

# Introduction of the dose and radioactive waste reduction program in Kashiwazaki-Kariwa NPS

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Tokyo Electric Power Company Holdings, Inc.  
Kashiwazaki-Kariwa Nuclear Power Station

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## **Significance of introduction of dose and radioactive waste reduction program**

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**To continuously improve radiation protection and radioactive solid waste management, apply the most effective programs throughout the facility to reduce radiation risks and hazards, and achieve the world's highest level of radiation safety**

### **■ Critical Success Factor**

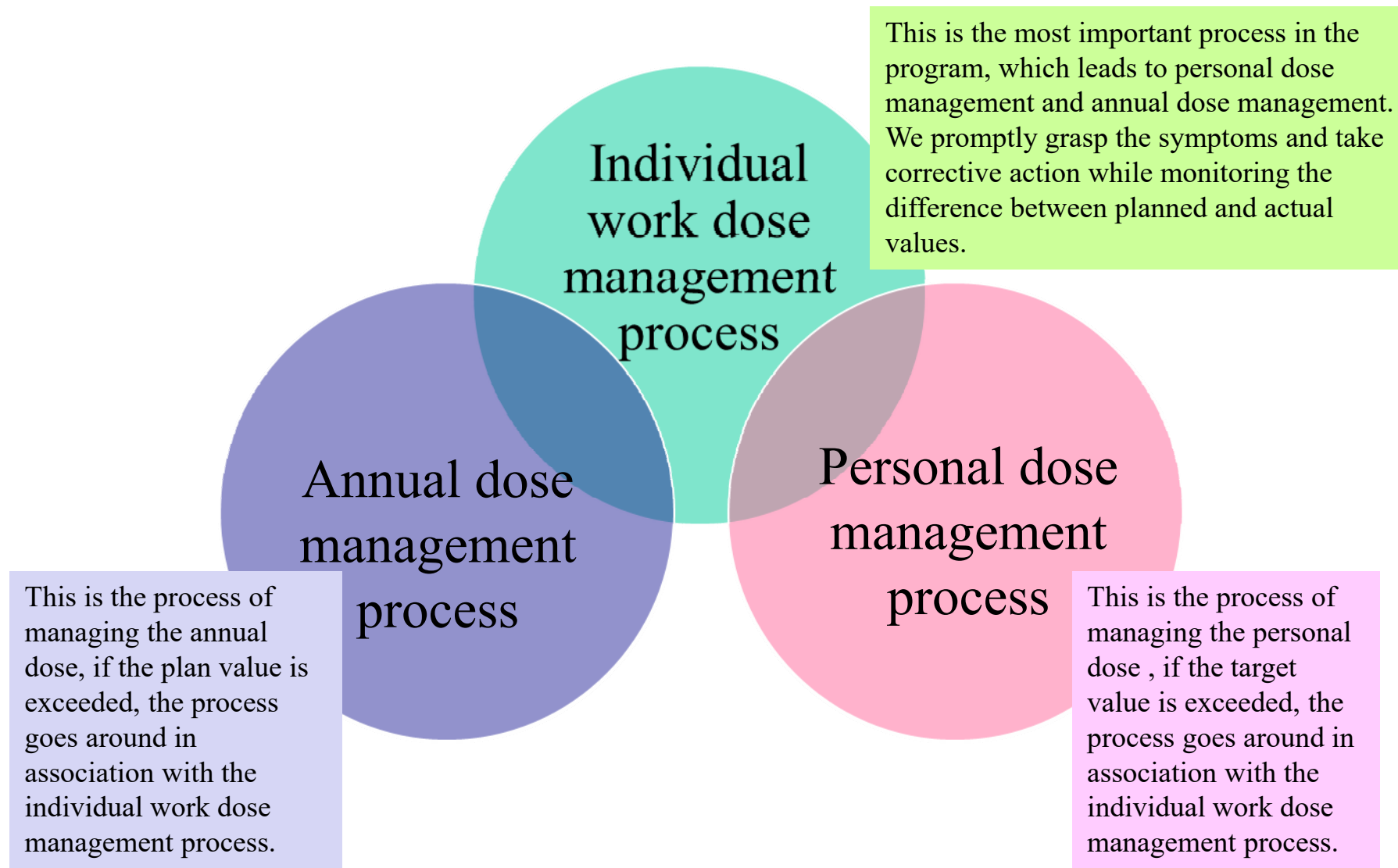
- Implementation of dose and radioactive waste reduction program
- In advancing the program, not only the Radiation Protection Department but the operating department and the maintenance department work together from the work planning Stage.

### **■ The state after improvement**

- Each department is accounting for the dose and its management of the own department and is actively executing ALARA.
- Bringing in goods to controlled area is managed, and all workers voluntarily take the initiative to limit the amount of radioactive waste generated.

