

# PANEL 2 : Fukushima Daiichi's Impact in Japan's Nuclear Power Programs

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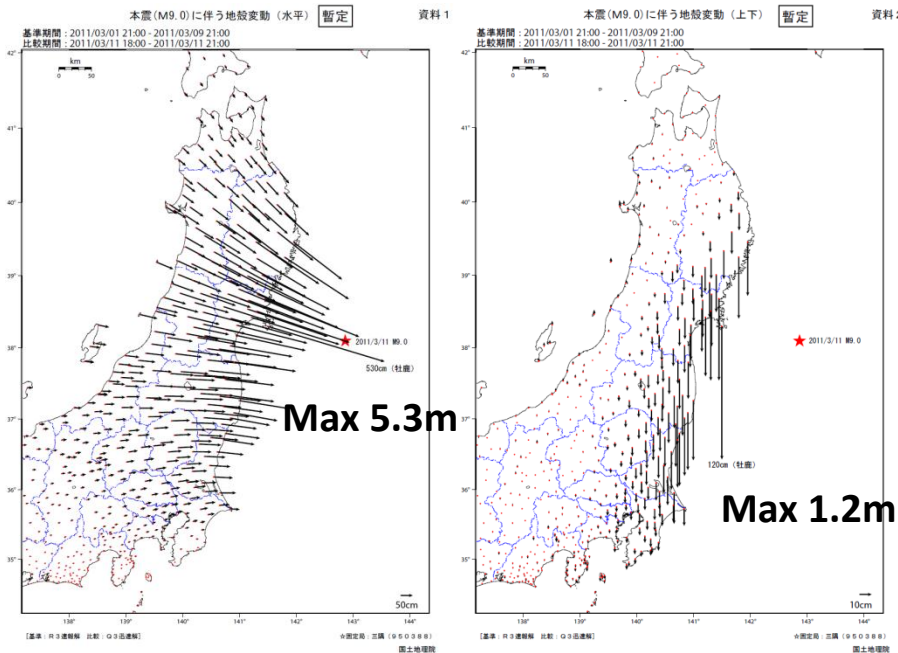
*Executive Director, Japan Atomic Energy Agency (JAEA)*

# Catastrophic Earthquake & Tsunami attacked Japan's Tohoku-area on March 11, 2011

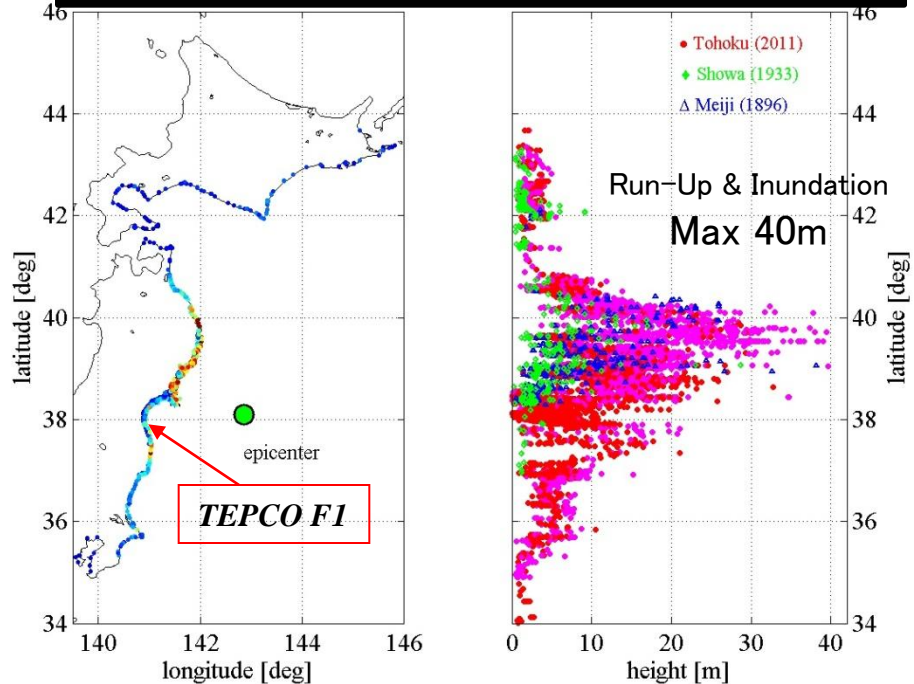
**Tohoku Region Pacific Coast Earthquake**  
*M9.0 scale*  
*No.4 strongest in the world recorded history*



**Wide range Crustal Movement**  
as identified by GPS based control station  
*HP Geospatial Information Authority of Japan*



