

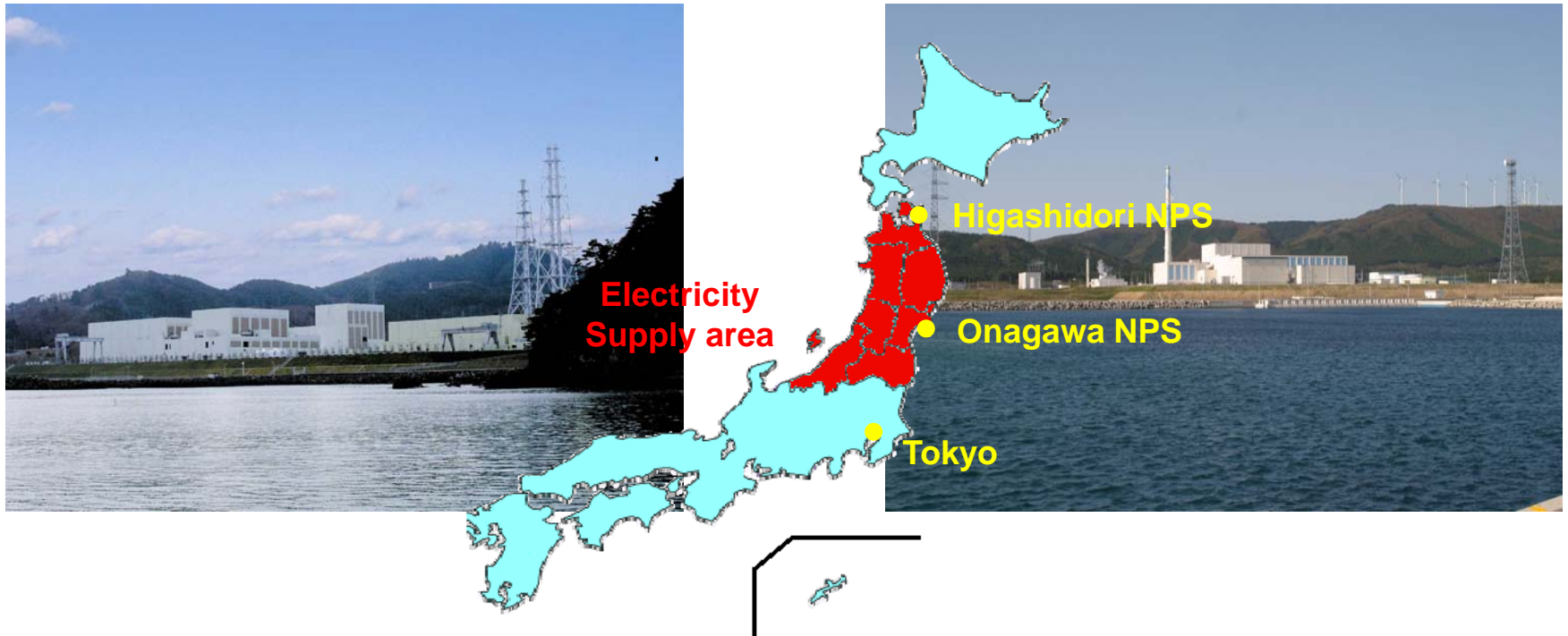
# Measures for Reduction of Radiation Exposure at Higashidori Nuclear Power Station



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Tohoku Electric Power Co.

# Tohoku Electric Power Company Nuclear Power Plants

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## Onagawa

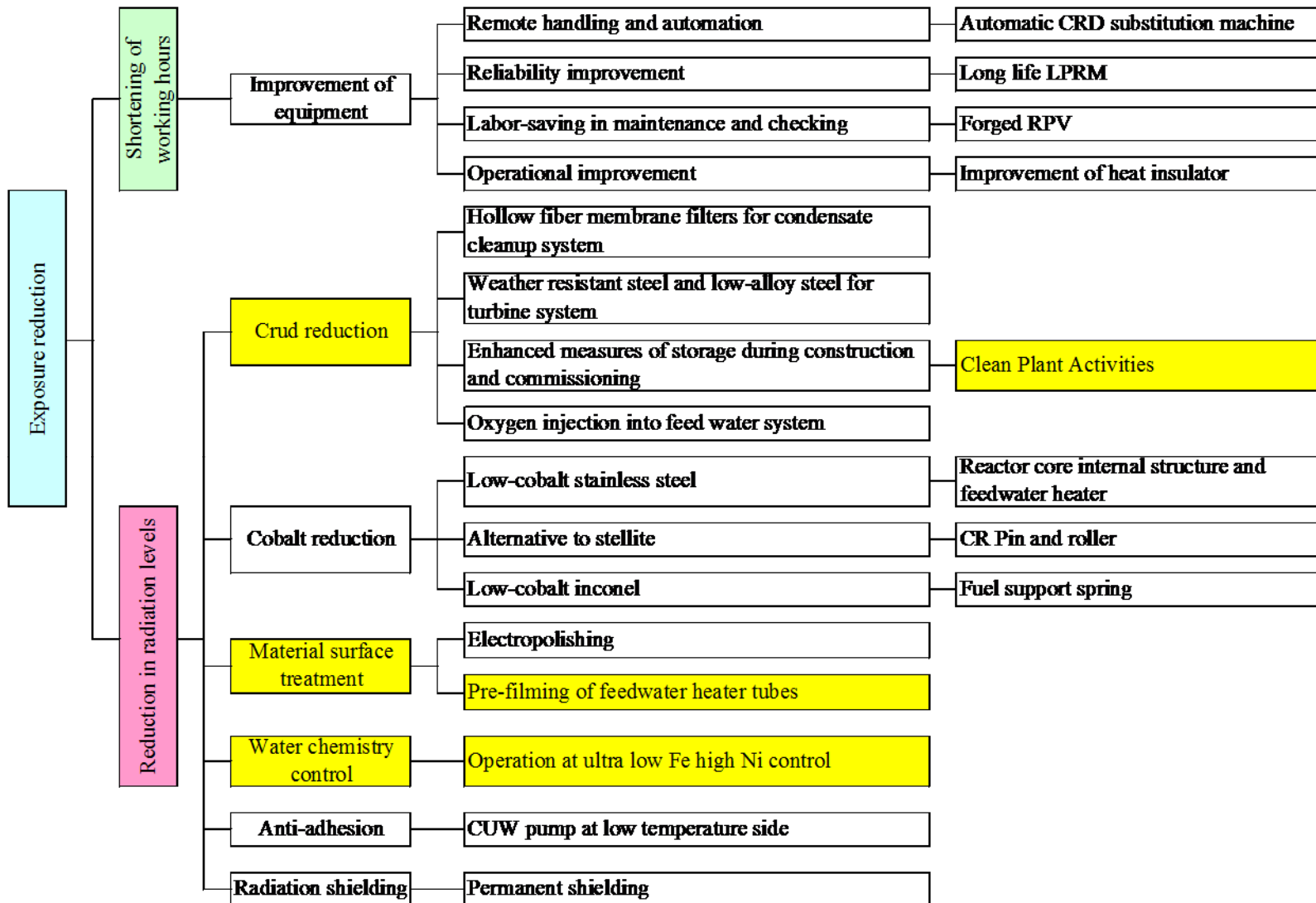
	MWe	Type	Commercial Operation
Unit-1(O-1)	524	BWR4	1984
Unit-2(O-2)	825	BWR5	1995
Unit-3(O-3)	825	BWR5	2002

