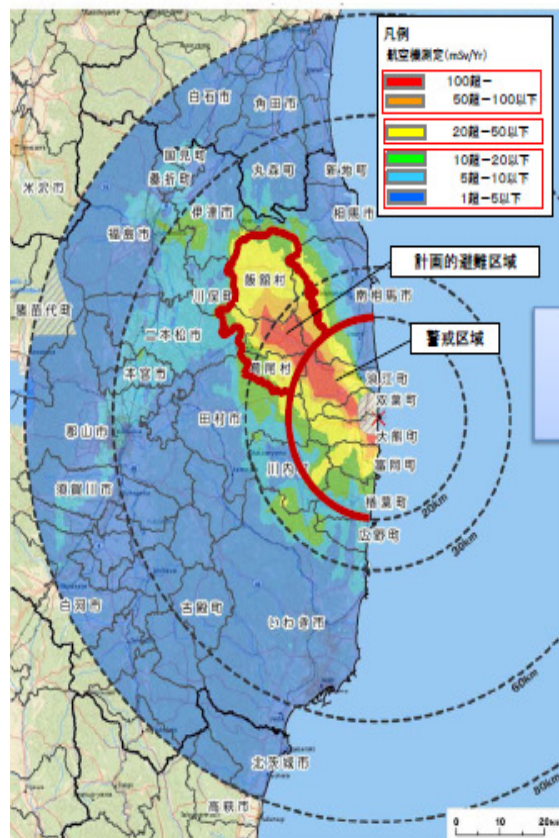
http://www.meti.go.jp/english/press/2013/0627_01.html



Evacuation Area Amended (March 7, 2013)

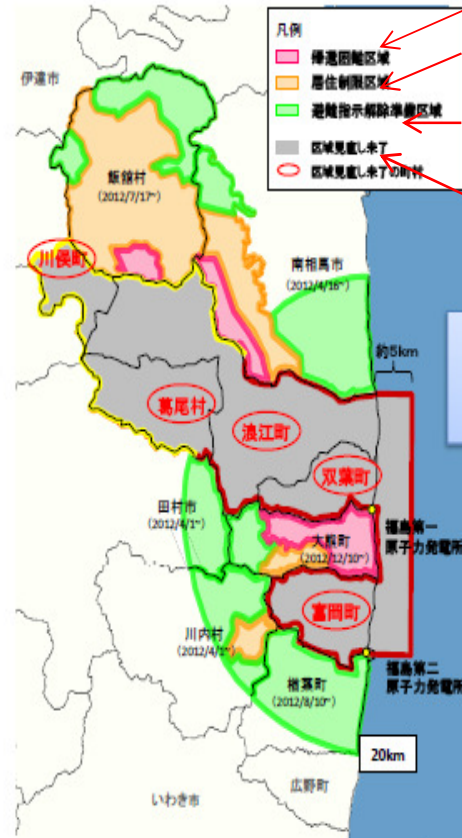
(As of April 29, 2012)

〔平成23年4月29日時点の
線量分布〕



(Dec 10, 2012)

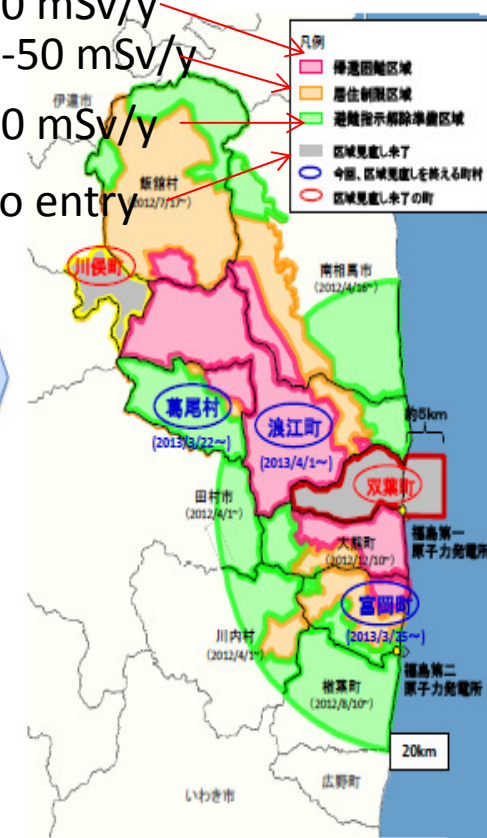
〔平成24年12月10日時点
(今回の区域見直し前)〕



(After April 1, 2013)

〔平成25年4月1日以降
(今回の区域見直し後)〕

>50 mSv/y
20-50 mSv/y
<20 mSv/y
No entry



Cherry blossom in Tomioka Town (10 km from Fukushima Daiichi)



