Shin-Kori 3 & 4

Integrated IT Radiation Management System in APR 1400

2013. 8

KOREA HYDRO & NUCLEAR POWER CO., LTD

Contents

Ⅰ. Introducion to KHNP & APR 1400

Nuclear Power Plants in KHNP

In operation

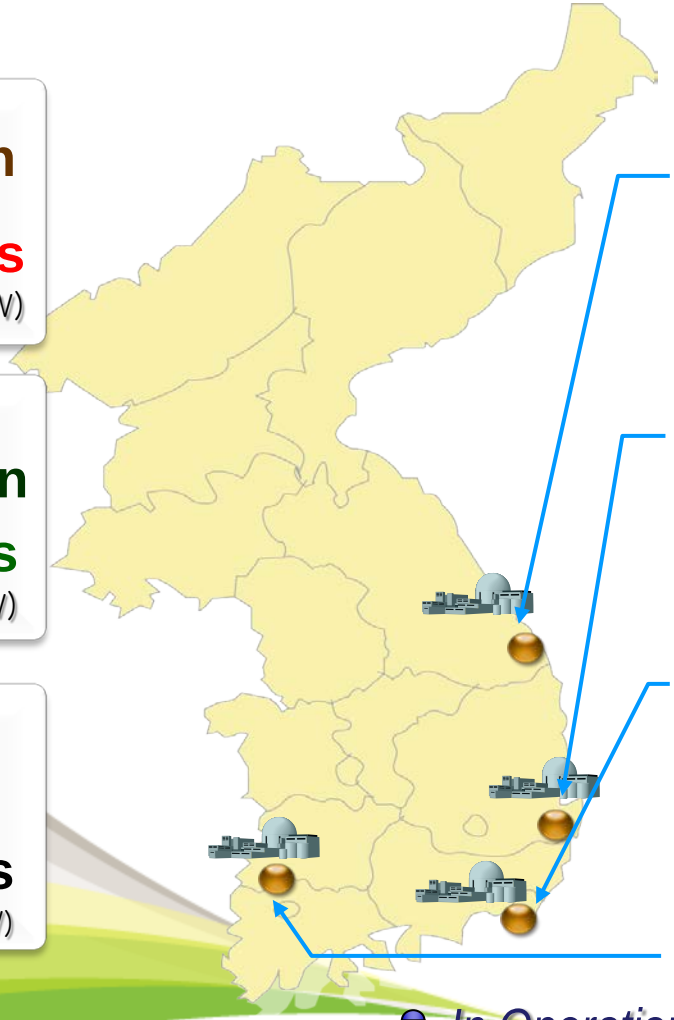
23 units
(20,715 MW)

Under construction

5 units
(6,600 MW)

Planning

4 units
(5,600 MW)



