

2014 ISOE Asian ALARA Symposium

Decreasing costs and increasing efficiency by reusing Lead vests for reduction of waste materials

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Dong-ki Yun
Korea Hydro & Nuclear Power Co.

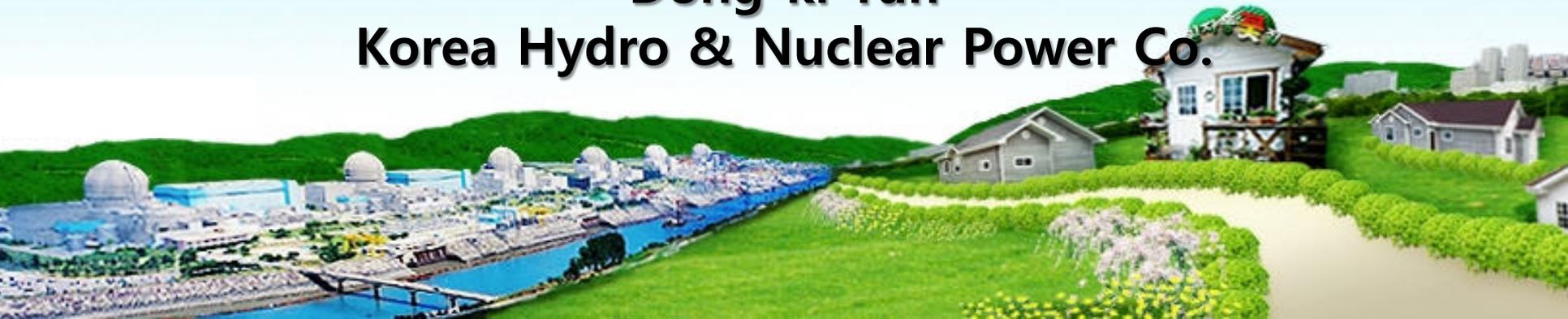


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I. Purpose & Background

Reduction of the waste materials
by reusing the disused Lead vest

**Disposal of the
disused radiation
protection supplies
in the RCA**

**Reduction of costs
& waste by
reusing the
obsolete materials**

**Contribution to
decreasing the low
base dose emissions
through the tailored
Lead vest**



I. Purpose & Background

The need of shielding for small size pipes among the high radiation pipes in the RCB

- **Hardship of shielding for HDSP***
 - Complicated configuration & structure of the existing Lead blankets
 - Different sizes between the blanket and pipes
 - Inconvenient pass-way & Eyesore of the external appearances
 - **Dislodgment from the pipes after shielding**
 - The issue of integrity for the blankets
- *HDSP : high dose rate & small sized pipes

Requirements for the way of shielding & the reduction of the waste materials

- **Reusing the radioactive waste**
 - Decreasing the waste by optimizing the Lead plates in the vest which should have been disposed of
- **Improvement of the shielding method**
 - Manufacturing the materials to shield the HDSP with the appropriate shapes and sizes

II. Reusing the Lead vests

1 Status in Hanbit PP2

Necklace Type	Shoulder type	General type
		
<p>Thickness/Weight : 2.0mm/9kg</p>	<p>Thickness/Weight : 2.0~1.5mm/8.1kg</p>	<p>Thickness/Weight : 1.5~0.8mm/6.5kg</p>

II. Reusing the Lead vests

2 Current conditions

Quantity \ Type	Necklace Type	Shoulder type	General type
Total	25sheet	41sheet	95sheet
Disposal	21sheet	15sheet	N/A
Lead plates	45ea/sheet	45ea/sheet	N/A

3 Separated Lead plates

Item	Collective(ea)	Useable(ea)	Remark
Necklace Type	945	853	-
Shoulder type	675	597	-
Total	1,620	1,450	Reusing

Specification of the Lead plate(Size : 31×2.5×0.2 cm/Weight : 0.12kg)

III. Manufacture of the Lead shielding

1 Design of shielding

Structure of the shielding

- Consideration for sagging from the pipe and length of the line
- Steady structure available for long term period

Material of the shielding

- Non-flammable & easily decontaminated material
- Outer cover : tarpaulin
- Inner part : Polyester 65%