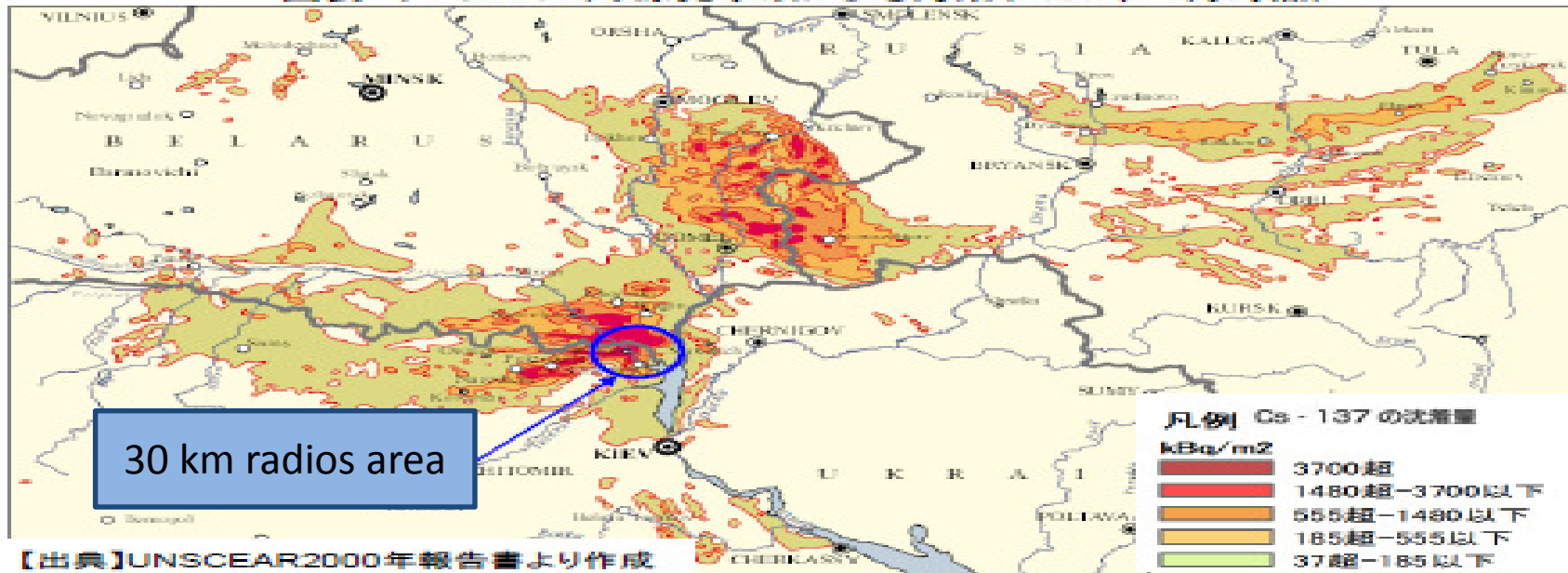
<http://www.asahi.com/special/10005/images/TKY201204190192.jpg>



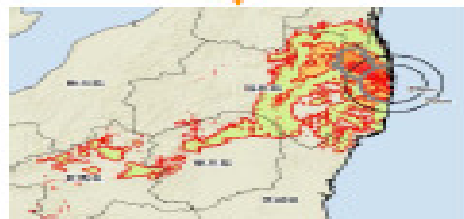
<http://img.47news.jp/PN/201204/PN2012041901001125.-.-.CI0003.jpg>

Compared with the Chernobyl accident

図表 チェルノブイリ原発事故による汚染(1989年12月時点)



両図を同縮尺
で記載



図表 東電福島第一
原発事故による汚染
(2011年11月時点)