## Higashidori

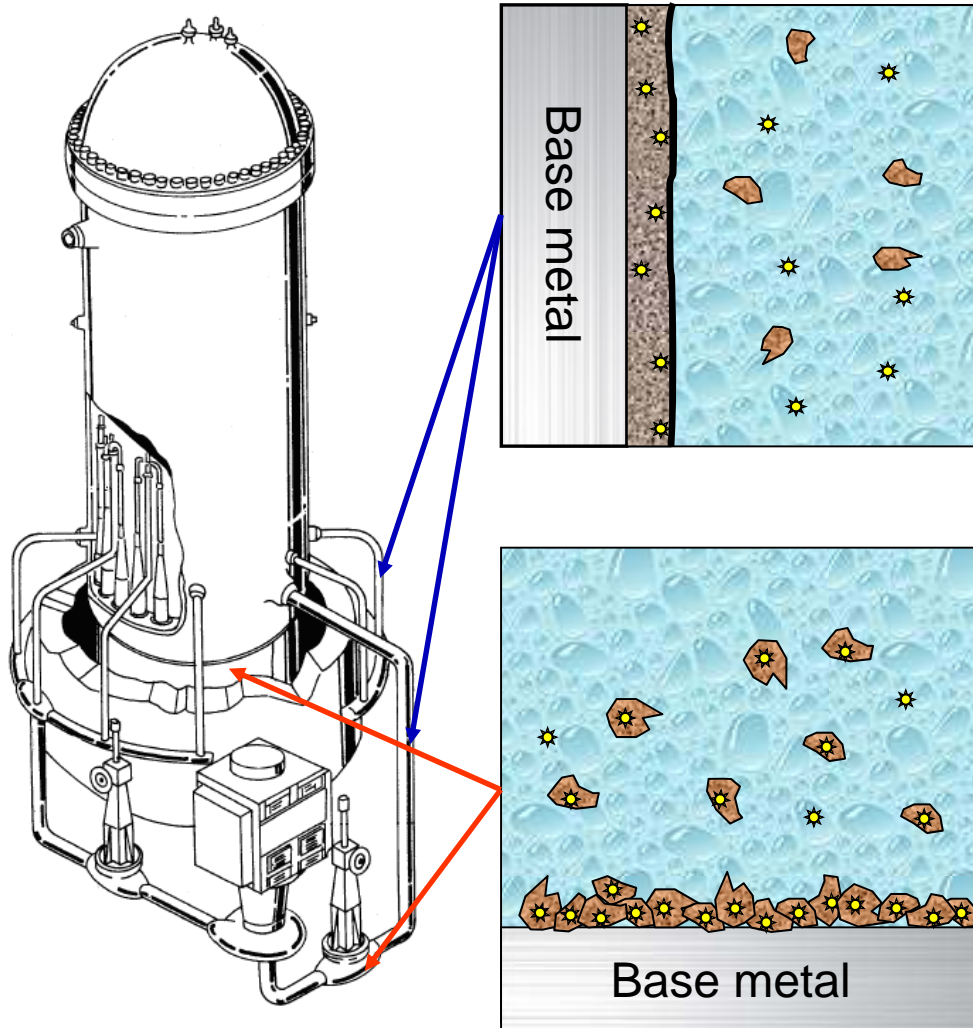
	MWe	Type	Commercial Operation
Unit-1(A-1)	1100	BWR5	2005



# Exposure reduction measures at Higashidori







## Replacement-type sources

Radioactive ions in reactor water are incorporated in the oxidized film generated on hot portion of the reactor piping system.

- PLR/CUW piping and components

## Deposition-type sources

Radioactive crud in reactor water is deposited at horizontal and other portions where water flow is stagnant or slow

- CRD flanges
- Filters
- Low temperature pipe sections, such as those in the RHR system
- Horizontal portions of PLR/CUW piping
- Nozzle sleeves

# Measures to reduce crud (Clean plant action No.1)



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1. Improvement of work environment
2. Protection
3. Maintenance of inner surface cleanliness



Prevention of carried-in dust by installing air guns and jet sprays at doorways



Thorough storage management and maintenance of cleanliness on inner/outer surface of system piping and equipment



# Measures to reduce crud (Clean plant action No.2)

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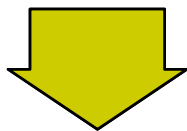
During system test



★ Thorough storage management

★ Purity control of test water

During start-up test



★ Primary system cleanup operation

★ Condensate/feedwater purification operation

★ Condensate/feedwater swing operation

★ Cleanup of hot well

★ Cleanup of residual heat removal system

★ Control of water treatment system

First cycle

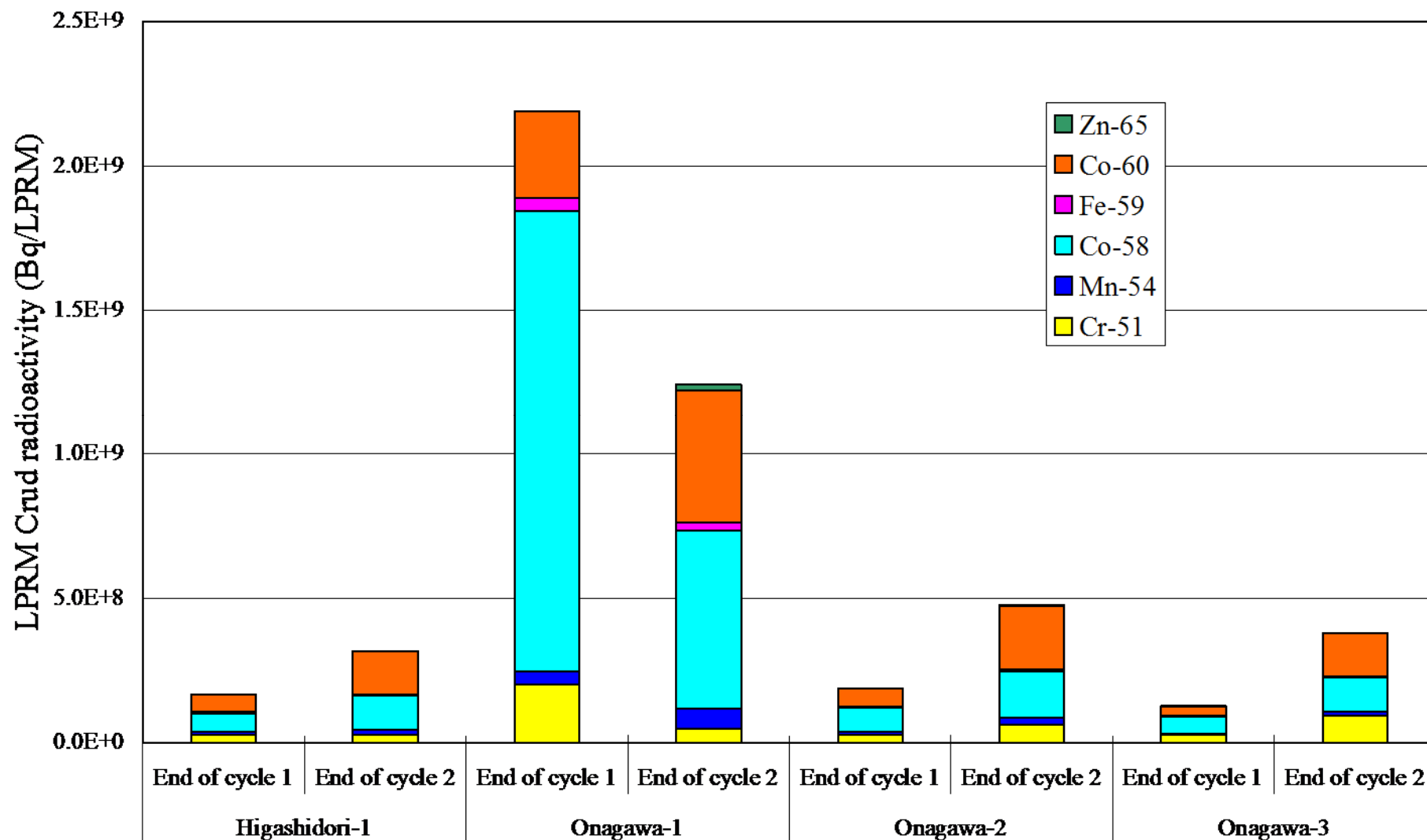
★ Suppression of reactor water activity concentration