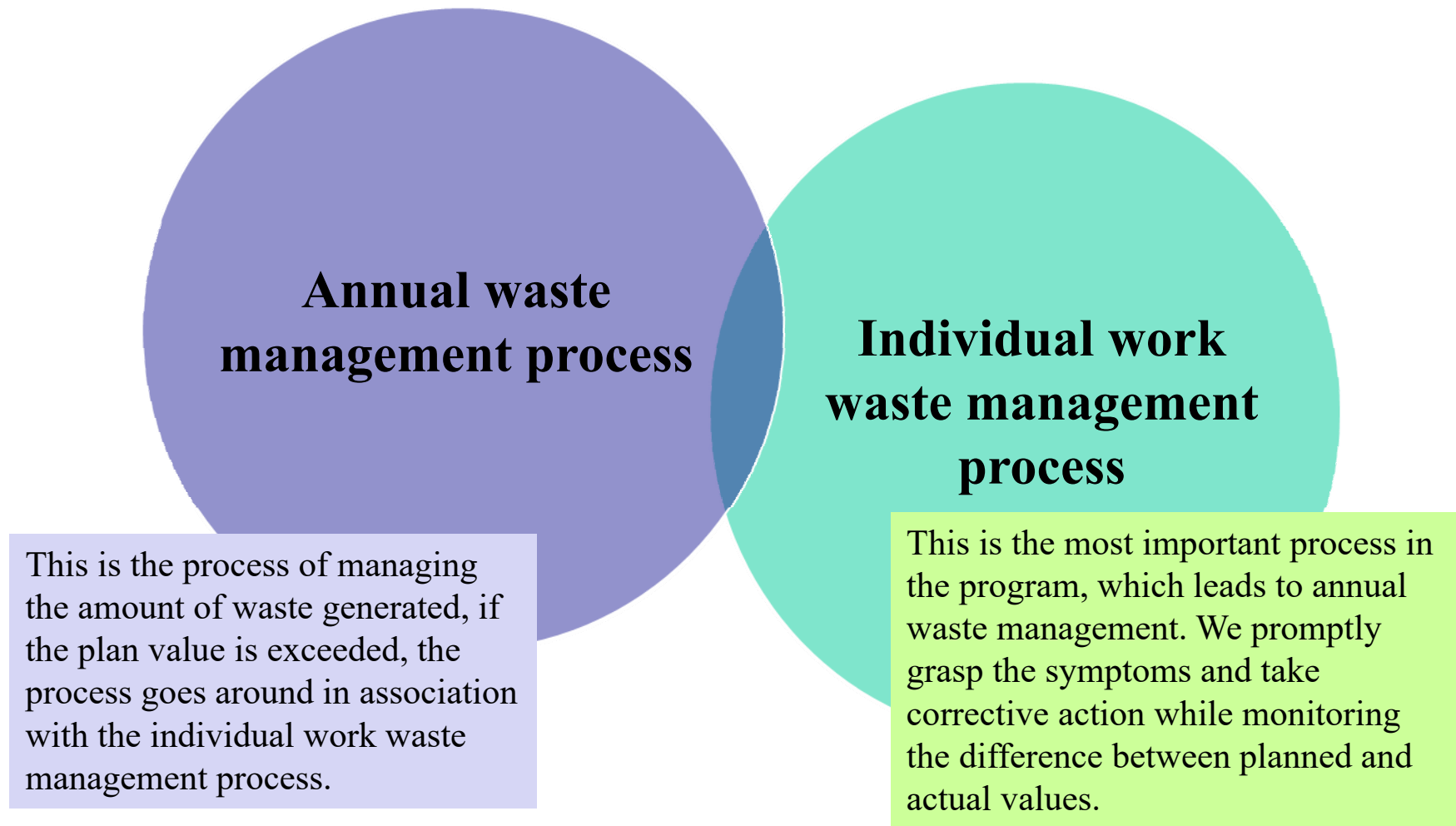
# Configuration of Dose reduction program

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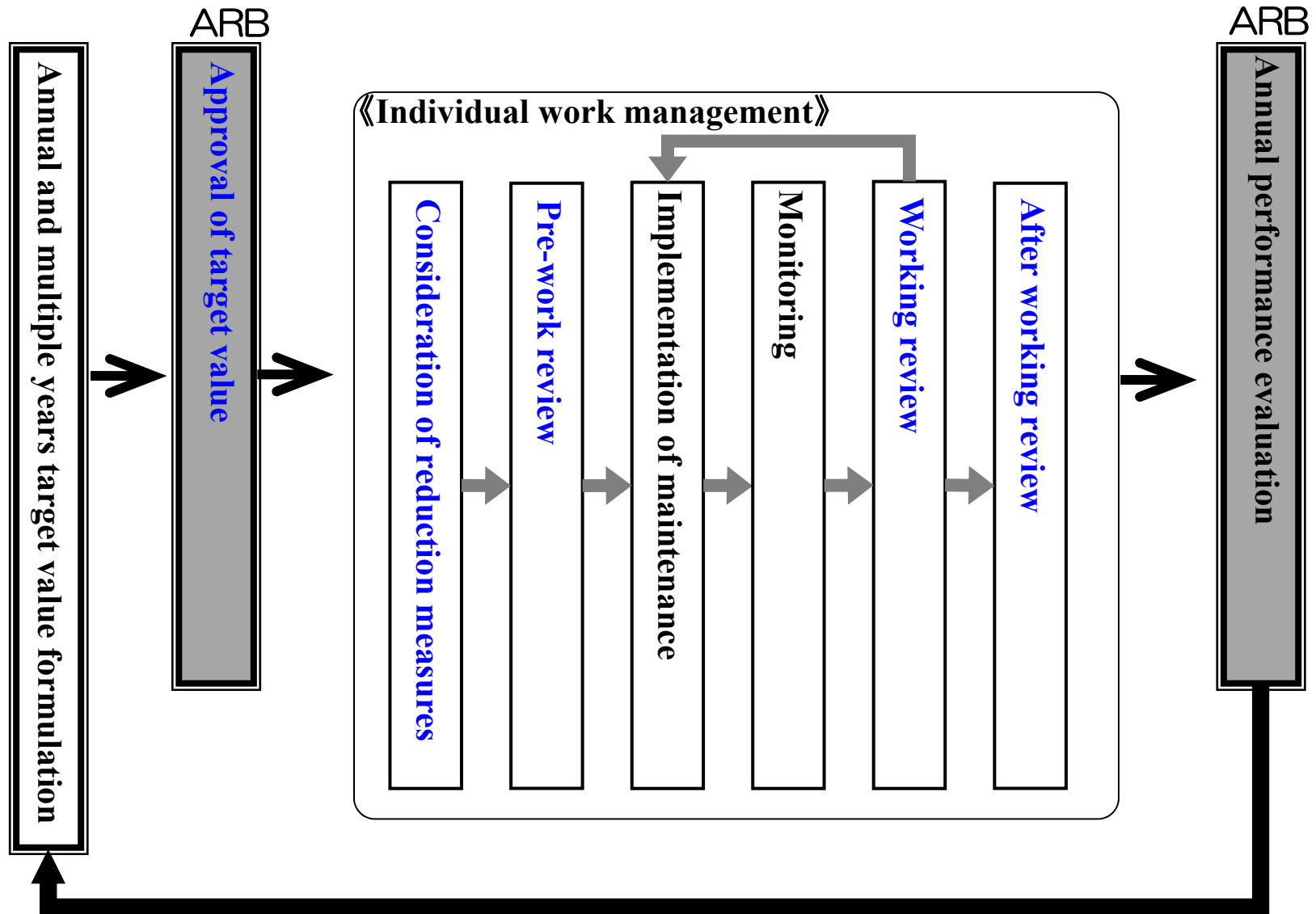
# Configuration of radioactive waste reduction program

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(Dose and waste reduction program)

## Program flow



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<Dose reduction program>

# **1. Annual dose management process**

(Dose reduction program)

## 1-1 Concrete method of annual and 3 years dose management : Set target value

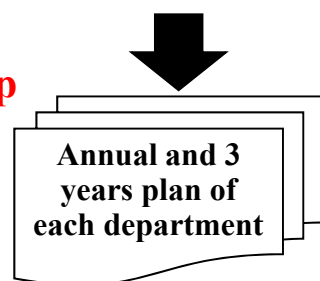
### ① Annual and 3 years dose plan formulation for each group