図表 汚染地域の面積

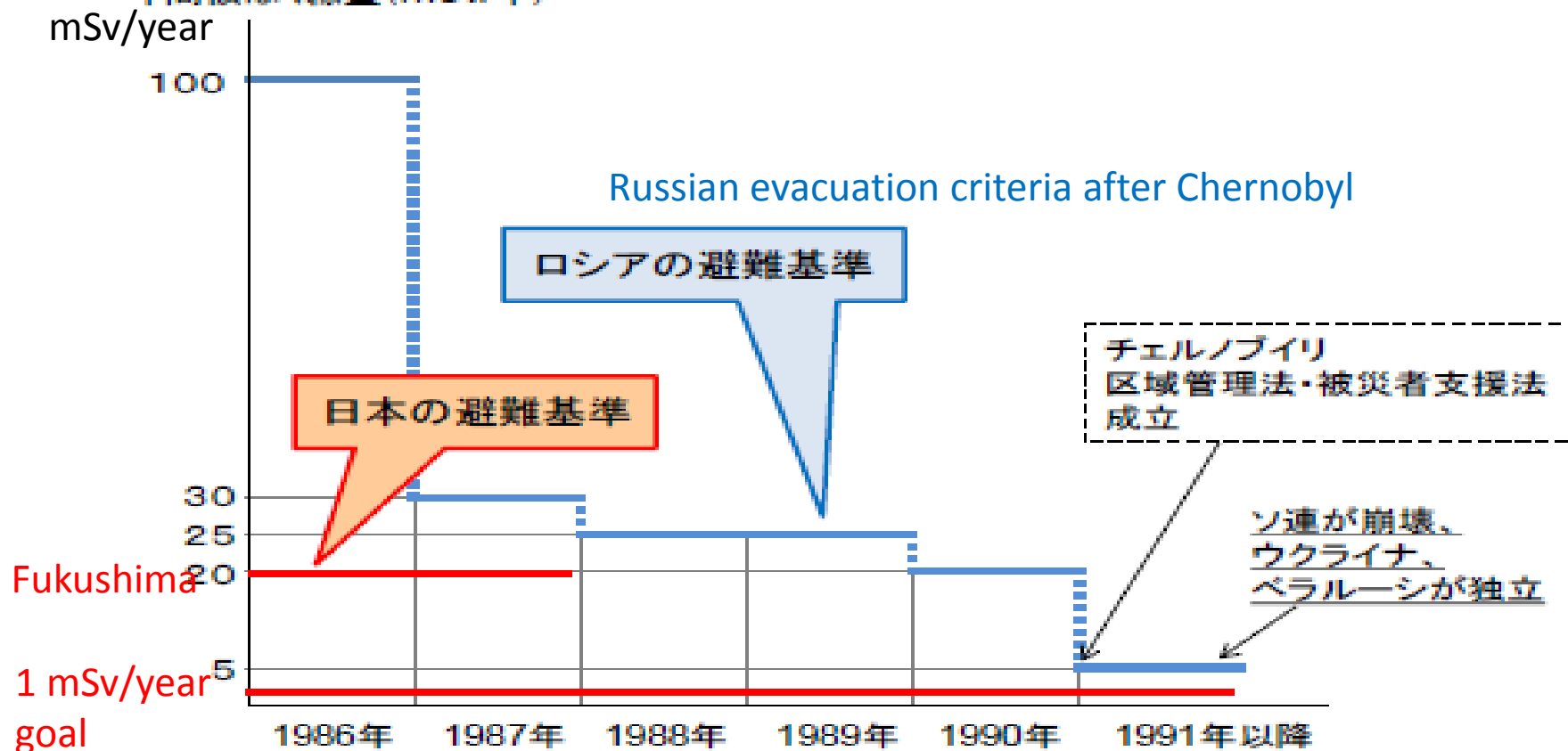
汚染濃度 (kBq/m ²)	汚染地域の面積(km ²)		
	Chernobyl	Fukushima	F/C
> 1,480	3,100	200	6 %
555 - 1,480	7,200	400	6 %
185 - 555	18,900	1,400	7 %
37 - 185	116,900	6,900	6 %
合計面積	146,100	8,900	6 %

【出典】文部科学省発表資料(2011年11月)より作成 3



Evacuation Criteria for Fukushima compared with the Chernobyl

図表 チェルノブイリ原発事故と東電福島第一原発事故の避難等の基準の変遷の比較
年間被ばく線量(mSv/年)



Most Important Lessons Learned from Fukushima: “Thinking Unthinkable” and “Resilience”

- *“The Investigation Committee is convinced of the **need of a paradigm shift** in the basic principles of disaster prevention programs for such a huge system, whose failure may cause enormous damage.”* - from the Interim Report by the Gov’t investigation committee (Dec. 2011)
- “Thinking unthinkable” is essential in preparing for the emergency and for energy security.
- “Resilience” beyond “defense in depth” is needed for preparing “unexpected crisis”.
 - Resilience means a capability to **respond to “unexpected crisis” as well as to restore safe and secure status** of the social system.