Reduction of carried-in crud



# Measures to reduce crud (LPRM crud radioactivity)

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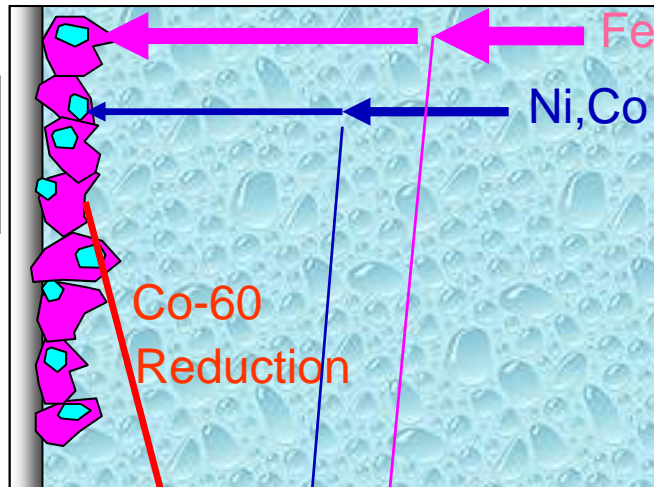


# Water chemistry control ( operation with extremely-low Fe high Ni)

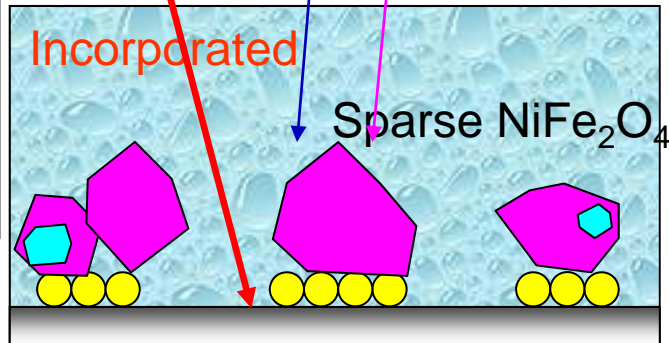
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## Control of Ni/Fe ratio

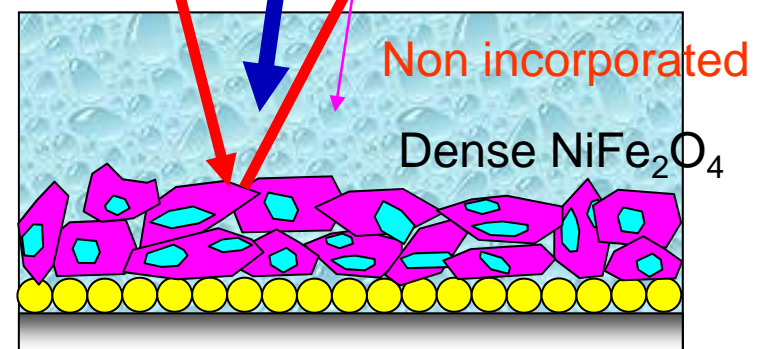
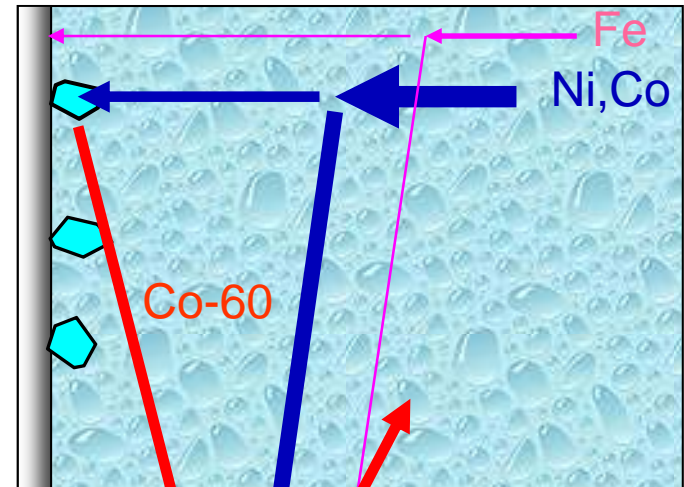
Behavior on  
fuel surface



