

# Improvement of the labor environment at Fukushima Daiichi Nuclear Power Station

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TOKYO ELECTRIC POWER COMPANY

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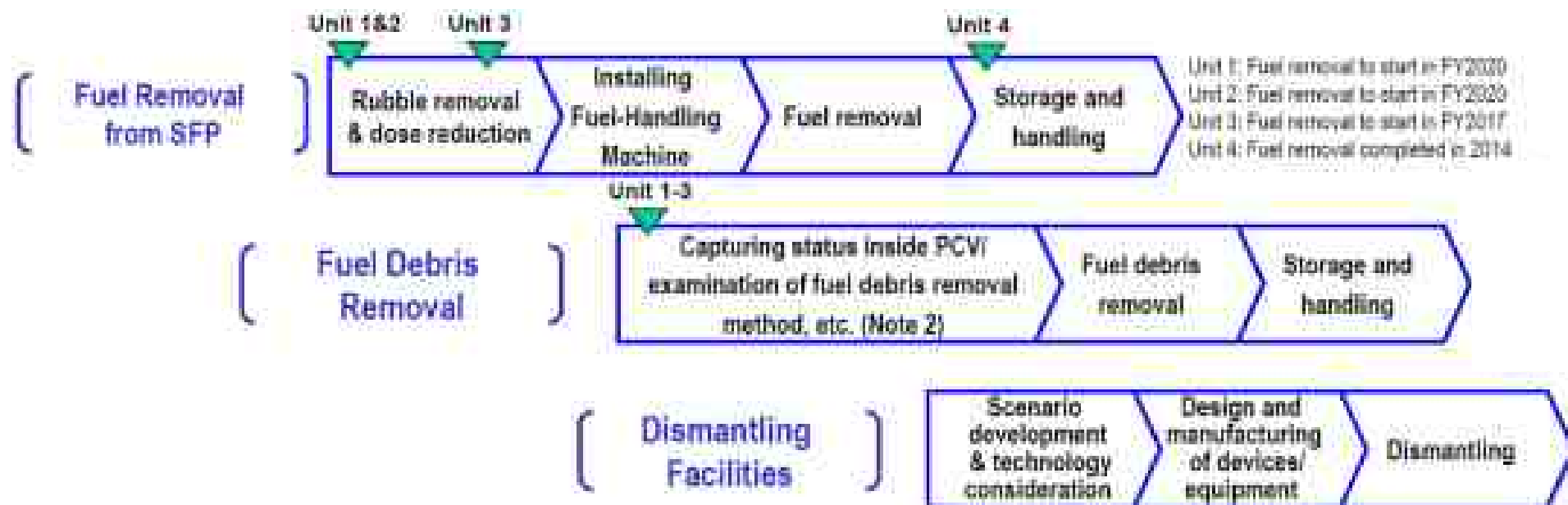
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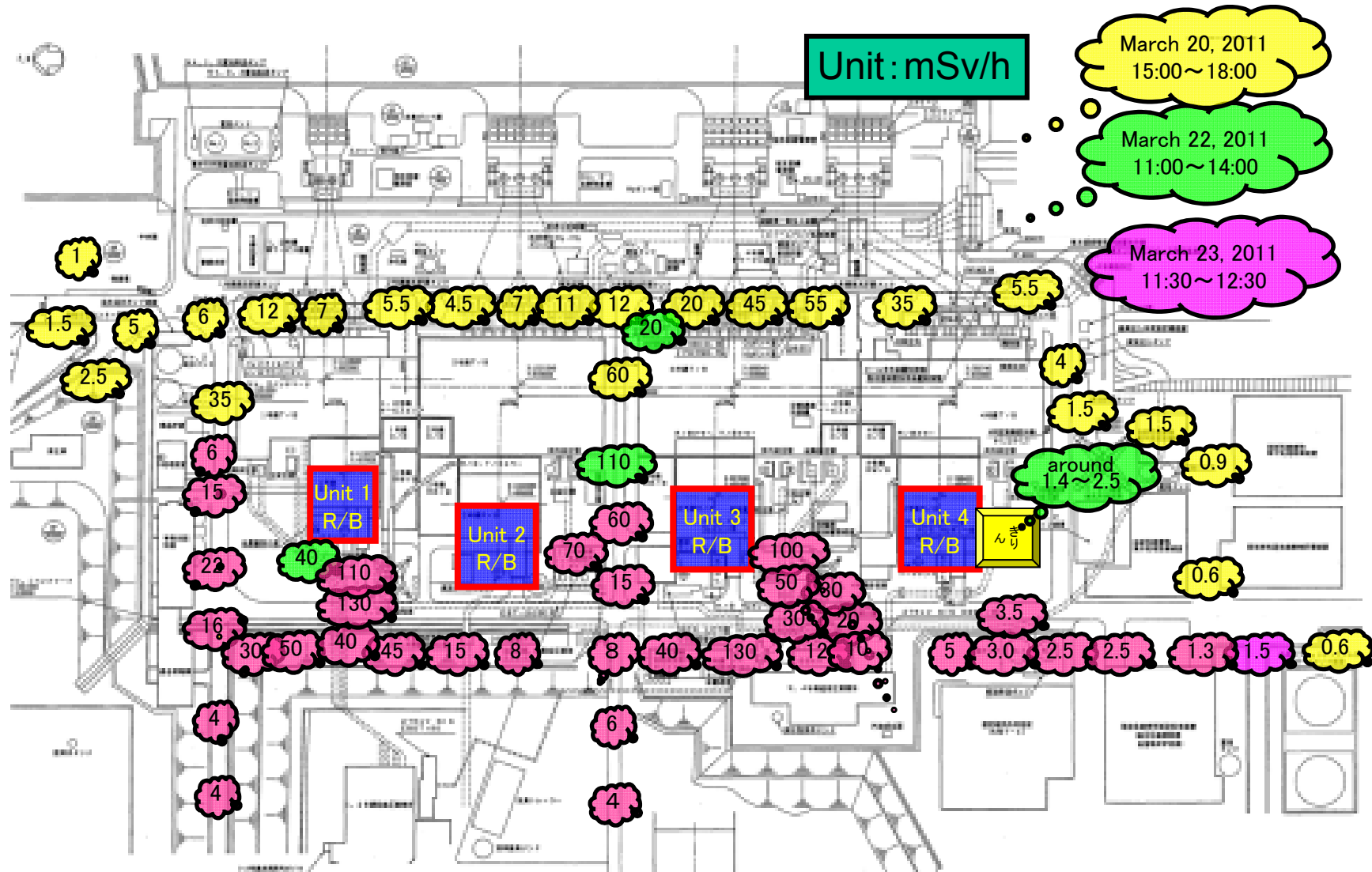