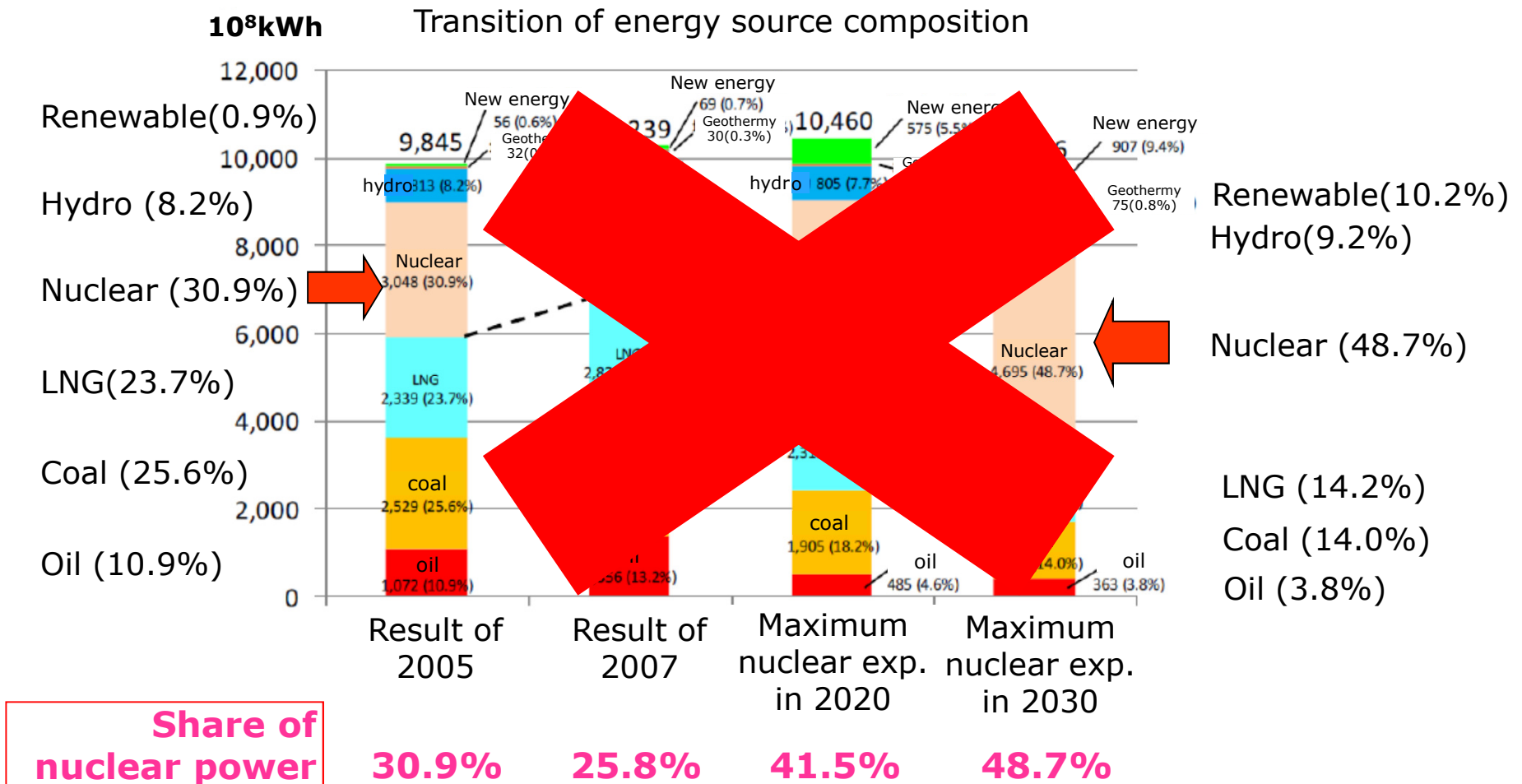


Restoring Public Trust in Nuclear Safety and Energy Policy

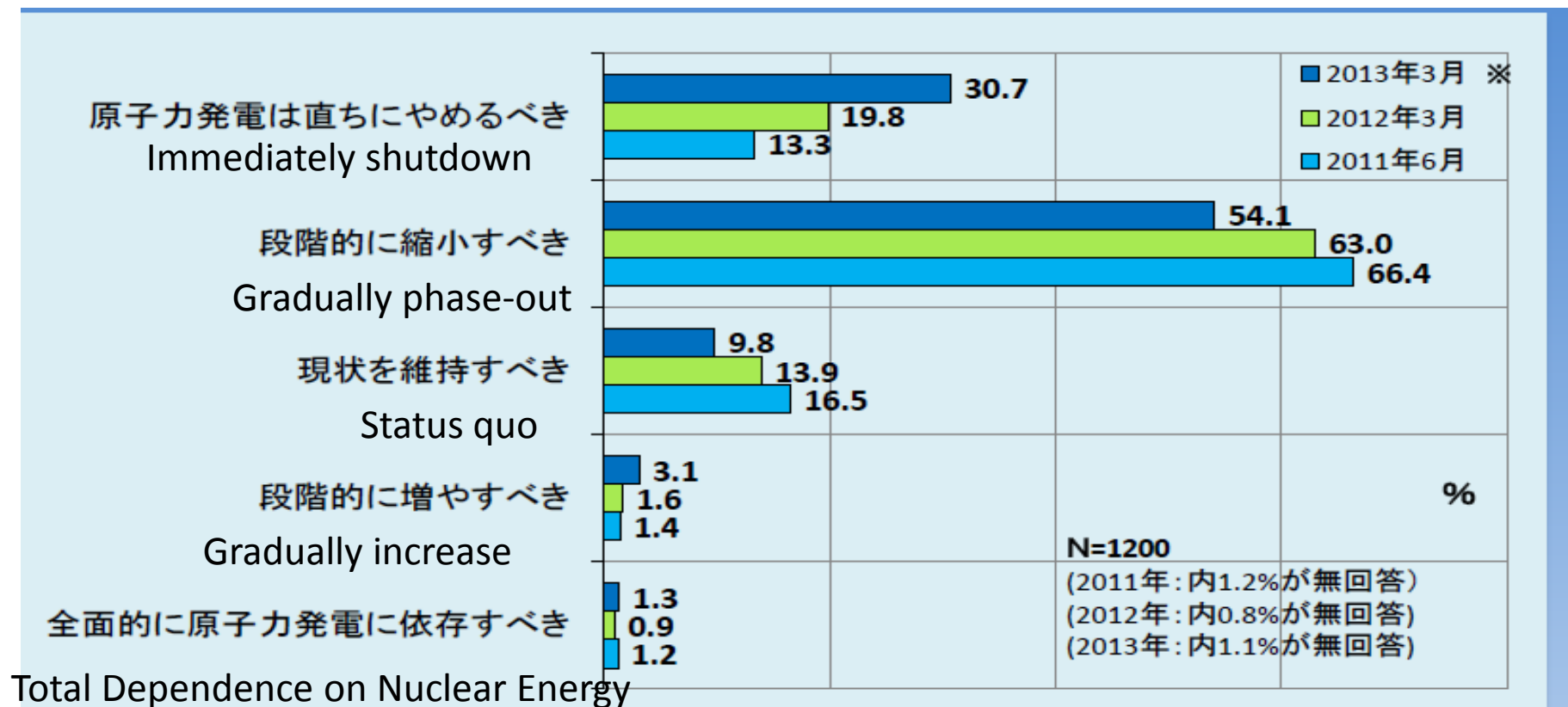


Goal of Power Production Mix in 2030

Before 2011/3/11



Source: Institute of Energy Economics, March 2010



What is your opinion about nuclear power in Japan?