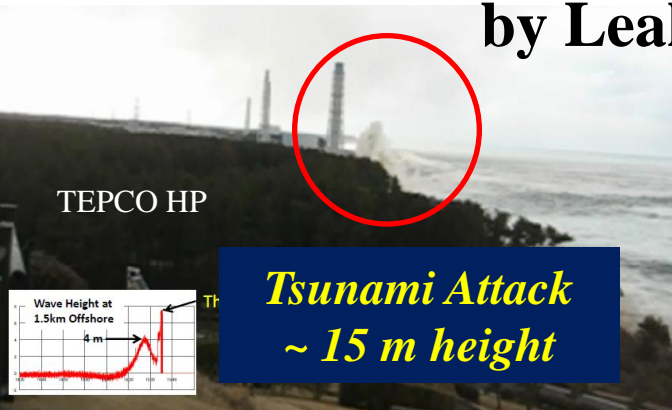
**Wide range Huge Tsunami**  
*The 2011 off the Pacific Coast of Tohoku Earthquake*  
 Tsunami Information, <http://www.coastal.jp/ttjt/>



# Severe accident of TEPCO Fukushima Dai-Ichi NPPs

- *Core meltdown and Hydrogen explosion occurred sequentially by 1) Station Black Out, 2) Loss of Ultimate Heat Sink, 3) Uncontrollable operation, .... due to Vulnerability of multi Plant Systems; 1, 2, 3 and 4 units.*
- **‘Environmental Release’ of rad. materials**

by Leakage, Bending, and Hydrogen explosions



## Hydrogen Explosion



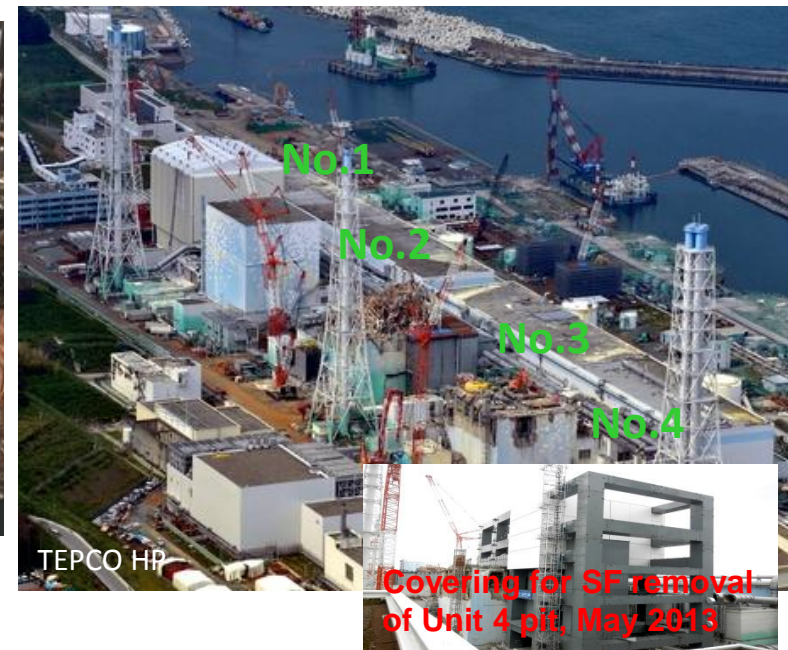
# **On-Site & Off-Site Activities related on TEPCO Fukushima Dai-ichi Accident**



# 1<sup>st</sup> priority for Japan's nuclear Decommissioning of TEPCO F1 NPPs

## *Step Wise Efforts for Mid-Term Decommissioning & On-Site Cleanup*

- Decrease annual dose level (Now 0.03mSv at site boundary)
- Decrease & Treat contaminated water
- Develop & Investigate decommissioning technologies
- SF retrieval & fuel debris removal for Decommissioning



# Decommissioning needs Challengeable Remote Technologies



Full Remote Operation for Dismantling  
for Unit 3 Operation floor, Jan.2013



To be established (June, 2013)  
**International Decommissioning  
Research & Development  
Organization**



