



Dose Rate Reduction Methods at Shimane Nuclear Power Station

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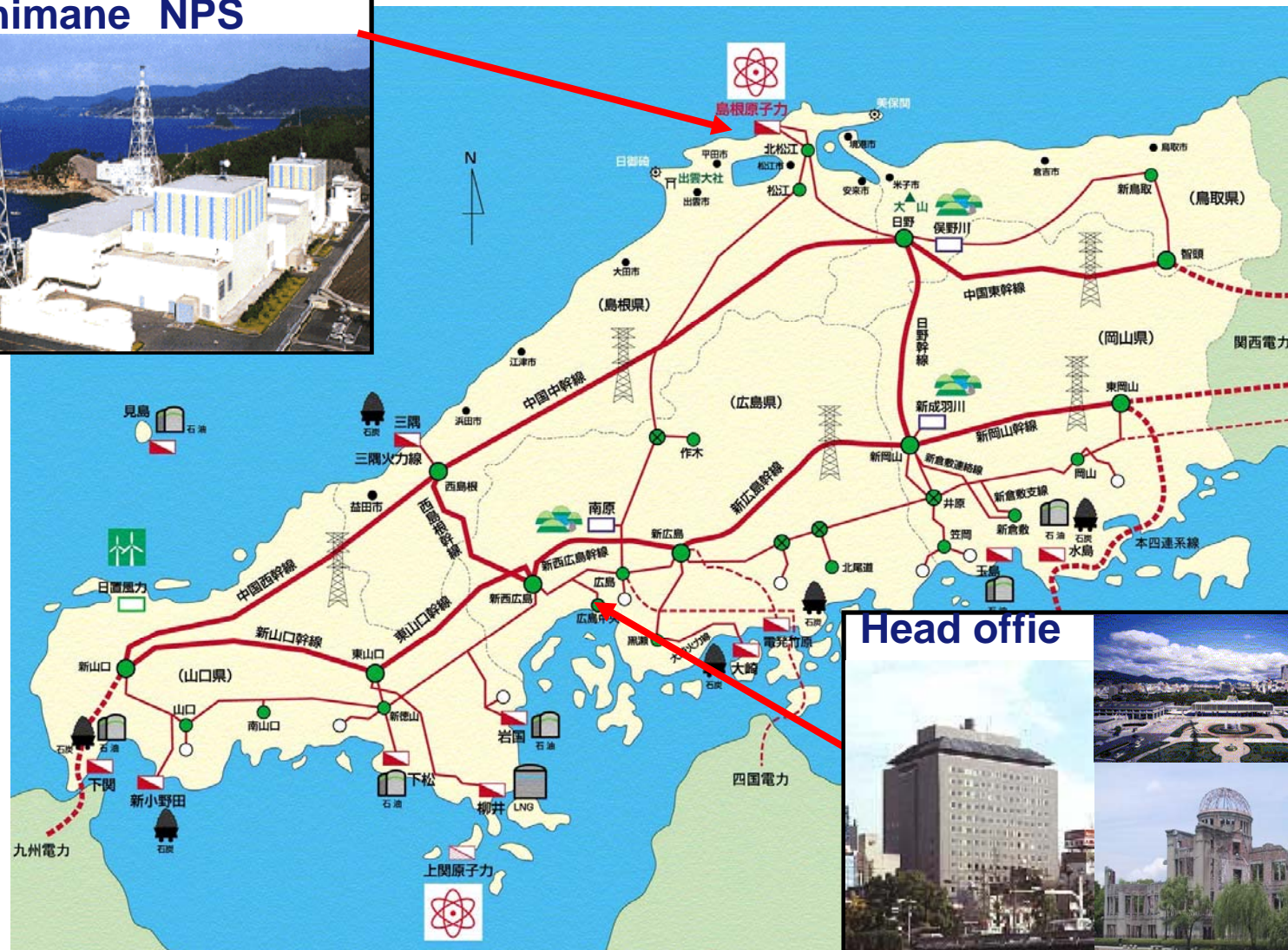
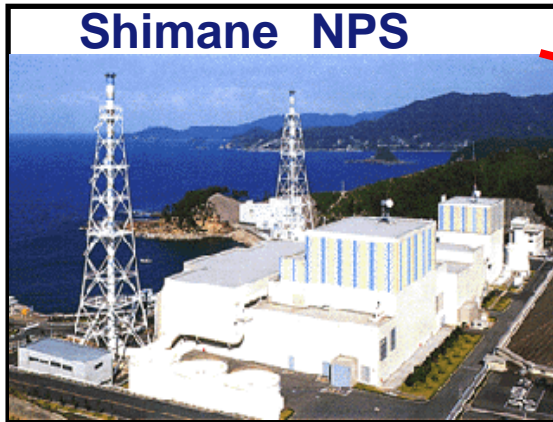


いいことプラス

Energia

0.The location of Shimane NPS and Head office

Shimane NPS



Head office



1.Introduction

- Shimane Nuclear Power Station Unit 1 continues operating smoothly since commercial operation started in 1974.