工事件名	号機	作業区分	作業開始	作業終了	予想総線量 人mSv	3ヶ年計画			月別計画(2018年度)											
						2018年度 予想	2019年度 予想	2020年度 予想	4月	5月	6月	7月	8月	9月	10月	11月	12月	1月	2月	3月
〇〇〇〇工事	K6	安全	2018/3/17	2018/12/22	20	20	—	—												
〇〇〇〇改造工事	K7	改造	2018/9/12	2019/12/31	180	80	100	—												
〇〇〇〇委託	K7	通常	2018/4/1	2019/3/31	10	10	—	—												
〇〇〇〇工事	K1	安全	2018/4/1	2021/9/30	25	10	10	5												
〇〇〇〇工事	K1	安全	2019/8	2020/5	100	—	50	50												
〇〇〇〇改造工事	K1	安全	2019/5	2020/3	200	—	50	150												

Create forecasts in individual work units

More than 100 predicted man-mSv planned monthly

② Create for each group and compile it in each department



Annual and 3 years plan of power station

③ Compile each department plan value, and set the target value of power station

Annual and 3 years target of power station

④ Approval the power station target at the ARB

Approval

(Dose reduction program)

## 1-2 Report on High dose work, Each department, Each group

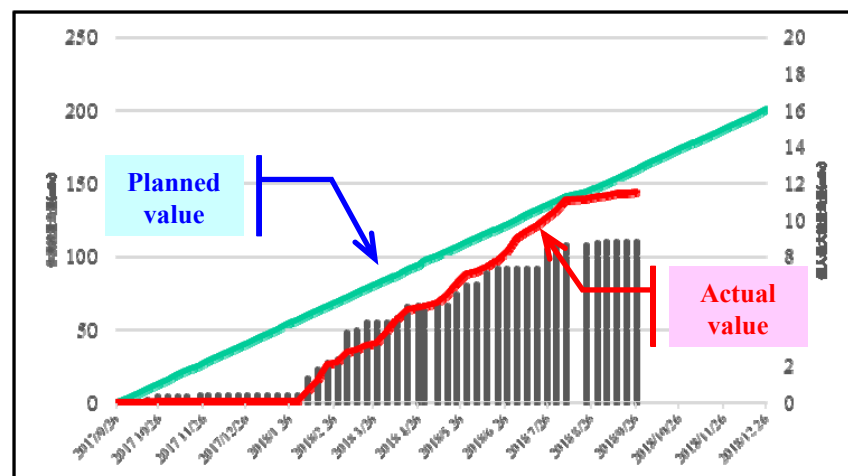
Report from the radiation management group once a month

### Items to check for each group

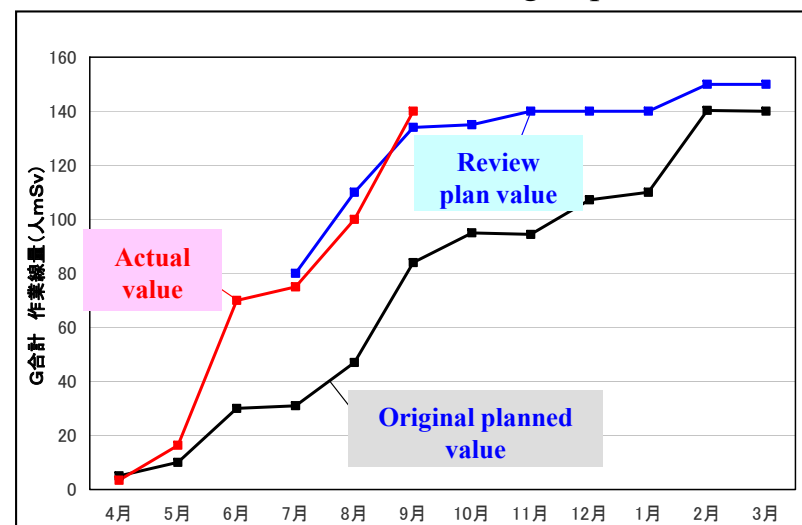
- ①Planned value and actual value
- ②If there is a difference, consider the cause and measures
- ③Information sharing at group and sectional meetings

### ◆ Dose trend of High dose work ◆

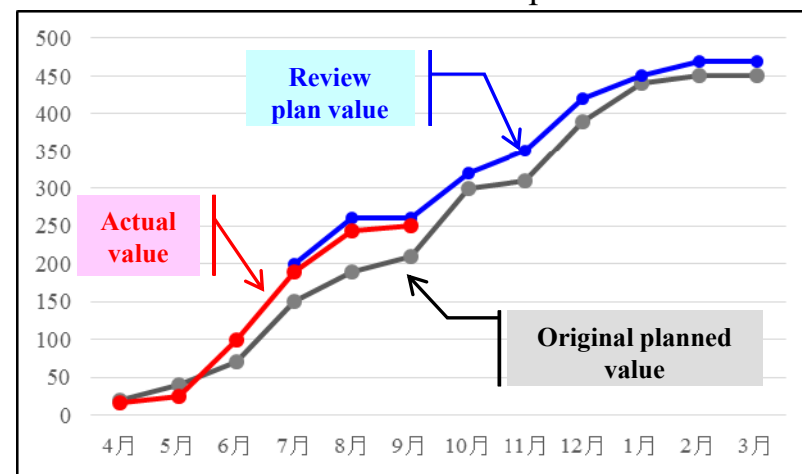
(Objective of planned value 100 mSv or more)



