



Nuclear Future in Japan

--perspective of Japanese nuclear industry--

**The 6th annual energy conference
“The Common EU Energy Policy
and
the Energy Security of Slovakia”
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What happened at Fukushima

- 14:46 Mar.11(Fri.)2011 **M9 earthquake**
~180 km from Fukushima Daiichi NPP (1F)
⇒Off-site power unavailable by earthquake
 - 15:35 **tsunami** (~15m height) reached 1F site
⇒Sea water pumps for cooling damaged by tsunami
12 out of 13 **EDGs** loss of function by inundation of sea water
Power supply sys. (AC/DC) damaged by inundation of sea water
 - ✿ **Loss of ultimate heat sink** (UHS)
 - ✿ Prolonged **station black out** (SBO)
- ↓
- **Severe Accident** (SA) in multi units
 - Core melt, Containment function damaged,
Hydrogen explosion⇒Radioactive material released into the environment



Current status (on site)

- **cooling:** cooling sys. of the degraded core and SFP was established and controlled stably
- **confinement:** release of radioactive material into the environment have been dramatically decreased
- **management of effluent water :** large volume of contaminated effluent water have been treated and recycled as cooling water for damaged core
- **Decommissioning :** mid. & long term road map towards the decommissioning was decided and deployed
- **Radiation exposure of workers**

(Mar.2011~Jul.2012; external + internal exposure)

total workers 23,312

highest exposure 678.8 mSv

average exposure 11.83 mSv



Current status (off site)

- **evacuation:** more than 160,000 people have suffered as evacuee apart from their hometown
- **decontamination:** decontamination work has been deployed based on the model projects but not progressed so much
- **waste management:** treatment of radioactive waste generated in the process of decontamination has been one of the biggest issue

■ Radiation exposure of general public

(Mar. 11~Jul. 11, 2011; external exposure)

highest 25 mSv (out of 119,450 people)

0~1 mSv 56.9%

0~2 mSv 92.4%

0~3 mSv 98.2%



Lessons learned

- **Investigation report by the National Diet**
 - man-made disaster, regulatory capture
- **Investigation report by the Government**
 - problems of management system, dependence on the myth of safety



- **Cause of the accident (personal view)**
 - Institutional defect / Lack of imagination

"The cause of the accident is not inevitable results of Nuclear Power technology itself, but inevitable results of management system."

- **Lessons Learned (personal view)**
 - Robustness of design
 - Emergency preparedness
 - Management system
 - Information release
 - Safety culture--- "questioning attitude"

"Recurrence of such severe situation could be prevented when it is well prepared in advance reflecting lessons learned"

Government action to enhance safety

- Emergency safety measures (NISA)
- Severe accident measures (NISA)
- Shutdown of Hamaoka NPPs (Gov. request)
- Comprehensive safety assessments (Stress Tests) (NISA/NSC)
- Direction of countermeasures (30 items to be reflected in future regulatory activities) (NISA)
- Decision of restarting of NPPs (Gov. decision)
- Resumption of seismic back check (NISA)