An increasing trend of the dose rate has been observed since the hydrogen injection was applied at 21st operating cycle (1998) and the dose reduction became the urgent problem.



2(1).Radiation exposure of the outage

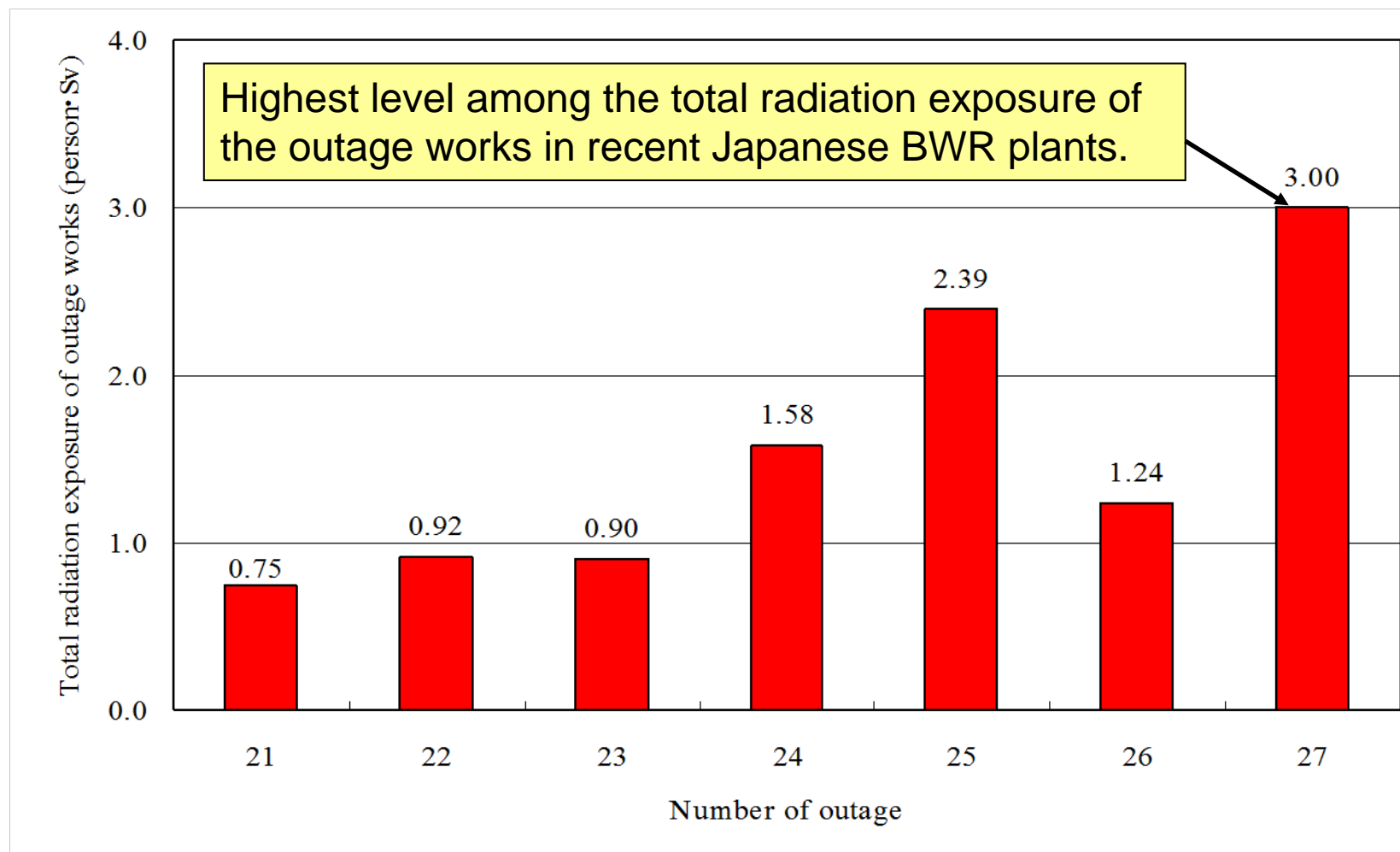


Figure 1 Radiation exposure at Shimane Nuclear Power Station Unit 1 after hydrogen injection