# Main works and steps for decommissioning

- Fuel removal from Unit 4 SFP had been completed.
- Preparatory works to remove fuel from Unit 1-3 SFP and fuel debris removal are ongoing.

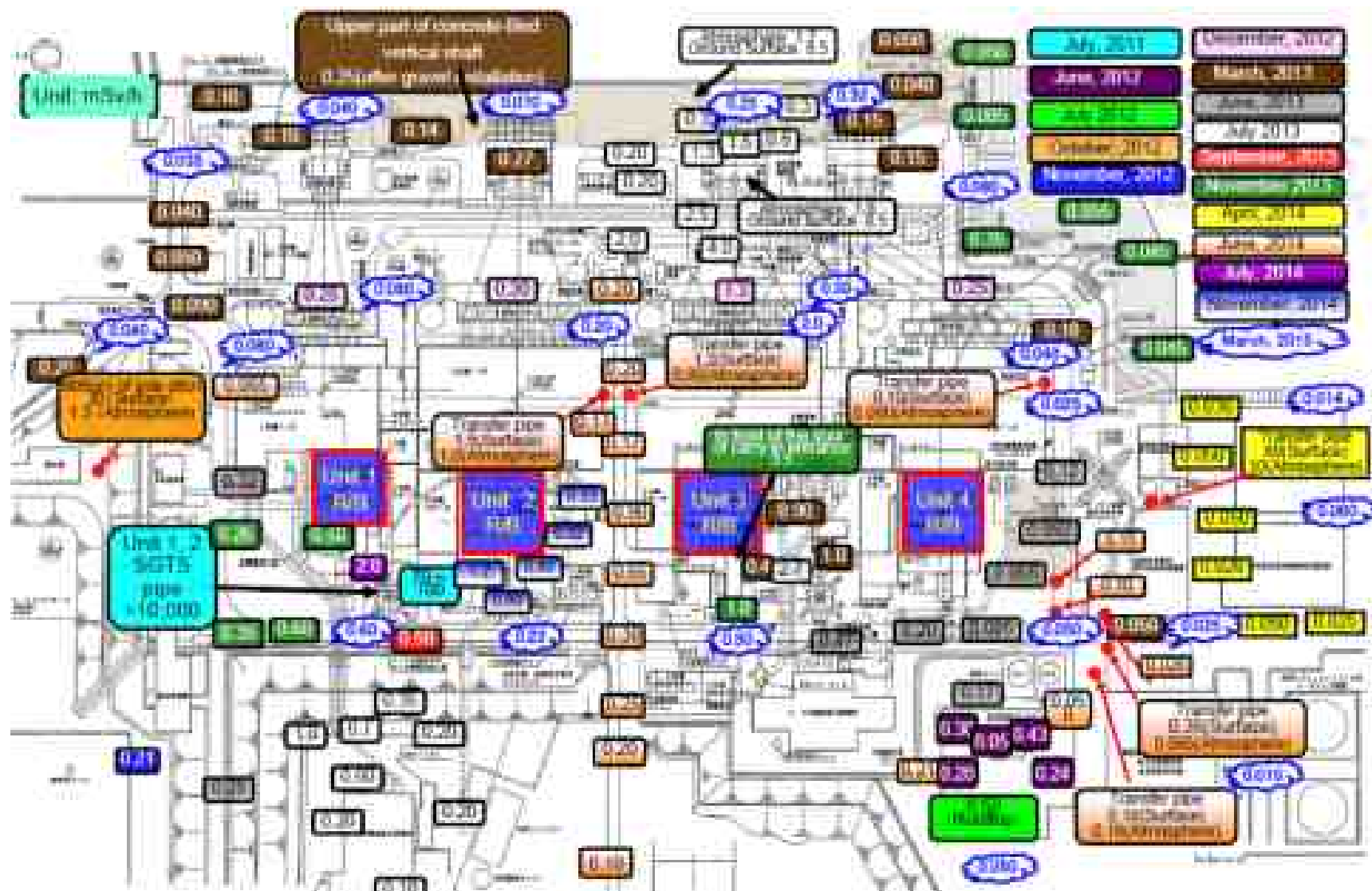


# Survey map of inside Fukushima Daiichi NPS (Unit 1 - 4) on March 23, 2011





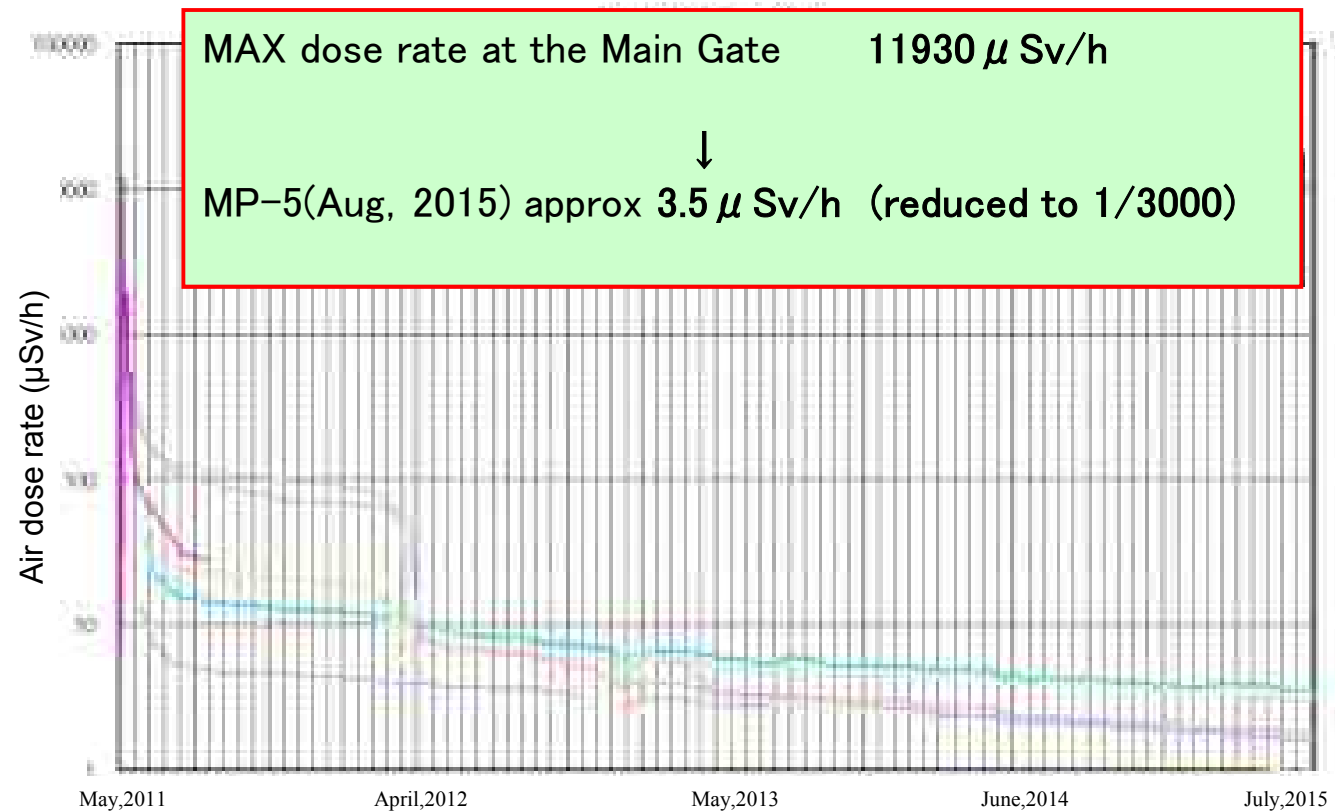
# Survey map of inside Fukushima Daiichi NPS (Unit 1 - 4) on March, 2015



# Radiation situation inside Fukushima Daiichi NPS

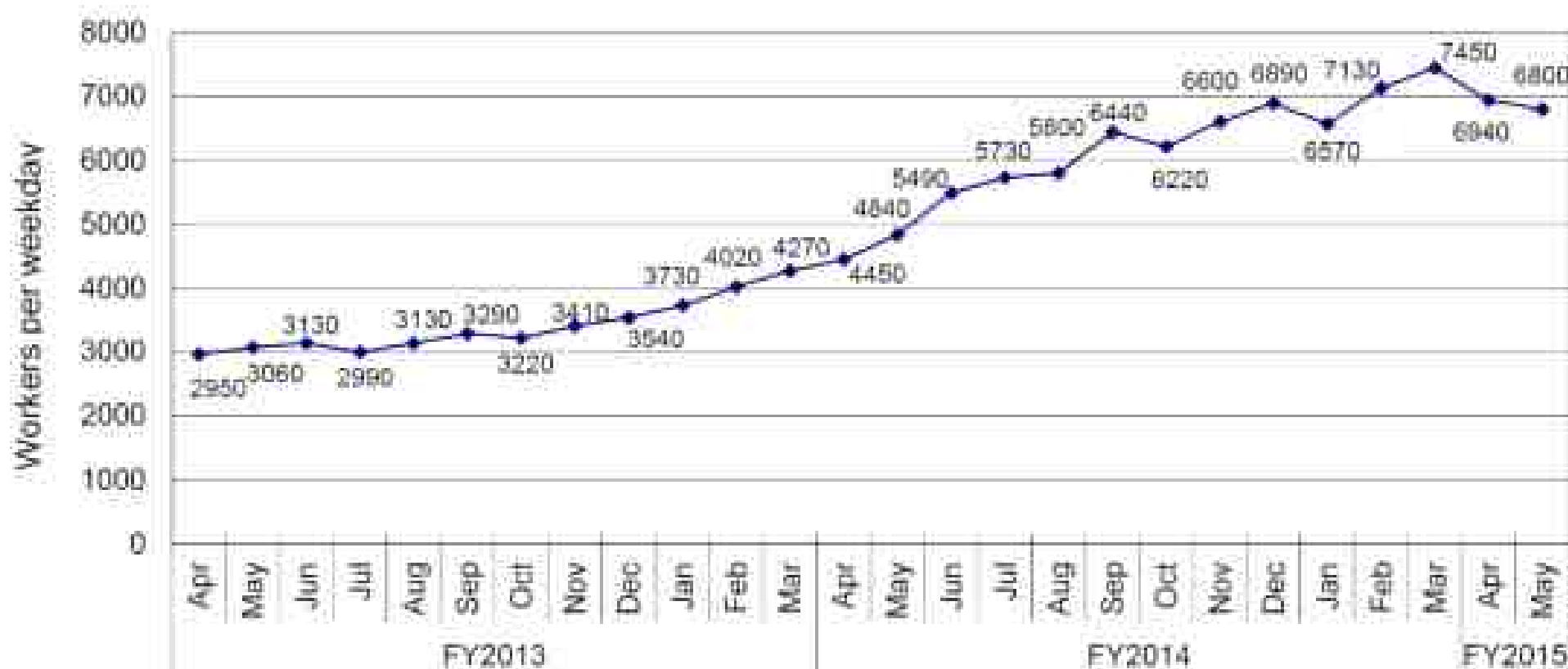
## ■ Dose rate monitoring at Monitoring Post