## Key Facilities for RD & D

### Radioactive Analysis Research Center

- Design : 2013 ~
- Operation : 2017



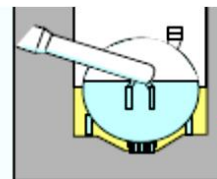
グローブボックスを用いた分析



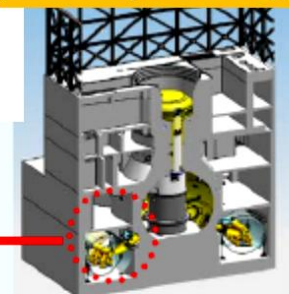
マニピュレータを用いた分析

### Demonstration Facility for Remote Robotic System (Mockup Facility)

- Design/Const.; 2013 ~
- Operation : 2014



格納容器下部（トラス室）の断面図



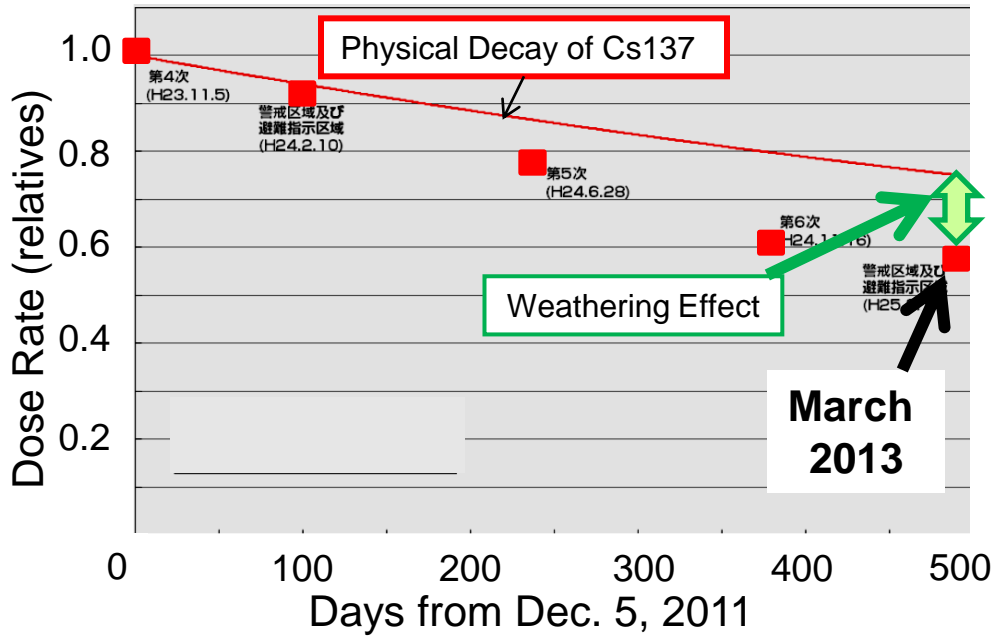
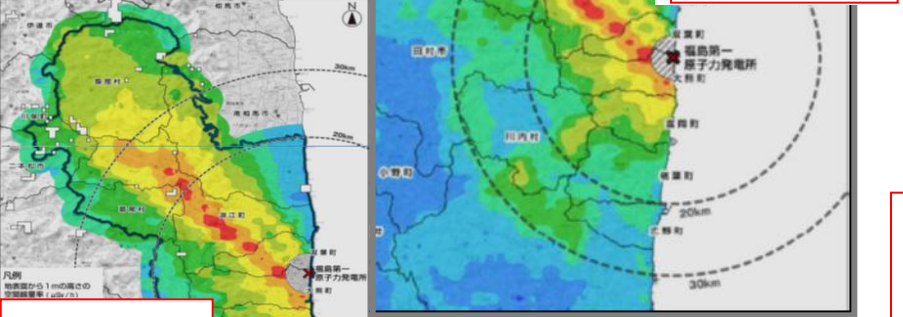
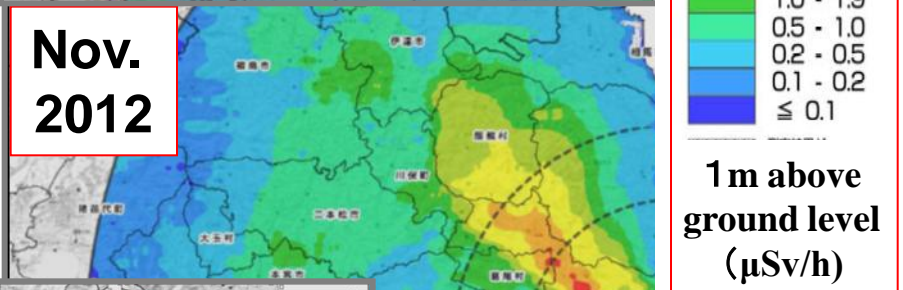
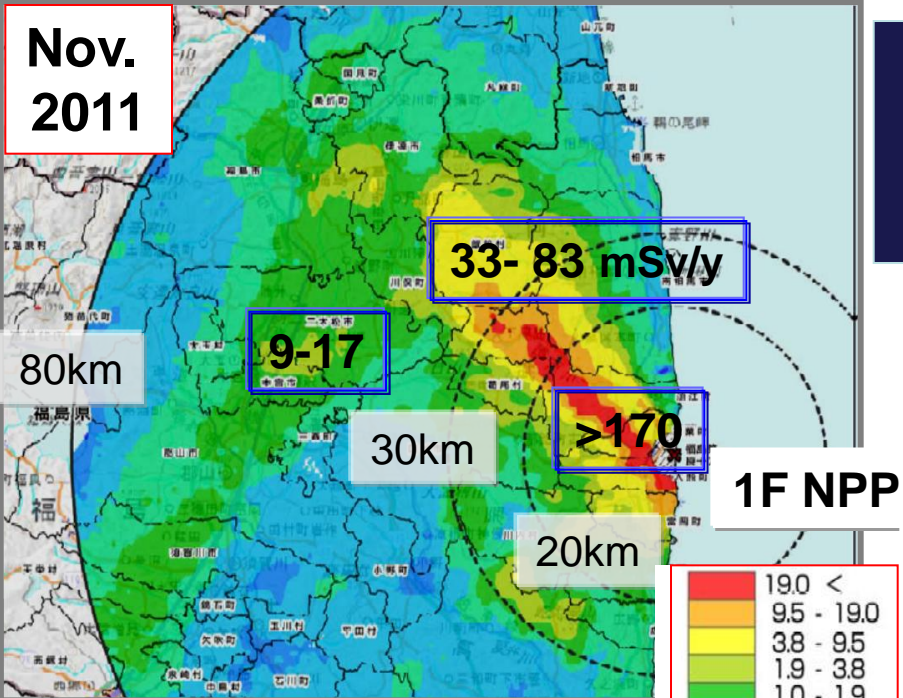
原子炉建屋の断面図