Adhesion of  
radioactive  
material to  
piping

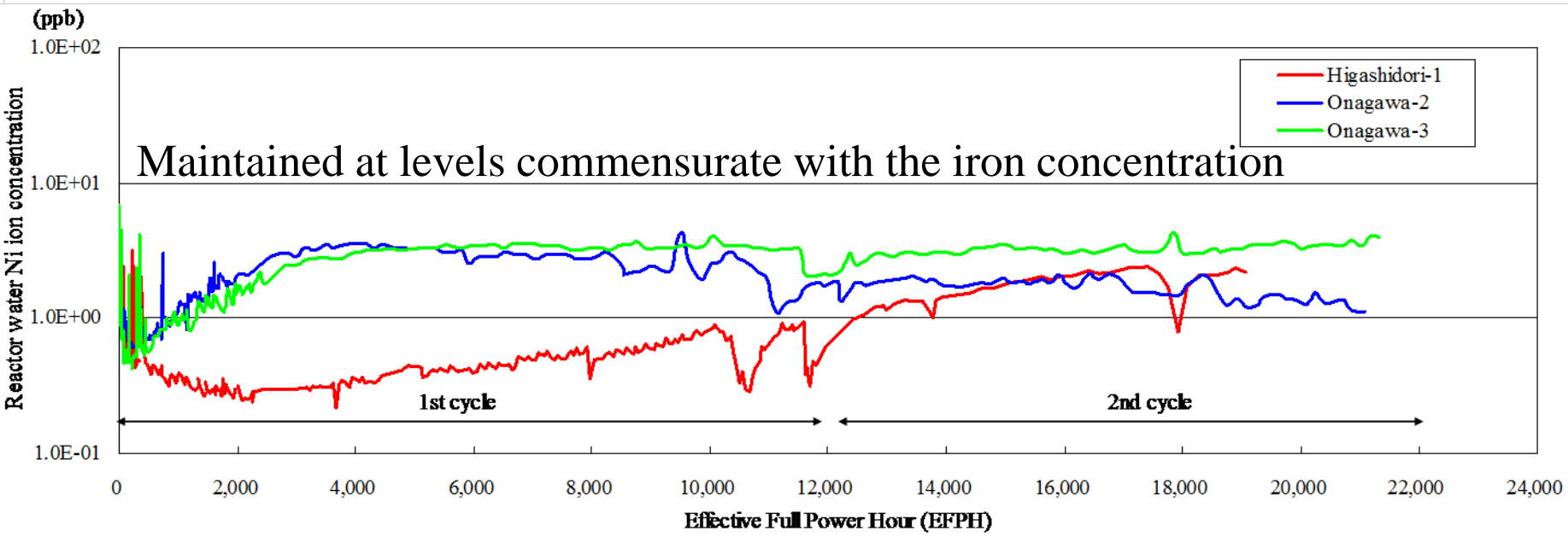
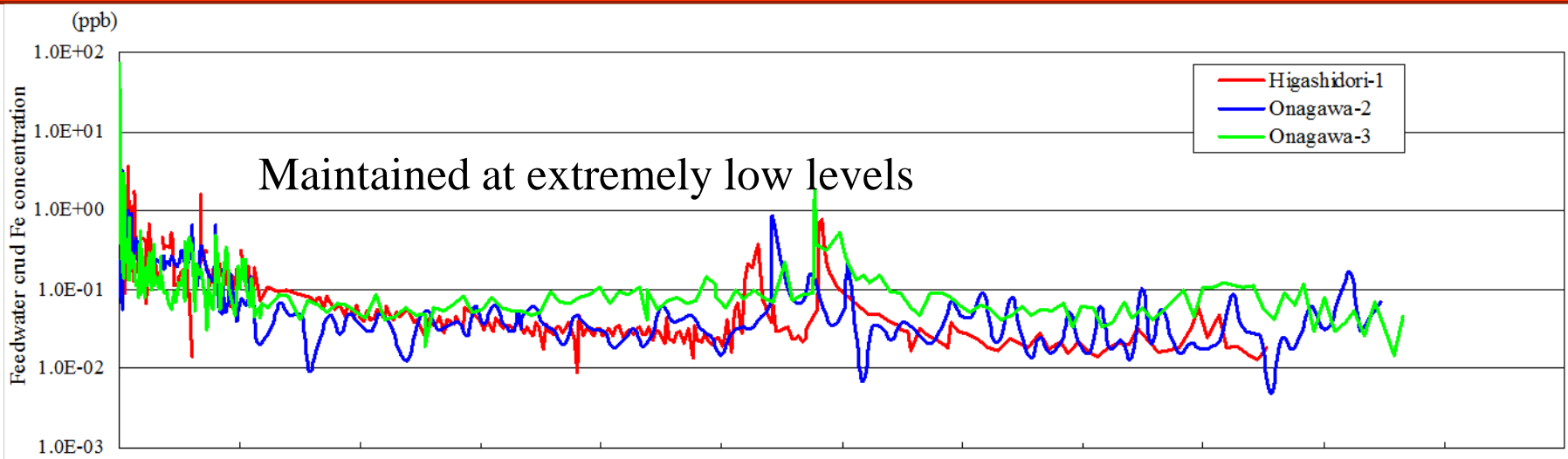


