Dose Constraints for Korean Nuclear Power Plants

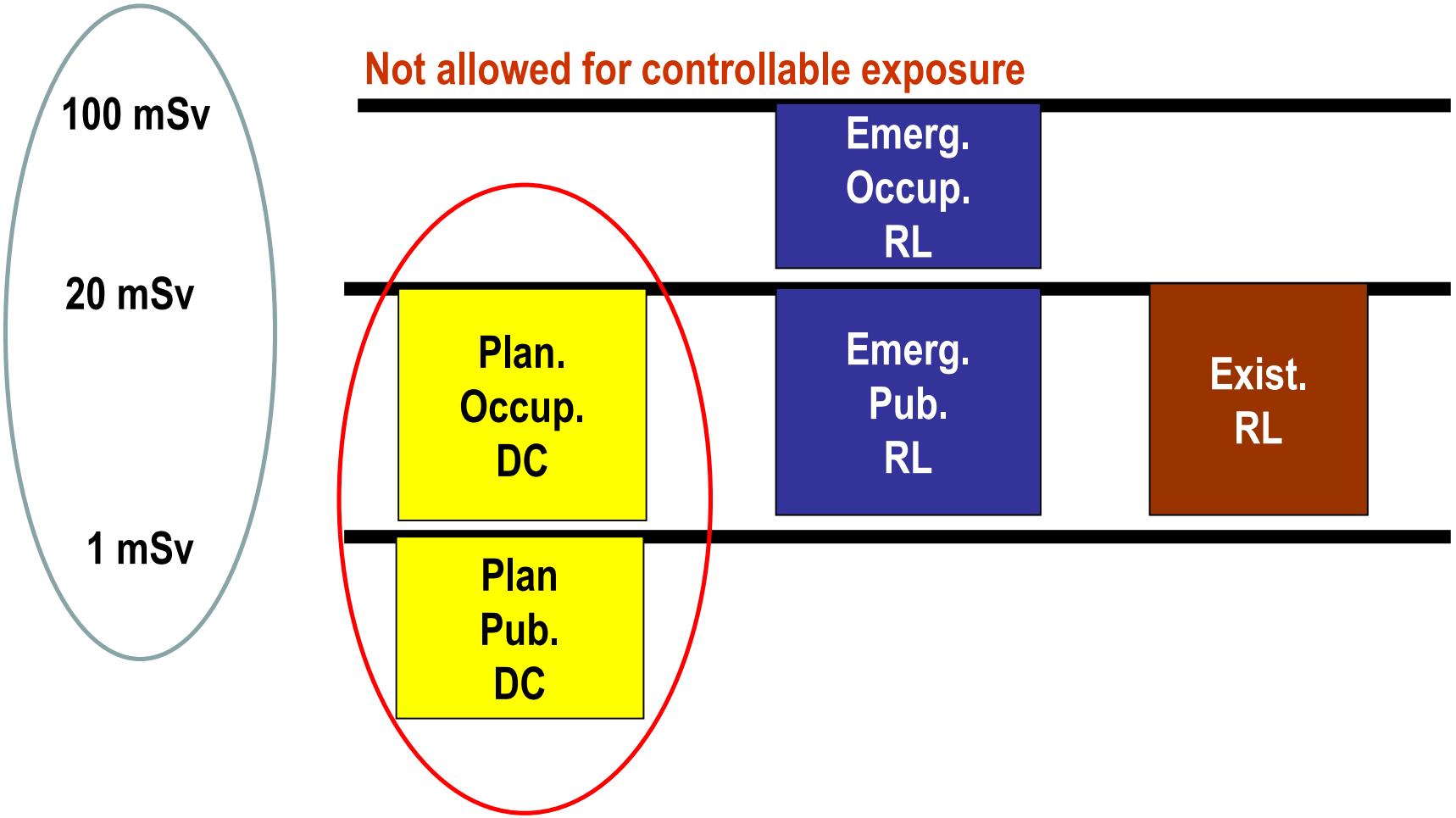
(Radioactive discharge associated with Nuclear New Build)