# Decay of Wide Spread Cs

## Air-borne Monitoring of Radiation Dose Rate, MEXT & JAEA

- Radiation dose decreases due to Physical Decay of Cs & Weathering Effect.



**150,000 residents are still evaluated from their home lands due to March 11 disaster.**

# Resident Self Efforts to improve the Existing Situations

## - Solve Concerns for Long Term Low Dose Consequences -



Handy type Rad. Monitor

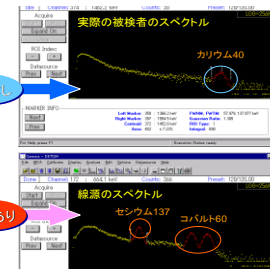


Weather Integral Radiation Monitor

### Off-Site Clean-up Efforts

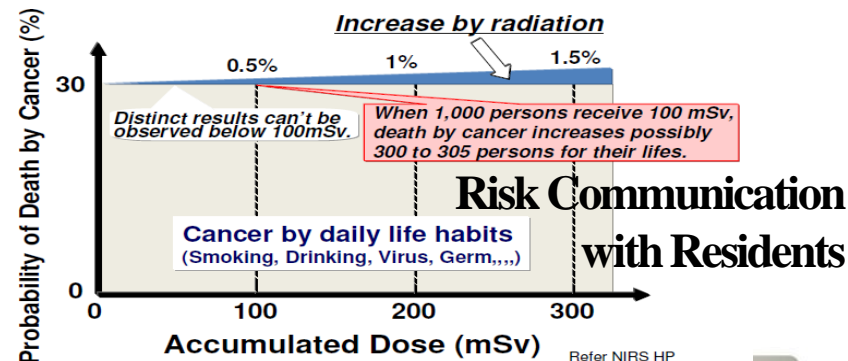


### Whole Body Inspection



All Foodstuff Inspection

### How effect the health more than 100 mSv ?








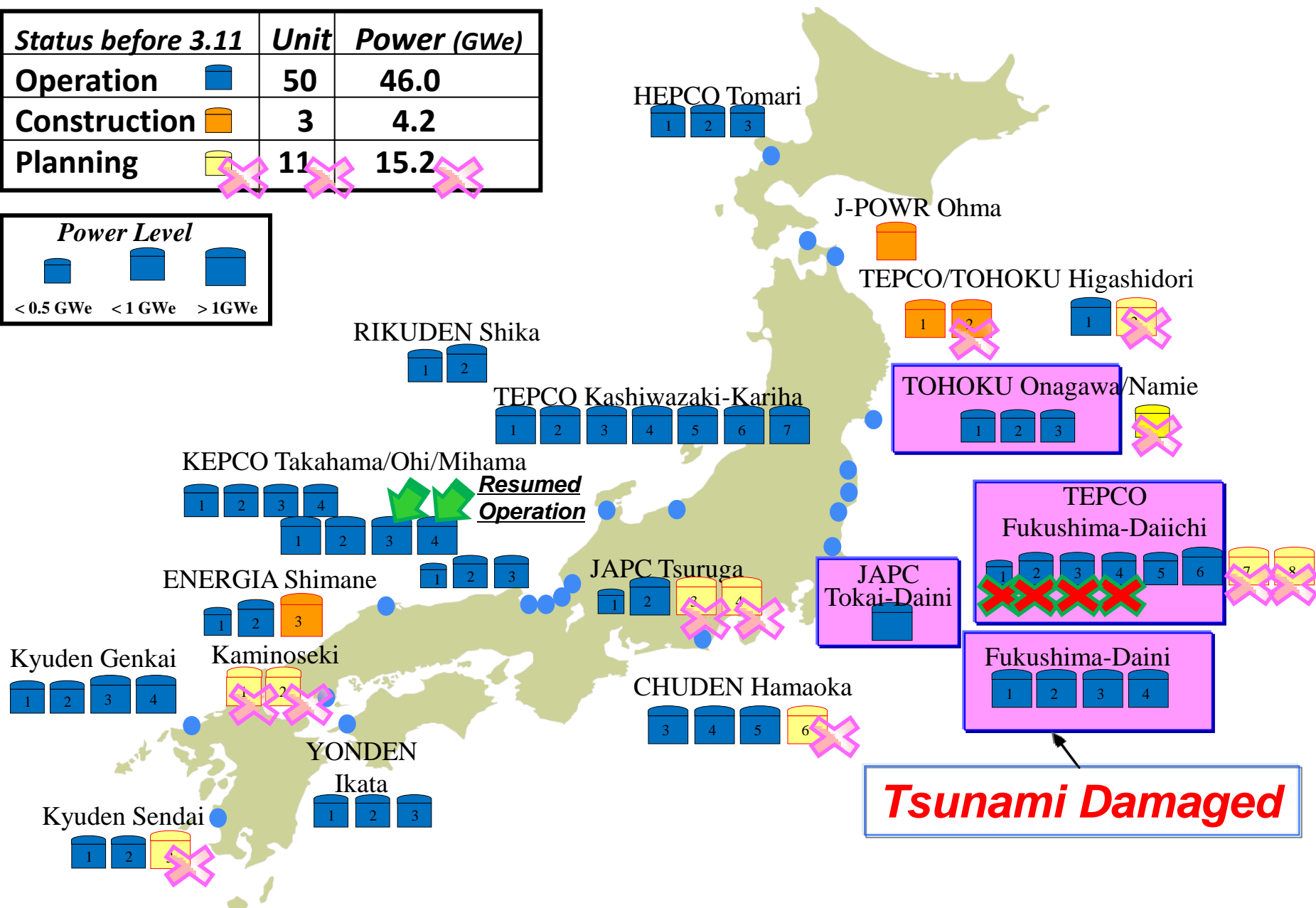
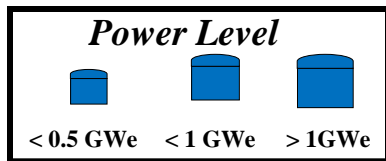
- *Current radiation protection; target 1 mSv/y is based on resident daily life and self-check mechanism.*
- *To judge scientifically for low dose health effect, 1mSv/y & probability approach is difficult to understand for public.*
- *It is necessary to recover the confidence for specialist opinions and science itself in Japan after Fukushima.*



# **Establish and Enhance Safety of Existing NPP**

# Domestic NPPs under Operation & Construction

| Status before 3.11   | Unit   | Power (GWe)  |
|--|--|--|
| Operation     | 50   | 46.0   |
| Construction  | 3  | 4.2  |
| Planning      | 11  | 15.2  |