2(2).The dose rate of the PLR piping

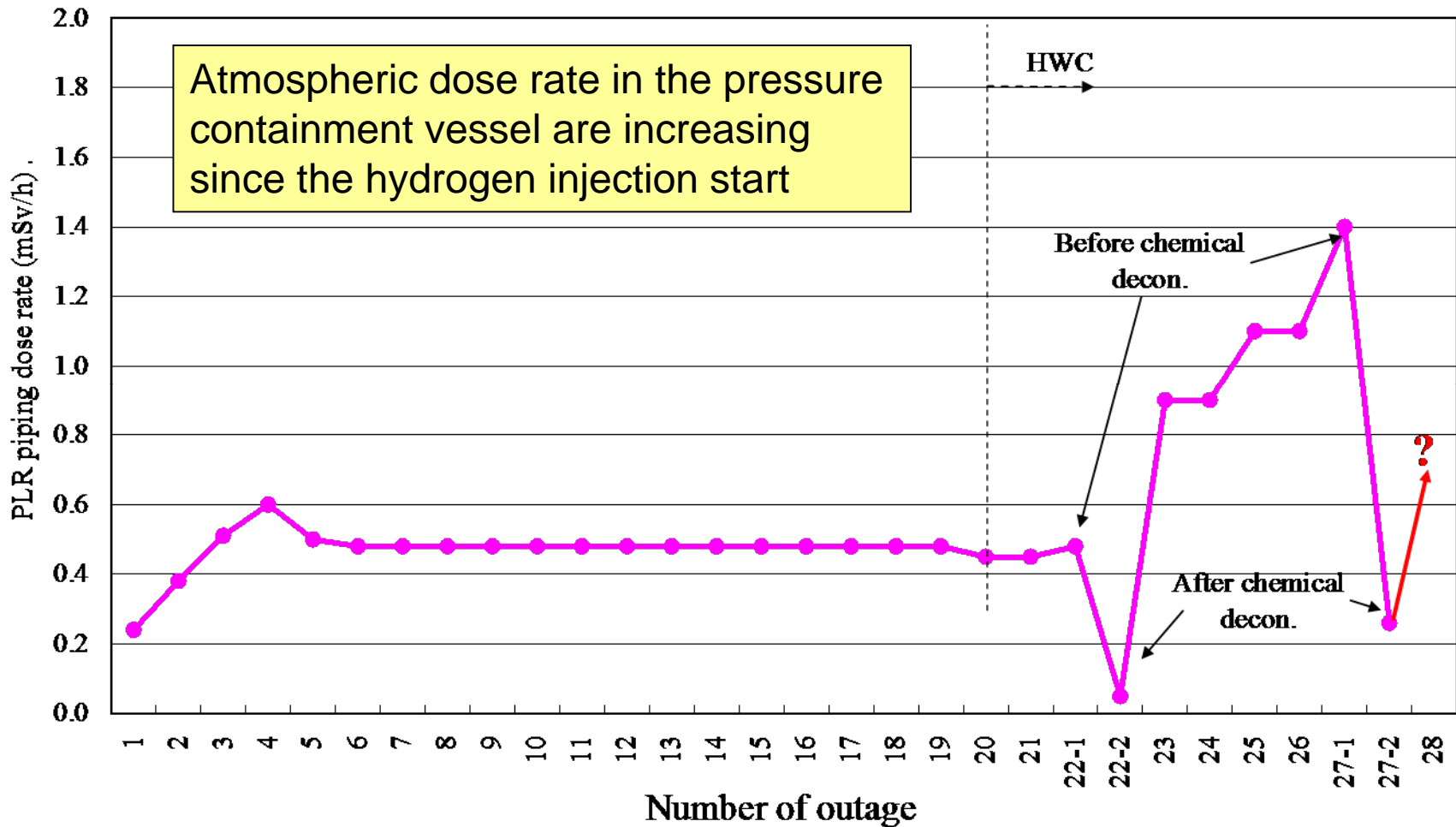


Figure 2 PLR dose rate trend at Unit 1

3.Dose rate reduction committee

- 3WG were settled under the committee.
- Maintenance staff and headquarter persons were added to the committee .