Hanul
8 units

Wolsong
6 units

Kori
8 units

Hanbit
6 units

In Operation Under Construction

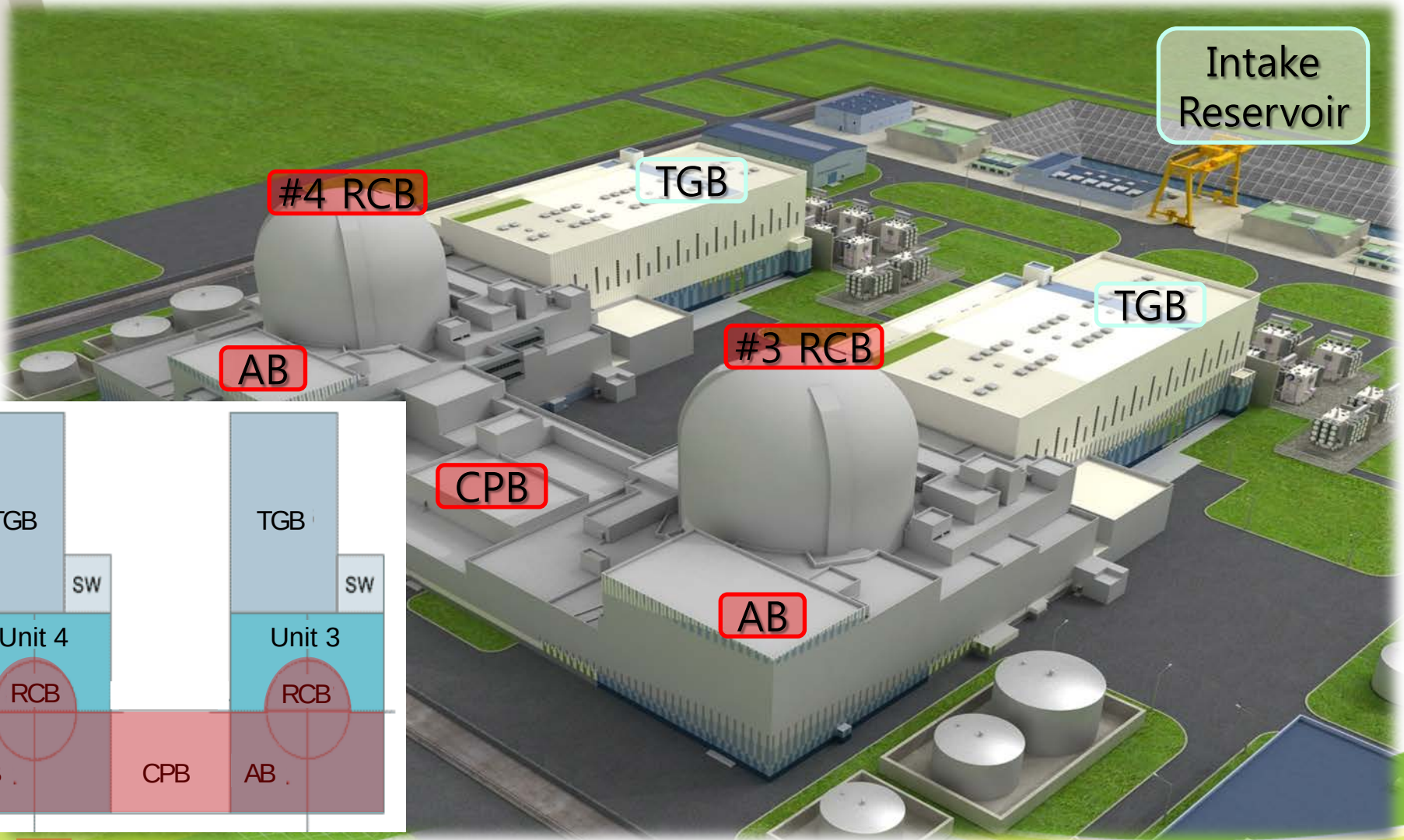
Ⅰ. Introduction to KHNP & APR 1400

Shin-Kori Unit 3 & 4 (APR 1400) - Project Overview

PROJECT	Shin-Kori Units 3 & 4
LOCATION	Ulsan Metropolitan City
REACTOR TYPE	Pressurized Water Reactor (PWR)
INSTALLED CAPACITY	1,400MWe X 2 Units
COMMERCIAL OPERATION	Unit 3: 2014 / Unit 4: 2015

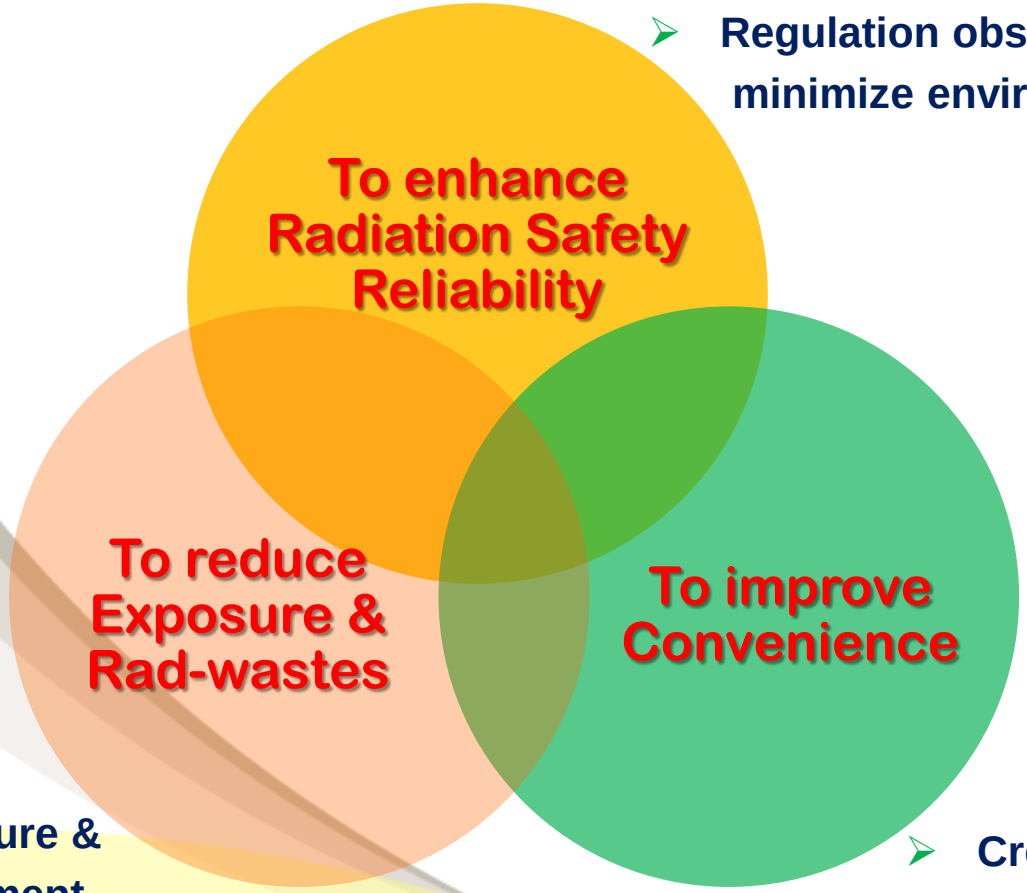
Ⅰ. Introduction to KHNP & APR1400

Shin-Kori Unit 3&4 (APR 1400) - Plant Layout



Ⅱ. System Overview

Goals of Integrated IT Radiation Management System



- Regulation observance & minimize environmental impacts
- Improve exposure & waste management
- Create an effective work control system

Ⅱ. Overview (Cont'd)

