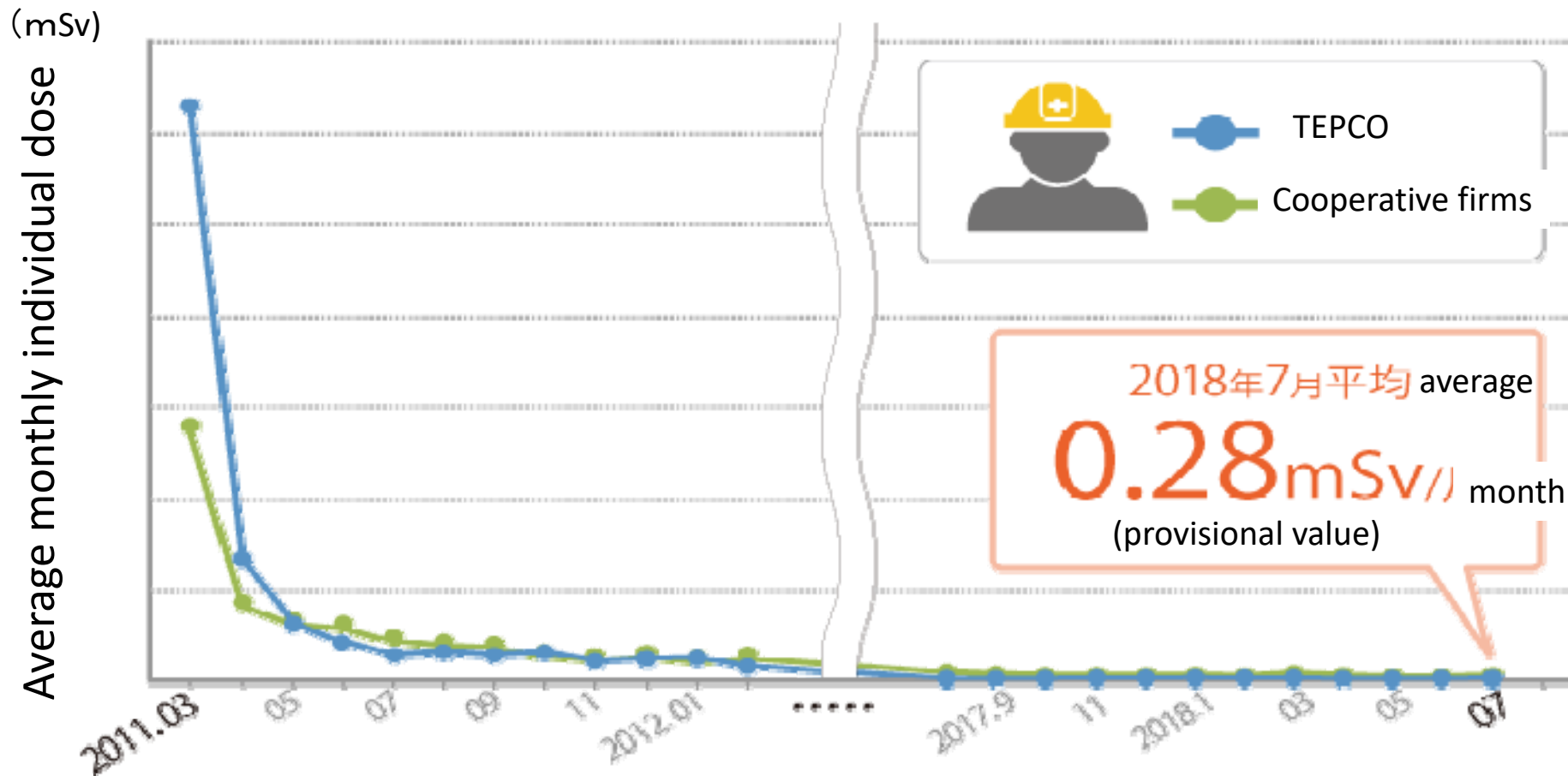


Voluntary Action for Managing the Equivalent Dose of the Lens of the Eye According to ICRP Recommendation

24 October 2018

Tokyo Electric Power Company Holdings ,Inc.