## Operation with extremely-low Fe high Ni



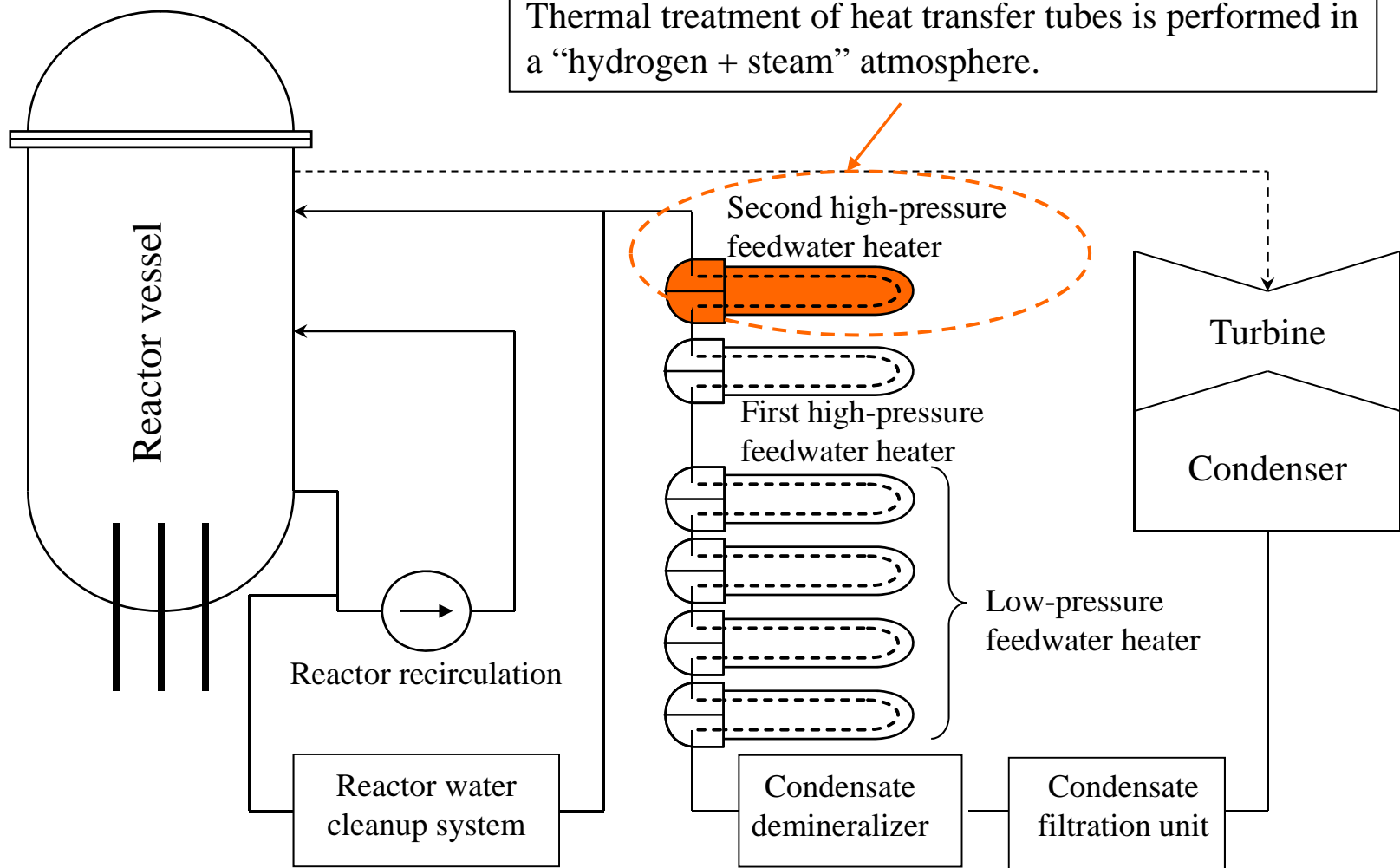


# Water chemistry control (progress of feedwater Fe crud concentration and reactor water Ni ion concentration)



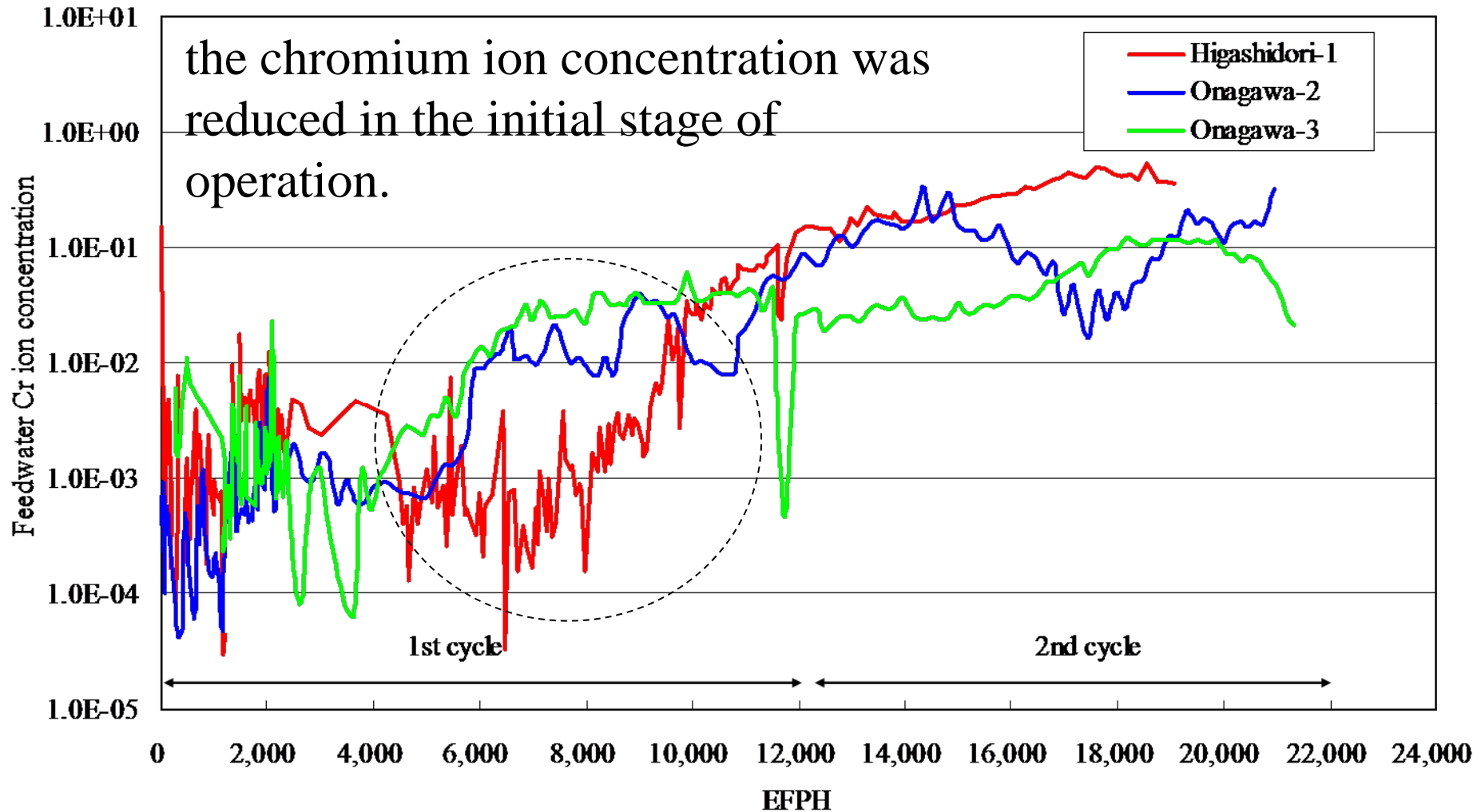
# Pre-filming of feedwater heater tubes

**【Steam oxidation treatment】**  
Thermal treatment of heat transfer tubes is performed in a “hydrogen + steam” atmosphere.