### ◆ Dose trend of Each group ◆



### ◆ Dose trend of department

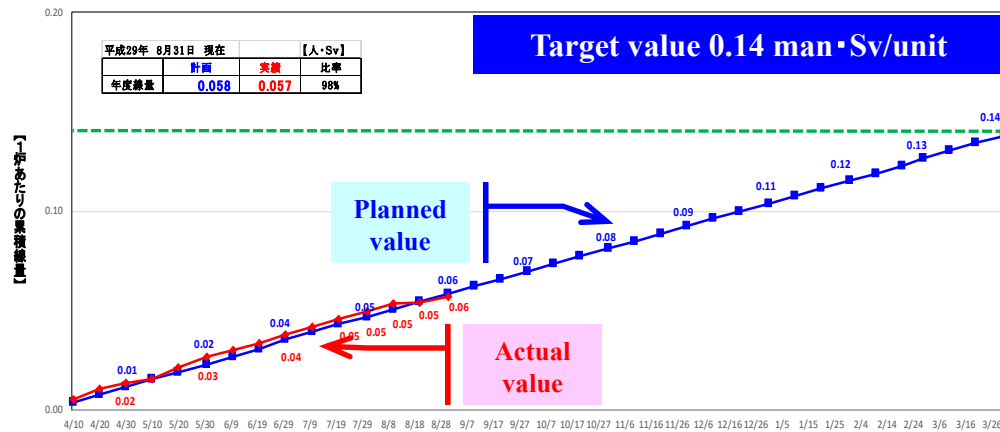




# (Dose reduction program)

## 1-3 Report on Power Station actual dose value

### ◆ Planned dose - Actual dose (per unit) ◆



### ◆ Persons with High personal dose ◆

No	年度被ばく線量 [mSv]	主な作業件名	主管グループ
1	6.66	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
2	6.31	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
3	4.22	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
4	4.1	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
5	4.1	K7 高圧窒素ガス供給系設備耐震強化他	第二保全部 原子炉G
6	4.02	K7 高圧窒素ガス供給系設備耐震強化他	第二保全部 原子炉G
7	3.94	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
8	3.81	K7 高圧窒素ガス供給系設備耐震強化他	第二保全部 原子炉G
9	3.39	K7 高圧窒素ガス供給系設備耐震強化他	第二保全部 原子炉G
10	3.36	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
11	3.35	K7 高圧窒素ガス供給系設備耐震強化他	第二保全部 原子炉G
12	3.34	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
13	3.32	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
14	3.3	K7 計装設備SΔ電路設置【上部D/W線量-3区域】	第二保全部 計測制御G
15	3.12	K7 高圧窒素ガス供給系設備耐震強化他	第二保全部 原子炉G
16	3.02	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
17	2.99	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
18	2.97	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
19	2.83	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
20	2.72	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
21	2.71	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
22	2.68	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
23	2.64	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G
24	2.52	K7 RW/B他耐震Bクラス配管耐震強化他	第二保全部 環境施設G

- Sharing on the company intranet ( every 10days )
- Report to the Alara Review Board

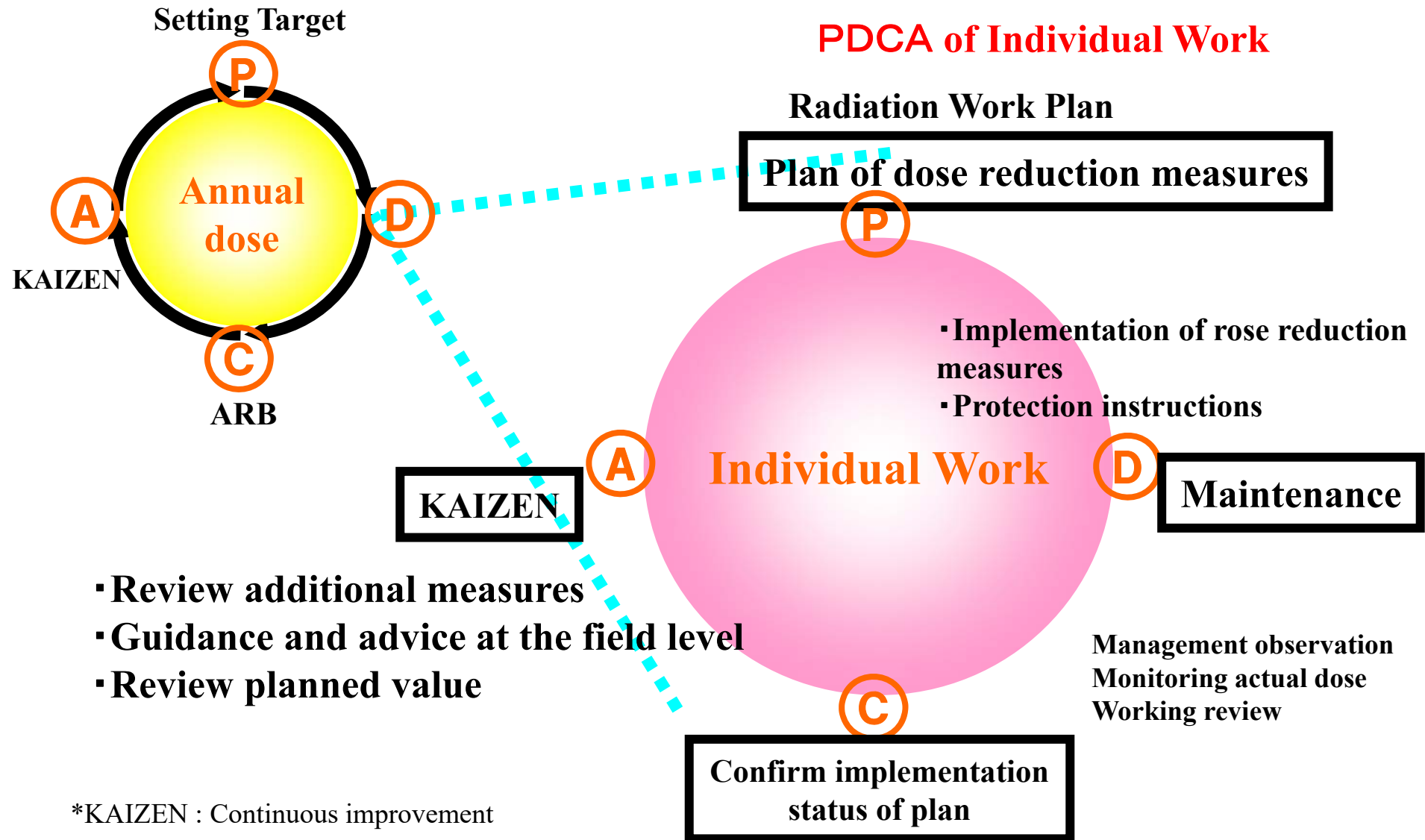
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<Dose reduction program>

## **2. Individual work dose management process**

(Dose reduction program)

## 2-1 Individual work dose management process



\*KAIZEN : Continuous improvement

(Dose reduction program)

## 2-2 Review according to category

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Planned Dose (mSv)	Pre-Work Review	Working Review	After Working Review
<b>Category 0</b> less than 5	No need	No need	No need
<b>Category 1</b> 5 or more, less than 10	4 people review	No need	No need
<b>Category 2</b> 10 or more, less than 50	4 people review	Over 50% of planned value 4 people review	No need
<b>Category 3</b> 50 or more, less than 100	4 people review	Over 50% of planned value 4 people review	4 people review
<b>Category 4</b> 100 or more	<b>ALARA Review Board</b>	Over 25 and 75% of planned value 4 people review	4 people review

※4 people review : Maintenance group, Radiation protection group, Contractor construction group, Contractor Radiation Protection group

