

# Leading After a Nuclear Accident

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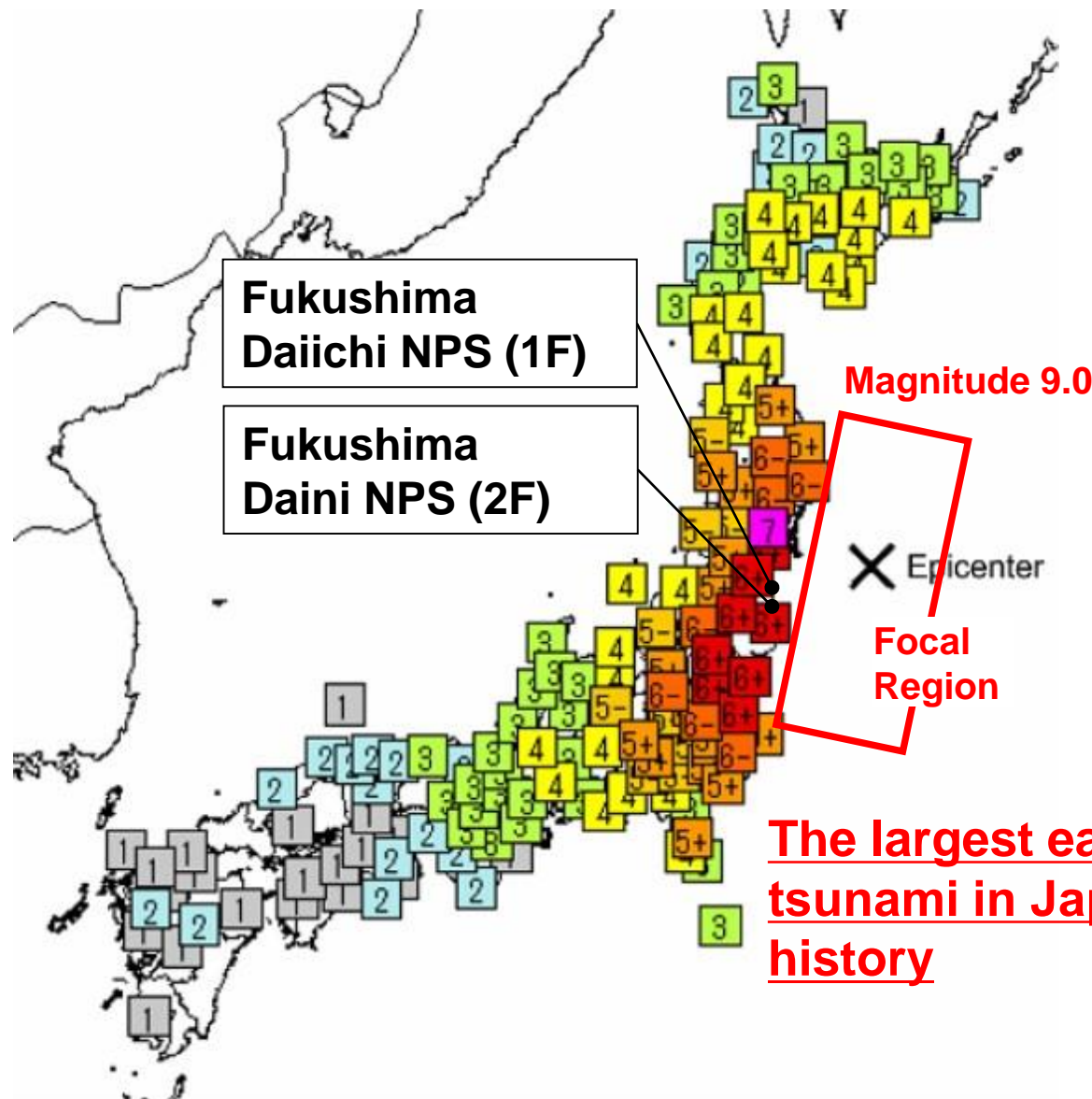
Naomi Hirose

Vice Chairman

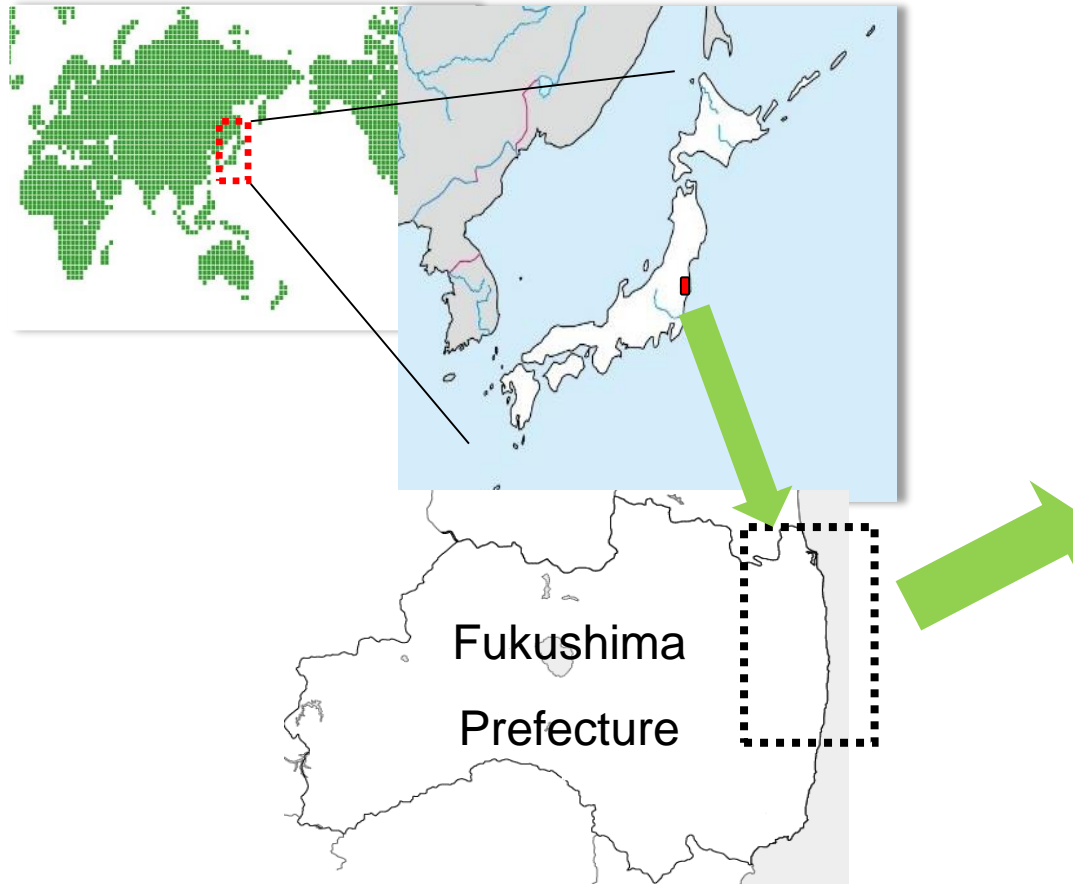
Tokyo Electric Power Company Holdings, Inc.

February 2020

# 1-1. Mar 11, 2011 The Great East Japan Earthquake & Tsunami



# 1-2. Location of 1F, 2F and Hirono Thermal PS



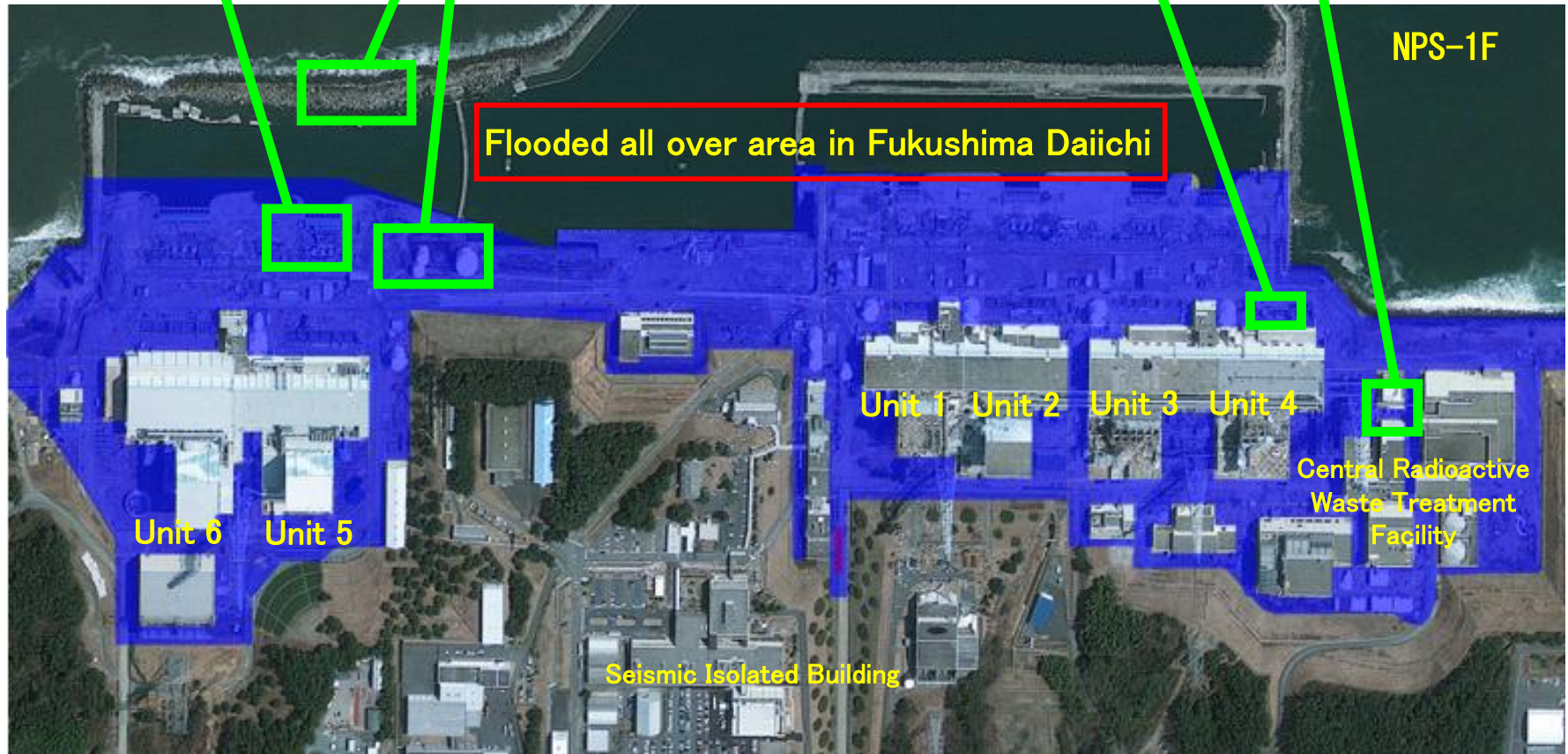
# 1-3. Video of Tsunami rushing into Hirono Thermal Power Station on March 11, 2011