The air dose rates at each point were dramatically increased by the accident. After that, indicated steady downward trend and at this moment, at the background level at each point.



## Staff Management

- The average number of workers per day for each month has been increasing gradually ,from approx.. 3,000 to 7,500 since FY2013.



## Improvement of the labor environment

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- Plan to reduce radiation dose
- Expansion of area where full-face masks need not to be worn
- Installation of Dose Rate Monitors within the 1F site
- Large rest house



# Plan to reduce radiation dose

## ■ Objective

To make basic foundation to move safely forward with long-term accident reactor resolution and reactor decommissioning by implementing measures to lower radiation levels, such as tree-felling, surface soil removal, plowing, and shielding, after ascertaining the impact on the entire site of fallout contamination and direct radiation from the plant.

## ■ Implementation plan

### (Priorities)

The areas where many workers are engaged in work will be a priority as these measures are implemented while considering interference with other construction

### (Target Dose Rates)

The target dose rate for areas excluding the areas around Units 1-4 (Areas II, III, IV) is  $5\mu\text{Sv/h}$  (area average). The target dose rate shall be lowered in steps.

### (Method of moving forward with radiation level reduction measures)

Radiation reduction measures shall be implemented using appropriate methods after ascertaining the attributes of the radiation sources in each area. After the countermeasures have been implemented dose rates shall be measured in order to assess the effect of radiation level reduction measures.



- Area I: Area around Units 1-4 that have particularly high dose rates
- Area II: Area where brush and trees still remain
- Area III: Area where equipment has been, or will be, installed
- Area IV: Areas that have already been paved such as roads and parking lots
- ■ ■ Scope of on-site dose reduction measure implementation

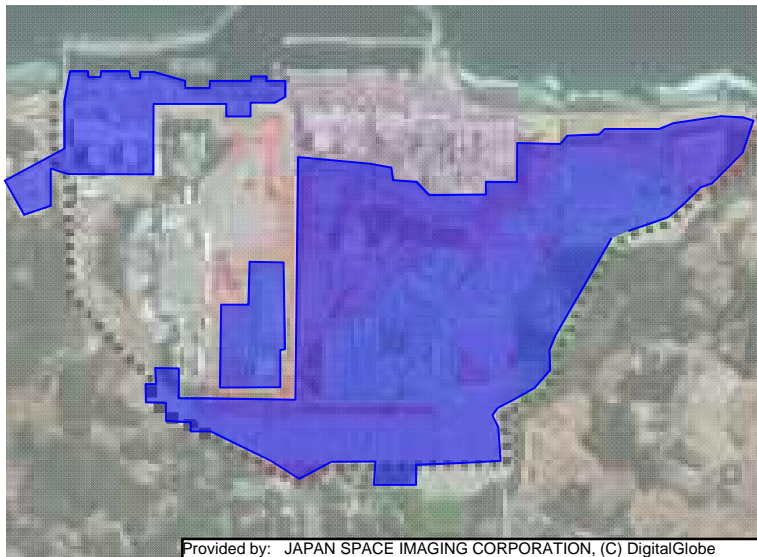


# Images of Expansion of 5 $\mu$ Sv/h areas

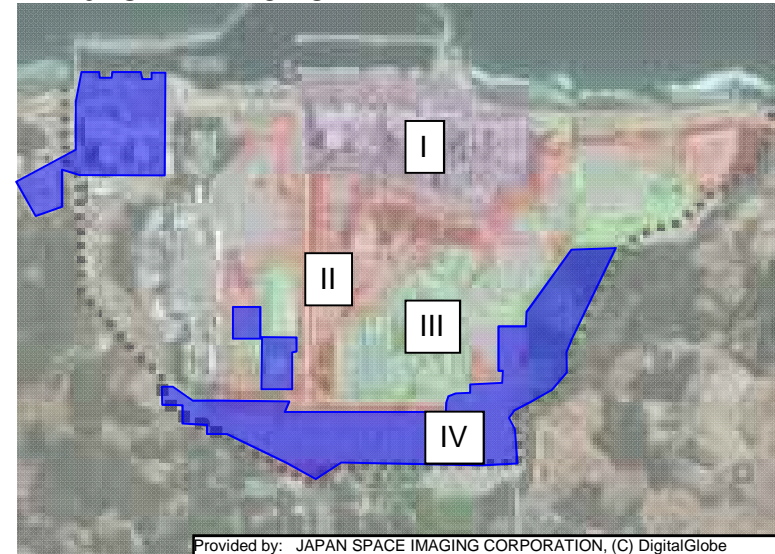
\* Areas with about 5  $\mu$ Sv/h are marked with 

We have been reducing dose in the area surrounding Units 1 to 4 (area I) by removing debris hindering work and shielding work areas; given the presence of places with high dose in the plant and facilities, we will continue reducing dose in conjunction with the removal of high-dose facilities and rubble removal from the reactor building.