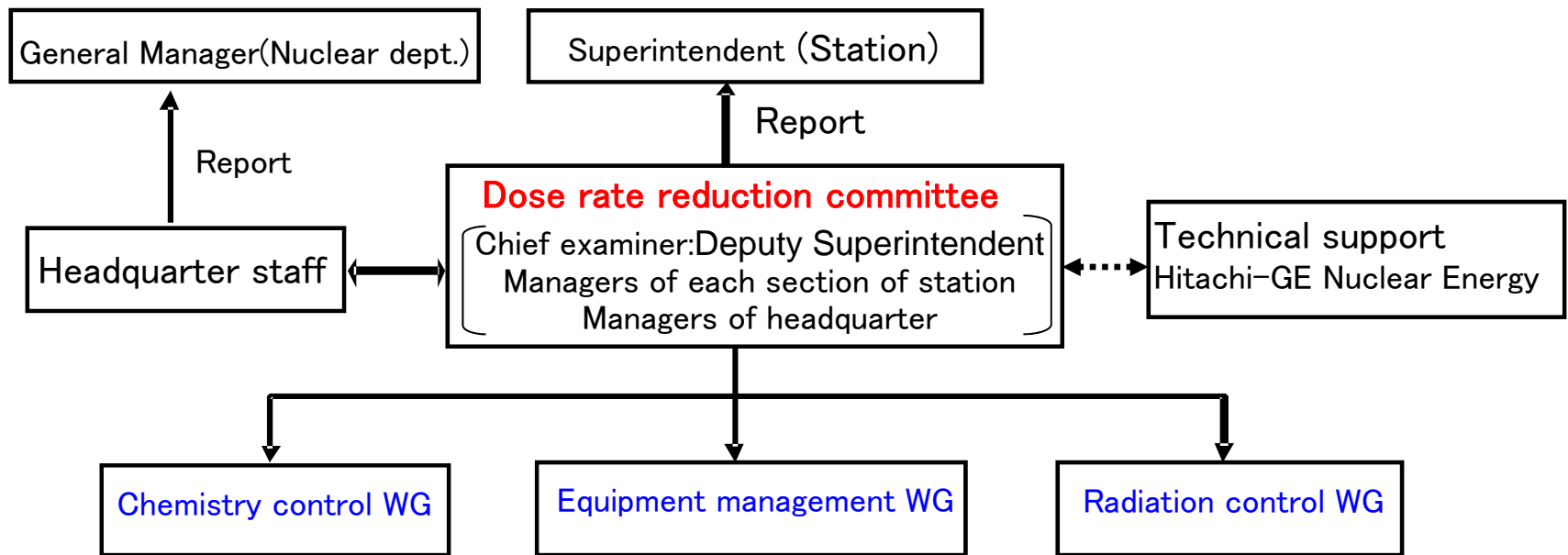


Figure 3 Structure of dose rate reduction committee

4.Examination items of dose rate reduction committee

- Short term target is to lessen the dose rate of 28th outage at Unit 1.
- Middle and long term items aim for permanent dose rate reduction.

| Item | Chemistry control WG | Equipment management WG | Radiation control WG |
|------------|--|---|---|
| Objectives | Dose rate reduction in PCV | Improvement of work methods and work environment | Improvement of radiation control |
| Matters | NWC pre-oxidation operation, CF bypass operation, Hi-F Coat, etc | Enlargement of chemical decontamination area ,etc | Piping dose rate prediction method, Temporary shielding, Survey of good practice, etc |

Extension to middle and long term

| | | | |
|------------------------------|--|---|---|
| Middle and long term matters | Zinc injection, Improvement of water chemistry control, etc | Adjustment of execution timing of inspection to reduce dose rate Chemical decontamination to Valve and PLR-pump impeller , etc | Establishment of piping dose rate prediction method Improvement of mounting method of temporary shielding ,etc |
|------------------------------|--|---|---|

Figure 4 Examination items at dose rate reduction committee

5(1).Applied countermeasures until 28th outage

- Hi-F Coat was applied after chemical decontamination at the 27th outage.
- NWC pre-oxidation operation of 90 days was conducted at the beginning of the 28th operating cycle to form a fine oxide structure under NWC conditions.