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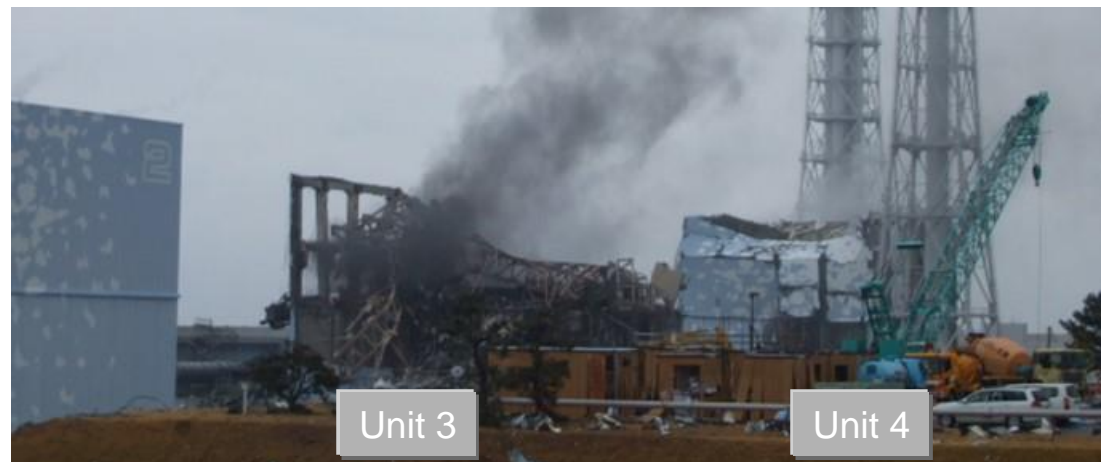
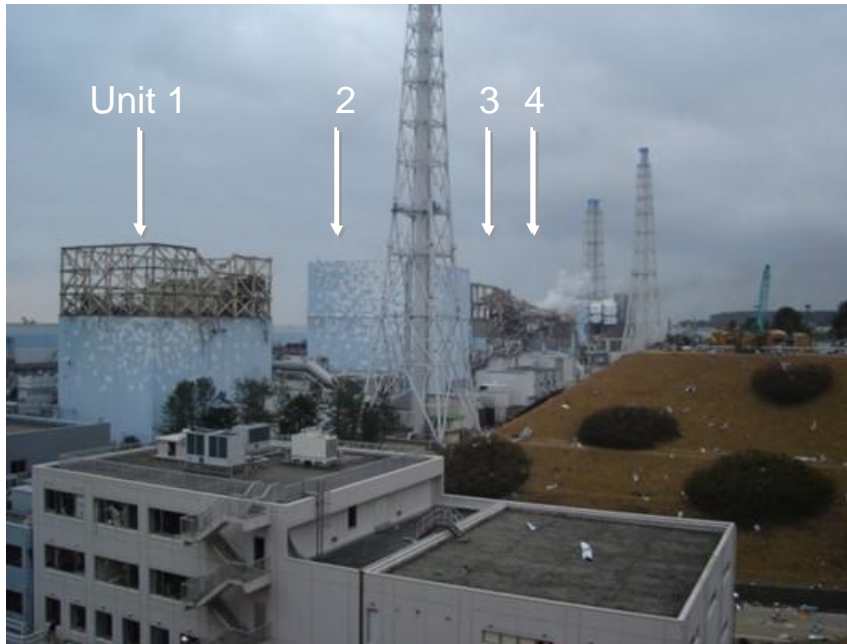




# 1-4. Fukushima Daiichi NPS (1F)



# 1-5. Nuclear Power Plant Damaged by Explosions

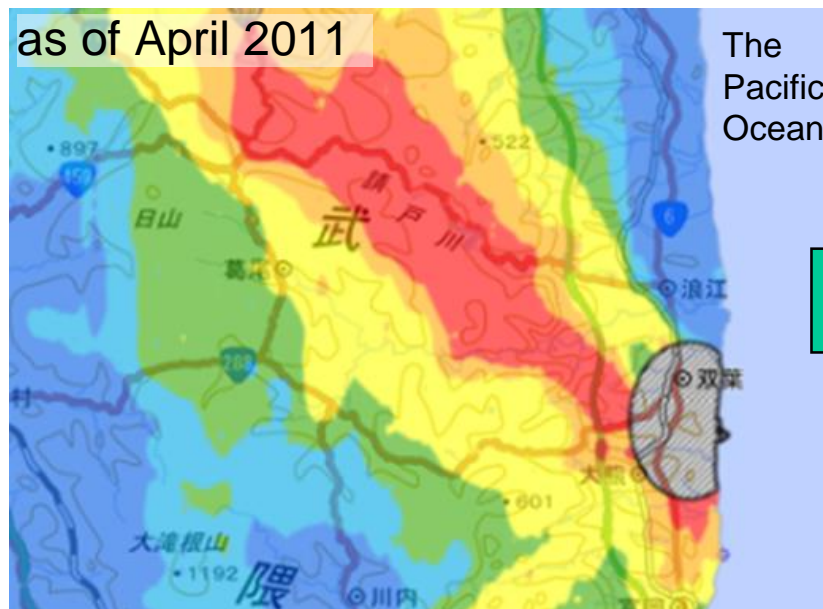




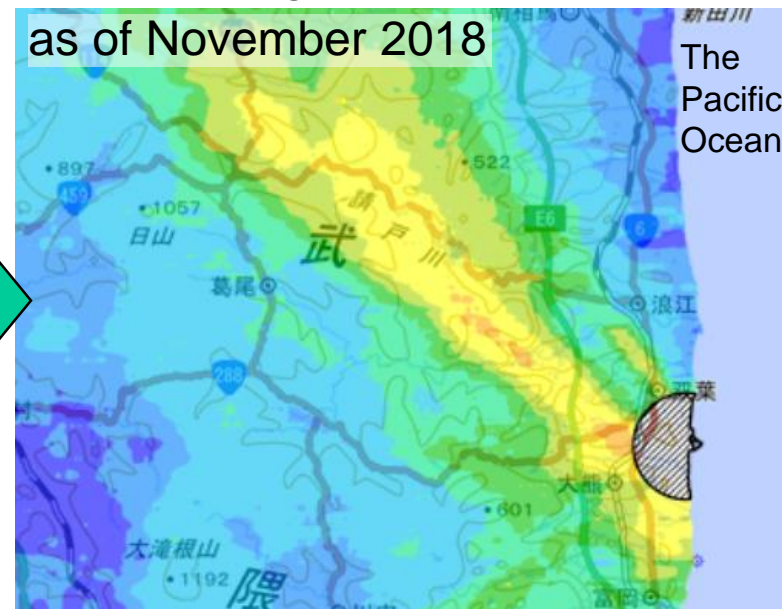
# 1-6. Radiation Dosage Levels around Fukushima Daiichi