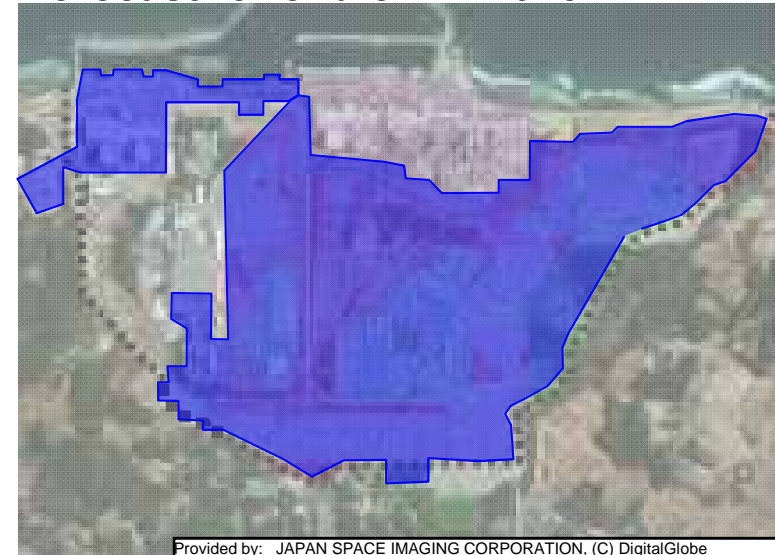
**End of FY 2014**



**End of FY 2013**

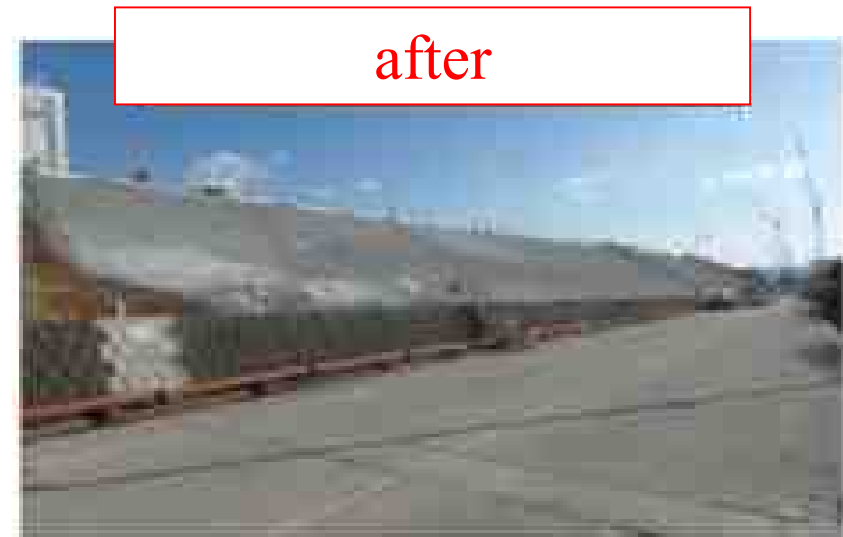
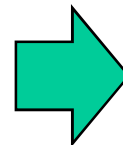
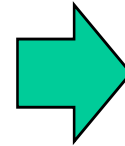


**Forecast for end of FY 2015**



## Facing work

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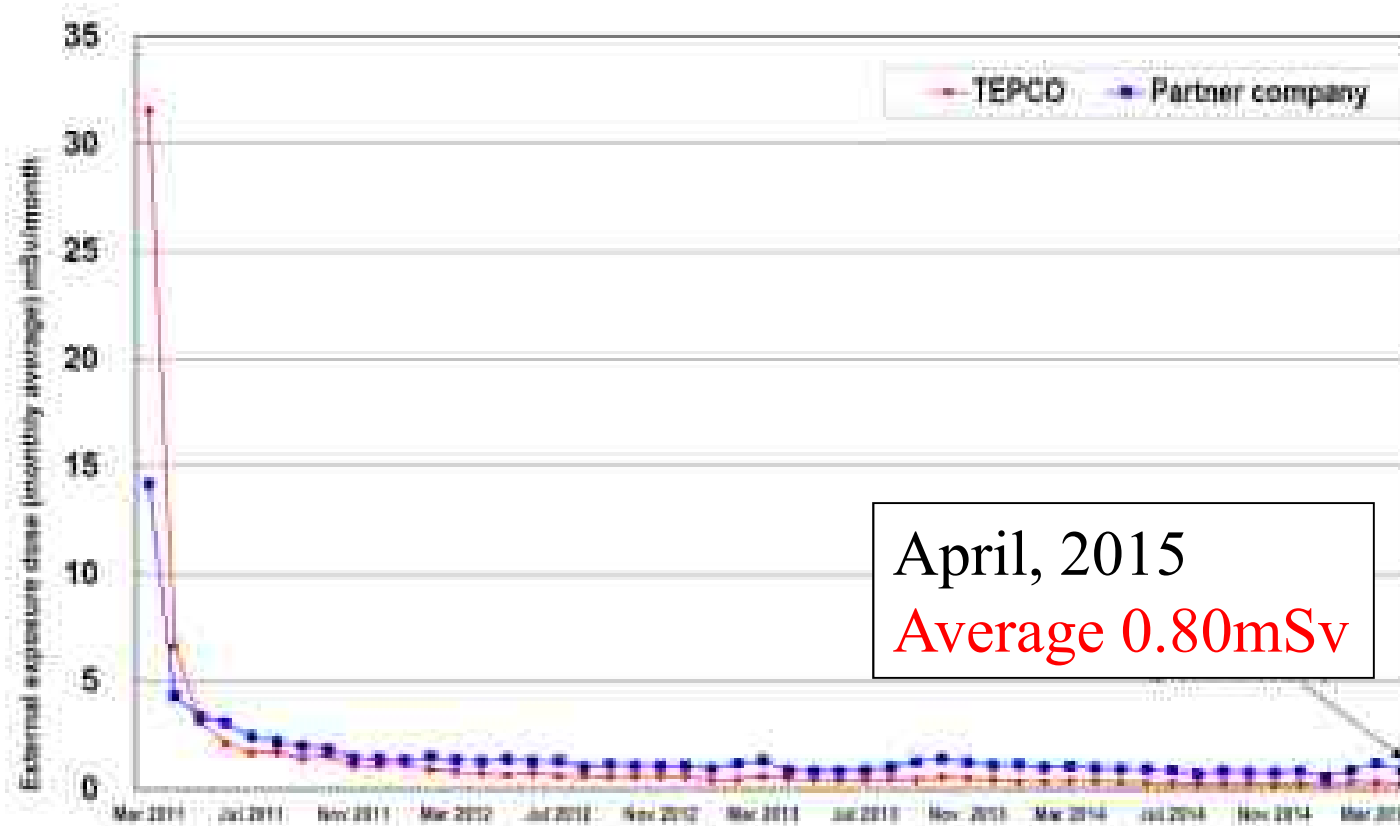