Average Monthly Individual Dose at Fukushima daiichi NPS'



External exposure management at 1F

By the influence of “fall out” by the accident, TEPCO set a Radiation Control Area all over the NPS site and manage the exposures for the all workers as “radiation workers”

Individual exposure dose control (Major example)

Passive integrating dosimetry systems dose dosimeter (fluoroglass dosimeter)
: β -ray(70 μ m dose equivalent) + γ -ray (70 μ m and 1cm dose equivalent)
measured on the chest, checked integral dose for 1 month.

※If the workers are exposed inhomogeneously, additional dosimeters shall be attached on the body part which can be most exposed among the body parts.

APD (ALARM POCKET DOSIMETER)

: β -ray (70 μ m dose equivalent) + γ -ray (1cm dose equivalent)
measured on the chest, checked integral dose daily



Effective dose : γ -ray 1cm dose equivalent

Equivalent dose : β -ray (70 μ m dose equivalent) + γ -ray (70 μ m or 1cm dose equivalent)

The trend in overseas about dose limit of lens of the Eye **TEPCO**

<The trend in overseas>

The statement by ICRP on April 2011 (Seoul statement)

Threshold of cataract : 5 ~ 8 Gy \Rightarrow 0.5 Gy

Equivalent dose limit of lens of eyes : 150mSv/y \Rightarrow average 20mSv/5years

<The trend in Japan>

7.25.2017~2.21.2018

At the subcommittee on Radiation Protection of the lens of the eye of the Radiation Council

Discuss about radiation protects of "lens of eyes"



3.2.2018 The report to the authorities from the Council



The authorities started the discussion about the legislative amendments

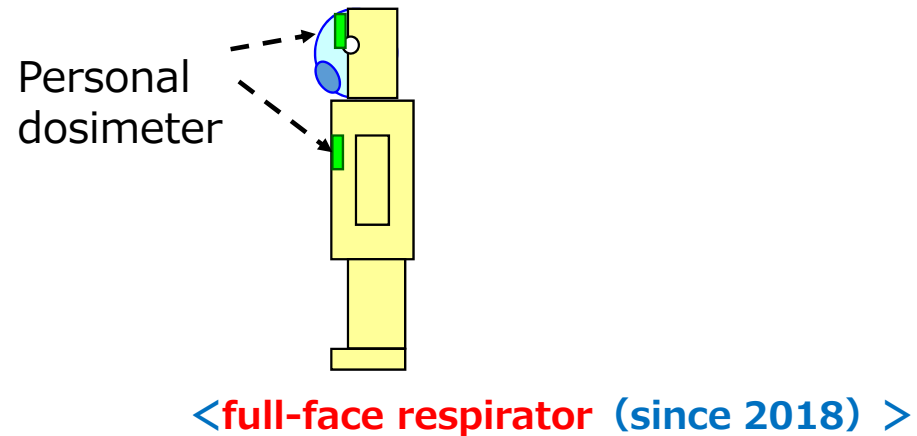
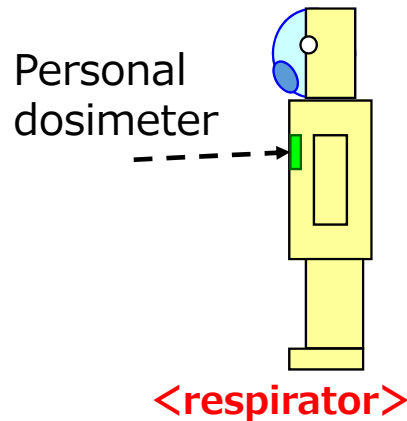
Voluntary efforts

Based on domestic and foreign trends, TEPCO started **“voluntary efforts”** for 1F workers safety before legislative amendments

- **voluntary management value**
50mSv/y (from April 2018)
5years ave20mSv/y (Plan “from April 2019”)
- **The managements method**
If the equivalent doses of lens of eyes of the radiation workers excess 15mSv or they are in the areas to be paid attention to β -rays(we called them β -areas), they shall wear the accumulated dosimeter inside their respirators.
⇒More accurate estimations about the equivalent dose