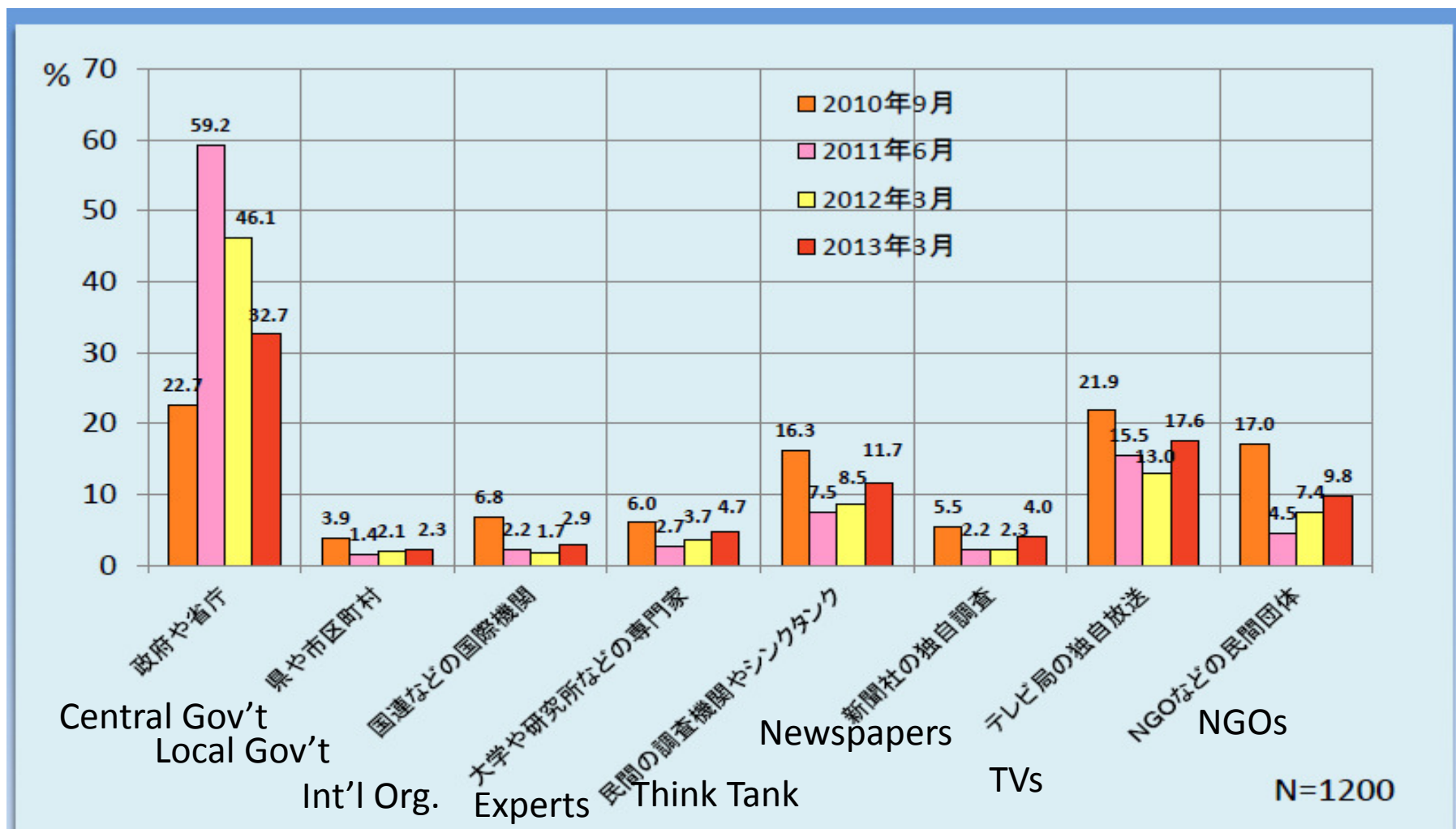
日本の原子力発電はどうあるべきか

※2013年の調査では、回答項目は「再稼働を認めず、直ちにやめるべき」「再稼働を認めて段階的に縮小すべき」「再稼働を認めて現状を維持すべき」「再稼働を認めて段階的に増やすべき」であった。

Source: Prof. Hirotada Hirose, "Changes of Public Opinion about Nuclear Power,"