## Monthly individual worker exposure dose

- The average exposure dose rate of workers remained at approx. 1 mSv/h during both FY 2013 and FY2014.

(Reference : Annual average exposure dose 20mSv/year  $\div$  12 months  $\div$  24 hours  $\div$  60 minutes  $\div$  1000  $\div$  1000 = 1.7mSv/month)

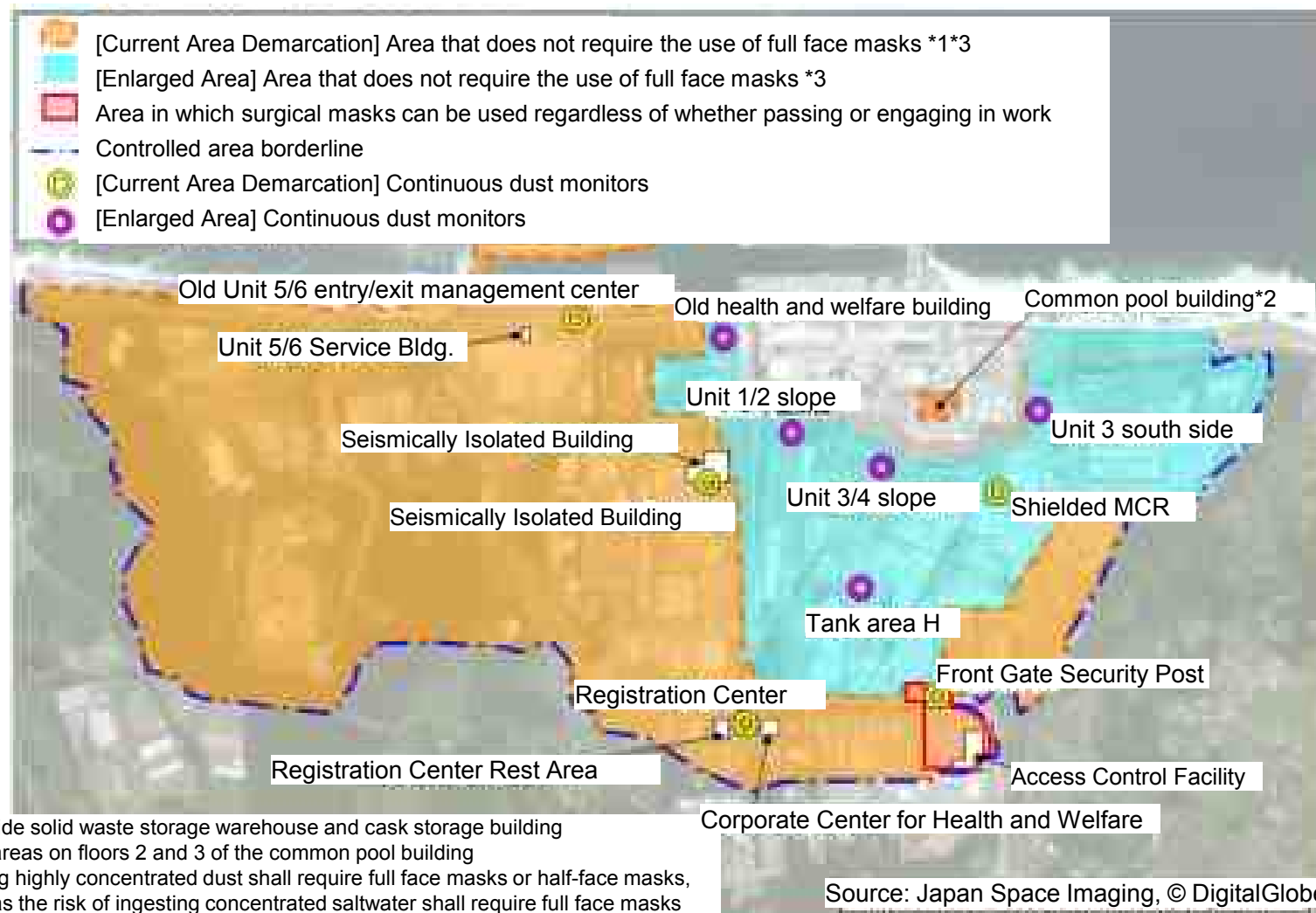
- Expansion of work areas for woman.