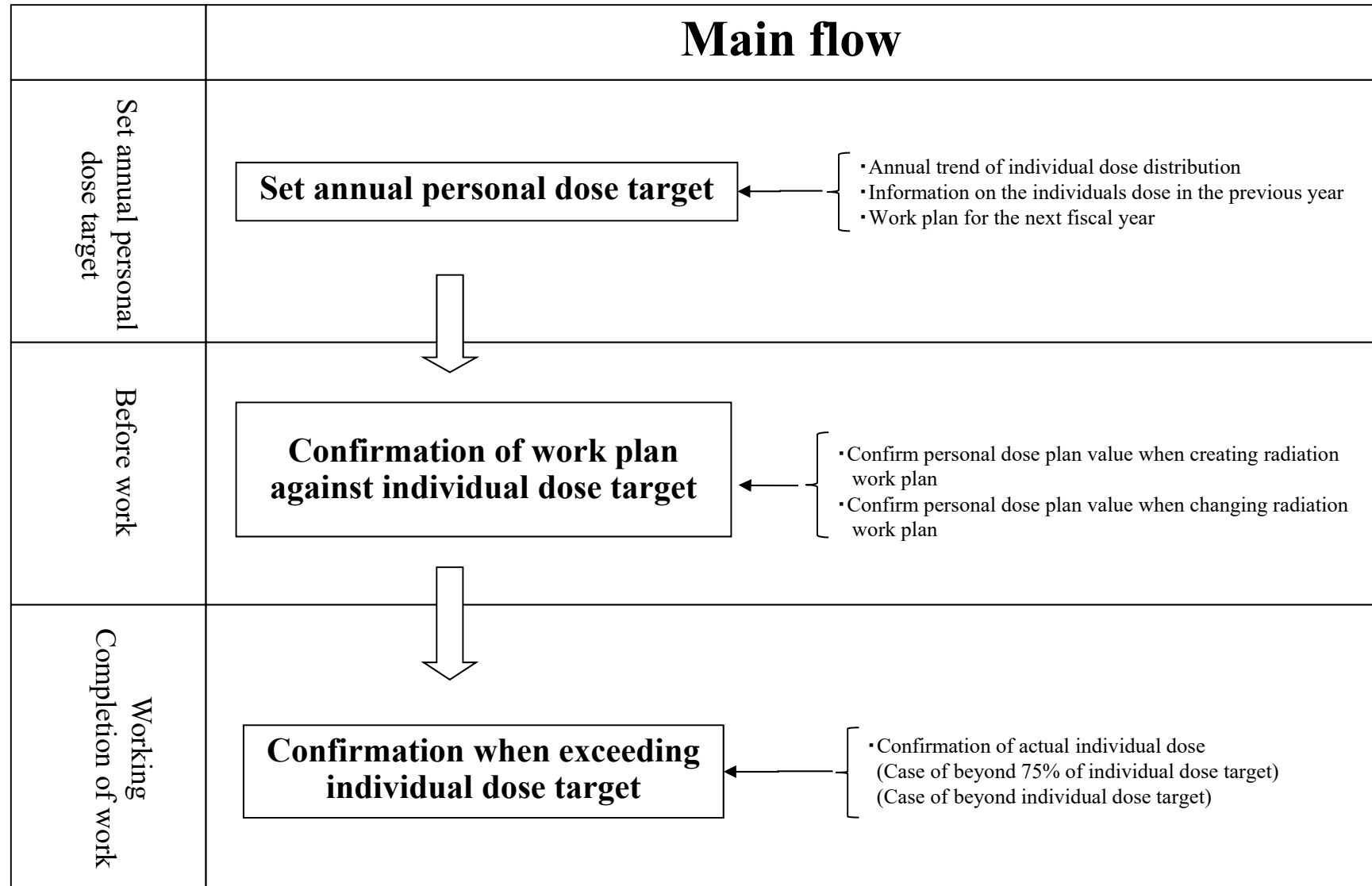
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<Dose reduction program>

### **3. Personal dose management process**

(Dose reduction program)

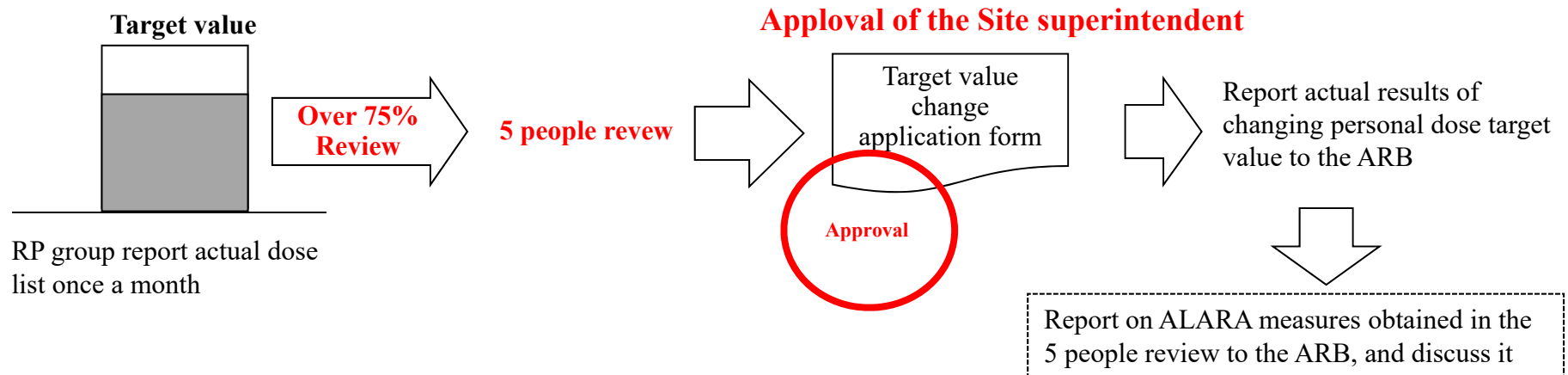
### 3-1 Personal dose management process



(Dose reduction program)