## Aerial Radiation Dose ( $\mu\text{Sv/h}$ ) at 1 m above ground)

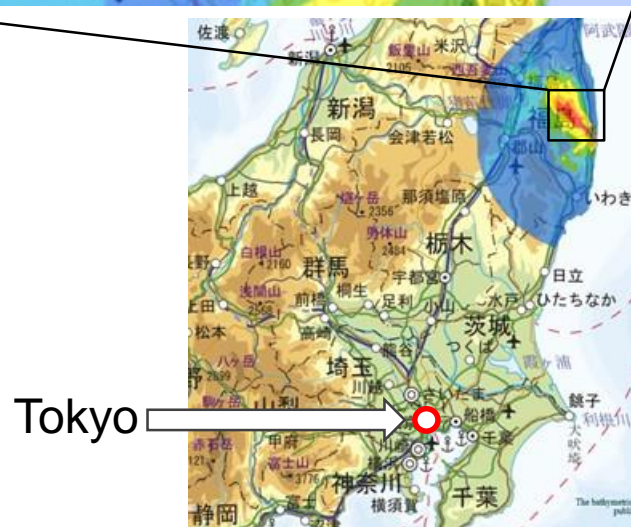
as of April 2011



as of November 2018

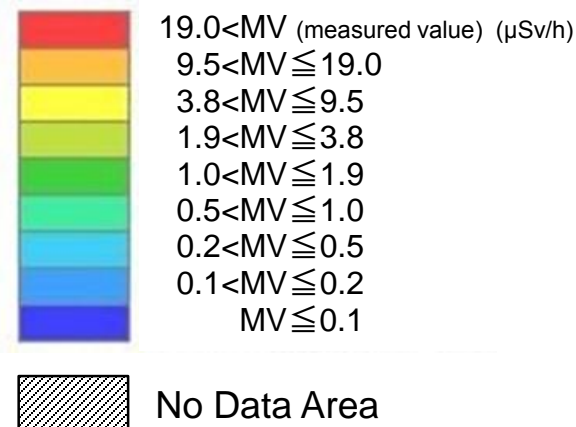


7.5 years





Tokyo

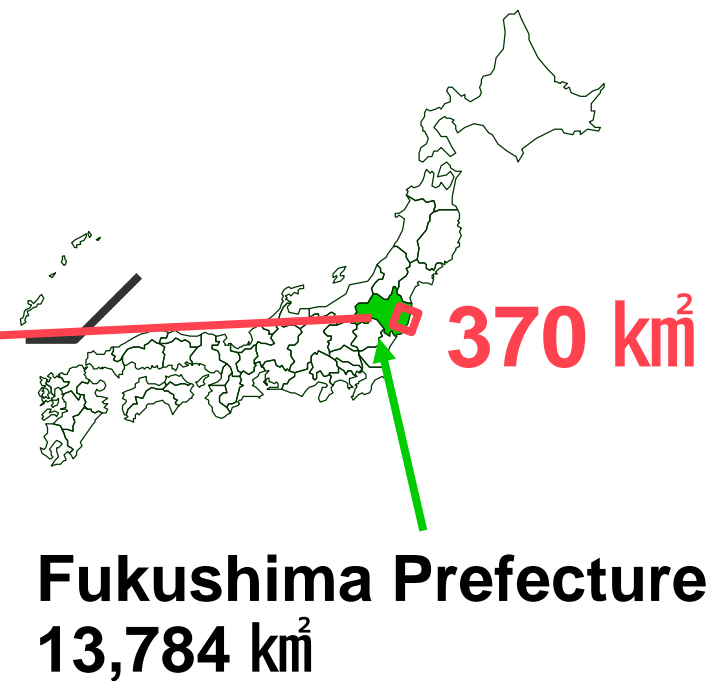
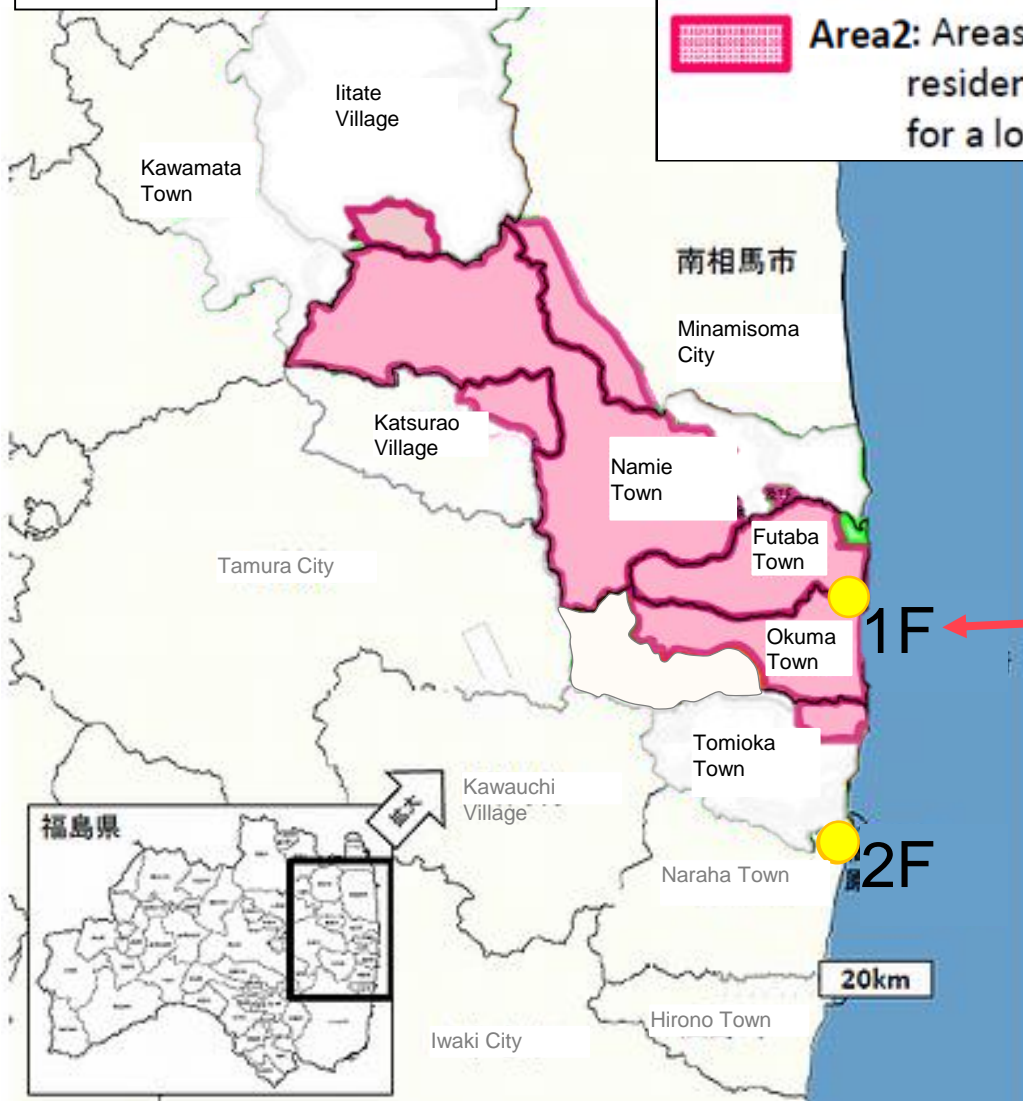
$1 \mu\text{Sv/h} = 8.76 \text{ mSv/y}$   
 $2.3 \mu\text{Sv/h} = 20 \text{ mSv/y}$



# 1-7. Evacuation Zones

Evacuation Zones  
(as of April 10, 2019)

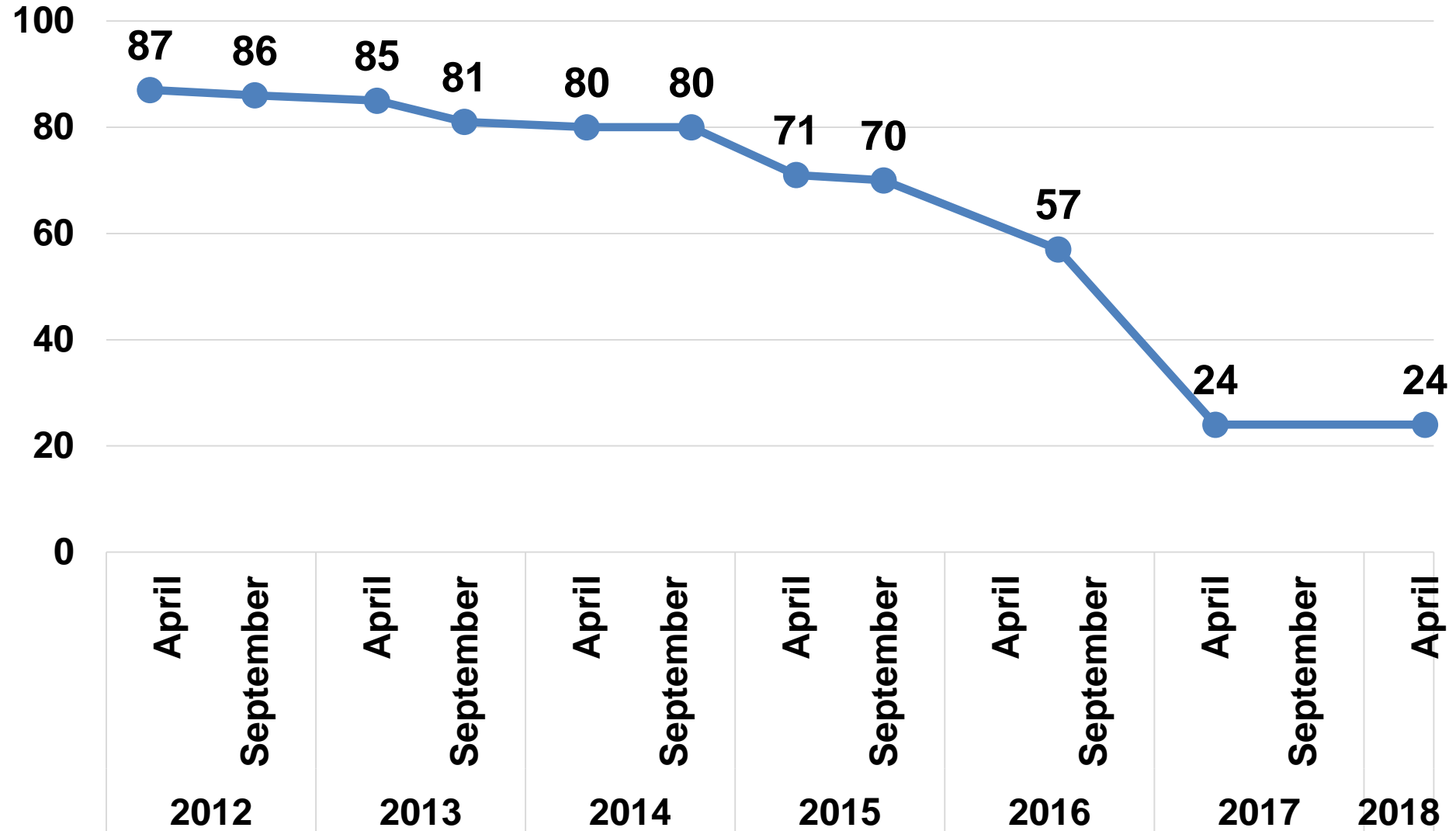
-  **Area1:** Areas to which evacuation orders are ready to be lifted
-  **Area2:** Areas where it is expected that the residents have difficulties in returning for a long time