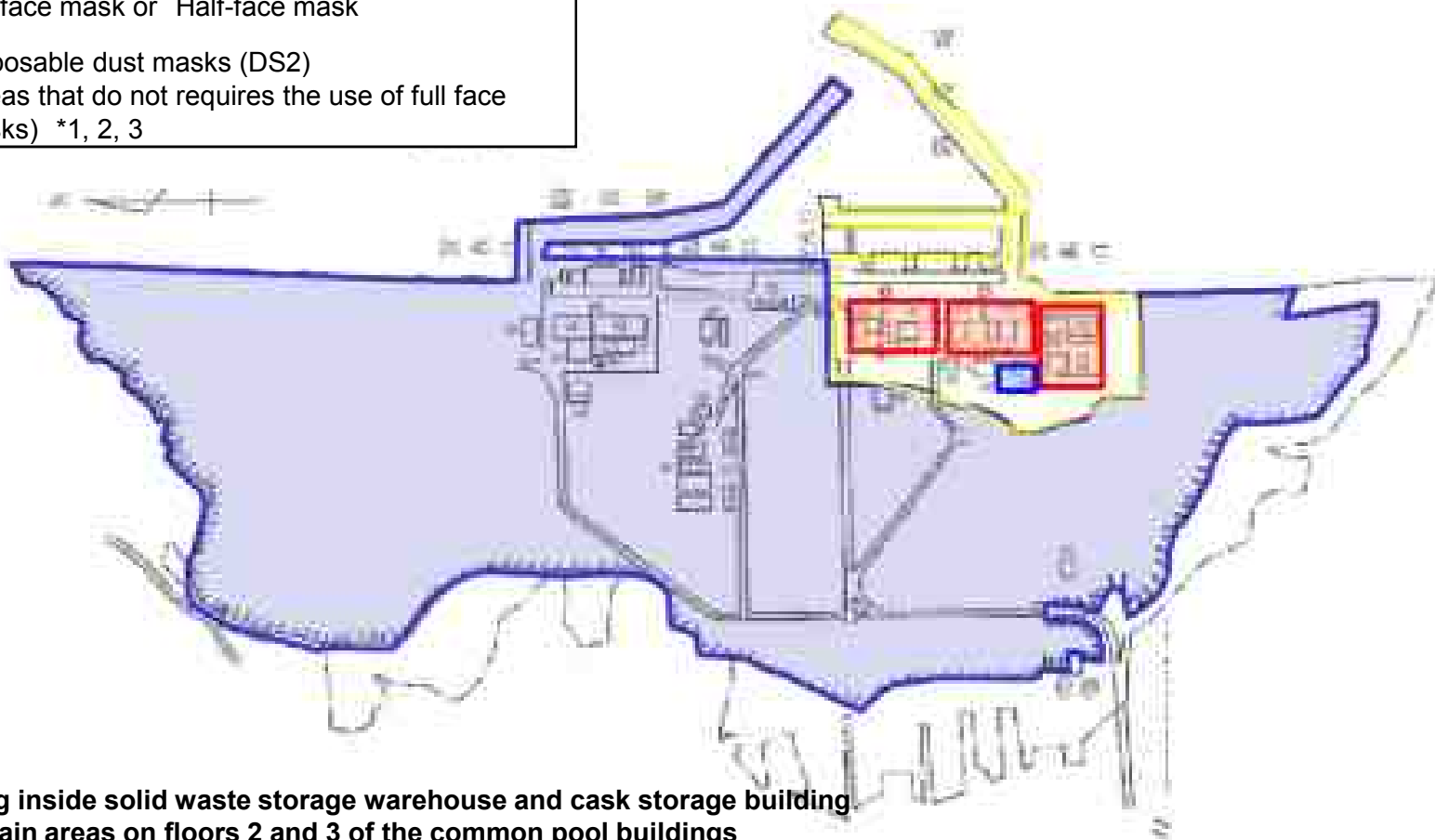
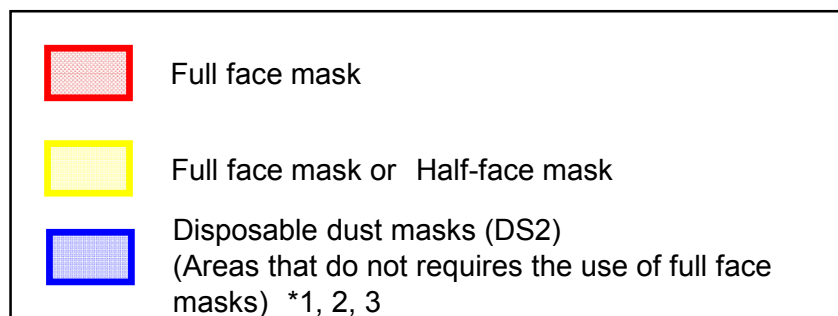


## Area that does not require full-face masks and which is going to be enlarged

Since continuous dust monitors have been additionally installed on the Unit 3/4 slope and in tank area H, thereby enabling monitoring with a total of 10 continuous dust monitors, all areas other than those around Units 1-4 require the use of only disposable dust masks (DS2)



# Mask requirement categories map (after May 29, 2015)



**\*1 Excluding inside solid waste storage warehouse and cask storage building**

**\*2 Only certain areas on floors 2 and 3 of the common pool buildings**

**\*3 Work involving highly concentrated dust shall require full face masks or half-face masks, and work that has the risk of ingesting concentrated saltwater shall require full face masks**

# Installation of Dose Rate Monitors within the 1F site

## ■ Objective

In order to monitor dose rates after radiation level reduction countermeasures have been implemented dose rate monitors will be installed at the site (Phase I: 20 monitors installed by March 2015, Phase II: 50 monitors installed by September 2015). The installation of these monitors will help to make field dose rates more visible by having the values from these dose rate monitors displayed on large display screens in the Seismically Isolated Building and other locations so as to enable workers to ascertain real-time radiation levels in the field prior to venturing out into it.