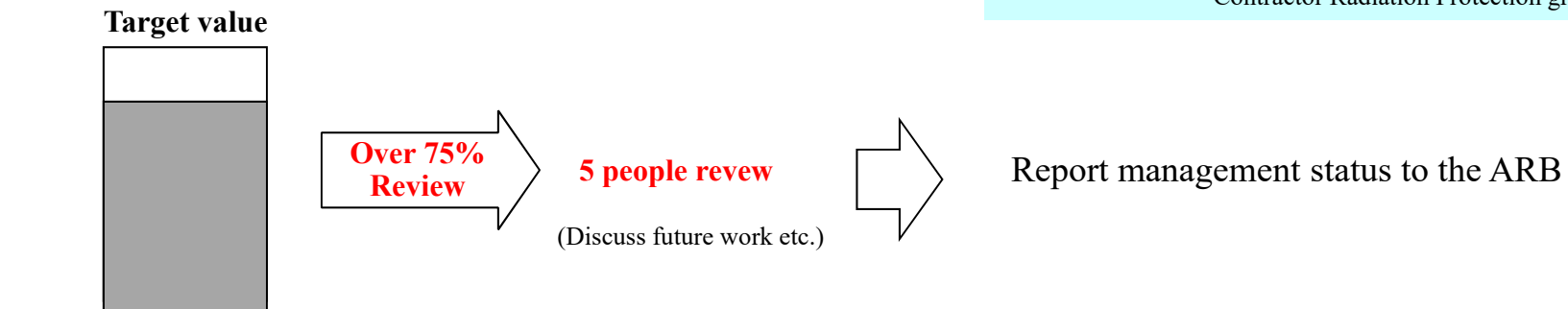
## 3-2 Activities for those who exceed the individual dose target

### ① Management of personal dose target



### ② Management of cumulative personal dose

(Specific operation will be examined in the future)



※5 people review : Maintenance group  
Radiation protection group  
Dose management group  
Contractor construction group  
Contractor Radiation Protection group

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<Radioactive waste reduction program>

## **4. Annual waste management process**



(Radioactive waste reduction program)

## 4-1 Concrete method of annual and 5 years waste management : Set target value

Radioactive waste reduction program requires long-term monitoring of the physical capacity of solid waste storage and requires a plan of five years of waste generation as it is necessary to judge further future expansion of storage etc. earlier.

### ① Annual and 5 years plan formulation for each group

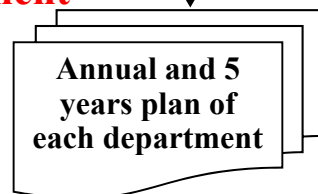
管理番号	子番号	改訂	グループ名	号機	作業件名 (RWA単位)	RWA番号 (不明の場合には記載不要)	内容物名(代表)	元請企業名	定検or通常	廃棄物発生量(袋数)				月別展開(袋数)													合計	
										不燃物	難燃物	可燃物	合計	4月	5月	6月	7月	8月	9月	10月	11月	12月	1月	2月	3月			
H34-0001	1	0												0													0	
H34-0002	1													0													0	
H34-0003	1													0													0	
H34-0004														0													0	
H34-0005														0													0	
H34-0006														0													0	
H34-0007	1													0													0	

Create for each group

Management on a work subject basis

Monthly plan

### ② Create for each group and compile it in each department



Annual and 5 years plan of power station



Annual and 5 years target of power station

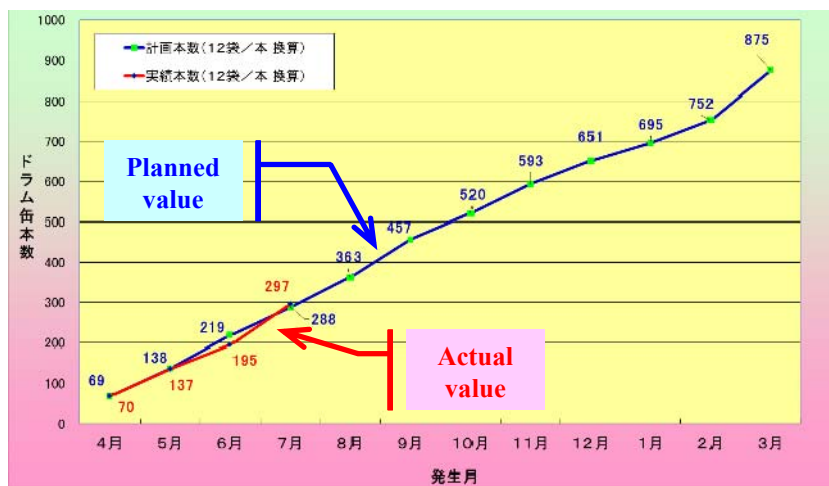
Approval

### ③ Compile each department plan value, and set the target value of power station

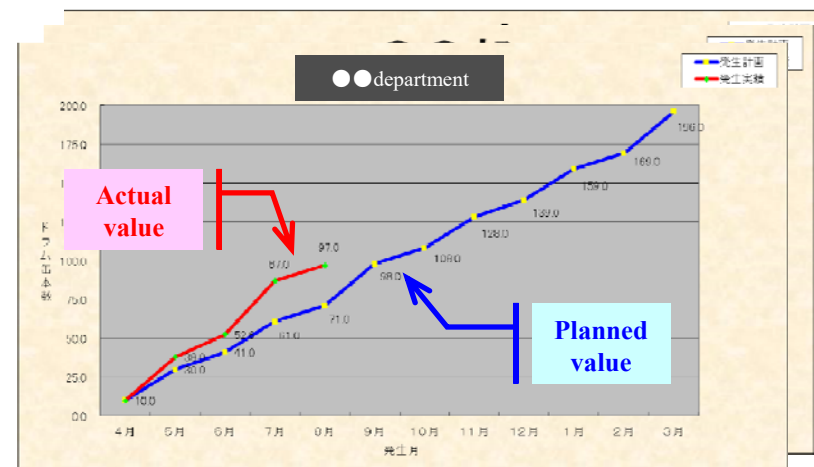
### ④ Approval the power station target at the ARB

## (Radioactive waste reduction program)

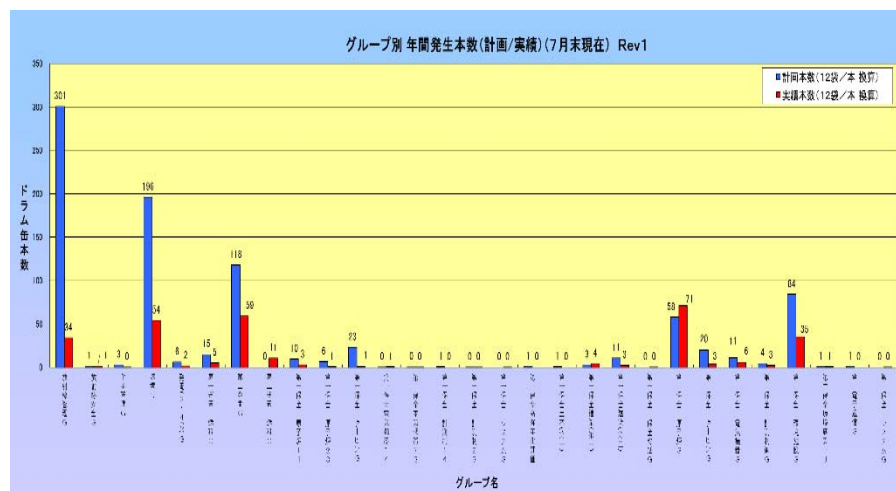
### 4-2 Report on Power station, Each department, Each group