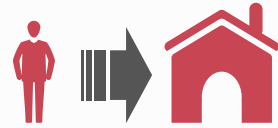
# 1-8. Number of Evacuees from Evacuation Zones

(thousands)



# 1-9. Fukushima Recovery - to achieve earliest homecoming

- Recovery activities counted over 500,000 person-days.
- Decontamination activities are also in place.



snow shoveling

dosimetric measurement



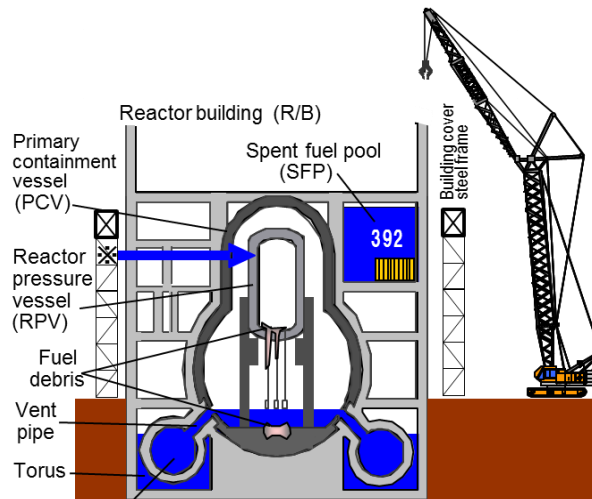
Weeding at cemetery



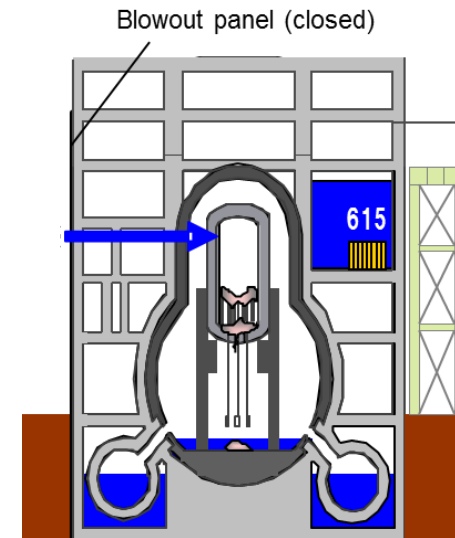
# 2-1. Challenges to Safe Decommissioning

- The situation of Fukushima Daiichi Nuclear Power Station is now stable and under control.

## UNIT 1

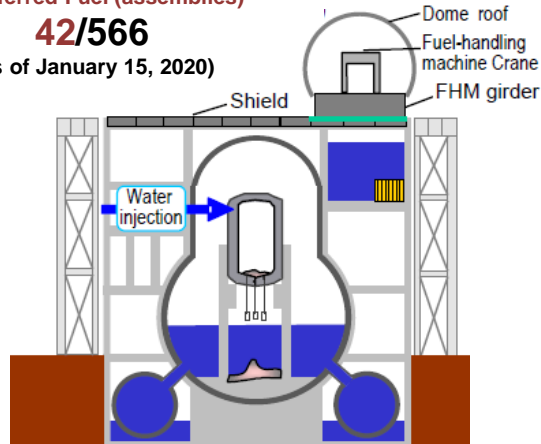


## UNIT 2

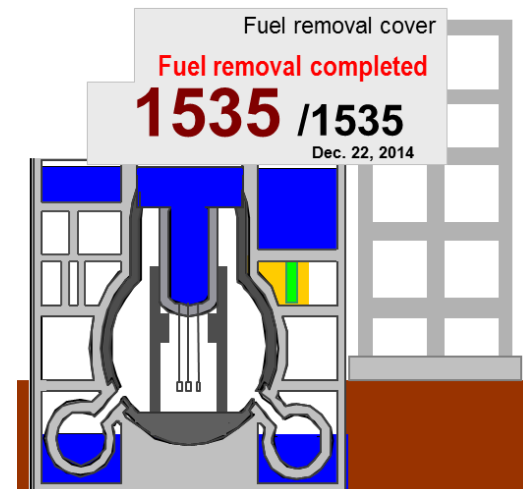


## UNIT 3

Transferred Fuel (assemblies)  
**42/566**  
(As of January 15, 2020)



## UNIT 4





## 2-2. Toward the Normal Workplace

- The radiation level in the most area of the site is low.

**September 2013**

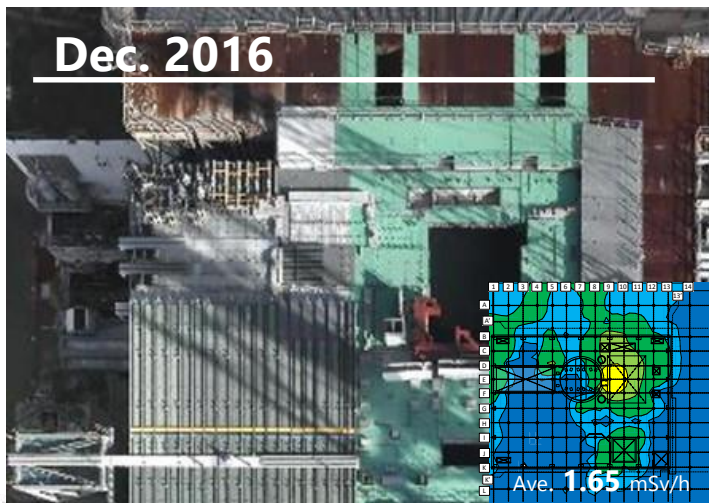


**April 2019**



## 2-3. Spent Fuel in the Pool

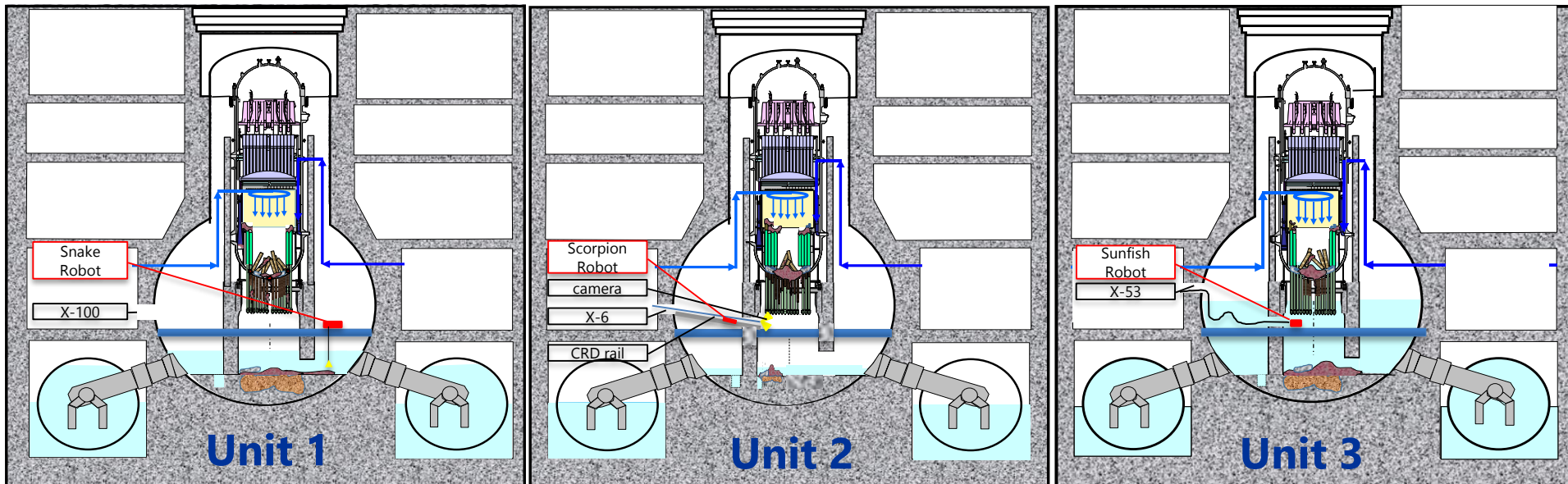
- Installing special equipment for removal of Spent Fuel from Unit 3





## 2-4. Debris

- Investigating the status of debris under highly contaminated conditions by newly developed robots.