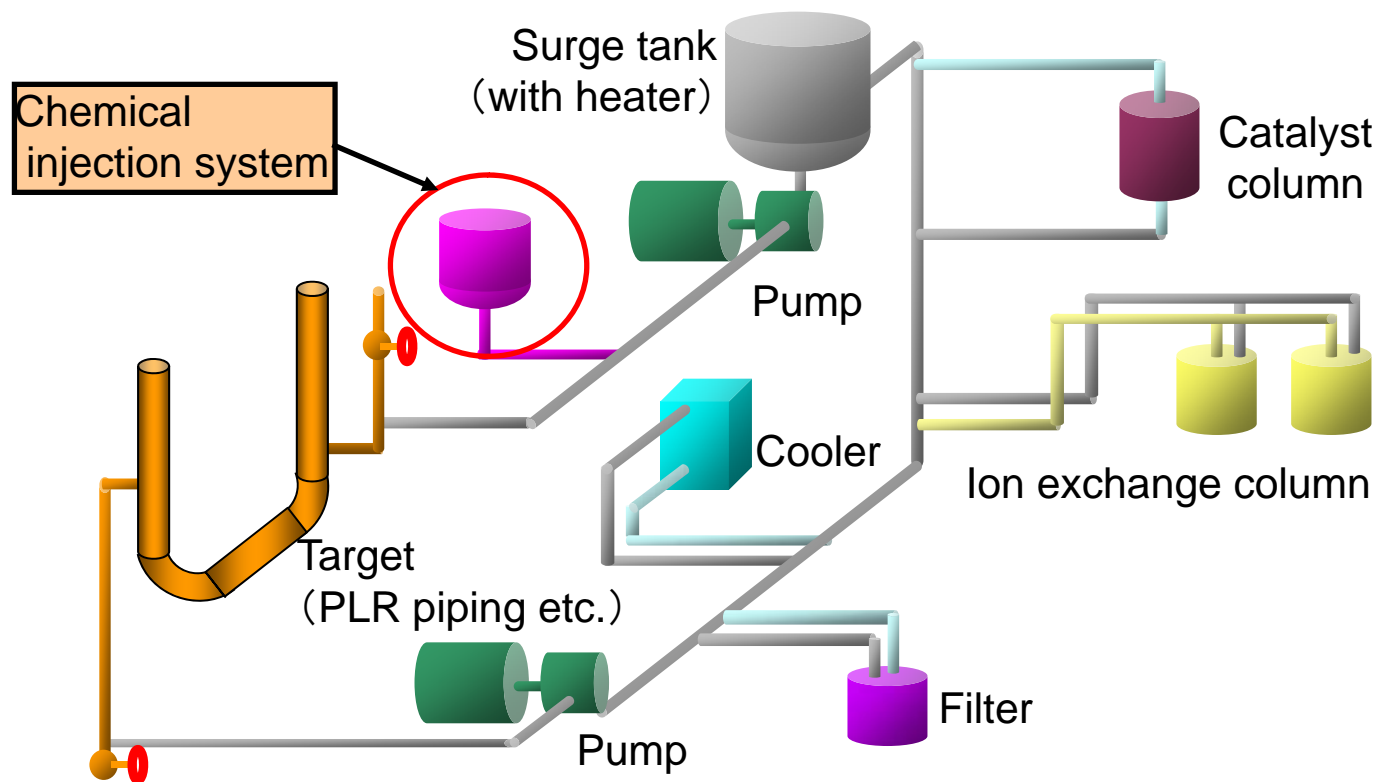


Figure 5 Outline of Hi-F Coat treatment equipments

5(2).Results of countermeasures(1) dose rate

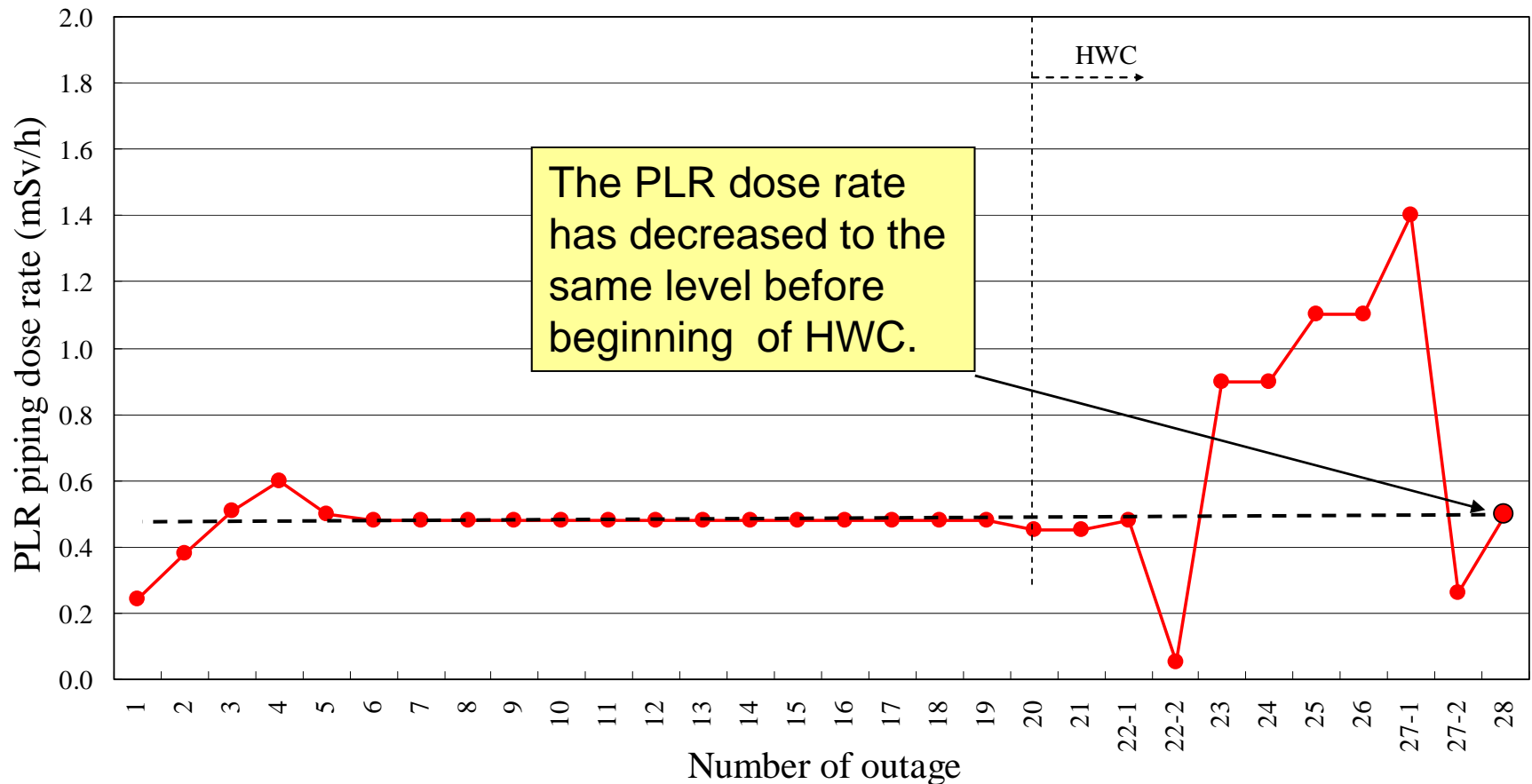


Figure 6-1 PLR dose rate trend at Unit 1

5(2).Results of countermeasures(2) dose rate

- Dose rate of PLR piping was about 0.5 mSv/h at the 28th outage at Unit 1 and became much lower than that at the 27th outage