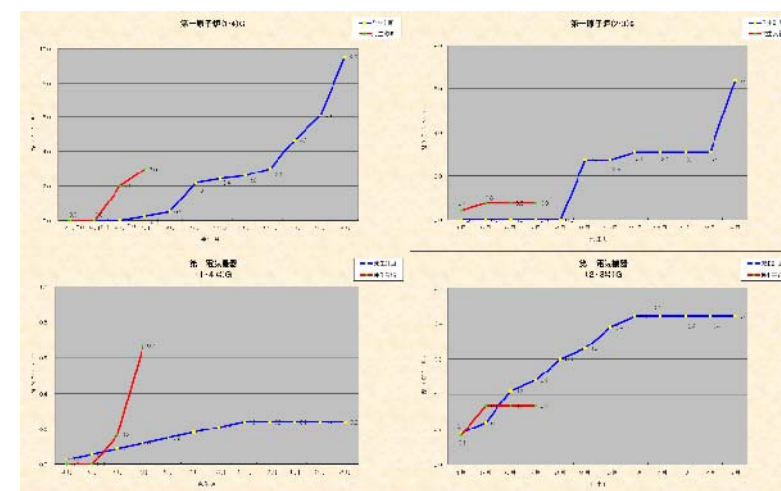
Waste generation trend of Power station



Waste generation trend of Each department



Waste generation graph of Each department



Waste generation trend of Each group

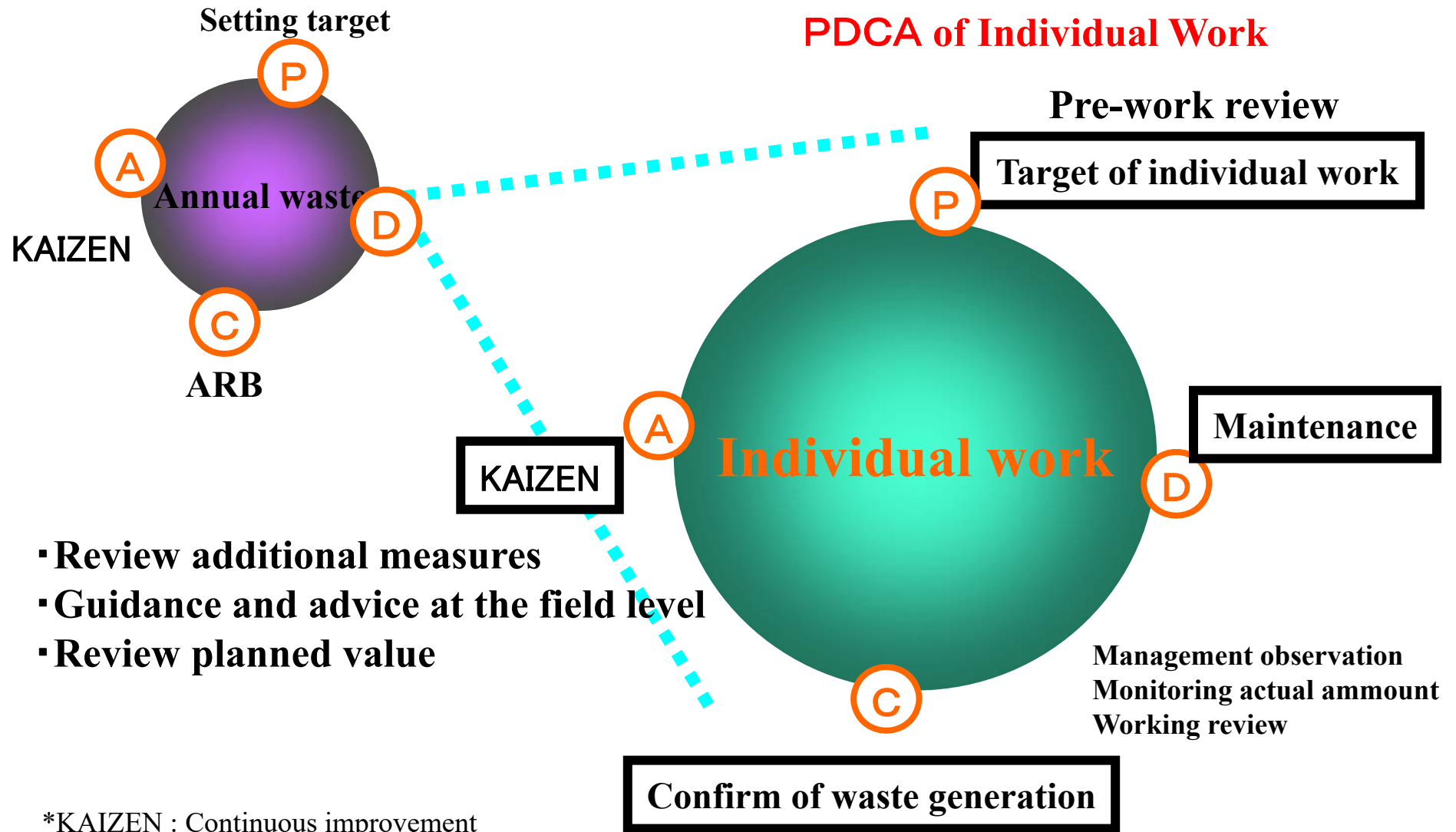
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<Radioactive waste reduction program>

## **5. Individual work waste management process**

(Radioactive waste reduction program)

## 5-1 Individual work waste management process



\*KAIZEN : Continuous improvement

(Radioactive waste reduction program)

## 5-2 Review according to category

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Planned waste amount (Plastic bags)	Pre-Work Review	Working Review	After Working Review
<b><u>Category 0</u></b> less than 60	No need	No need	No need
<b><u>Category 1</u></b> 60 or more, less than 120	4 people review	No need	No need
<b><u>Category 2</u></b> 120 or more, less than 300	4 people review	Over 50% of planned value 4 people review	No need
<b><u>Category 3</u></b> 300 or more, less than 600	4 people review	Over 50% of planned value 4 people review	4 people review
<b><u>Category 4</u></b> 600 or more	<b>ALARA Review Board</b>	Over 25 and 75% of planned value 4 people review	4 people review