Manufacture of the shielding

- Grid patterned plate with the double stitch
- Within 2mm between inner sheath & plate
- Sealed Lead plates with the outer cover
- Edge of the Lead plate to be spherical



III. Manufacture of the Lead shielding

2

Process of manufacturing

Separated Lead



Decontamination



Completed



Extracted Lead



III. Manufacture of the Lead shielding

3

Results of Manufacturing

Existing Lead shielding

- Size(cm) : 110 * 40
- Weigh(kg) : 12.46



Improved Lead shielding

- ① Size (cm) : 40 * 35
Weigh (kg) : 4.2
- ② Size (cm) : 60 * 35
Weigh (kg) : 6.2
- ③ Size (cm) : 80 * 35
Weigh (kg) : 8.0



IV. Application of the Lead shielding

1 Application of the shielding

S/G C/L → Small size pipe of RDT line (RCB 86ft)

Before



After



IV. Application of the Lead shielding

1 Application of the shielding

The HRL around the Cavity FAN (RCB 86ft)

Before



After



* HRL : High Radiation Line

IV. Application of the Lead shielding

1 Application of the shielding

The HRL around the S/G 2 C/L Man-Way (RCB 100ft)

Before



After



IV. Application of the Lead shielding

1 Application of the shielding

RC LOOP 2A → The HRL around the PZR (RCB 100ft)

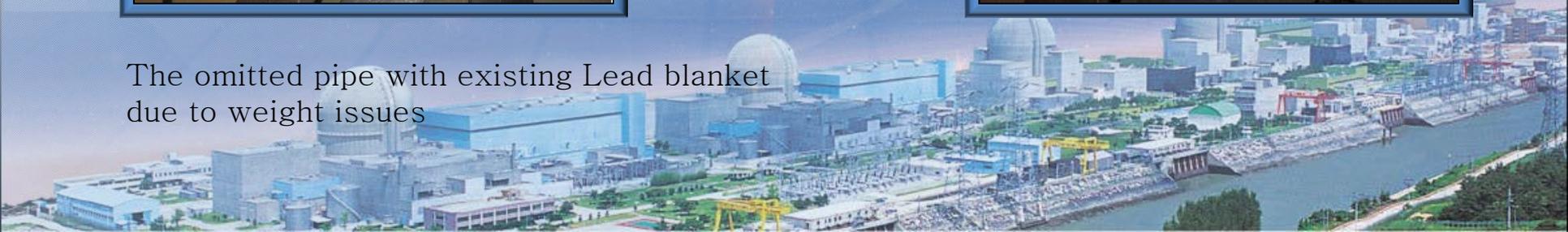
Before



After



The omitted pipe with existing Lead blanket due to weight issues



IV. Application of the Lead shielding

1 Application of the shielding

The HRL of the Let-Down 441-201Q (SAB100ft)