 Presented at Japan Atomic Energy Commission, July 17, 2013

<http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2013/siryo27/siryo2.pdf>

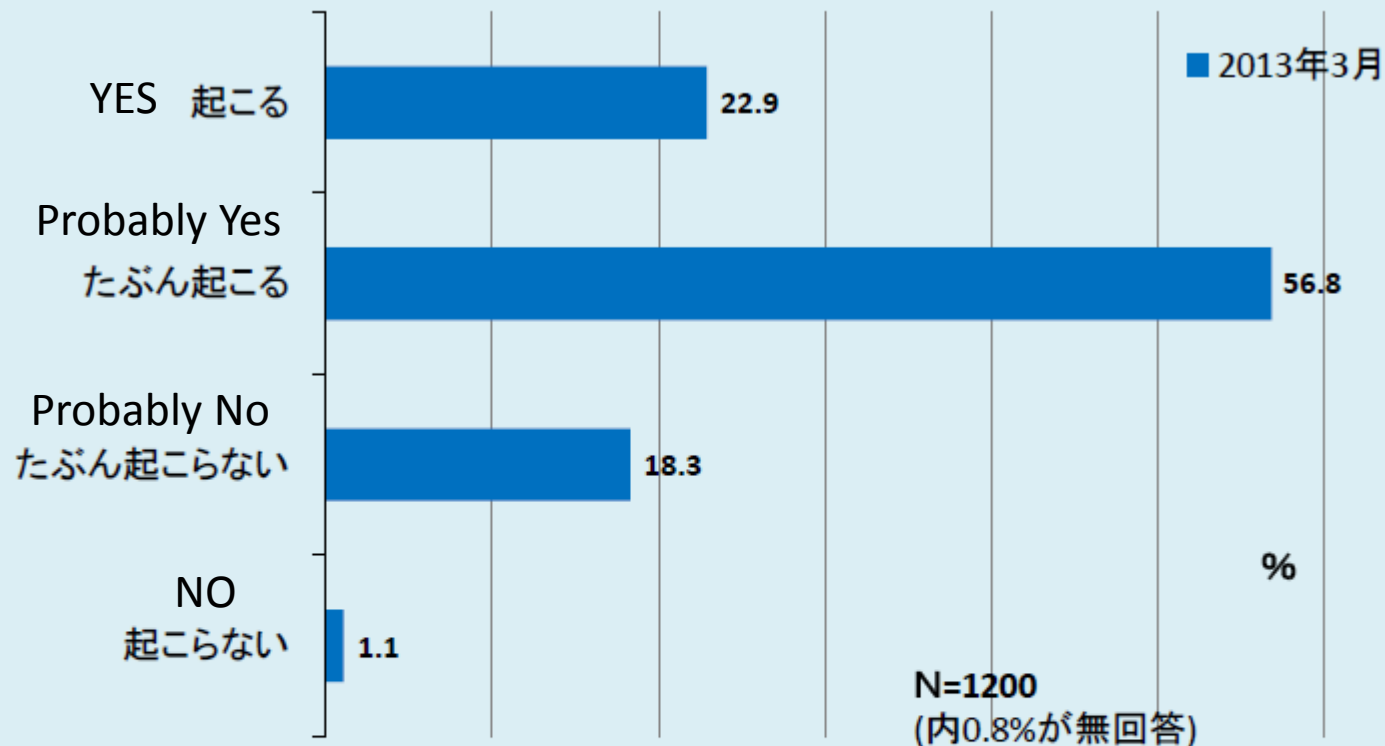




What sources do you think are most “untrustworthy”?