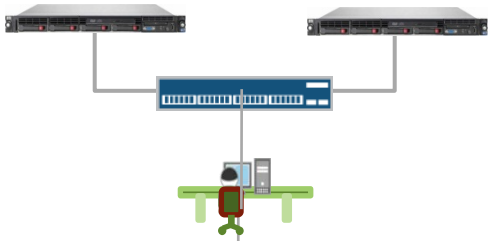
System Components

Traceable Article-carry in & out device using Image Recognition

Individual Fingerprint Locker

Facial Recognition Personal Workwear Dispenser

Integrated Server



Administrator

Ethernet

Remote Monitoring & Video Telephony Facility

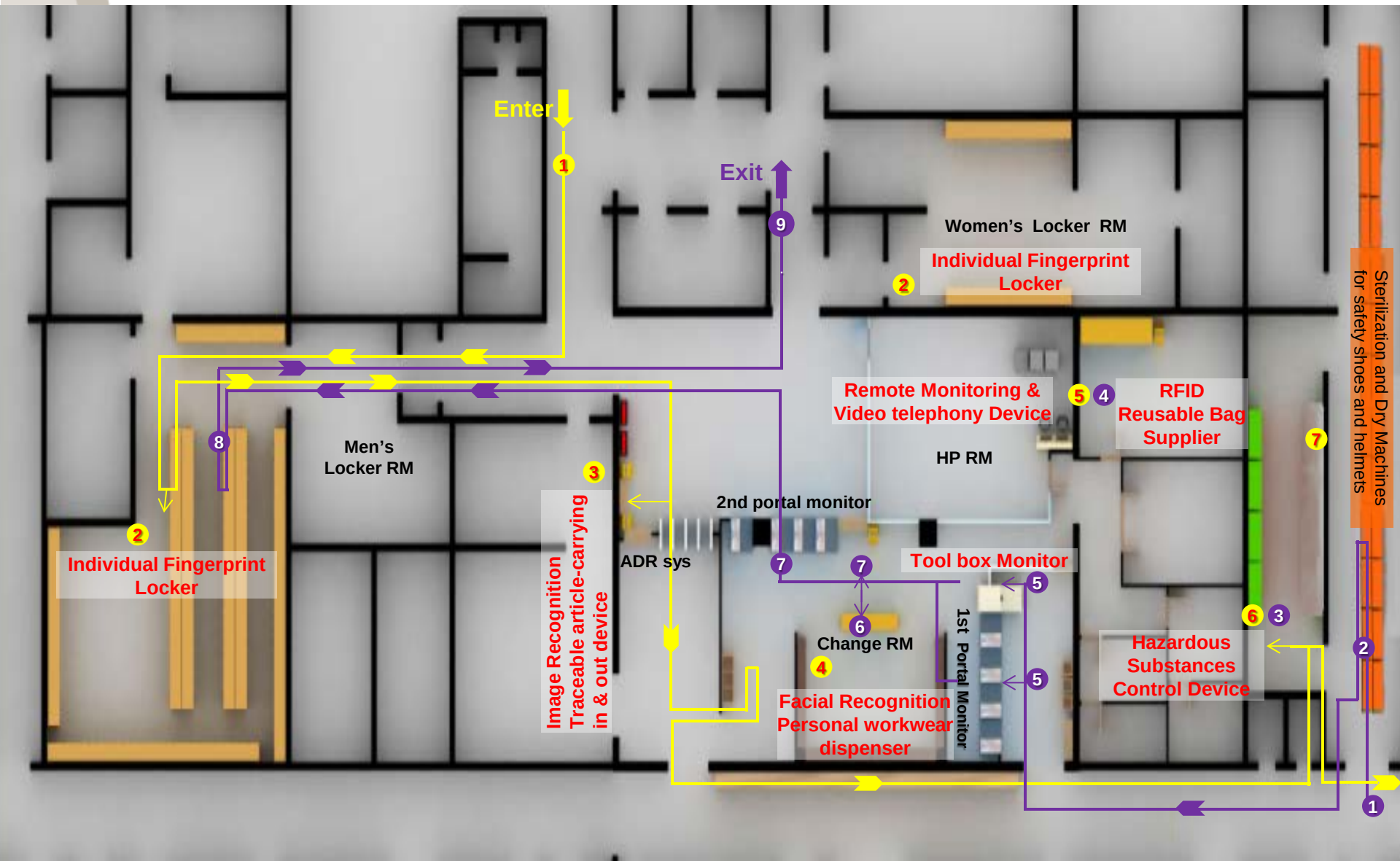
RFID Reusable Bag Supplier

Hazardous Substances Control Device

Tool Box Monitor

Ⅱ. Overview (Cont'd)

Layout of IT System & Access to RCA

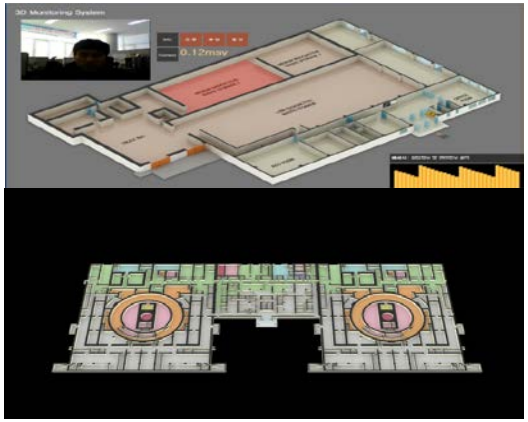


Ⅲ. System Components

1. Remote Monitoring & Video Telephony Facility

- Reduce Workers' access & exposure dose in High Radiation Area

Main Control Panel (HP RM)