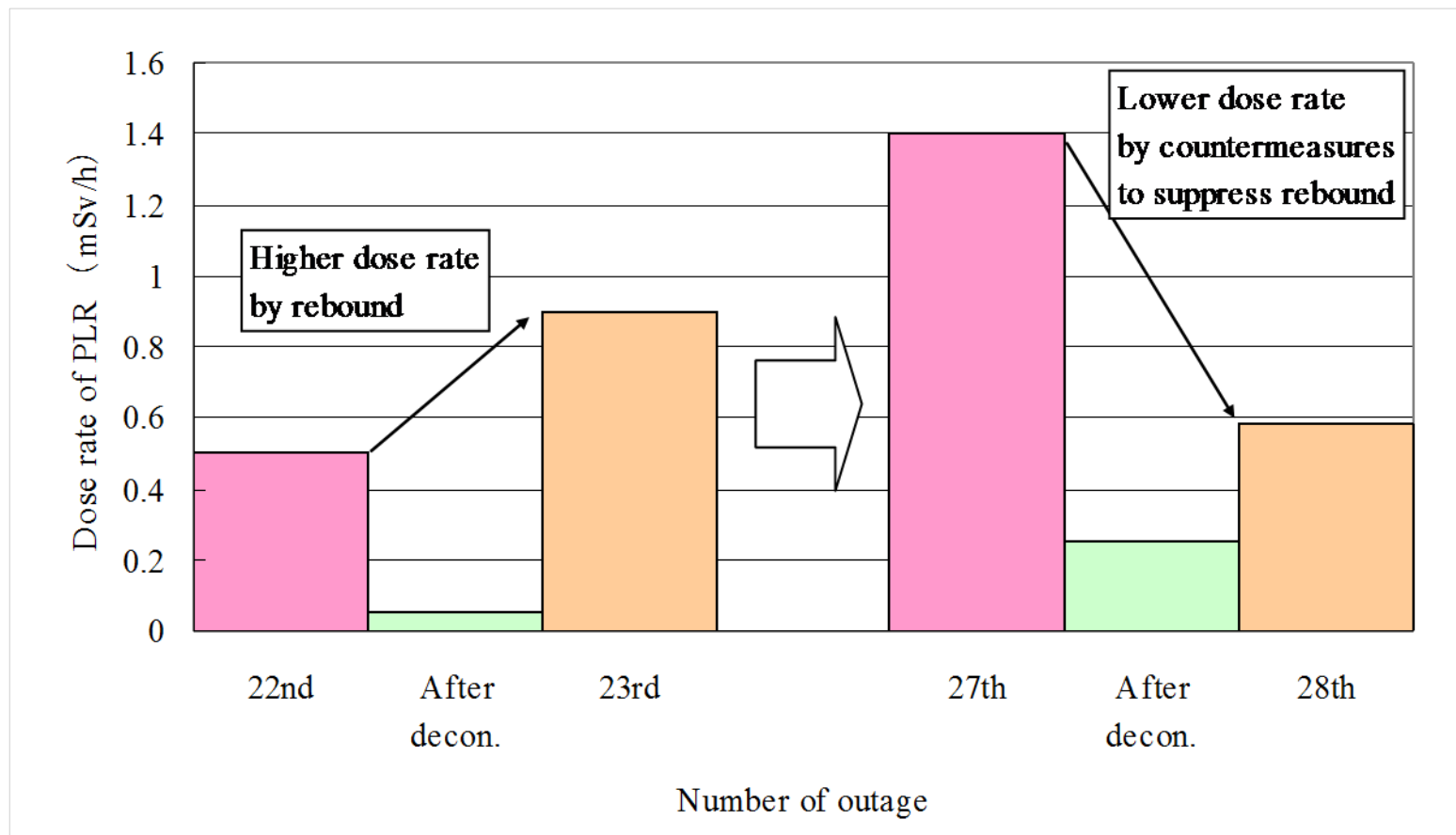


Figure 6-2 Dose rate change of PLR piping after the 27th outage

5(2).Results of countermeasures(3) total radiation exposure

- Total radiation exposure could be suppressed to about 70% of the planned value.
- Term of the outage could be cut for about 40 days compared to the original plan