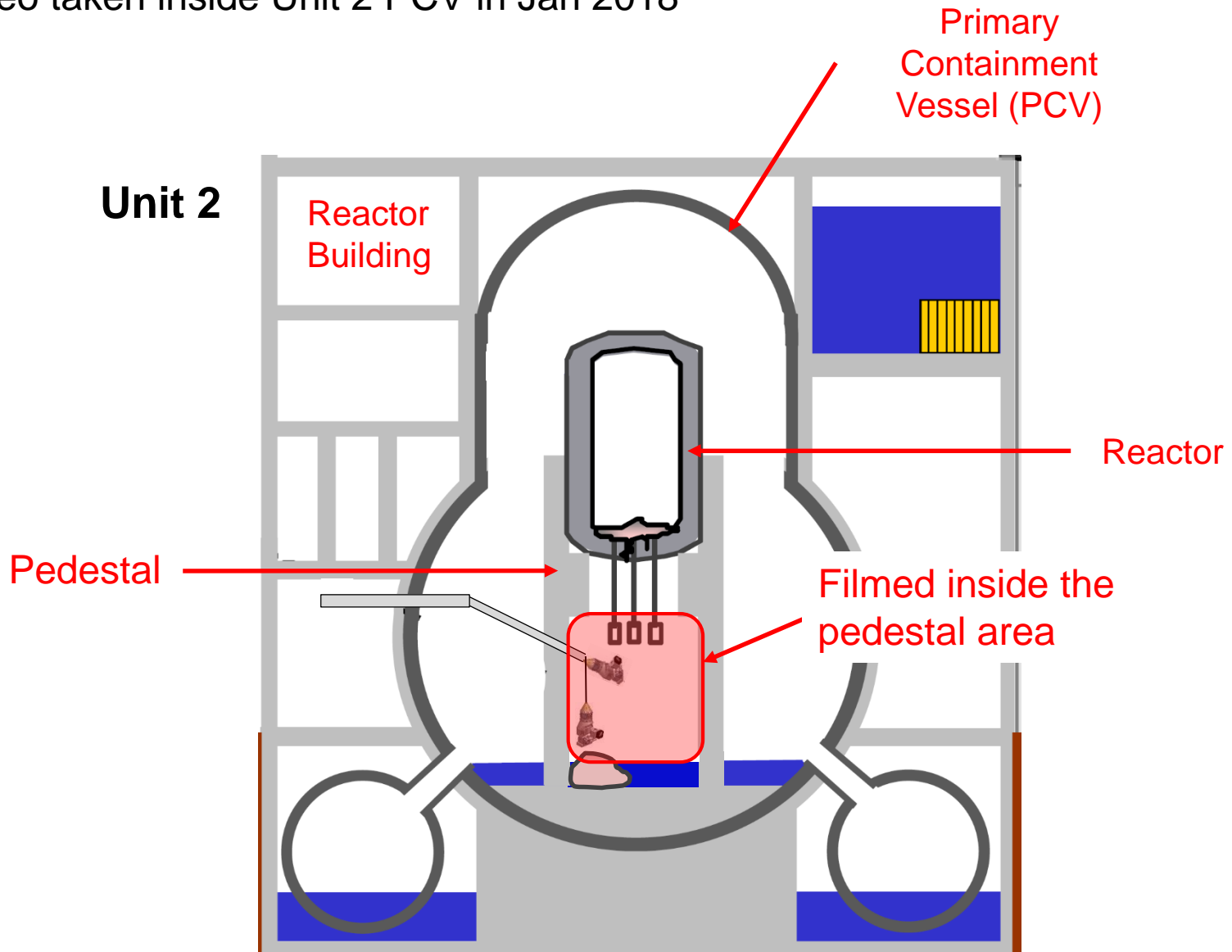




## 2-5. Internal Exploration of Unit 2 PCV

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- Video taken inside Unit 2 PCV in Jan 2018



## 2-6. Processed Film of Internal Exploration at Unit 2

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<Jan, 2018>

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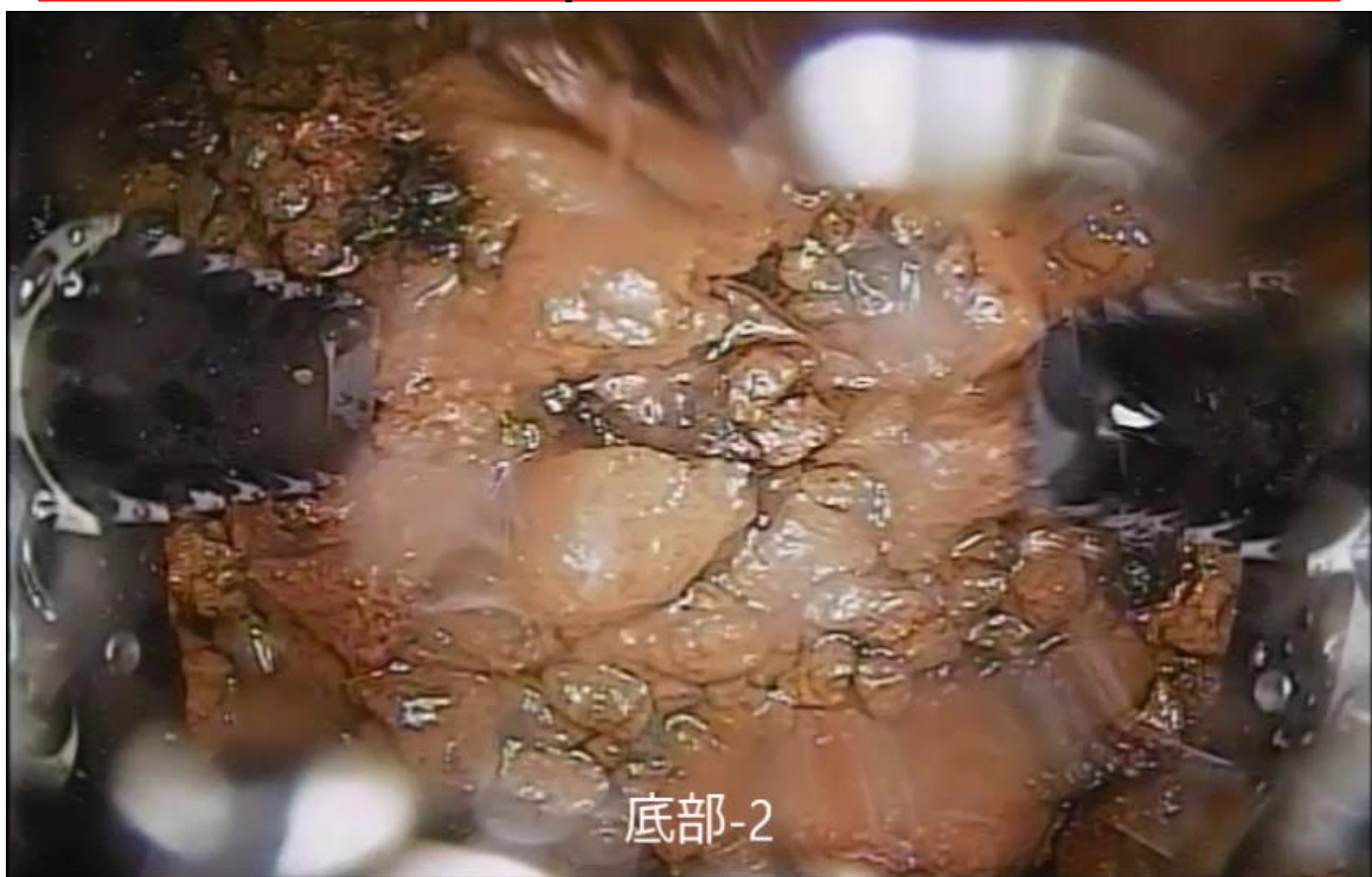