Video telephony

Real-time exposure dose of workers

Real-time radiation dose on site

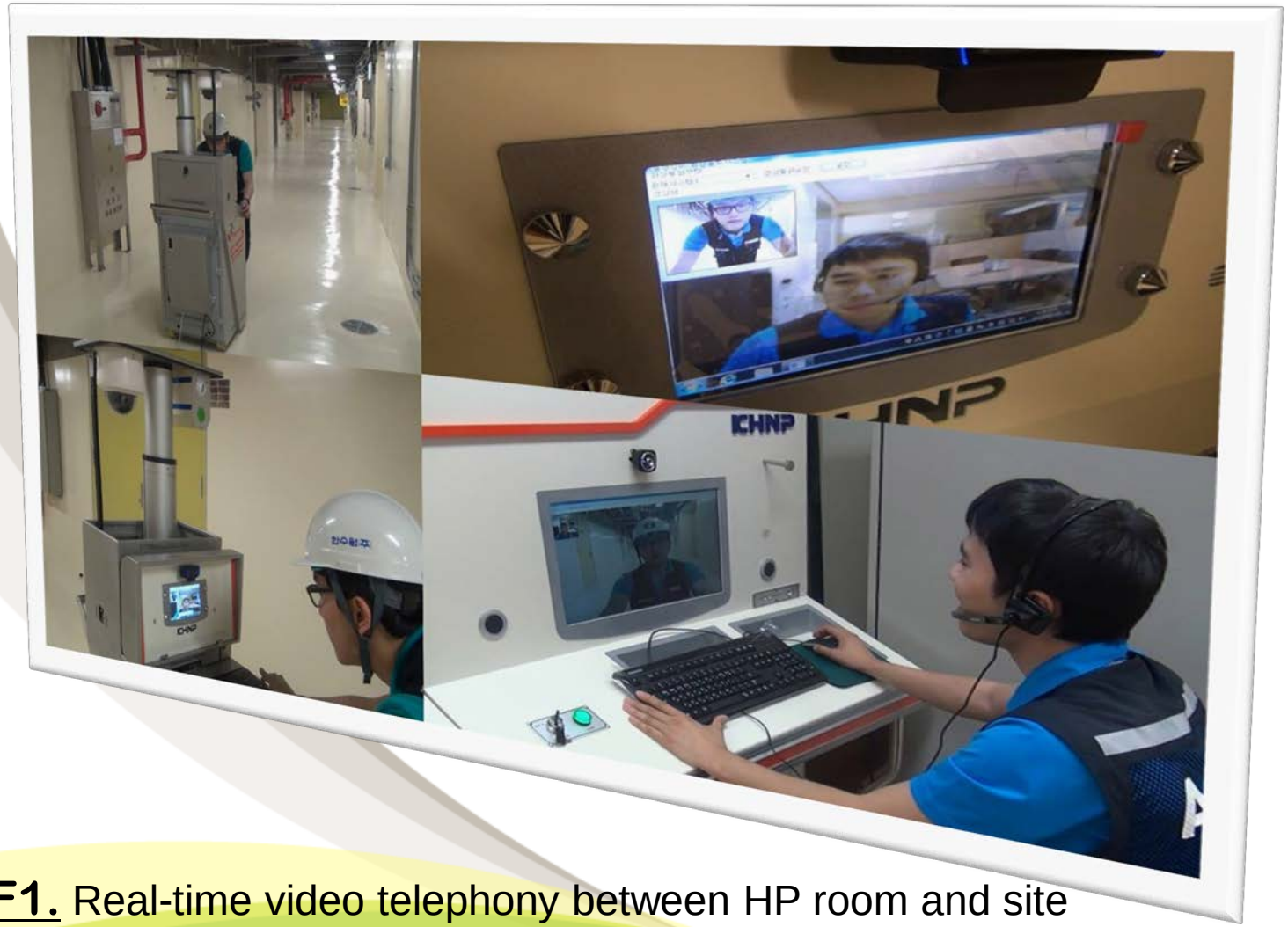
Image of work place

Movable device (Field)

1. Remote Monitoring & Video Telephony Device

- Function snapshots (1 to 4)