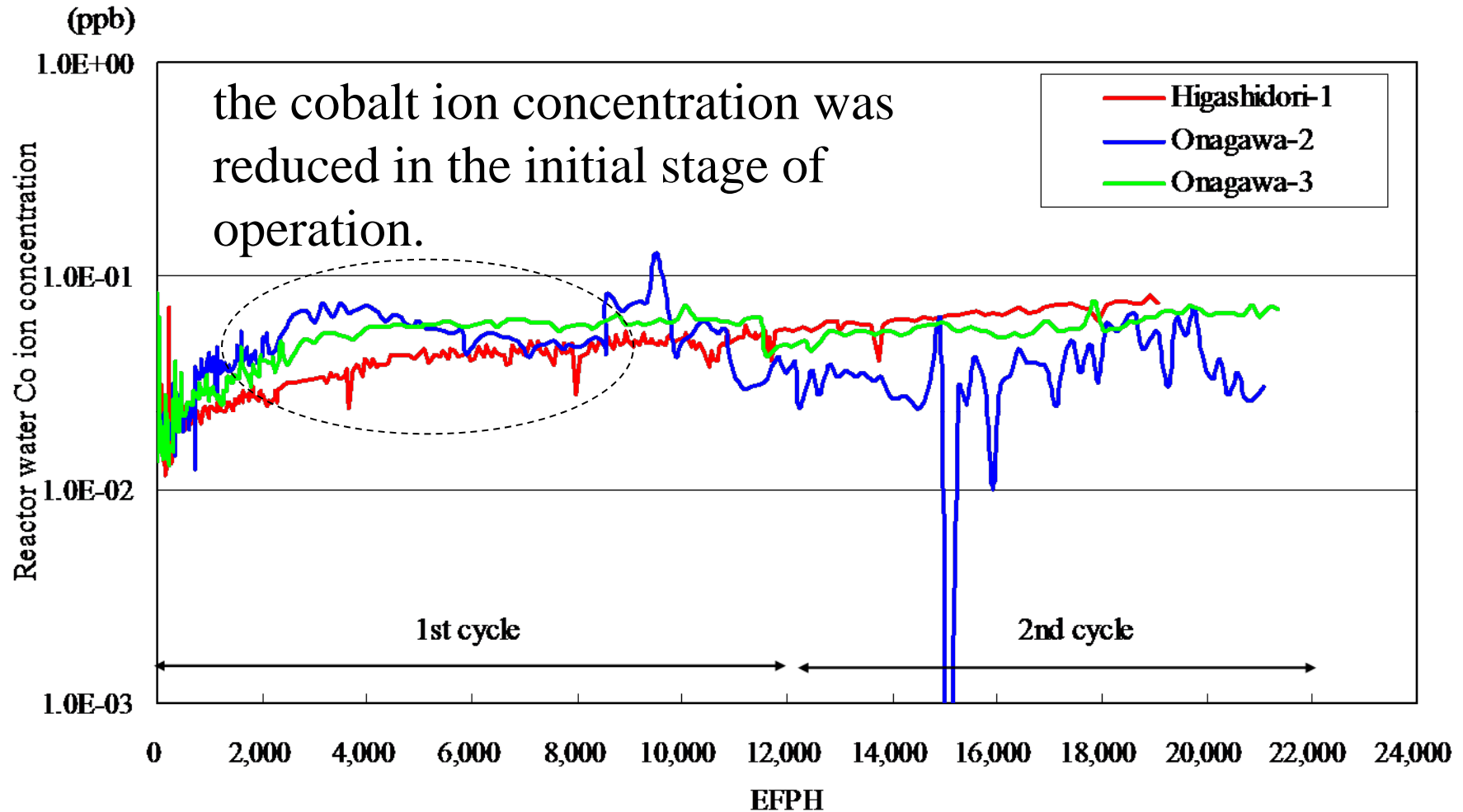
# Progress of Cr ion concentration in feedwater

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# Progress of Co ion concentration in reactor water

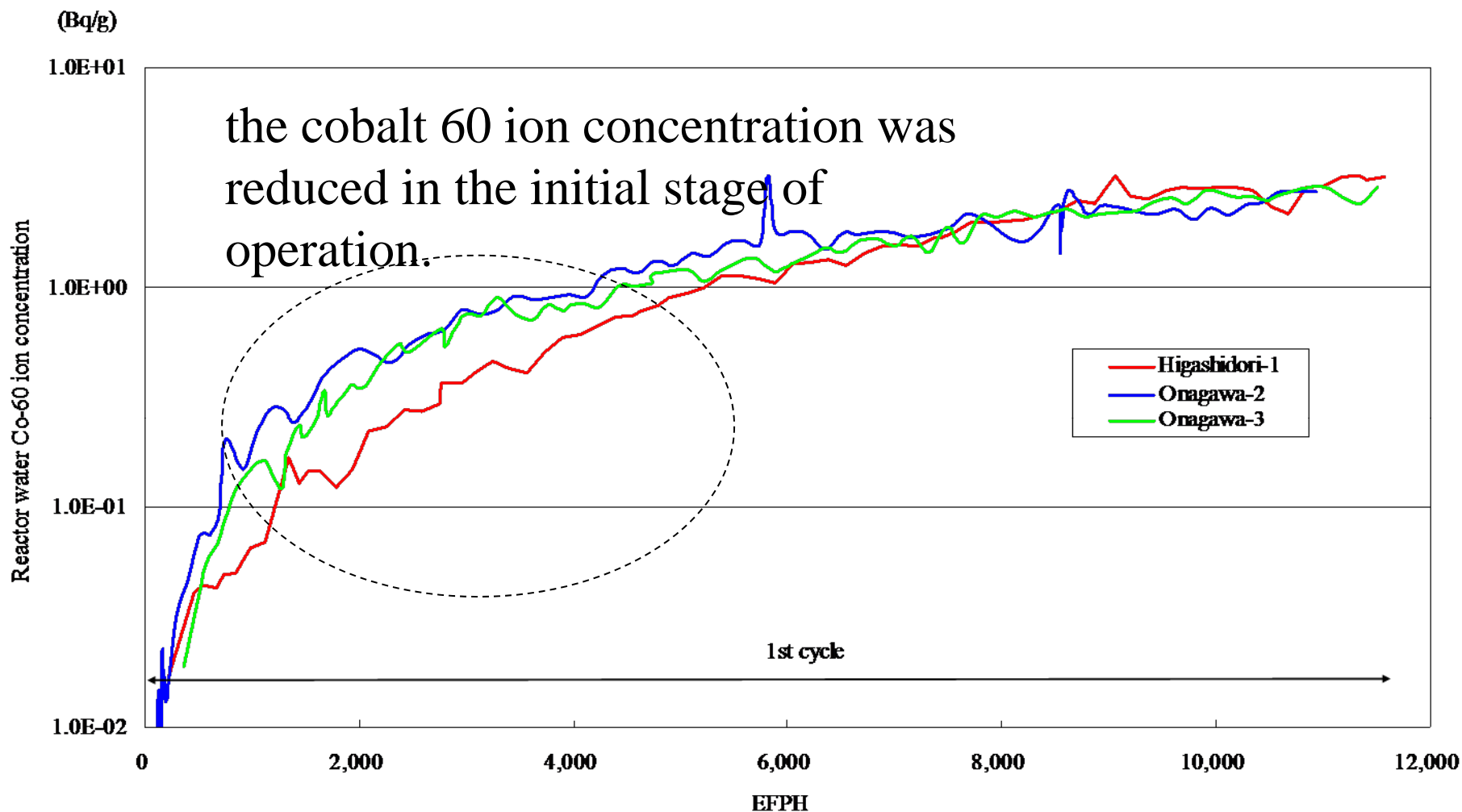
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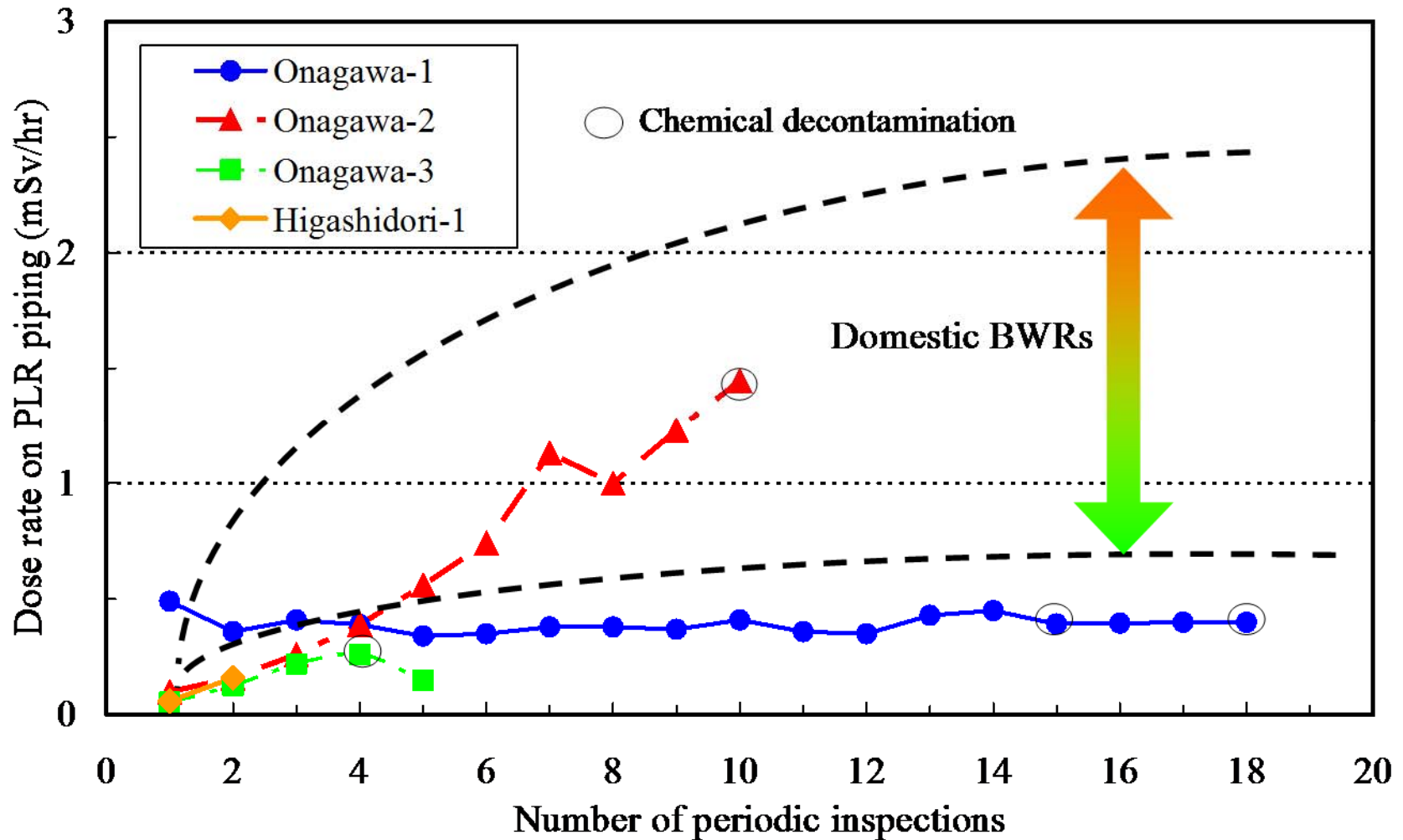
# Progress of Co-60 ion concentration in reactor water