Before



After



IV. Application of the Lead shielding

2 Improvement

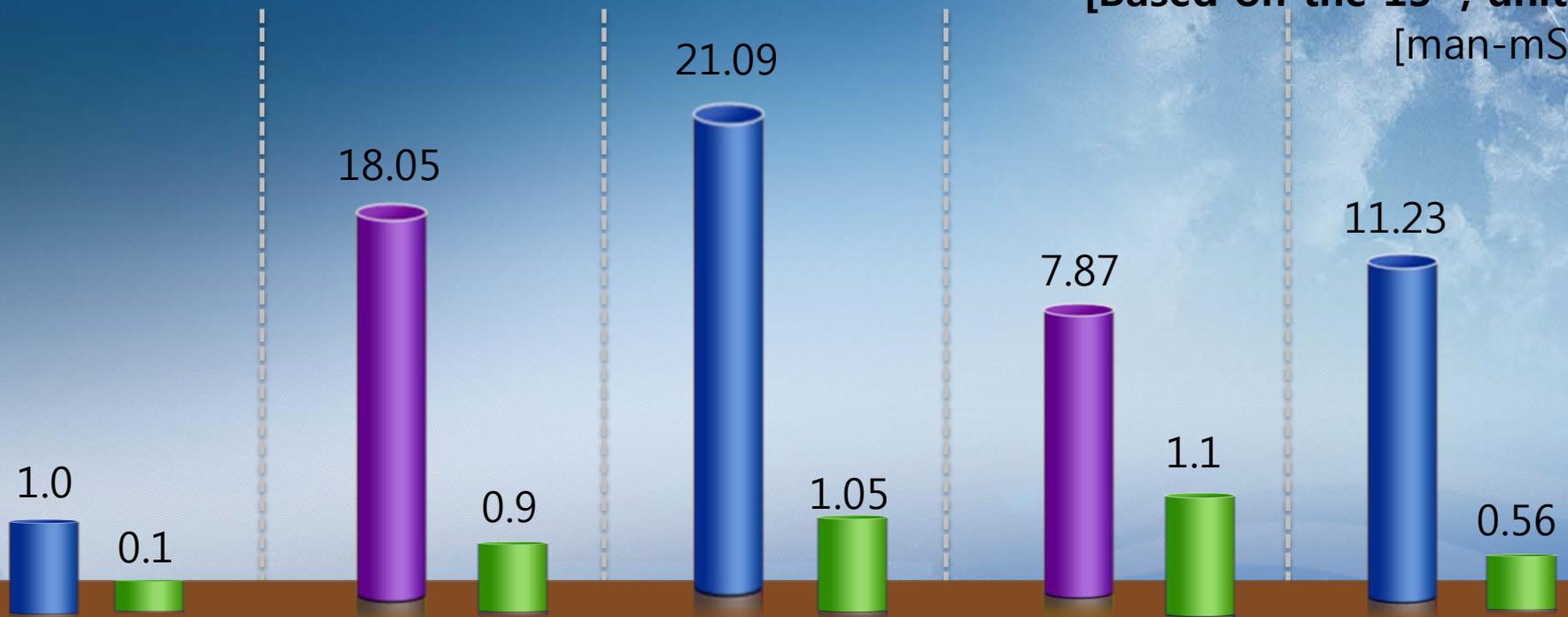
- Taking less time than expected to shield these lines
- Solving the environmental conditions of the narrow work spaces
- Increasing its shielding function by attaching securely

Shielding area	Dose rate(mSv/h)		reduction efficiency(%)
	Before	After	
1. RCB 86' S/G C/L → RDT Line	0.62	0.51	17.7 ↓
2. HRL around the Cavity FAN	0.81	0.65	19.6 ↓
3. HRL around the S/G 2 C/L	0.58	0.56	3.5 ↓
4. RC LOOP 2A → HRL by the PZR	0.72	0.18	75 ↓
5. HRL of the Let-Down 441-201Q	3.10	2.80	9.7 ↓

V. Effects & plans

Reduction of the exposure dose

[Based on the 13th, unit3]
[man-mSv]



Maintenance of
the Rx Cavity Fan

ISI

Carrying out
the S/G ECT

S/G Lancing

Disassembling
work of the valves

V. Effects & plans



Conclusion

1

Reduction of the radioactive waste materials and the costs to process the drums

- Achievement of decreasing the waste by reusing the vests
- Reduced Capacity : about 1 drum

2

Acquiring the technique for the radiation safety management

- Improvements for the efficiency of the shield and analysis of the HRL
- Boosting the external appearances by perfecting the shields

3

Raising awareness of the insufficient shielding areas with the existing Lead blanks

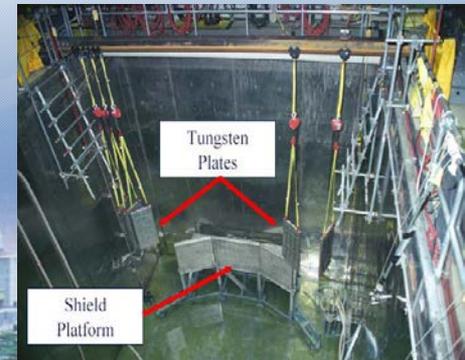
- Increasing the shield efficiency in comparison with existing Lead blankets solved the weight issues
- Enhancement of the way to shield the large size pipes
- Need to try to manufacture the tailored shielding for the complicated structures