1-1. Remote Monitoring & Video Telephony Device

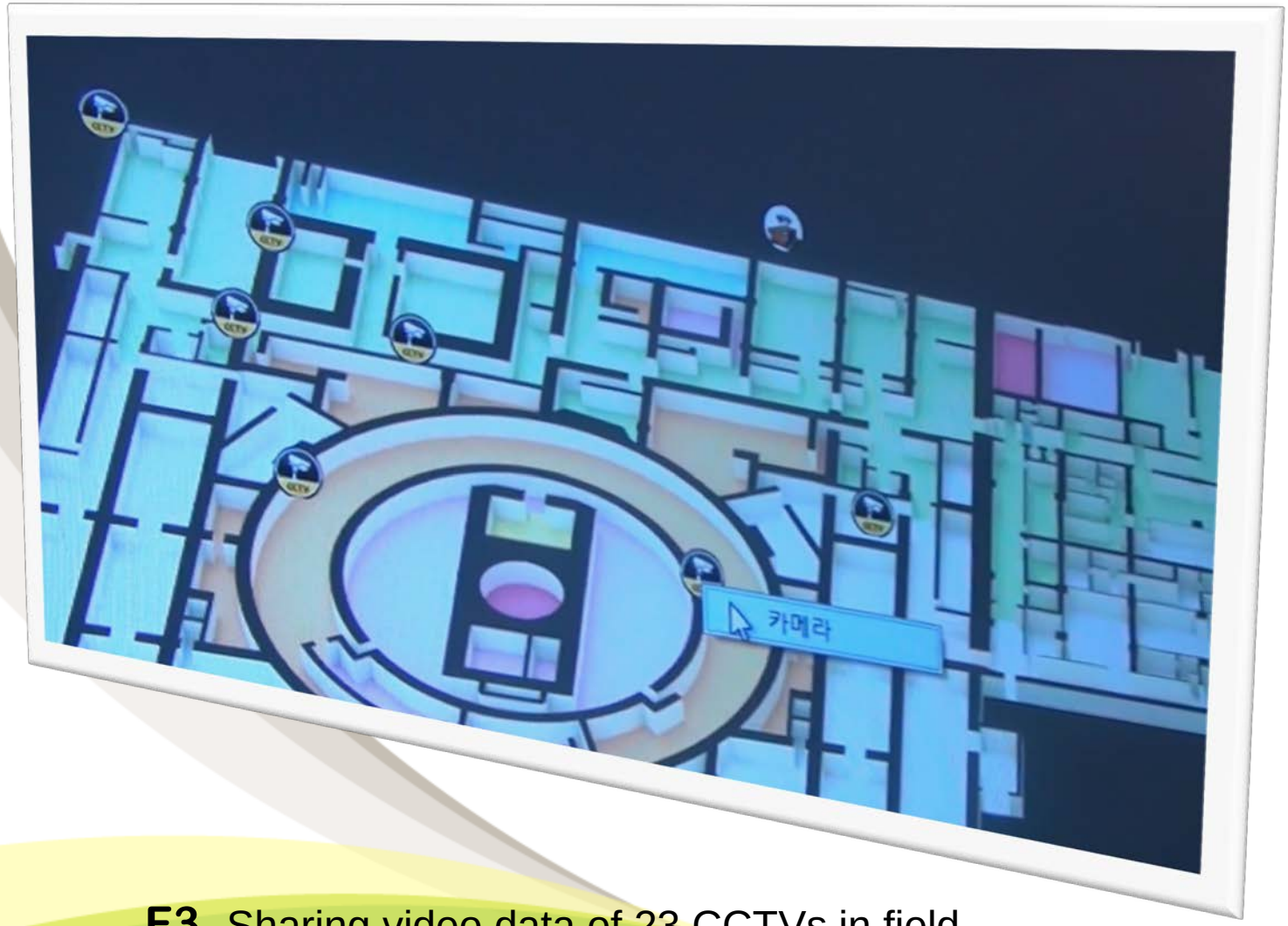


F1. Real-time video telephony between HP room and site

1-2. Remote Monitoring & Video Telephony Device

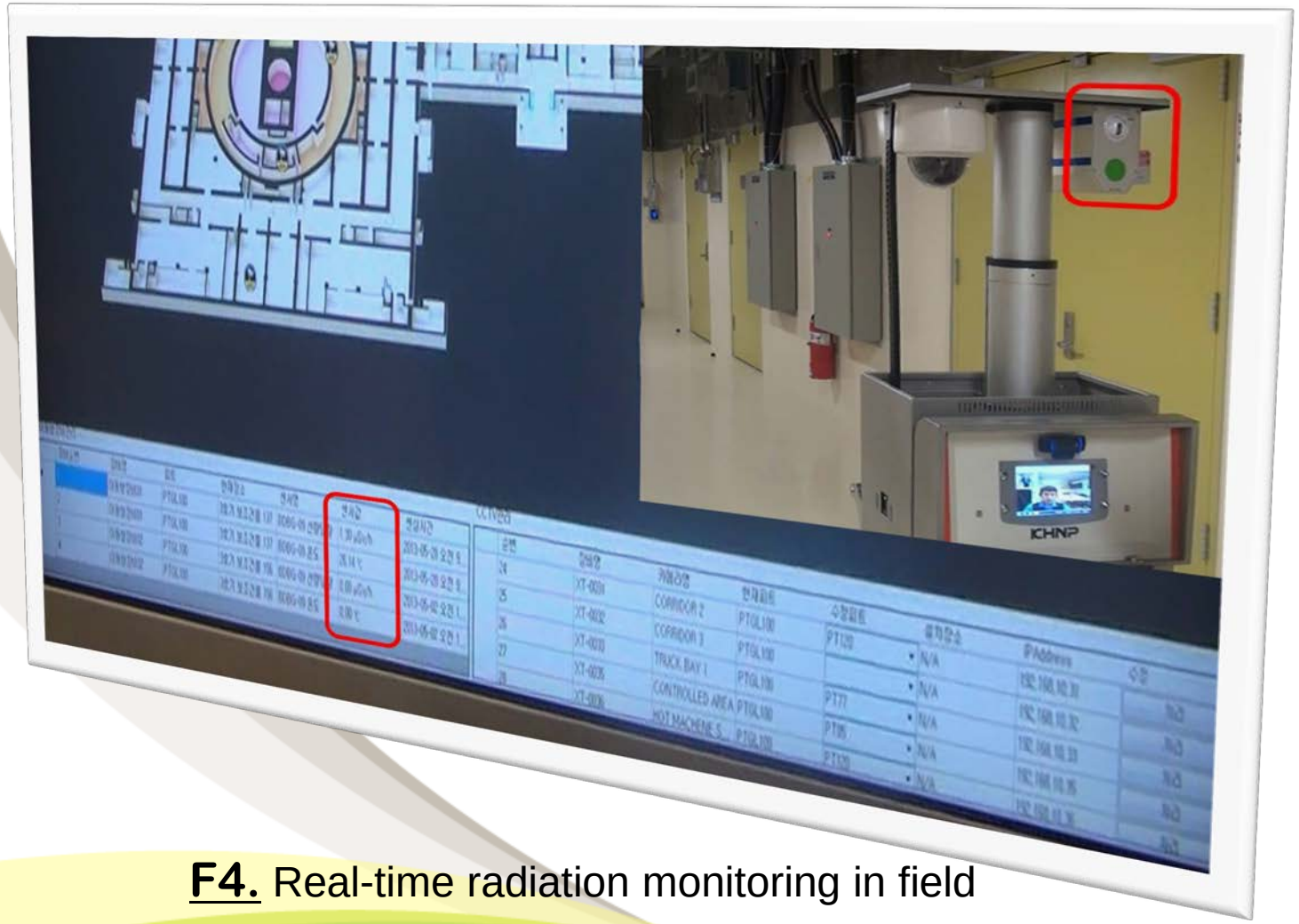
F2. Real-time video monitoring in field (multi-window and multi-tasking)