The management method of the lens of eyes in β ray area

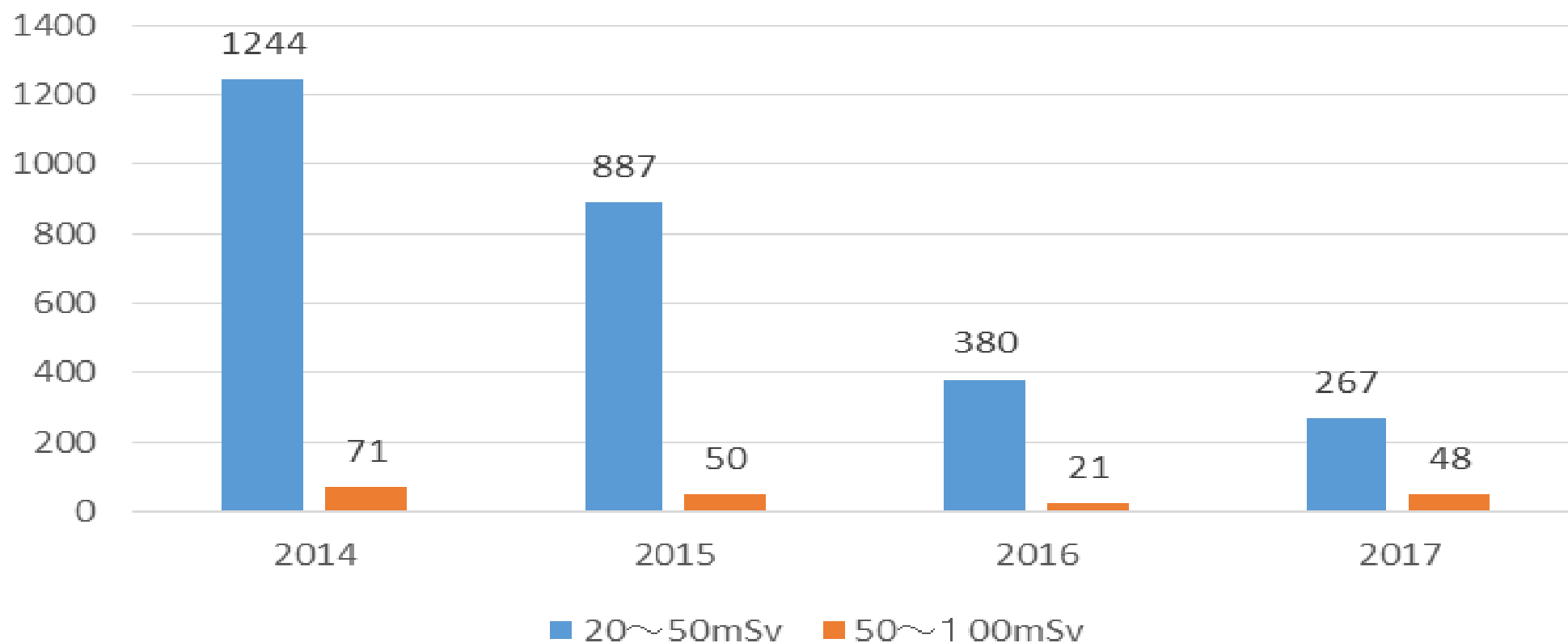
- Personal dosimeter : 70 μ m and 1cm dose equivalent measured by fluoroglass dosimeters
- Point : the chest
- **Equivalent dose (lens of eyes)**
: β -ray(70 μ m dose equivalent)+ γ -ray (70 μ m or 1cm dose equivalent)



- In the case of respirator (β -area)
Equivalent dose of lens of eye (measured on the chest)
> **Equivalent dose of lens of eye (measured inside respirators)**
- **Conservative estimation without shielding the effect by respirators(until 2017)**
 \Rightarrow accurate estimations considering the shielding effect since 2018.