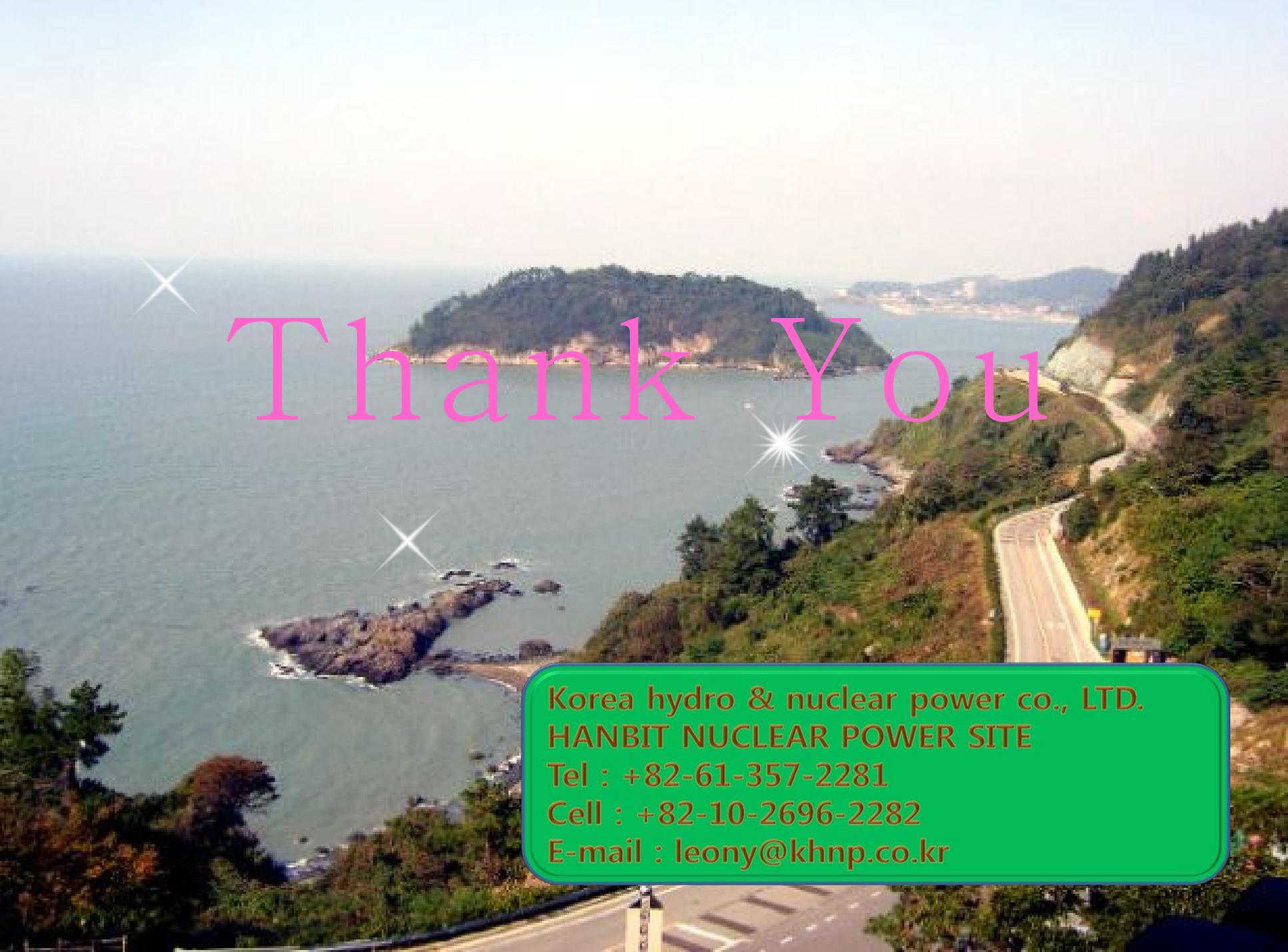
V. Effects & plans



Plans

- **Developing the shield superiority to enhance the efficiency of the existing shielding materials**
 - **Tungsten Shielding**
 - High intensity and flexibility
 - Non-poisonous & superior shielding function than Iron or Lead
 - But more expensive(3times price of Lead)
- **Sustainable improvements for the shielding methods for the large sized pipes**





Thank You

Korea hydro & nuclear power co., LTD.

HANBIT NUCLEAR POWER SITE

Tel : +82-61-357-2281

Cell : +82-10-2696-2282

E-mail : leony@khnp.co.kr