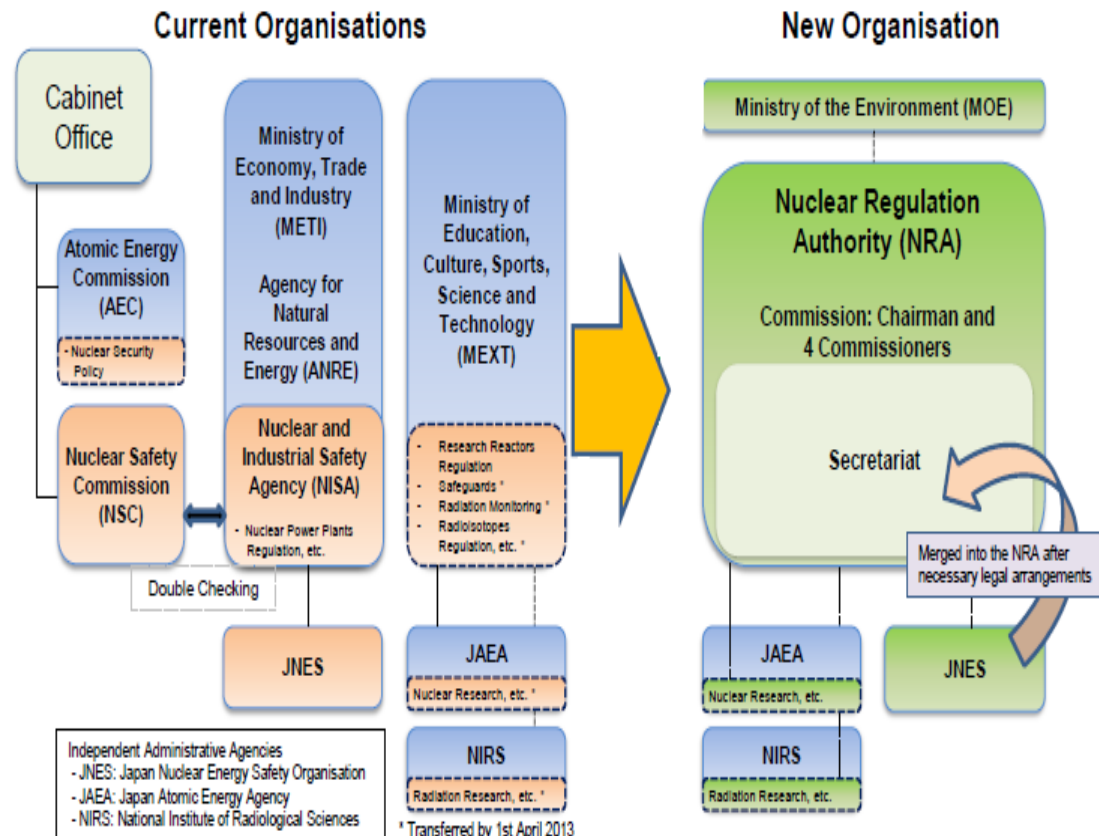


Source: Federation of Electric Power Companies of Japan

Establishment of new regulatory body

“**Nuclear Regulation Authority**” was established on Sept. 19, 2012 as a new **independent regulatory body**

- **Integration** of nuclear regulation functions (nuclear safety, security, safeguards, radiation monitoring and radioisotopes regulation)
- **Review and reinforcement** of nuclear safety regulations
- **Separate nuclear regulation function** and nuclear **promotion** function