## 2-7. Video obtained from

## Recent Internal Exploration at Unit 2 <as of Feb 13, 2019>

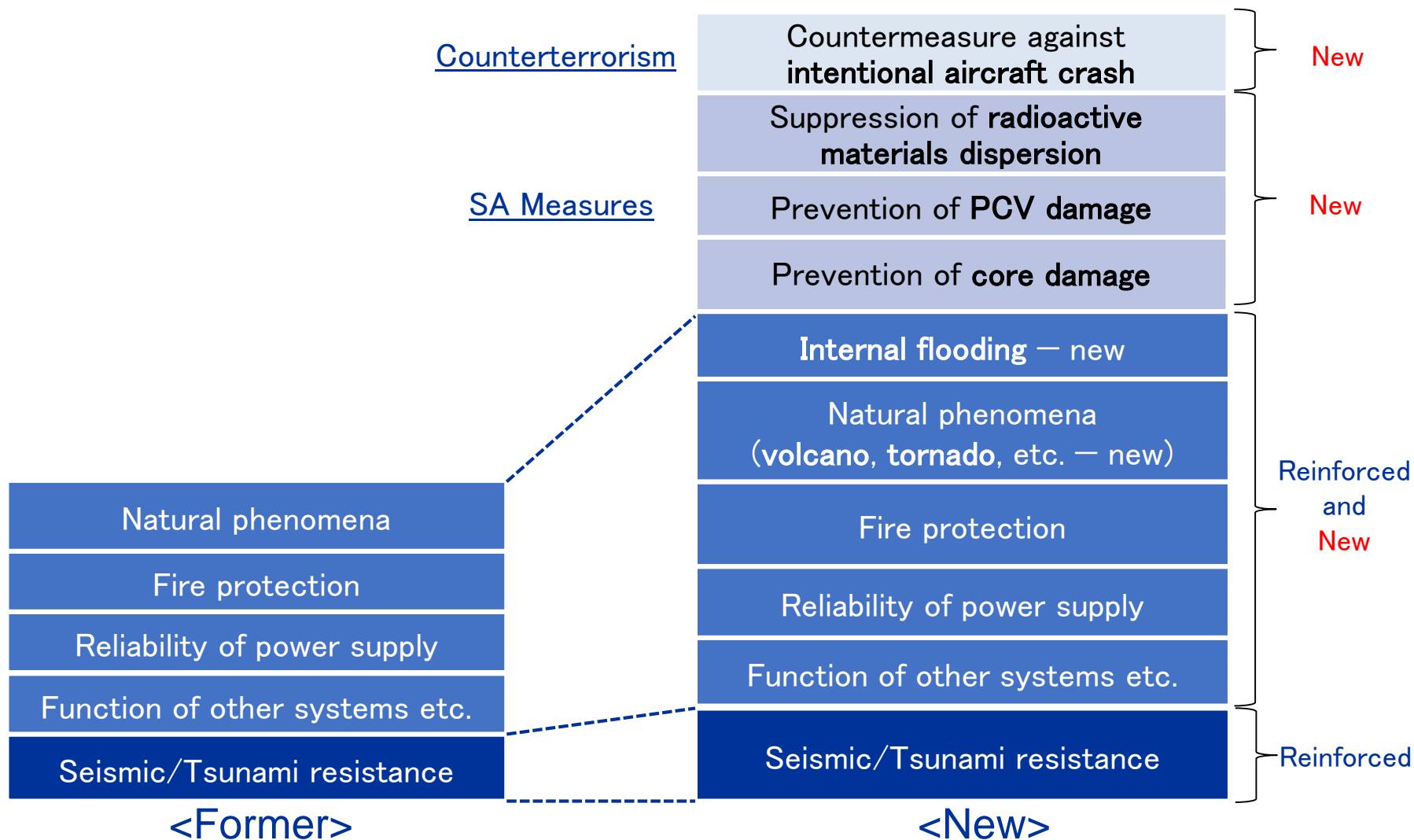
16





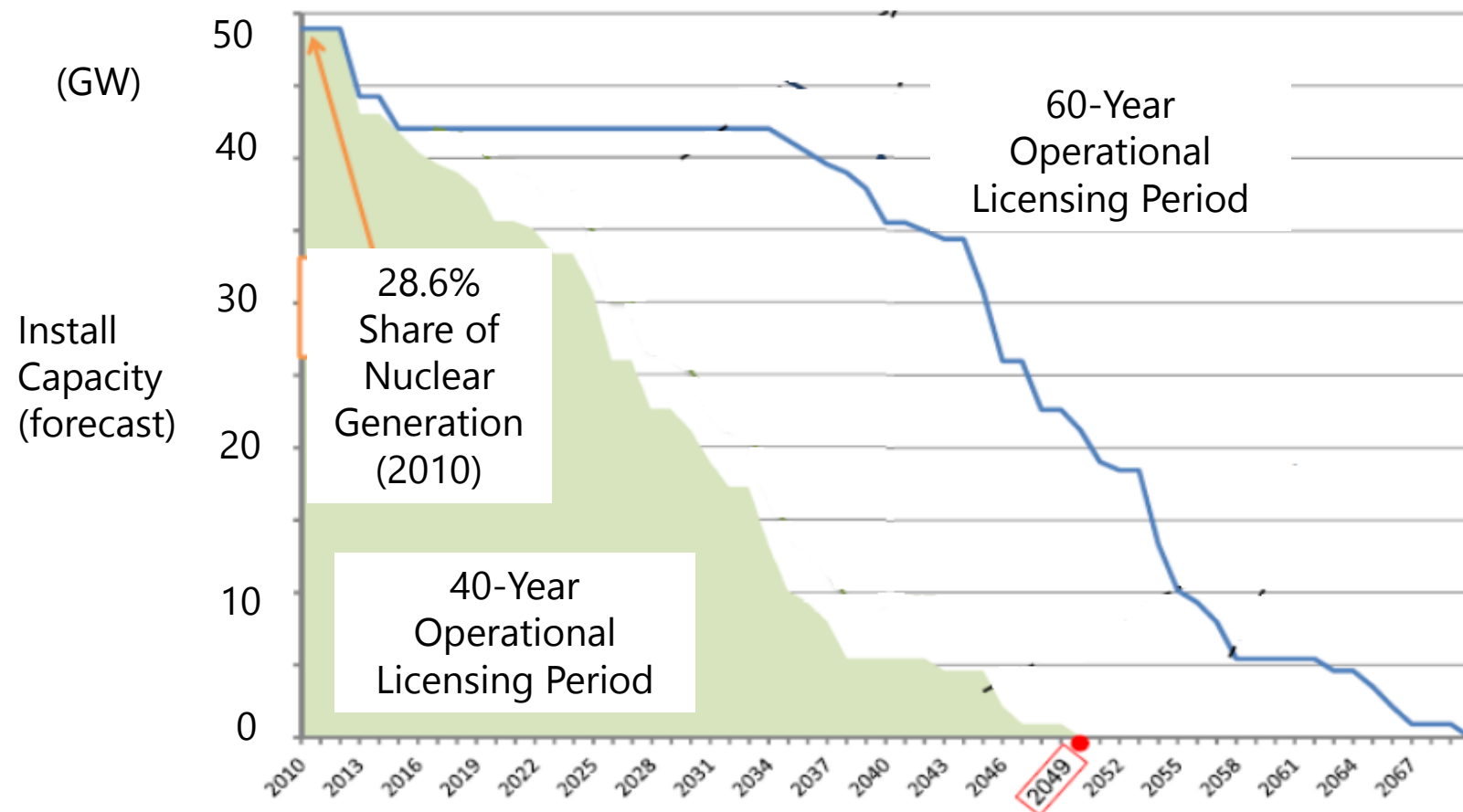
# 3.1 New Safety Standards

➤ **New Safety Standards** was in force in 2013.



## 3.2 40-Year Operational Licensing Period

- A 40-year operational licensing period was imposed in 2012. A 20-year extension can be applied for only once.
- Actual time passed, not operation time, is used to count this period.



# 3.3 Operational Status of Nuclear Power Plants in Japan

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<as of February 4, 2020 >

- **54** plants were operating prior to 3/11 (BWR & PWR).
- Today, only 9 have restarted operations, 21 units are to be decommissioned.

✓ **Re-started: 9** (PWR)

- Takahama-3,4, Ohi-3,4, Ikata-3, Genkai-3,4, Sendai-1,2

✓ **Not operating: 24**

- Partially permitted: **6**
  - Mihama-3, Takahama-1,2, Kashiwazaki-Kariwa-6,7, Tokai Dai-2
- Under review of restart: **10**
- Unapplied: **8**

✓ **To be decommissioned: 21**

- Fukushima-Daiichi: **6**
- Fukushima-Daini: **4**
- Another: **11** (*gave up on meeting new standards*)
  - Tsuruga-1, Mihama-1,2, Shimane-1, Ikata-1,2, Ohi-1,2, Genkai-1,2, Onagawa-1



# 3.4 Electricity Supply by Source in Japan

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➤ Target : Nuclear **20-22% by 2030**

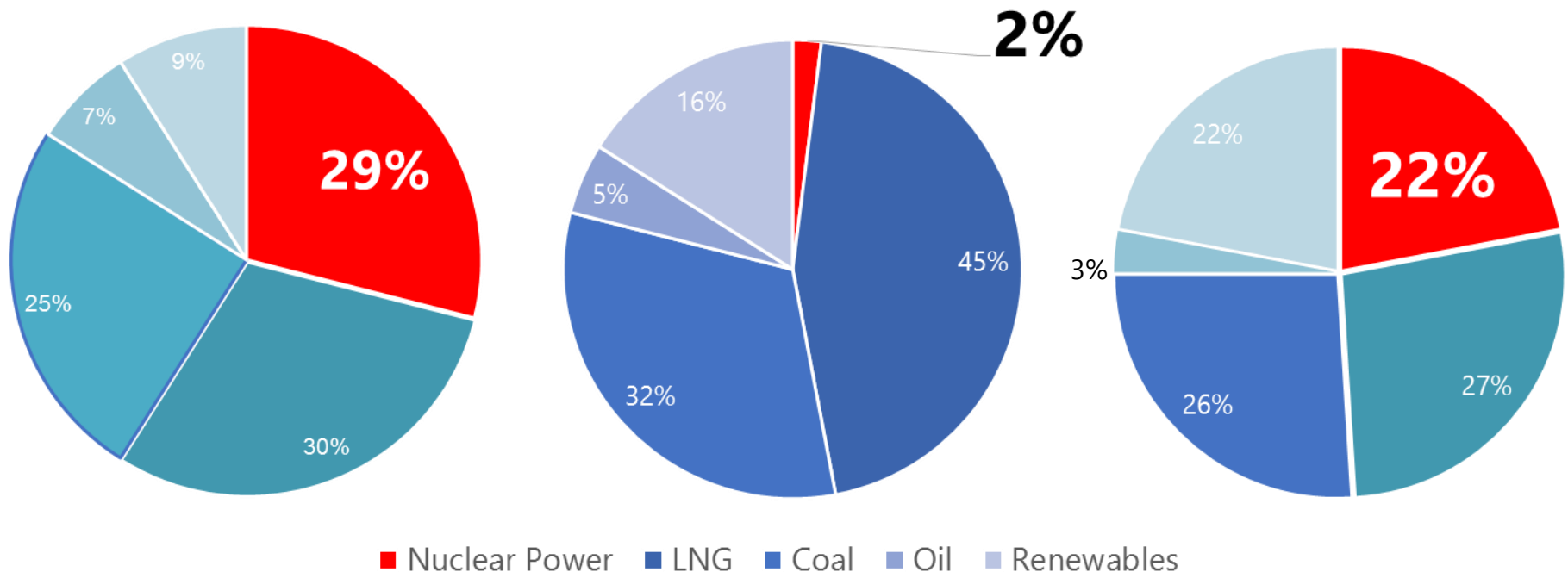
<Electricity supply by source in 2016 and projection to 2030 in Japan>