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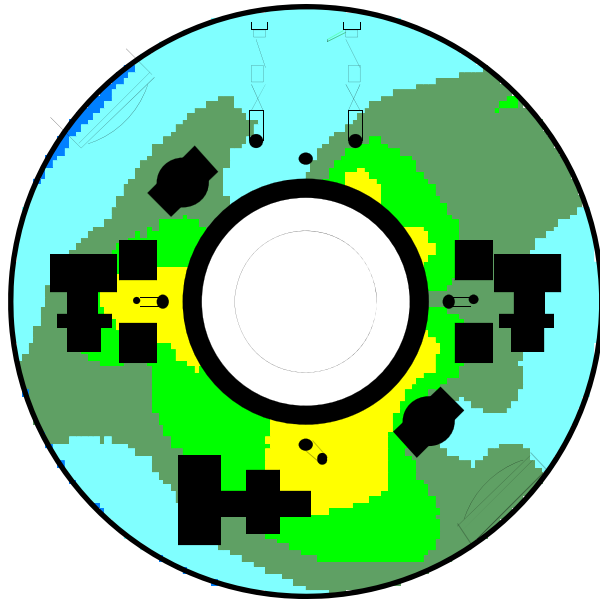
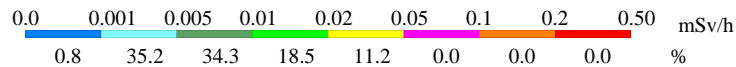
# Dose rate on PLR piping

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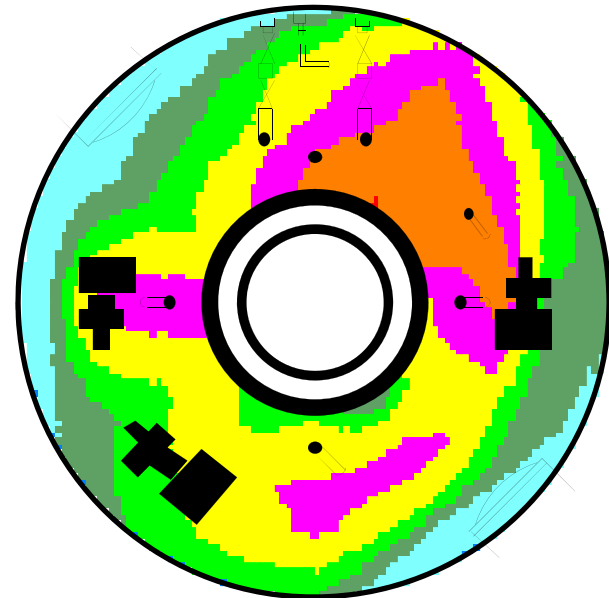
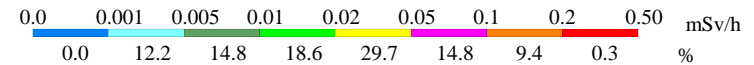


# Air dose rate in reactor containment vessel

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Higashidori Unit 1 First measurement