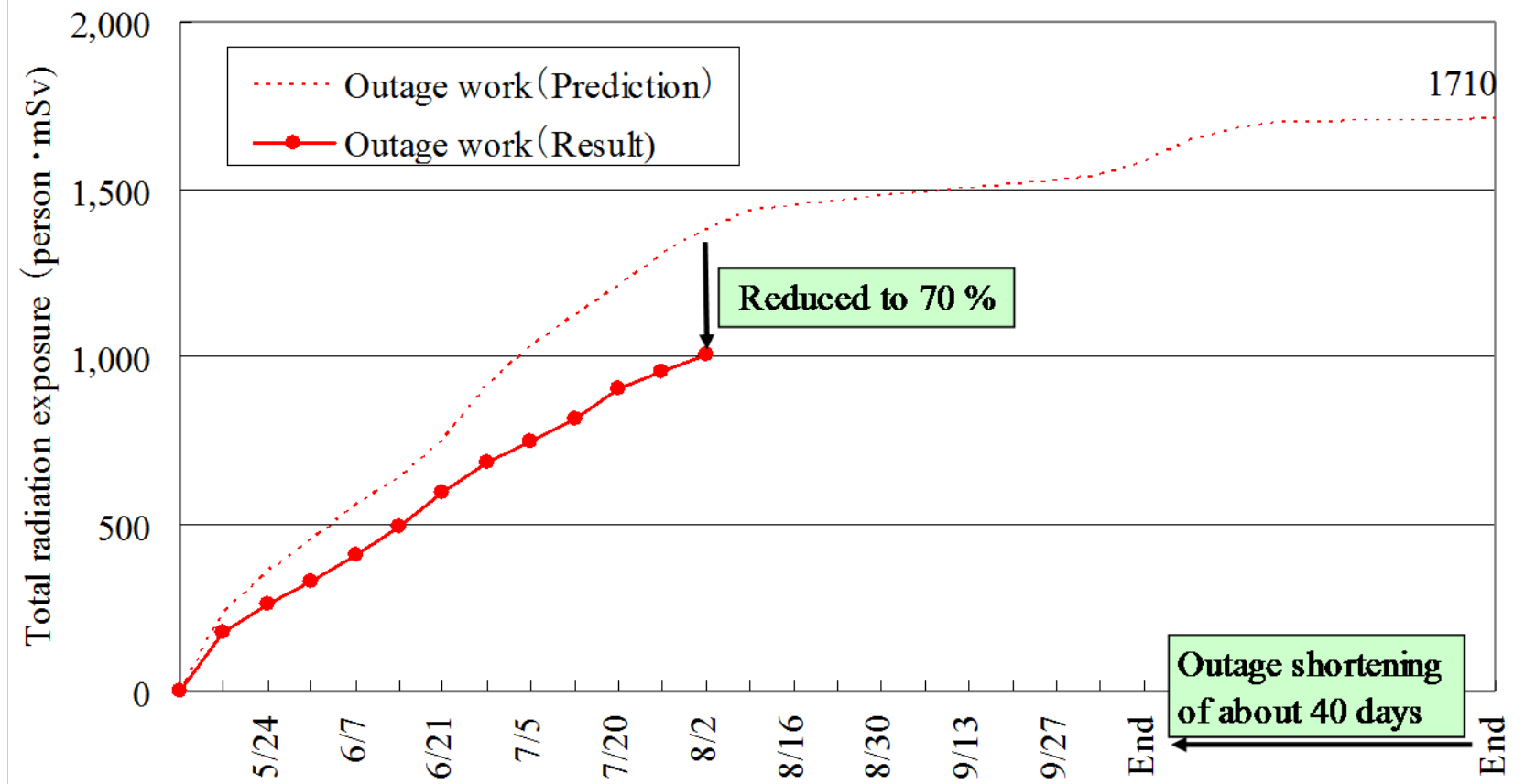


Figure 7 Trend of total radiation exposure during the 28th outage (Outage works)

6.Future activities(1) On-line monitor

- Experimental equipments to gather basic data such as energy distribution of gamma ray and atmospheric dose rate in the PCV.



Figure 8 Appearance of experimental equipments

6.Future activities(2) Zinc injection

- Zinc injection is a permanent countermeasure to reduce dose rate to meet the company need to continue hydrogen injection.

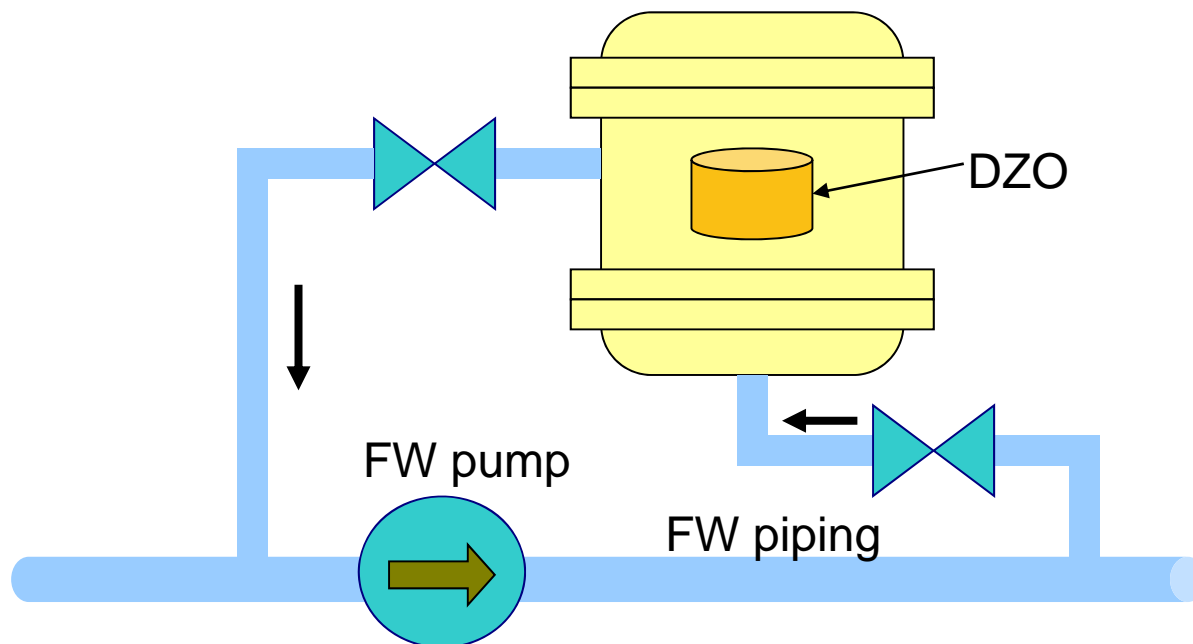


Figure 9 Image of zinc injection system

7.Conclusion



- We have decreased the dose to the same level before beginning of HWC.
- We will evaluate the contribution and durability of Hi-F Coat etc..
- We will research the Zinc injection etc. as further countermeasures.