1-3. Remote Monitoring & Video Telephony Device



F3. Sharing video data of 23 CCTVs in field

1-4. Remote Monitoring & Video Telephony Device



F4. Real-time radiation monitoring in field

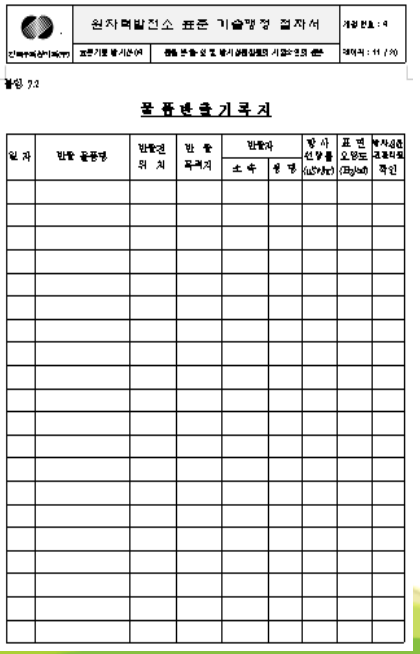
Ⅲ. System Components

2. Traceable Article-Aarry in & out Control Device

Personal ➡ Image recognition automatic device

Before

- Monitored by HP
- Handwritten records



원자력발전소 표준 기술명정 절차서

물 품 반 출 기 록 지

일 자	반출 물품명	반출경위	반 출 목적지	반출자		방사선량률 (μSv/hr)	표면오염도 (Bq/cm²)	방사성물질 검출여부 확인
				소 속	성 명			

Problems

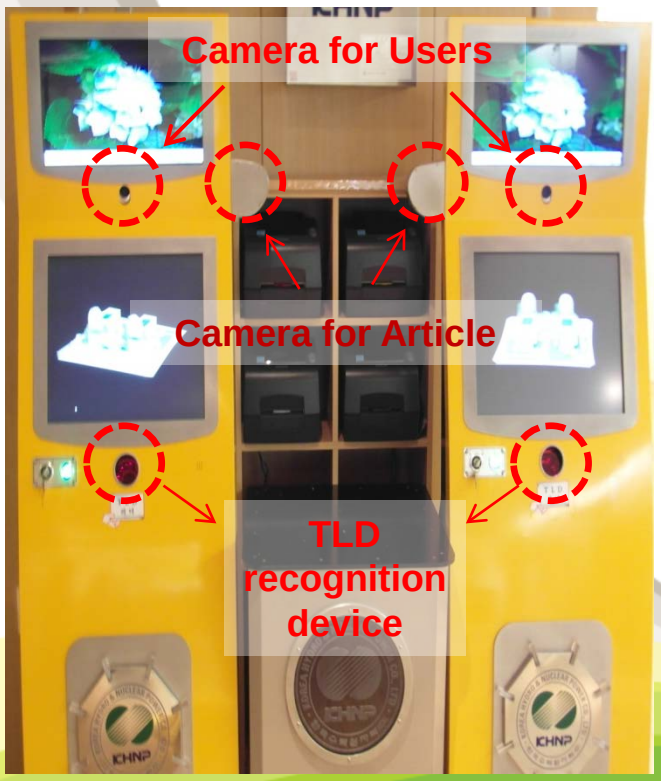
- Unreliabe control of article access into RCA
  - recording errors, unsystematic information collection, etc.
- Supervised by HP staff
  - time delay and over loaded manpower

Ⅲ. System Components

2. Traceable Article-Carry in & out Control Device

After

Articles ⇒ Image scan
Users ⇒ Face or TLD identification (No paper recording)



Carry-in (Access area)

Smart Pad

HP approval

Carry-in article

Carry-out (Changing room)

HP approval

Carry-out article

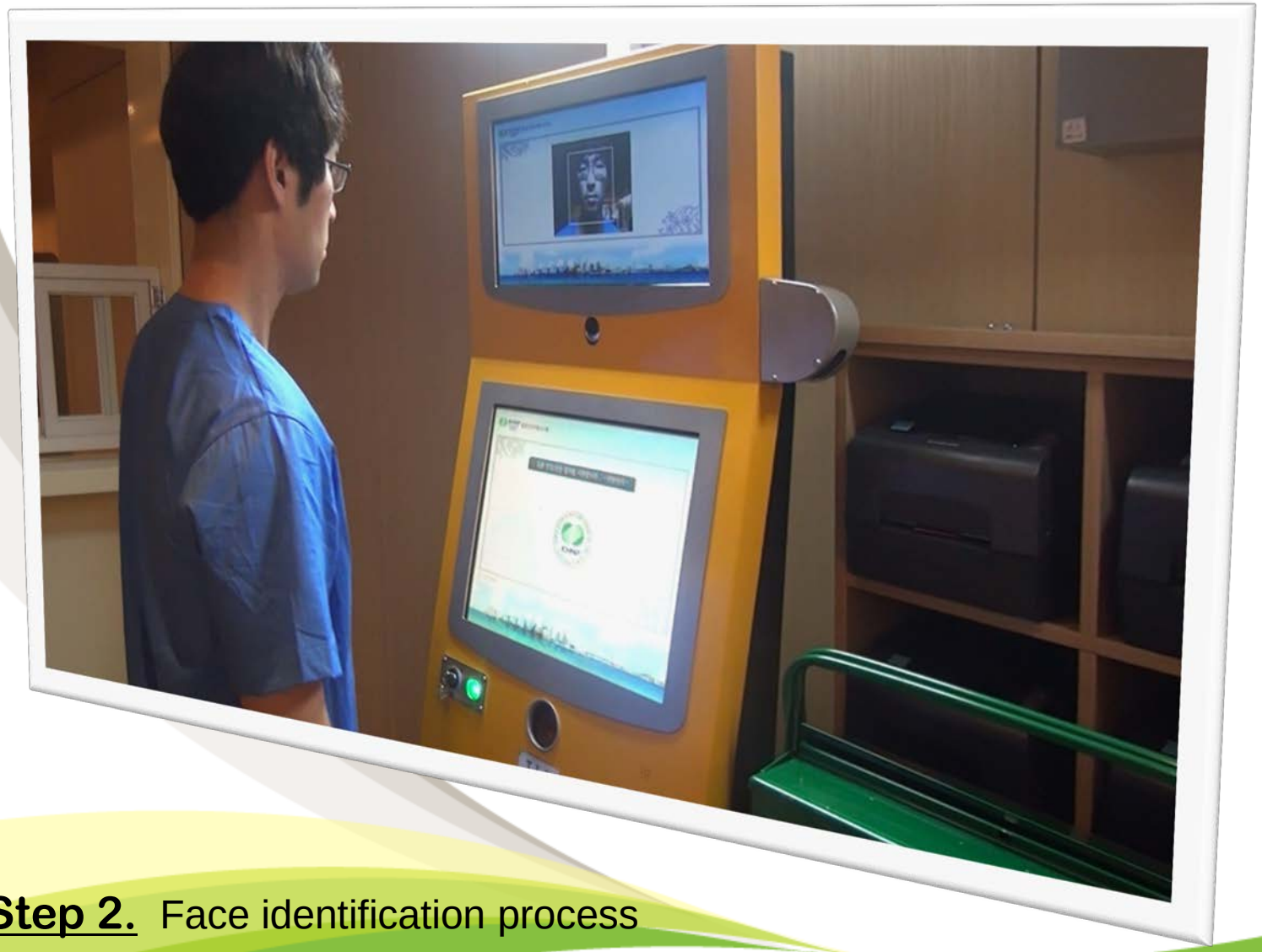
2. Traceable Article-Carry in & out Control Device