FY2009

FY2016

FY2030 (planned)

↑ Earthquake on March 11, 2011

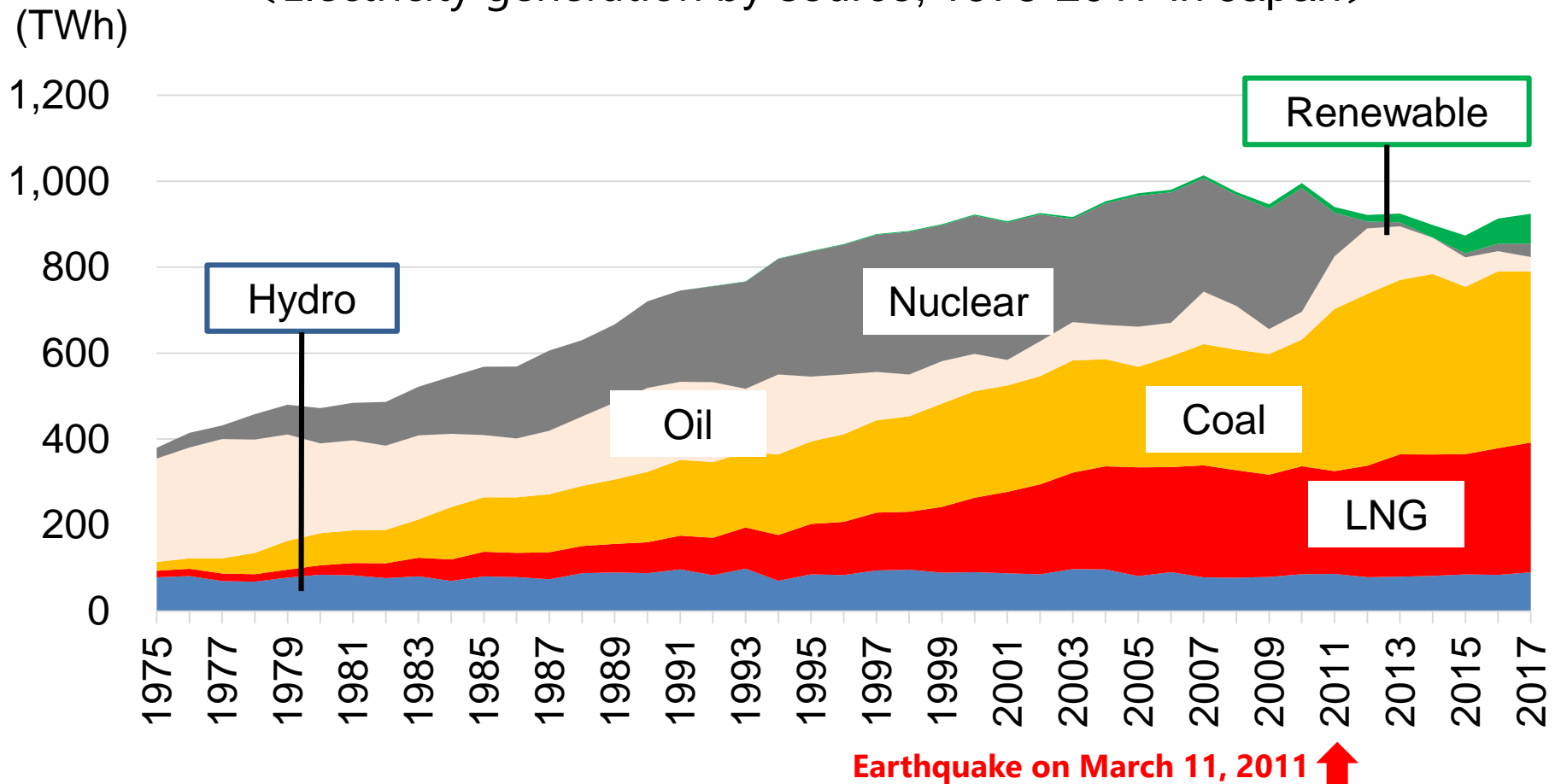


# 3.5 Implication for Energy Security of Japan

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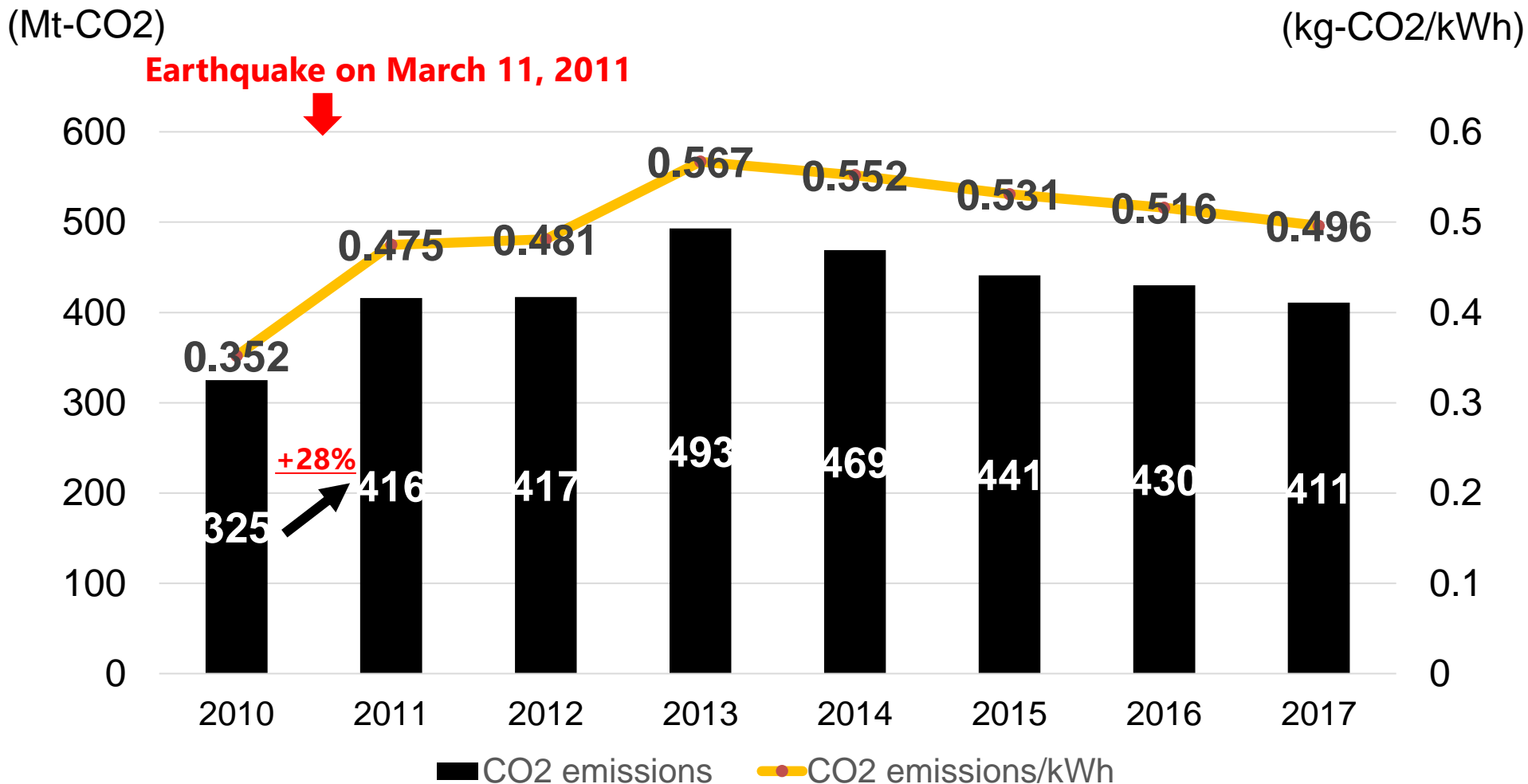
- Japan's power generation mix has changed drastically after the Fukushima accident and energy self-sufficiency rate is only 11%

＜Electricity generation by source, 1975-2017 in Japan＞



## 3.6 Implications for CO2 Emissions in Japan

- Significant CO2 increase by electricity generation because of the temporal nuclear shutdown