# Typical Measures for Emergency of Domestic Existing LWR

## Tsunami Barrier



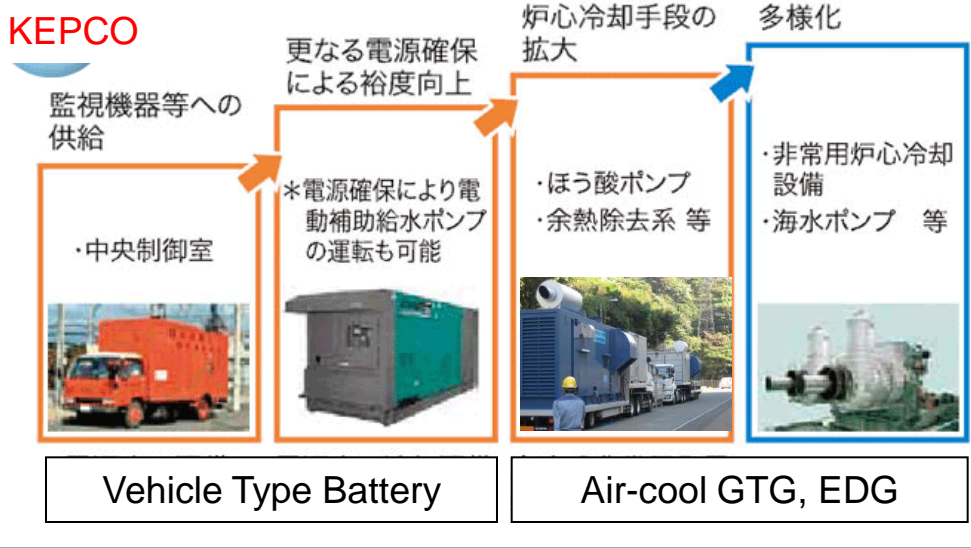
## Water Proof



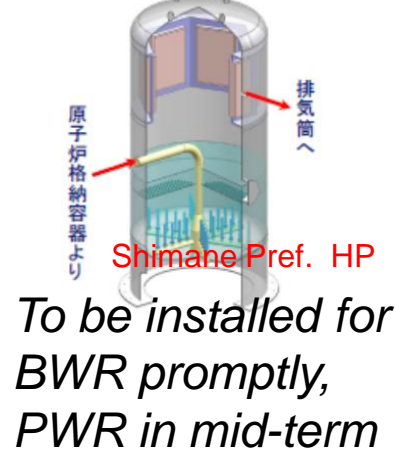
## Seismic Protection



## Emergency Power Supply



## Filtered Bent for SA Mitigation



## Drills for SA



# Continuous Efforts for Safety Improvement



# New NPPs under construction

now reinforced by new safety rules to be completed

## *ENERGIA Shimane (ABWR 1.37GWe)*

93.6% (April, 2011), Now apply Stress Test



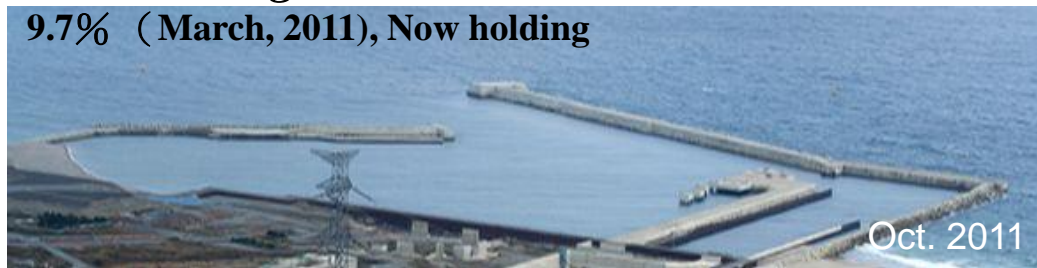
## *J-Power Ohma (ABWR 1.38GWe Full MOX)*