- Snapshots of practice (Step 1 to 6)

2-1. Traceable Article-Carry in & out Control Device

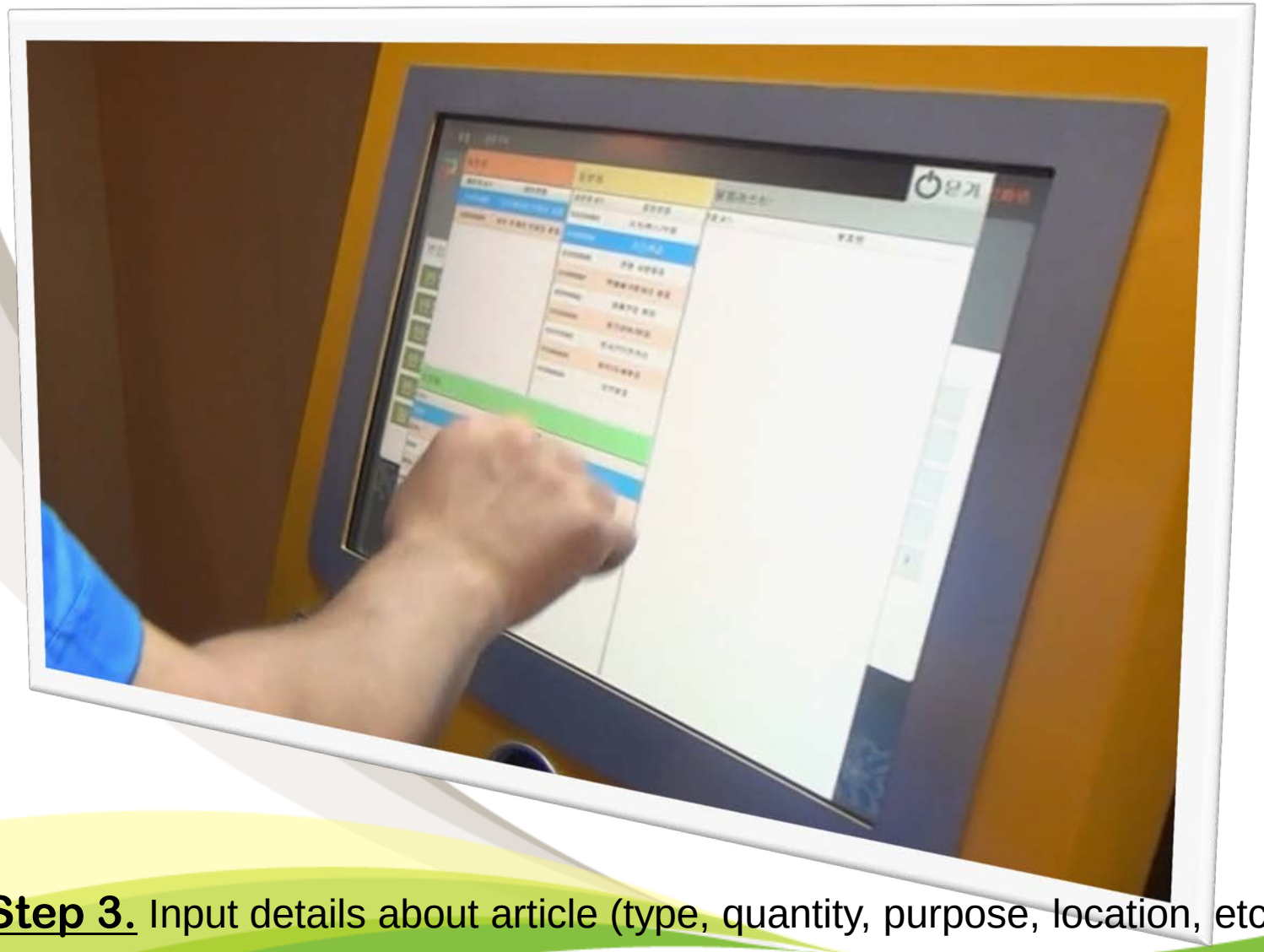
Step 1. Ready for article-carry in

2-2. Traceable Article-Carry in & out Control Device



Step 2. Face identification process

2-3. Traceable Article-Carry in & out Control Device

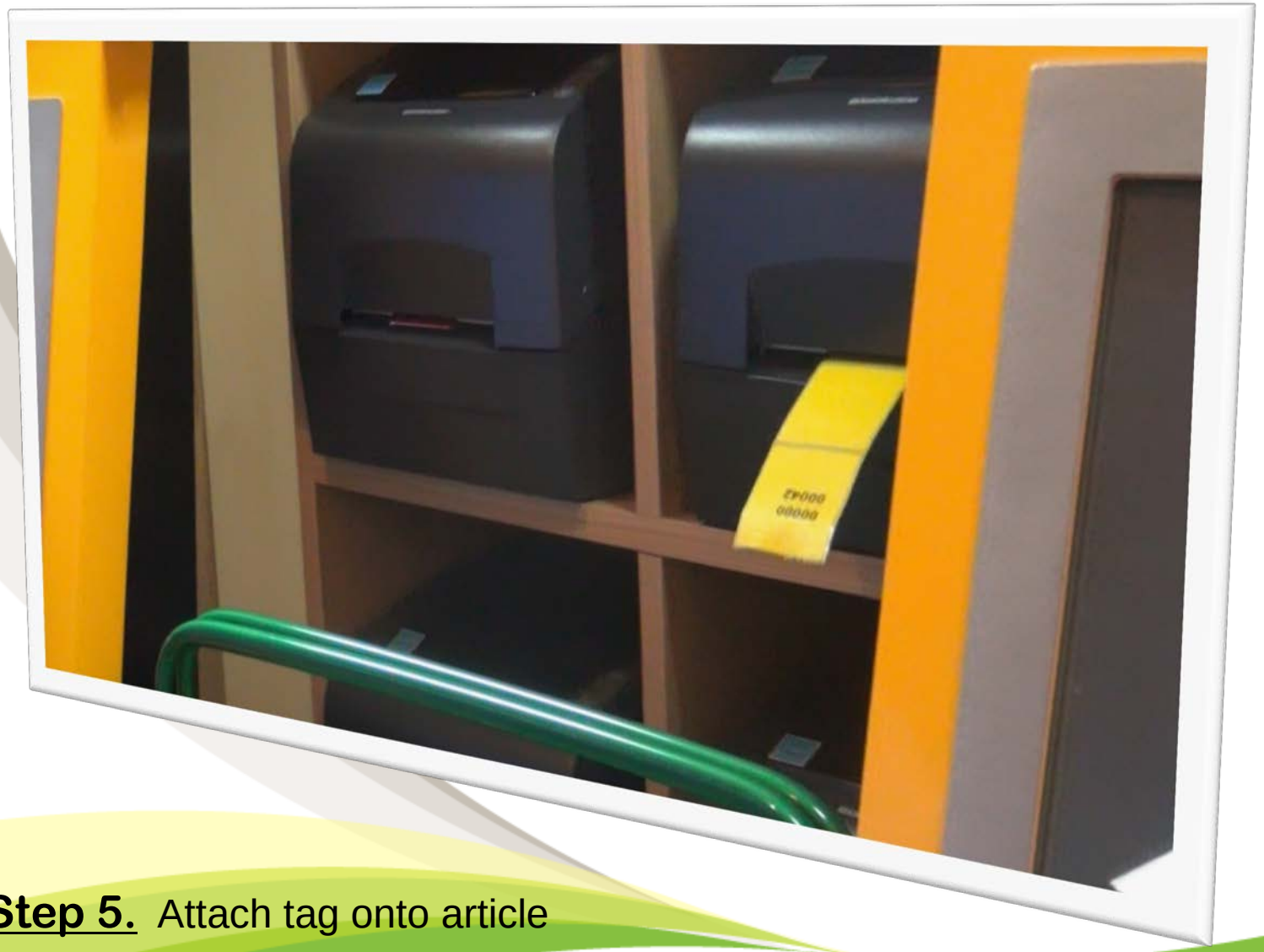


Step 3. Input details about article (type, quantity, purpose, location, etc.)

2-4. Traceable Article-Carry in & out Control Device

Step 4. Image scan of article

2-5. Traceable Article-Carry in & out Control Device



Step 5. Attach tag onto article

2-6. Traceable Article-Carry in & out Control Device

Step 6. Enter into RCA with article

Ⅲ. System Components

3. Individual Fingerprint Locker