Operators action to enhance safety

Pursuing the highest level of Excellence by operators



1. Expansion of **safety improvement measures**

- Measures for SA prevention and effect mitigation incl. 30 items

2. **Check & review of safety improvement measures**

- Response to recommendations of investigation reports

3. **Continuous enhancement of safety improvement measures**

- Establishment of **Japan Nuclear Safety Institute (JANSI)**

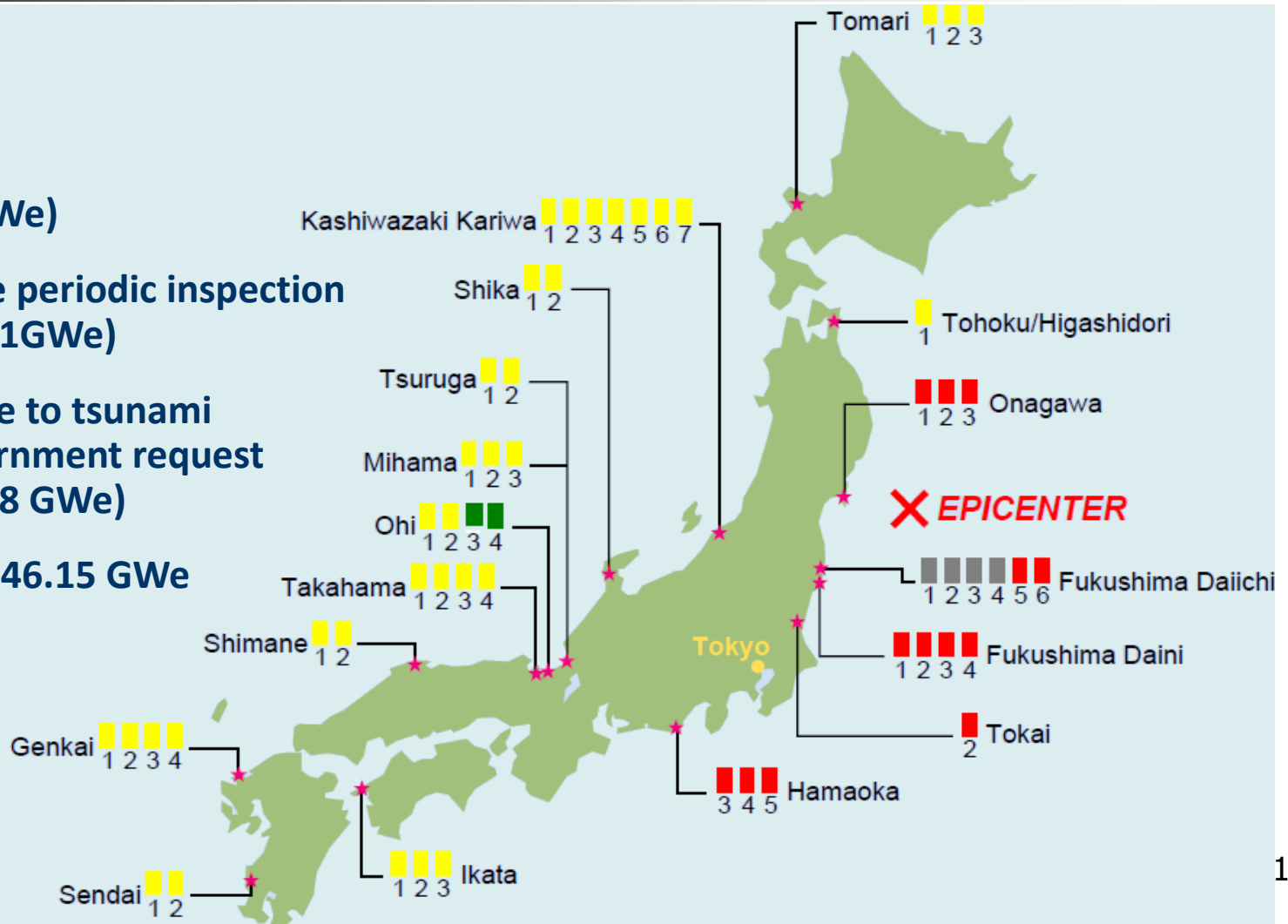
Current status of NPPs in Japan

In operation
(2 unit, 2.36GWe)

Outage for the periodic inspection
(35 units, 30.61GWe)

Shutdown due to tsunami and the government request
(13 units, 13.18 GWe)