37.6% (March, 2011), Resume construction, Oct. 2012



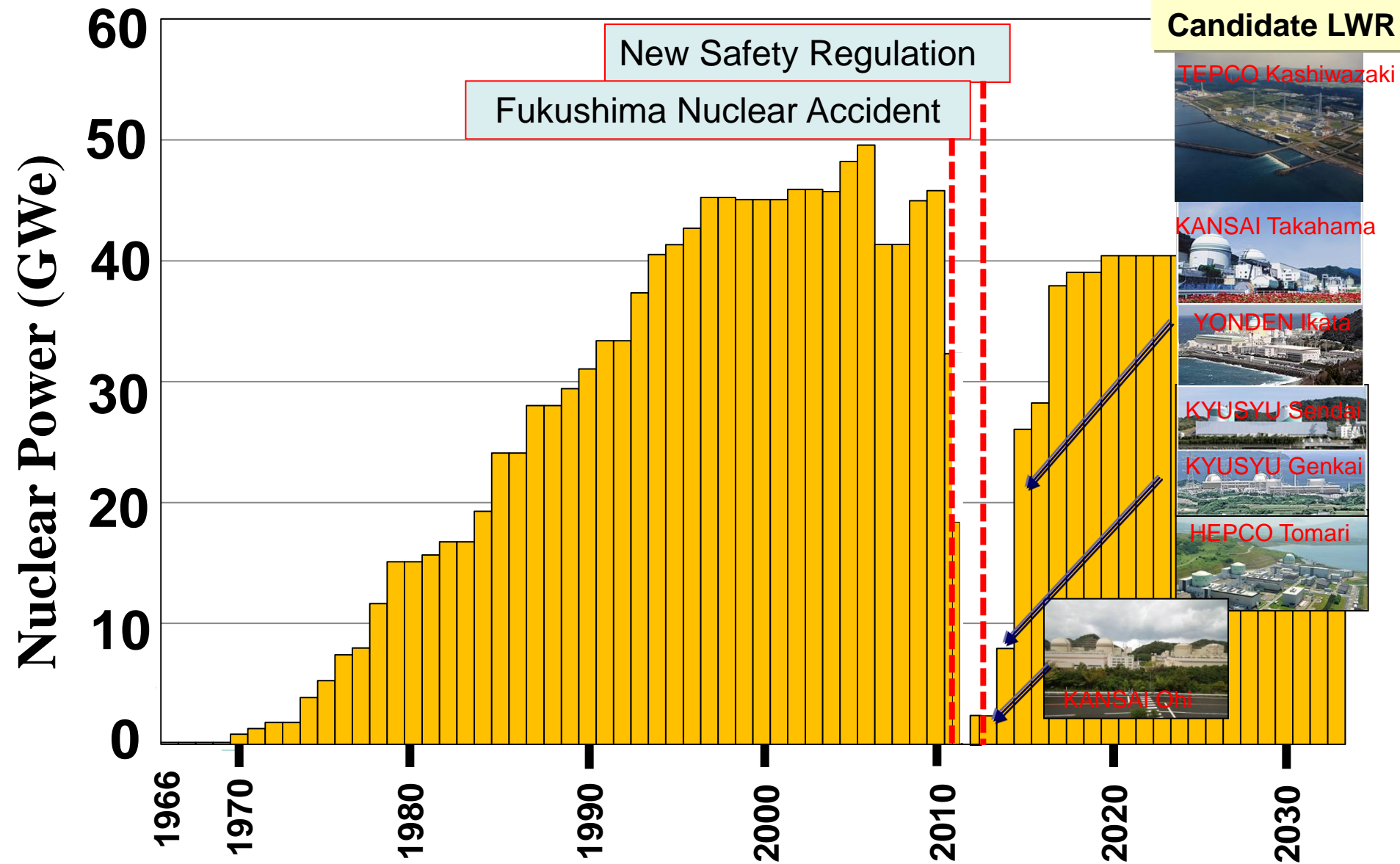
## *TEPCO Higashidori (ABWR 1.38GWe)*

9.7% (March, 2011), Now holding



# Personal Prospect of Japan's Mid Term LWR Operation after March 11 Accident

*Early Case to be applied for New Safety Rules and then restart*



# Fukushima's Lessons for GEN-III+ ALWR in mid-term Nuclear Global Program

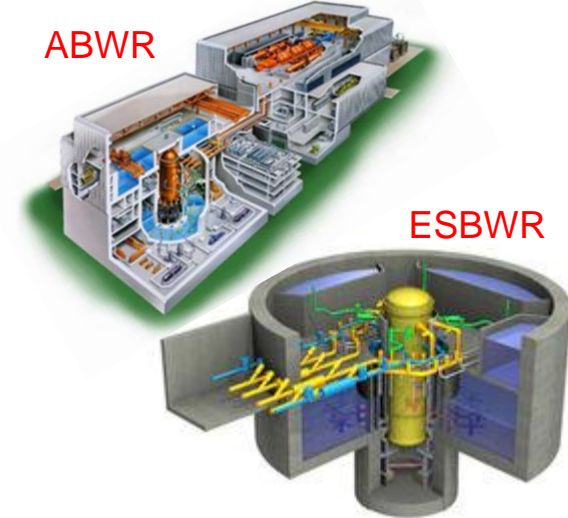
## MHI-AREVA



## Toshiba-WH



## Hitachi-GE



## + Wide Lessons from FUKUSHIMA

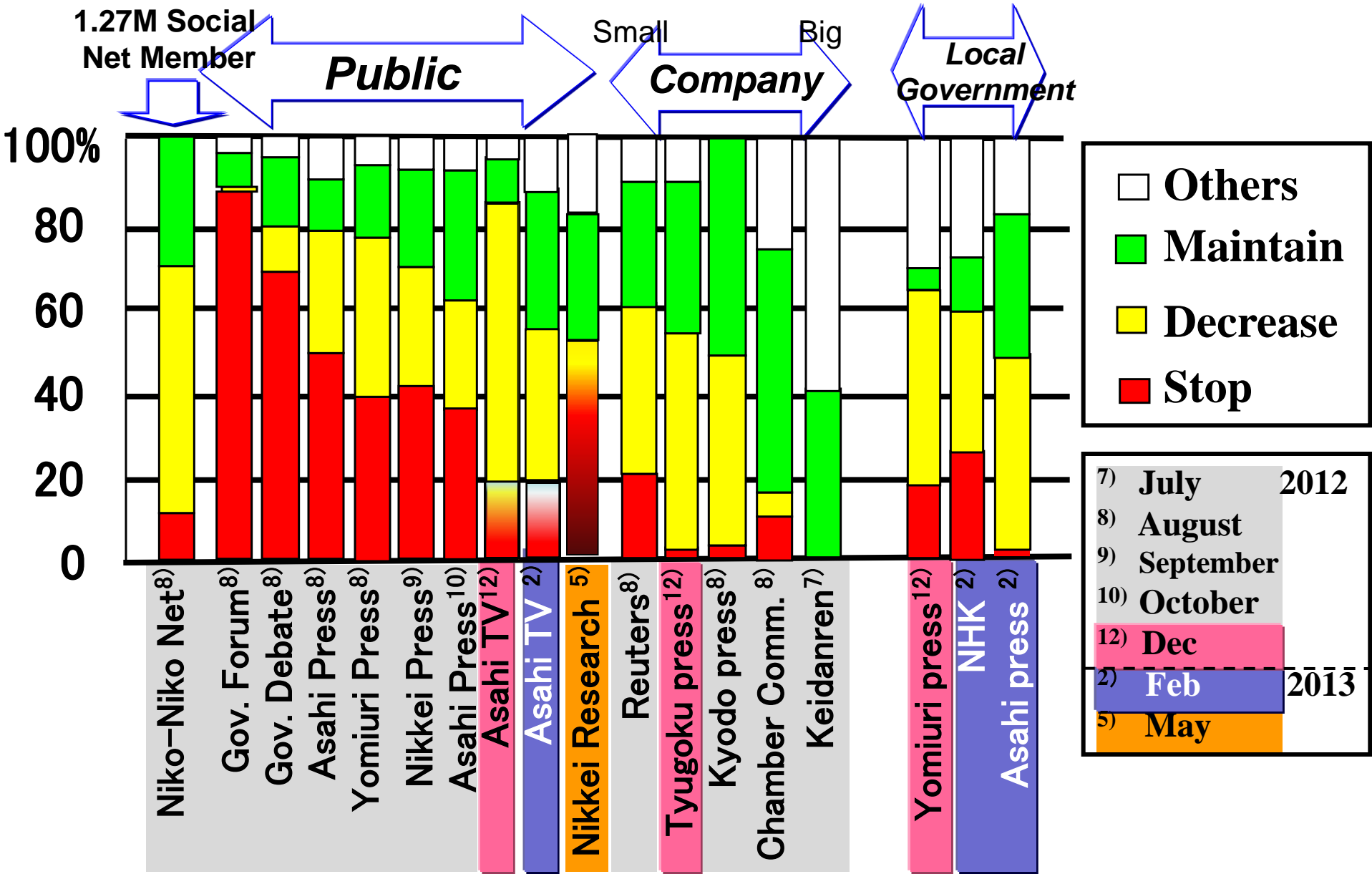
- Prepare catastrophic Beyond Design Base Events, especially for external hazards.
- Prepare the long time all SBO without any off-site supports.
- Install independent sequential passive safety mechanisms in off-normal blind operation.
- Drill 'SA Management in several hours' with operator, regulator, & other stakeholders.
- Make continuous efforts to improve 'Safety Culture', .....,.....

# Achieve

Highest level Safety & Technology for Advanced Nuclear Plants



# Diverse Opinions for Japan's Nuclear Acceptance depending Stakeholders (July 2012 to May 2013)



# Resilient Engineering for Japan's Nuclear

*'Nuclear as Safe, Stable, & Sustainable Base Energy'*



- Recovery from Historical Disaster, Severe Accident & Loss-of-Public Confidence
- Resistance for Off-Normal Extreme Events, & System Vulnerability
- Optimization among Robustness, Diversity, Responsiveness & Economics