Jeong In, Kim

Radiation Health Research Institute

KHNP

How to set the dose constraint



How to set the dose constraint

Target	How	Who	Dose Range
Workers	Dose which have been well operated since before (ICRP Recommendation)	KHNP	< 20 mSv
General Public	Dose which will be used for Designing and Planning Level (IAEA BSS)	KINS	< 1 mSv

Current status of the Dose Constraint set up

Dose Constraints

Radiation workers : less than 20 mSv

Allows for operation dose constraint specific to certain job

General public upon the operation of NPP : 0.25 mSv

- **KINS : MEST NOTICE 2009-37 'Standards for Radiation Protection'**

→ **Reviewing the methods for calculation of the dose from discharge**

Recent regulatory activities to improve ALARA performance of NPPs in Korea
(Sep. 2010, ISOE Asian ALARA Symposium)

Dose constraint for General Public

✓ **Dose to General Public near the each NPP sites-KHNP (2008)**
> Dose Constraint = 0.25mSv/yr

unit : mSv/yr

Yonggwang(6 units)	0.0096
Kori(4 units)	**0.0046** (1.84%)
Wolsong(4 units)	0.0083
Ulchin(6 units)	0.0019

Dose constraint for General Public

Topic 1 | Dose constraint for GP already having been operated

MEST NOTICE 2009-37 Article 16 'Prevention of the harm to environment'

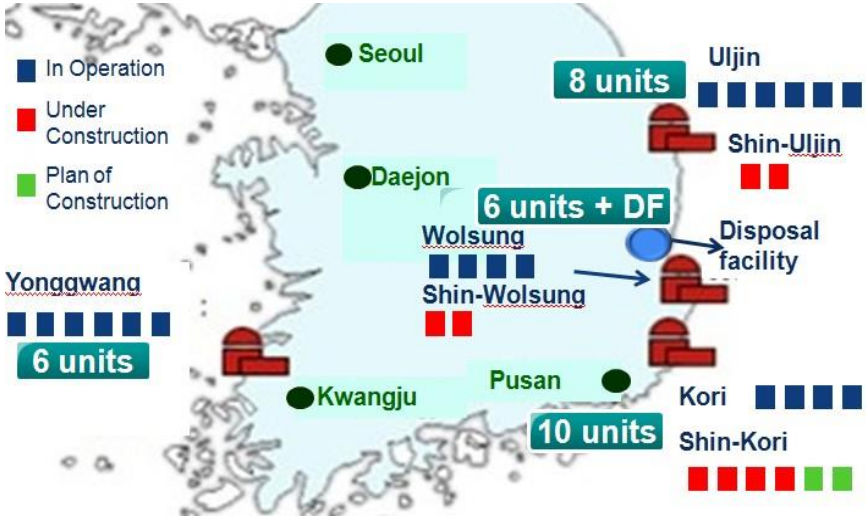
Same Site **Multiple nuclear facilities**	**Effective dose** **: 0.25 mSv/yr**	**EPA 40 CFR part 190** **- Subpart B**

***) EPA suggested that 0.15 mSv/yr for Yucca Mountain**

→ NRC have showed the severe worry about the low dose constraint

Dose constraint for General Public

Topic 2 — 0.25mSv/yr is a big obstacle to design the new plants



USA	Vogtle	2(+2)
JAPAN	Fukushima I	6(+2)
CANADA	Pickering	8

UNITs	Estimated (mSv/yr)	Ratio	remark
Shin Kori 1 & 2	0.131	52.4 %	KORI 1 to 4 + Shin Kori 1 & 2
Shin Kori 3 & 4	0.197	78.8%(+26.4%)	Preliminary Test