Source: Prof. Hirotada Hirose, “Changes of Public Opinion about Nuclear Power,”
Presented at Japan Atomic Energy Commission, July 17, 2013

<http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2013/siryo27/siryo2.pdf>



Do you think a similar scale of nuclear accident will happen again?

各地の原発再稼働で 福島第一原発と同程度の事故が起きる可能性

Source: Prof. Hirotada Hirose, "Changes of Public Opinion about Nuclear Power,"
Presented at Japan Atomic Energy Commission, July 17, 2013

<http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2013/siryo27/siryo2.pdf>

Summary of New Energy and Environmental Strategy (2012/09/14) (on nuclear energy policy)

Realization of “Society not dependent on nuclear power” in earliest possible future

: Mobilize all possible policy resources to such a level as to even enable zero operation of nuclear power plants in the 2030s.

(1) 3 Principle guidelines

- Strictly apply 40-year limitation of reactor operation
- Restart the operation of nuclear power plants once the Nuclear Regulation Authority gives safety assurance
- Not to plan the new and additional construction of a nuclear power plant

(2) 5 policies to achieve society without dependent on nuclear power (later)

(3) Review and constantly re-examine the path towards realization of a society not dependent on nuclear power

Source: The Energy and Environment Council, “Innovative Strategy for Energy and Environment,” September 14, 2012. http://www.cas.go.jp/jp/seisaku/npu/policy09/pdf/20120914/20120914_1.pdf



PM Abe's Statement at Diet on Energy Policy (2013/02/28)

- Reflecting on the accident at Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station, under the Nuclear Regulation Authority, **we will foster a new culture of safety that will uncompromisingly enhance the degree of safety.** After doing so **we will restart nuclear power plants where safety has been confirmed.**
- **We will promote the introduction of energy conservation and renewable energies to the greatest possible extent to reduce our degree of dependency on nuclear power as much as possible.** At the same time, we will begin **a fundamental reform of the electric system.**

http://www.kantei.go.jp/foreign/96_abe/statement/201302/28siseuhousin_e.html



Toward Public Confidence Building Measures (JAEC, 2012/12/25)

- 4 important principles for improving public trust:
 - (1) Accountability of policy decision
 - (2) Disclosure of accurate information
 - (3) Transparency and Fairness and public participation in policy making process..
 - administrative bodies **should establish a verifiable decision-making process**, namely, from the creation of administrative documents, hearing from experts, interested parties and the public, to final making decisions
 - (4) Clear and understandable communication (for the general public)
- The government, with collaboration with local governments and utilities, need to establish a forum where **local public and stakeholders can share the information to improve transparency of policy making process and public confidence**.
 - Good examples can be seen in Kashiwazaki-Kariwa Citizen Forum and CLI in France

http://www.aec.go.jp/jicst/NC/about/kettei/121225_1.pdf



Challenges for Evidence-based Policy Making: Based on Experiences at JAEC

1. **Biased Experts:** Experts are also not neutral. How to establish a panel consisting of “biased” experts who may express their subjective opinions.
2. **Uncertainty on evidence:** Need to understand that there is always “uncertainty” in “evidence.”
3. **Communication difficulties:** “Evidences” could be interpreted differently by media, policymakers and public.
4. **Time constraints:** Policy making needs to be done (or postponed) under a specific time frame.
5. **Role of secretariat:** Expertise, independence, and compliance are needed.
6. **Transparency in policy making process:** Not only the results but the process needs transparency. Traceability is also important. How to enhance public participation is another important issue.



Major Issues remain to be solved
regardless of future of nuclear energy
(with emphasis on nuclear safety and security)

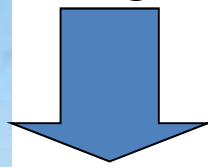


Three types of spent fuel storage capacity

At-reactor storage

Storage capacity: 20,630 tU/17 sites (as of Nov. 2011, 69% full)

On-site dry cask storage is not allowed by local governments (Fukushima-1 & Tokai-2 was allowed).



If Rokkasho was cancelled...