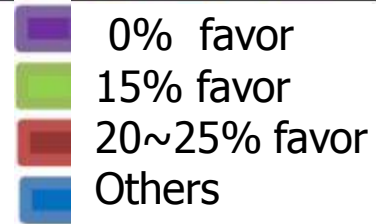
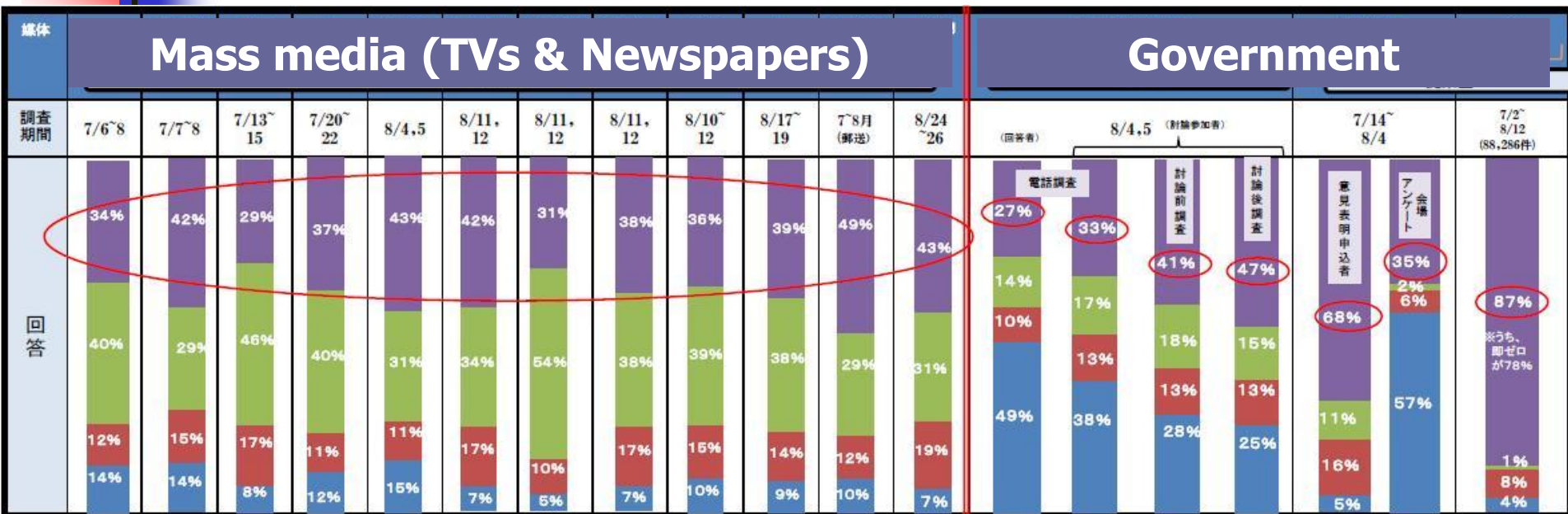
TOTAL : 50 units, 46.15 GWe



Effects by shutdown of NPPs

- **Outflow of national wealth by increased fossil fuel imports**
 - +3.1 trillion yen (40 billion\$) (FY2012: estimated)
- **Additional burden on household expenditure and hollowing out of industry by higher electricity rates**
 - e.g. TEPCO (FY2012) + 8.46% for household, +14.9% for industry
KEPCO(FY2013) +10% for household, +20~30% for industry
- **Increase of CO2 emissions from energy**
 - +3.5% (FY 2012 from FY2011), +11.5% (FY2012 from 1900 levels)
- **Possible shortage of human resources**
 - University applicants for nuclear department (FY2012): - 10%
 - Student visitors to the nuclear industry recruiting seminar (FY2011): - 75%

Opinion pole of general public



- After the accident all the nuclear related organizations in Japan (**nuclear village**) completely lost the trust from the society
- Rebuilding the trust of the **operator**, the **regulatory body** and the **academic society** would be the starting point
- **Openness** and **transparency** is crucial to recover **public confidence**

New energy policy of Japan

■ The Innovative Strategy for Energy and the Environment

(decided by the Energy and Environment Council on Sept.14, 2012)

- Realization of a nuclear-independent society

”Devote all political resources to reducing nuc power generation to zero in the 2030s”

i. 40-year lifespan

ii. Restart after approval from NSA

iii. No new construction

■ The Future Policy for Energy and the Environment

(endorsed by the Cabinet on Sept.19, 2012)

“The government will implement future policies on energy and the environment, taking into account of “the Innovative Strategy on Energy and the Environment”, while having discussions in a responsible manner with related local governments, the international community and others, and obtaining understanding of the Japanese public, by constantly reviewing and reexamining policies with flexibility.”

⇒The Cabinet didn't put the “Zero in the 2030s” goal in the cabinet decision

Role of nuclear power

- World energy demand increase would be inevitable
- For sustainable future of the planet, we have to challenge to realize low carbon society
- Nuclear power have played an important role for energy supply assurance and reduction of CO₂ emission within marginal cost
- Green energy revolution is required but its potential is unclear
- There is no silver bullet to realize low carbon society, but there would be no solution without nuclear

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Conclusion

- **Responsible** and **sustainable** development of nuclear power is the duty of Japan
- **Safety** is the top priority in nuclear development
- **Transparency** is the key factor for nuclear development
- **International cooperation** is indispensable for nuclear development

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- ***We are on the same boat***
 - ***Never, ever again like Fukushima accident anywhere in the world***

Thank you for your attention !

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