Dose constraint for General Public

Topic 2

0.25mSv/yr is a big obstacle to design the new plants

Year	Plants(+14)
2010	Shin-Kori unit 1 (1,000)
2011	Shin-Kori unit 2 (1,000)
2012	Shin-Wolsong unit 1 (1000)
2013	Shin-Wolsong unit 2 (1000) Shin-Kori unit 3 (1400)
2014	Shin-Kori unit 4 (1400)
2016	Shin-Ulchin unit 1 (1400)
2017	Shin-Ulchin unit 2 (1400)
2018	Shin-Kori unit 5 (1400)
2019	Shin-Kori unit 6 (1400)
2020	Shin-Ulchin unit 3 (1400)
2021	Shin-Ulchin unit 4 (1400)
2022	Shin-Kori unit 7 (1500)
2023	Shin-Kori unit 8 (1500)

31.4% to 48.5% by 2024

Dose constraint for General Public => Target

Now: 0.25 mSv

Topic 1 — **Realization**

- 1-1 Isolation of the Site
- 1-2 Improvement of the conservativeness

Topic 2 — **Basis**

- 2-1 Inconsistency
- 2-2 No scientific basis
- 2-3 No Radiation Effect

Target: 0.5 mSv

Dose constraint for General Public

Topic 1-1 Isolation of the Site (New Definition)

MEST NOTICE <2009-37>
Article 16(Prevention of harm to environment)
2. In the case of operating multiple nuclear facilities in same site
a. Annual dose
1) Effective dose : 0.25mSv

•Recent report for the improvement of radiation management system in NPPs.
('10.7, KARP ALARA conference)

The range of same site where multiple nuclear facilities located includes the overlapped restricted area.
But, different administrative district is exceptional

- ✓ Kori 1 to 4 and Shin Kori 1 & 2 : Same site
- ✓ Shin Kori 3 to 6: Different site

Dose constraint for General Public

Topic 1-2 — **Improvement of conservativeness**

UNITs	Estimated (mSv/yr)	Ratio	remark
Shin Kori 1 & 2	**0.131**	**52.4 %**	**KORI 1 to 4 + Shin Kori 1 & 2**
Shin Kori 3 & 4	**0.197**	**78.8%(+26.4%)**	**Preliminary Test**

◆ Discharge source term (in operation)

- For Shin-Kori 1&2 : At least 10 year maximum value for each radio-nuclides

*** improvement : not for radio-nuclides but maximum annual dose from the each sources (KINS : average value)**

◆ Test point

- For Shin-Kori 1&2 : All direction for maximized point

*** improvement : Point on the sea should be excluded**

Dose constraint for General Public

Topic 2-1 | Inconsistency

Definition of DC(ICRP 103 & IAEA BSS)

… For occupational exposures, the dose constraint is a value of individual dose used to limit the range of options considered in the process of optimisation.

For public exposure, the dose constraint is an upper bound on the annual doses that members of the public should receive from the planned operation of any controlled source.

⇒ **Occupational Exposure**

Not for Public Exposure

→ Just reduce to dose limit

Dose constraint for General Public

Topic 2-2 | No scientific basis

Acute or annual dose 100mSv → **Not confirmed,**
Just apply the LNT hypothesis(ICRP 103)

Dose limit : **Natural background(Radon excluded) 1 mSv/y (ICRP 60)**

* Many scientific research results for acceptable range of the risk
  - 1mSv/yr => 1 / 100,000 person

No meaning for more scientific research
to set up the DC in the range of dose limit

Dose constraint for General Public

Topic 2-3 No radiation effect

Lifetime cancer risk attributable to radiation exposure (male, chronic exposure throughout life)

cancer type	Baseline Incidence (per 100,000 persons)	LAR (per 100,000 persons)			Attributable Fraction(%)		
		1mSv/yr	0.3mSv/yr	0.25mSv/yr	1mSv/yr	0.3mSv/yr	0.25mSv/yr
stomach	10,805	116.59	34.98	29.15	**1.08%**	0.32%	**0.27%**
lung	10,124	109.26	32.78	27.31	**1.08%**	0.32%	**0.27%**
liver	6,128	89.26	26.78	22.32	**1.46%**	0.44%	**0.36%**
colon	3,455	99.16	29.75	24.79	**2.87%**	0.86%	**0.72%**
thyroid	608	31.23	9.37	7.81	**5.14%**	1.54%	**1.28%**


Thank you