Equivalent dose distribution of Lens of eyes

(人) The number of the radiation workers who were exposed more than 20mSv(2014~2017)



The radiation exposure situation of Lens of eyes

■ Distribution of equivalent dose of Lens of eyes

- The number of the workers who were exposed over 50mSv/y is 48
- The works in which the radiation workers who were exposed highly are following.
 <the works over 50mSv/y>

<Equivalent dose in 2017> [units: man]

(mSv)	TEPCO	Cooperative firms
100~	0	0
75~100	0	<u>6</u>
50~75	0	<u>42</u>
20~50	0	273

fact	number	Main work
<u>γ-ray</u>	<u>0</u>	
<u>β-ray</u>	<u>48</u>	<u>· tank scrap. storage</u>

<the work 20~50mSv/y>

fact	number	Main work
r-ray	144	· spent fuel storage pool cover construction over the unit No.3 Reactor Building
β-ray	129	· tank scrap .storage · flange tank disposal

Consideration about measurement inside respirator **TEPCO**

■ Measured inside respirator

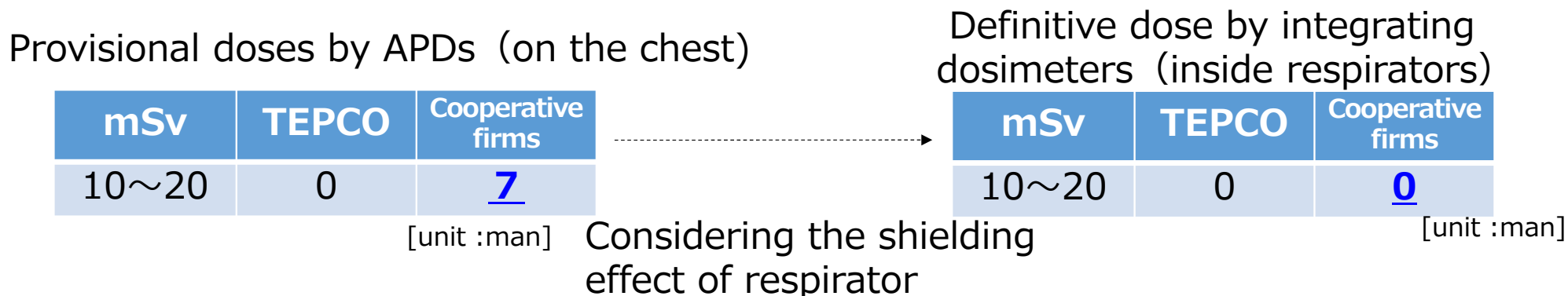
- Application of current dosimeters [70 μ m dose equivalent] :
 - Considering the measurement point without hindering their visions of the workers.



The state of radiation exposure on “Lens of eyes”

■ About the workers who were exposed over 10mSv (equivalent dose of “lens of eye”)

- ① Provisional doses (measured by APDs (on the chest))
The number of the workers who were exposed over 10mSv is
- ② Definitive doses
(measured by integrating dosimeters inside respirators(considering the shielding effect by respirators))
The worker who were exposed over 10mSv is
- ① Comparison ①and② : about 40 ~ 70%reduced



The state of radiation exposure on “Lens of eyes” **TEPCO**

■ The tank scrap. Storage work in which the radiation workers who were exposed over 50mSv/y in FY 2017

Provisional doses by APDs (on the chest)

Ave 5.1mSv
(about 60mSv/y)

Shielding effect of
the full face mask

----->
about 70~95%reduced

Integral dosimeters

Ave 0.8mSv/y
(about 10mSv/y)



Considering the shielding effect by respirators, we will be able to keep the equivalent doses of lens of the eye in FY2018,2019 below our voluntary control values, even if we work β -area works in which the equivalent doses in FY 2017 were over 50mSv.

summary

- Based on domestic and foreign trends, TEPCO started “voluntary efforts” for 1F workers safety before legislative amendments
- If the equivalent doses of lens of eyes excess 15mSv or they work in the β -area, they shall wear the accumulated dosimeters inside respirators.
⇒more accurate estimations
- Considering the shielding effect by respirators, we will be able to keep the equivalent doses of lens of the eye in FY2018,2019 below our voluntary control values, even if we work β -area works in which the equivalent doses in FY 2017 were over 50mSv.
- Because of the little the shielding effect by respirators against γ -ray, TEPCO will challenge dose reduction activity continuously.