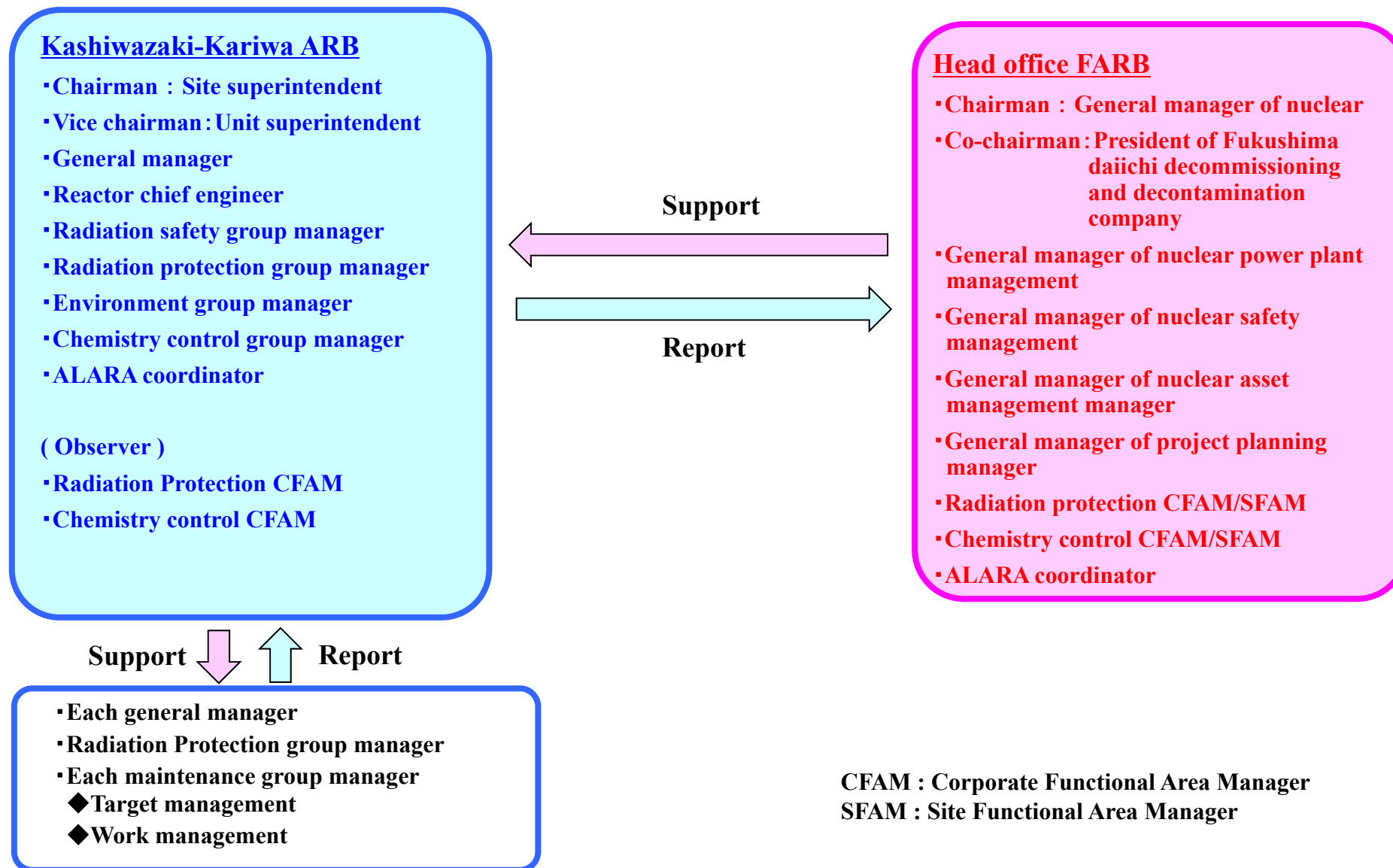
※4 people review : Maintenance group, Waste management group, Contractor construction group, Contractor Radiation Protection group

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<Dose and Radioactive waste reduction program>

## **6. About the ALARA Review Board ( ARB )**

## 6.1 Members of the ARB



## 6.2 About the ARB

### ①Frequency

<b>Regularly</b>	<ul style="list-style-type: none"> <li>•Once in a half year ... (During Outage)</li> <li>•Once in quarter ... (During normal operation)</li> </ul>	
<b>Extraordinary</b>	<b>Dose</b>	<ul style="list-style-type: none"> <li>▪ When a work with a risk that a planned total dose exceeds or exceeds 100 man · mSv occurs</li> <li>▪ When an important work for radiation protection is necessary to evaluate exposure reduction</li> <li>▪ In addition, when a review is necessary</li> </ul>
	<b>Waste</b>	<ul style="list-style-type: none"> <li>▪ When a work with a risk that the amount of waste generated exceeds or exceeds 600 plastic bags occurs</li> <li>▪ In addition, when a review is necessary</li> </ul>

### ②Matter to be discussed

<b>Regularly</b>	<b>Dose</b>	<ul style="list-style-type: none"> <li>▪ Approval annual and multiple years target value of Power station, each department, each group</li> <li>▪ Confirm the difference planned value and actual value, and corrective action of Power Station, each department, each group</li> <li>▪ Confirm the sutatus of personal dose target</li> </ul>
	<b>Waste</b>	<ul style="list-style-type: none"> <li>▪ Approval annual and multiple years target value of Power station, each department, each group</li> <li>▪ Confirm the difference planned value and actual value, and corrective action of Power Station, each department, each group</li> </ul>
<b>Extraordinary</b>	<b>Dose</b>	<ul style="list-style-type: none"> <li>▪ Review of work with a planned total dose exceeds 100man·mSv</li> <li>▪ Review of important work from the aspect of radiation protection</li> </ul>
	<b>Waste</b>	<ul style="list-style-type: none"> <li>▪ Review of work with a planned ammount of plastic bags exceeds 600 bags</li> <li>▪ Review of important work from the aspect of radioactive waste management</li> </ul>



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<Dose and Radioactive waste reduction program>

## **7. Effect of program introduction**

## 7. Effect of programs introduction

- We have introduced the programs earnestly from this fiscal year
- Therefore, only half a year passed since programs introduction
- In order for the programs to penetrate deeply, a little more time is needed
- From now on, we will carry out the PDCA of the programs accurately

	Amount of reduction	Remarks
<b>Dose</b> 【Reduction of 11 works(Total planned dose 940 man・mSv)】	210 man・mSv*	▪ Cleaning by high-pressure washing machine ▪ Recovery of bottom cladding by robot ▪ Communicate instructions and information by transceiver ▪ Waiting in low radiation area
<b>Waste</b> 【Reduction of 6 works(Total planned waste 300 bags)】	24 plastic bags	Examined and implemented a method that can fill the drum effectively
	120 cardboard boxes	Instead of cardboard boxes, we used reusable plastic boxes

\*Works from 2017/11 to 2018/9