Onagawa Unit 3 First measurement

Four days after reactor shutdown On the floor of recirculation pump motor





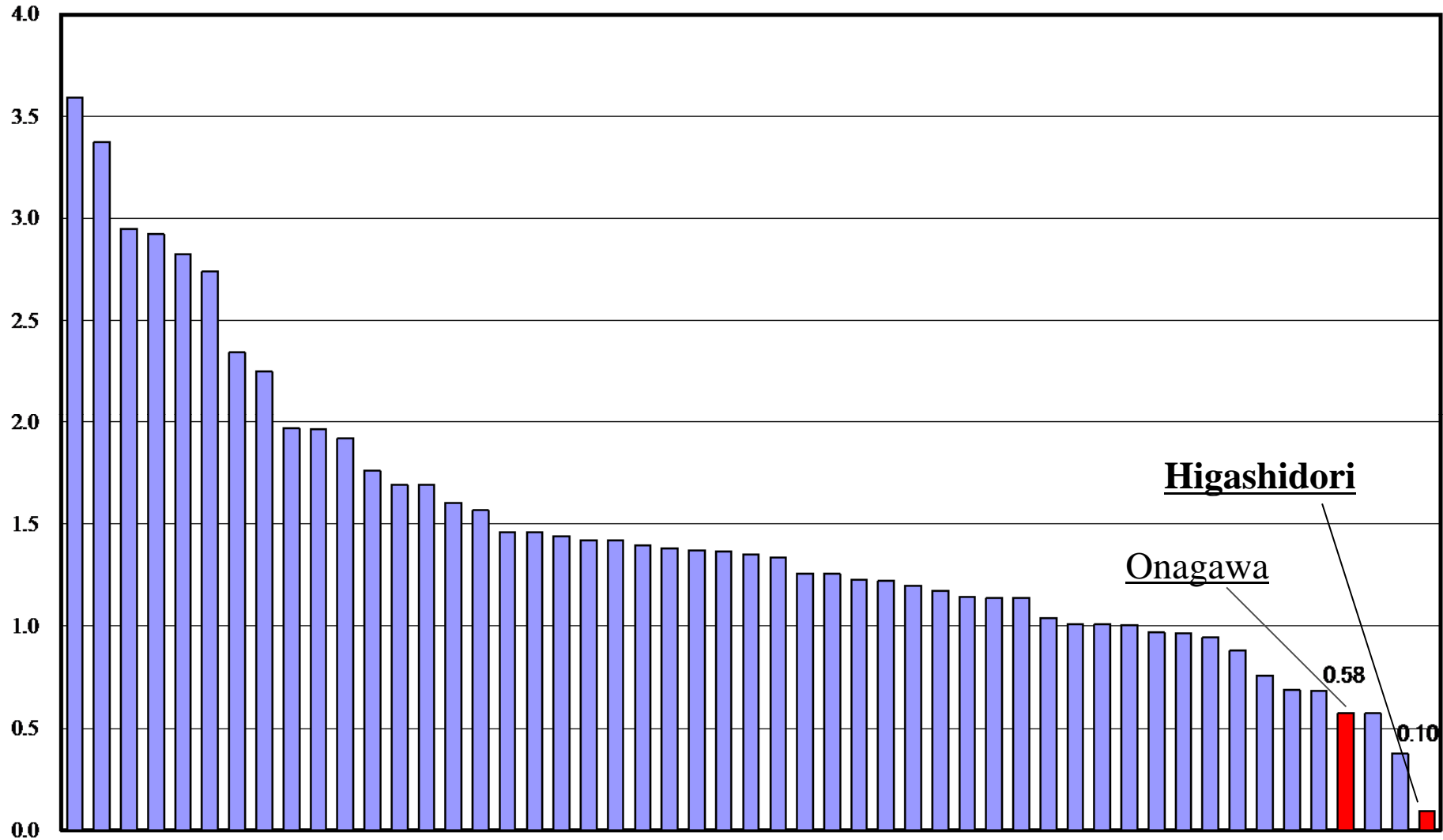




# 3-year rolling BWR average annual collective dose per reactor by site (2005-2007)

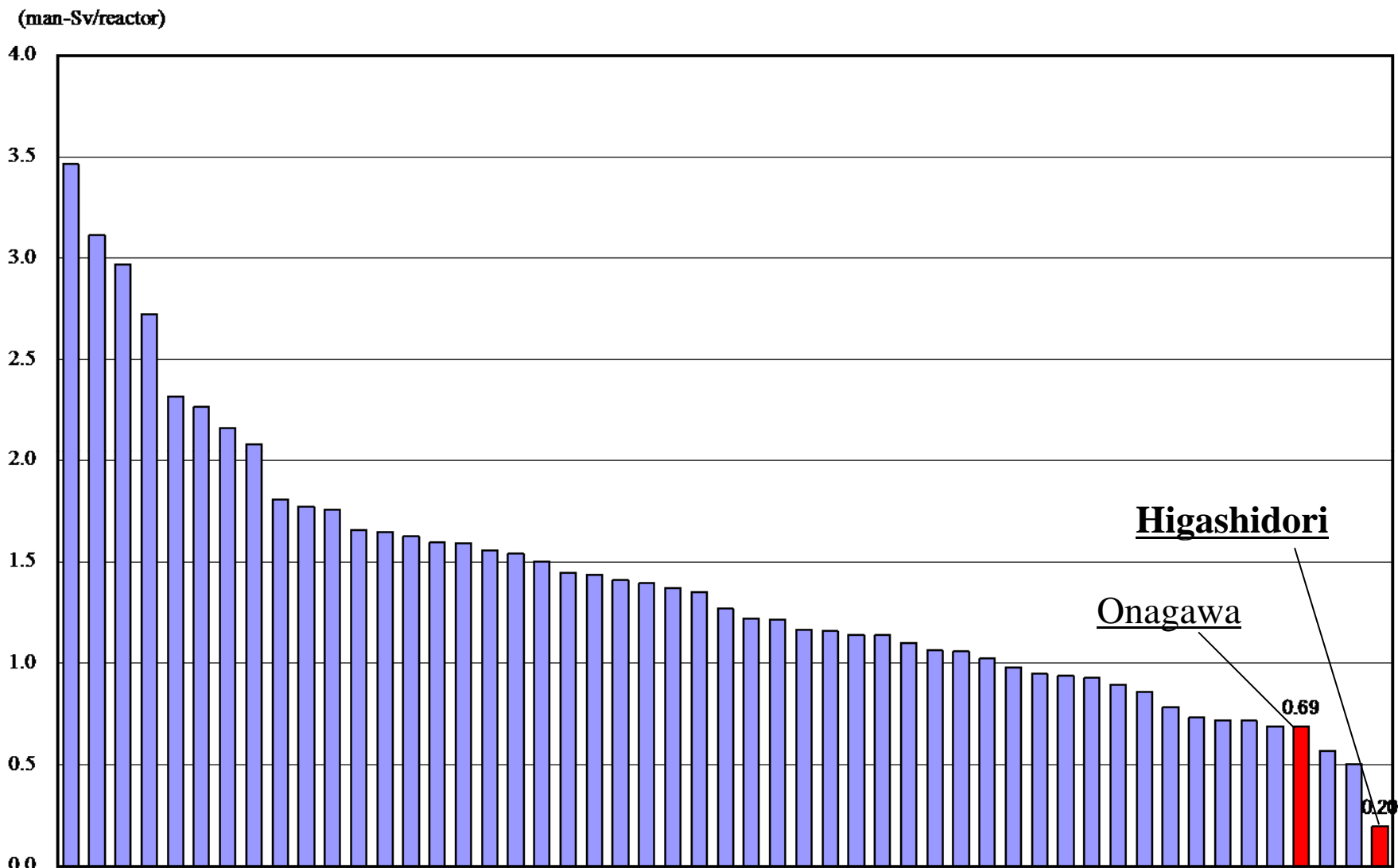
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(man-Sv/reactor)



# 3-year rolling BWR average annual collective dose per reactor by site (2006-2008)

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**It is easy to fear something too  
much or too little,  
but it is difficult  
to fear things reasonably.**

**Tank you for your attention**