Rokkasho reprocessing plant

Storage capacity: **3,000tU**

(storage **2,929 tU** as of Sept. 2012)

Construction cost: ¥2.14Trillion



Mutsu Interim storage site

Dry Cask storage type

Capacity : totally 5,000 tU

1st 3,000 tU, add 2,000tU in future

Operation: October 2013 (or later)

(Status : under construction)

Construction cost: ¥0.1Trillion

(including dry casks)



Dry Cask Storage at Fukushima Daiichi (after 3/11)



http://photo.tepco.co.jp/library/110909_2/110909_69.jpg

Global Civilian Plutonium Stockpile (2010)

- Reprocessing has international security implications -



Figure 4. National stocks of separated plutonium. Civilian stocks are based on the most recent INF-CIRC/549 declarations for December 2010 and are listed by ownership, not by current location. Weapon stocks are based on non-governmental estimates except for the United States and United Kingdom whose governments have made declarations. Uncertainties of the military stockpiles for China, France,

India, Israel, Pakistan, and Russia are on the order of 10–30%. The plutonium India separated from spent heavy-water power-reactor fuel has been categorized by India as “strategic,” and not to be placed under IAEA safeguards. Russia has 6 tons of weapon-grade plutonium that it has agreed to not use for weapons but not declared excess.

Source: International Panel on Fissile Material (IPFM), Global Fissile Material Report 2012, <http://fissilematerials.org/library/gfmr11.pdf>

Plutonium Stockpile in Japan (as of the end of 2012)

	2012 (kg)	2011 (kg)
Stock in Japan (Pu total)		
Reprocessing Plants	4,363	4,364
MOX Fuel Plant	3,364	3,363
Stored at Reactors	1,568	1,568
Sub-total (Pu fissile)	9,295(6,315)	9,295 (6,316)
Stocks in Europe (Pu total)		
UK	17,052	17,028
France	17,895	17,931
Sub-total :Pu total(Pu fissile)	34,946 (23,277)	34,959(23,308)
Total (Pu fissile)	44,241(29,592)	44,254(29,624)

Source: Japan Atomic Energy Commission (2013, 2012) <http://www.aec.go.jp/jicst/NC/sitemap/pdf/130911e.pdf>

US Concern over Japanese Plutonium Stockpile

- **Recommendation: Credible Strategy for Japan's Plutonium Stockpile**

The disposition of Japan's sizeable plutonium stockpile is an outstanding issue that must be addressed regardless of whether or not Japan decides to move forward with nuclear power. ..*Absent a credible strategy for reducing Japan's plutonium stockpile, nonproliferation and security concerns will grow over time, undermining Japan's international leadership on nuclear nonproliferation.* (US-Japan Working Group, Mansfield Foundation, Sasakawa Peace Foundation)

Source: "U.S.-Japan Nuclear Working Group Statement on Shared Strategic Priorities in the Aftermath of the Fukushima Nuclear Accident," <http://mansfieldfdn.org/mfdn2011/wp-content/uploads/2012/04/US-Japan-Nuclear-Working-Group-Statement.pdf>

- U.S. Assistant Secretary of State Thomas Countryman as saying *that if Japan conducts nuclear spent fuel reprocessing while its profitability remains unclear, there is a chance that Japan's international reputation may be significantly damaged.* (Kyodo, 13/04/22)

Source: Kyodo News, "U.S. officials concerned about Japan's plan to reprocess nuclear fuel." Mon, 04/22/2013



JAEC's "No Pu surplus policy"

- In August 2003, JAEC announced its new guideline for plutonium management
- Utilities are expected to submit **its plutonium usage plan annually before separation of plutonium.**
- Its plan should include the information on:
 - (1) current plutonium stock
 - (2) planned usage of plutonium (name of power plant, or site, insertion period)
 - (3) amount of reprocessing (during that year)
 - (4) usage of plutonium (during that year)
 - (5) MOX contract plan and fabrication amount (during that year).
- ***"Plutonium stockpile should be reduced regardless of fuel cycle options chosen in the future"*** (Statement in JAEC Subcommittee on Nuclear Power/Nuclear Fuel cycle technologies)
<http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2012/siryo22/siryo1-1.pdf> (in Japanese)



A Proposal for Plutonium Use Policy

- personal opinion -(2013/03/26)

3 new principles should be introduced.

1. **Demand comes first:** Reprocessing should take place only when plutonium demand(use) is specified.
2. **Stockpile reduction:** Matching demand/supply is not good enough. Existing stockpile should be reduced before further reprocessing.
3. **Flexible plan:** Current Pu use plan (MOX recycling in 16~18 units) is no longer certain. Other options (Pu ownership transfer, disposition as waste etc.) need to be pursued. With minimizing cost, transportation and time required to dispose.