## ■ Main Equipment Specifications

### (1) Dose rate monitors

- Measurement range: 0.1 $\mu$ Sv/h -100mSv/h
- Power source: The equipment can either be battery driven or run on AC  
\*The unit can run continuously for 10 days without sunlight
- Other: GPS function included (automatic tracking after relocation also possible)

### (2) Large display screen

- Radiation level measurement results are shown on a map using different colors
- The dose rate trends at each measuring point are also displayed
- Data refresh rate: every 10 minutes



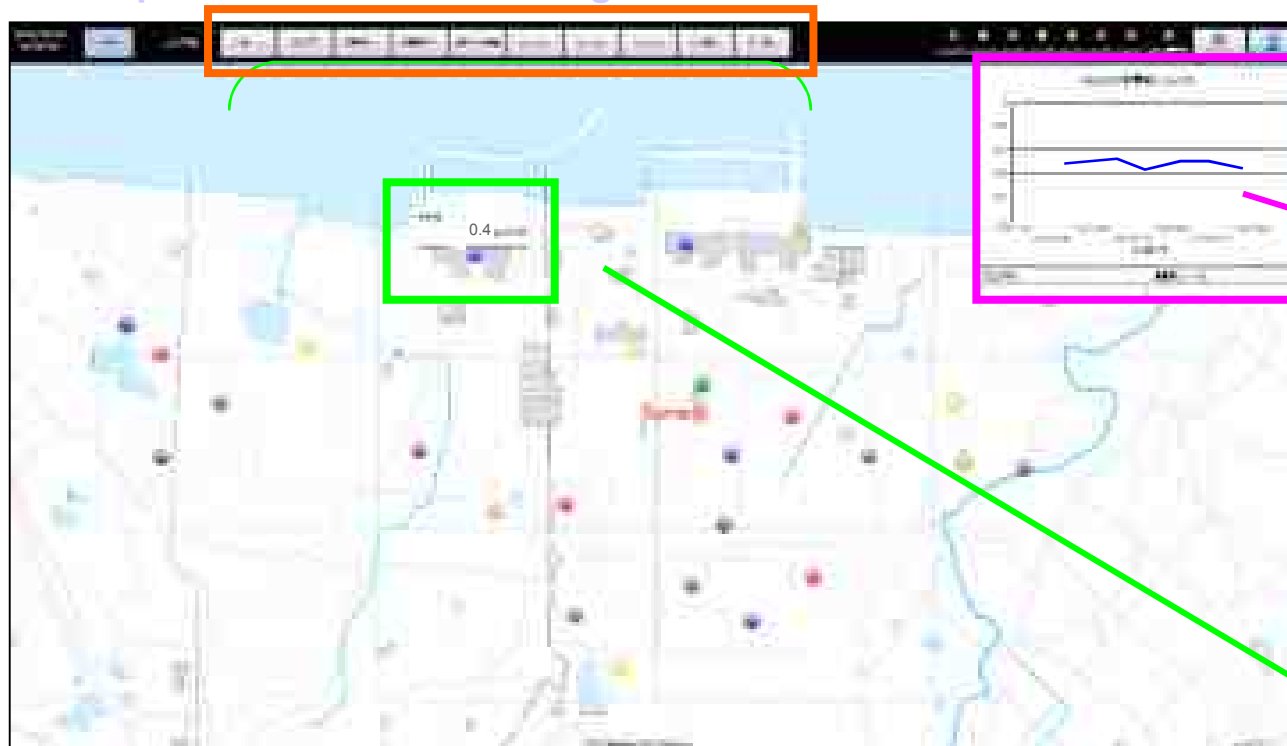
Weight: Approx. 160kg

Concept drawing of dose rate monitor

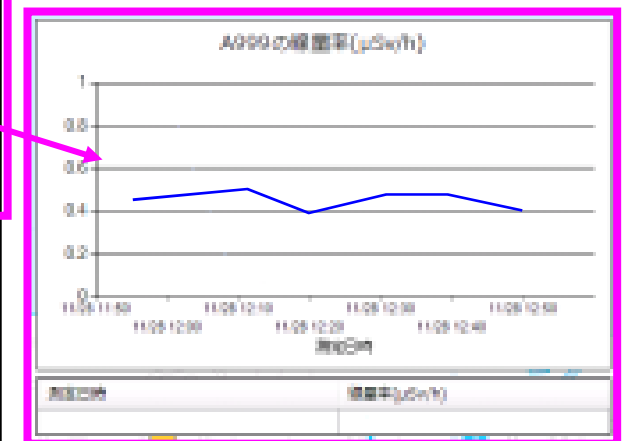
# Real-Time Display of Radiation Levels in Rest Areas

Measurement results from dose rate monitors will be displayed in real-time on large display screens (80 inch) (refresh rate: every 10 min.) that will be installed in locations that are visible to all workers, such as the first floor of the Seismically Isolated Building and the second floor of the Access Control Facility.

In addition to displaying the entire site specific areas can be enlarged



The latest measurement results and trends for specific measurement point can be displayed on the upper right portion of the screen by touching the measurement point



The most recent measurement results are shown in a pop-up screen when a measurement point is touched



\*A touchscreen will be employed so that workers can inform themselves of radiation level information.

\*The example shown above is a concept drawing and the actual display is subject to change

## A Large rest house

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- At the large rest house with a capacity of approx. 1,200 workers, operation started on May 31 and meal services at the dining room commenced on June.
- This rest house is used for workers to rest, conduct office work and receive safety checks before starting work.



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for your support to  
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