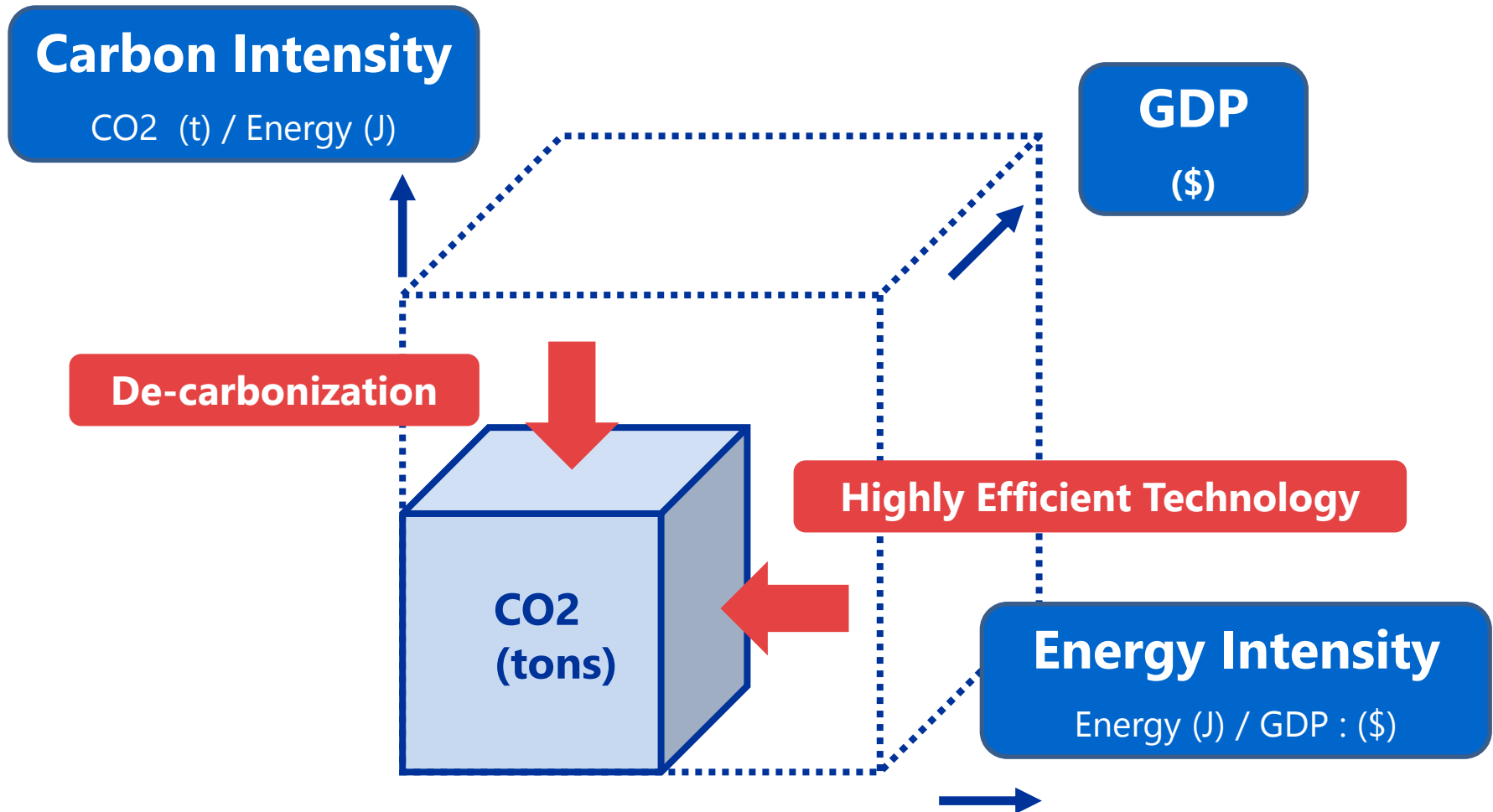




## 3.7 Factors of CO2 Emissions

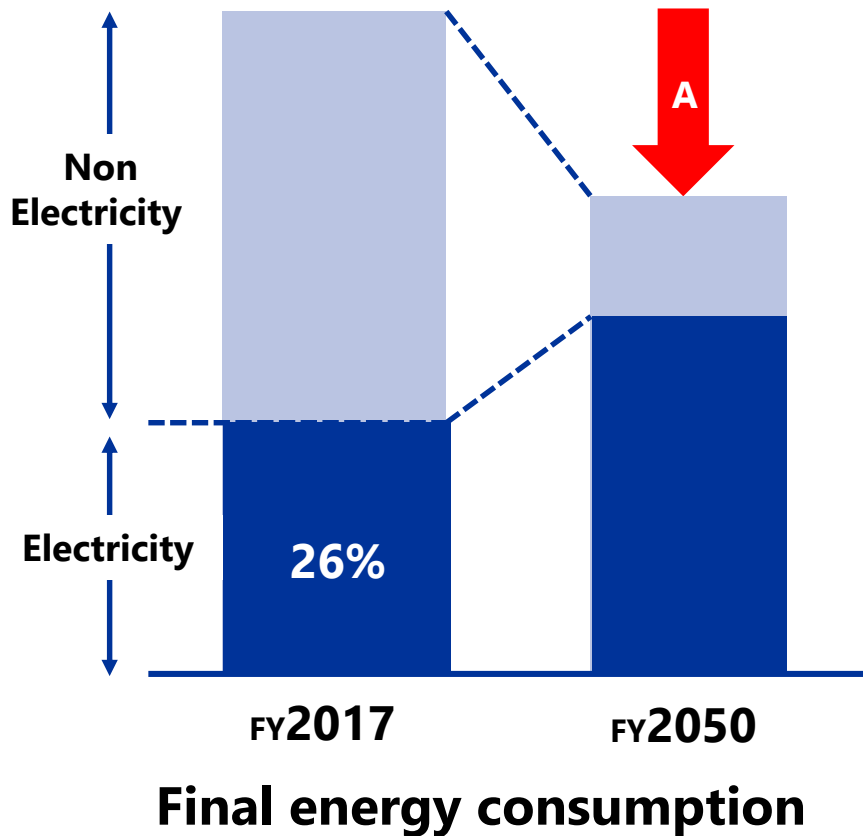
- CO2 Emissions =

$$\text{GDP} \times \text{Energy Intensity} \times \text{Carbon Intensity}$$

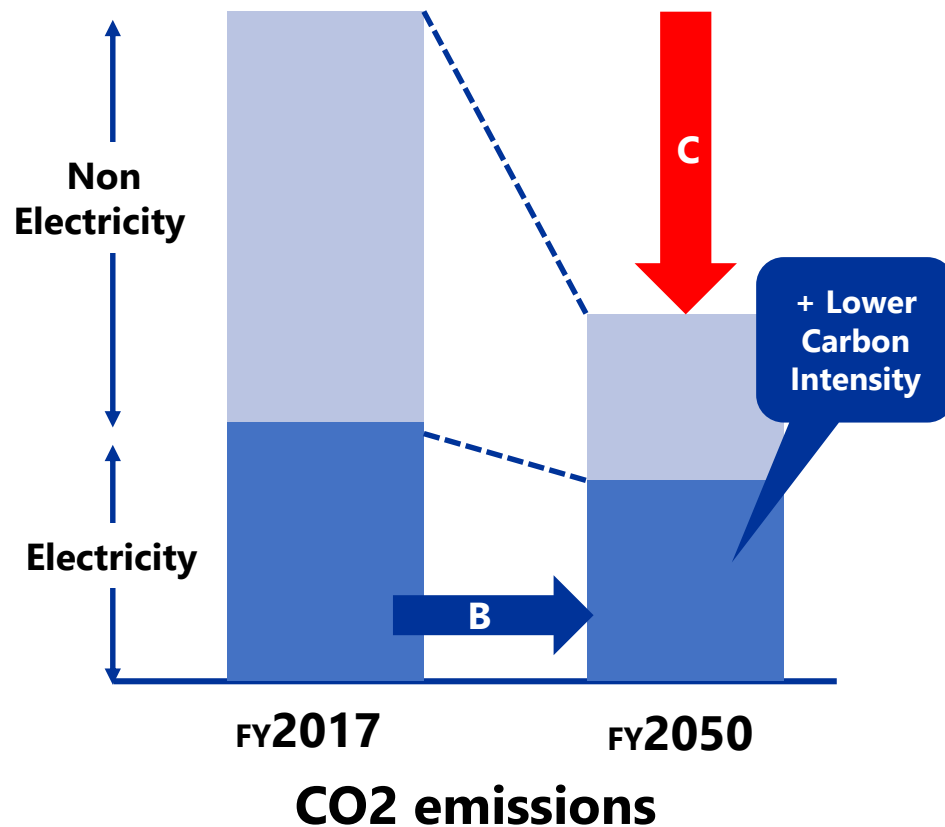


## 3.8 How Electrification Reduces CO2

### ● Electrification



### ● Decarbonization



# 3.9 Electrification and Decarbonization from both demand and supply side

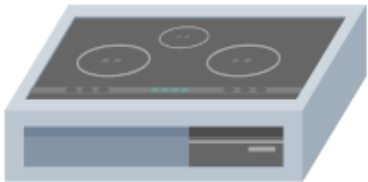
25

## Demand side (Electrification)

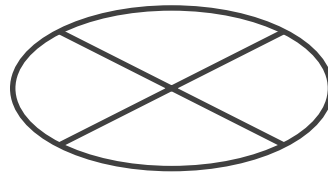
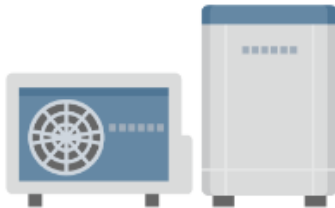
Electric Vehicle



IH  
Cooking Heater



Heat Pump  
Water Heater



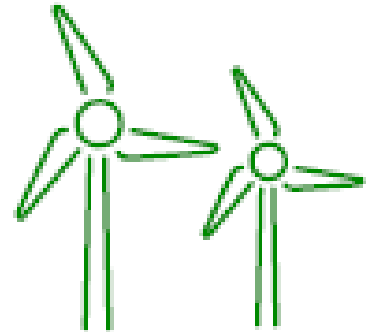
Network

## Supply side (Decarbonization)

Solar



Wind



Nuclear