Access number or key → Open/Close by fingerprint recognition

Before

Key-operated or Digital Locker

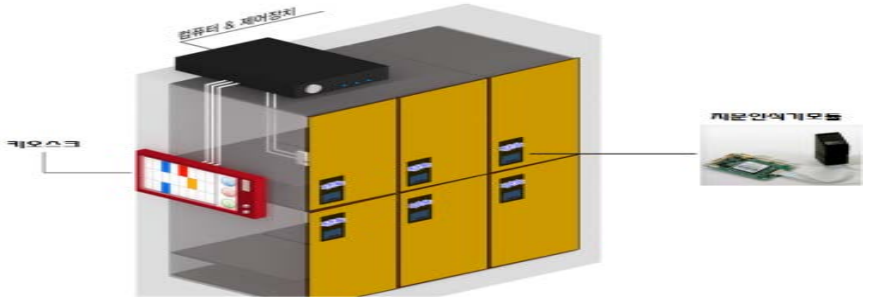
Problems

- Difficult to find if vacant or occupied

Ⅲ. System Components

3. Individual Fingerprint Locker

After



Locker	Save individual fingerprint data

Kiosk	• Information Display • Locker data sent to Server

Vacant (Blue light)

Occupied (Red light)

Kiosk

Ⅲ. System Components

4. Facial Recognition Personal Workwear Dispenser

Common use ➡ Personal dispenser for designated workers

Before

Common use for workers

Problems

- Unhygienic
- Deteriorated wearability
  - contamination, damage, frequent wash, etc.
- Overloaded manpower & laundry machine during O/H
  - More than 600 clothes per day

Ⅲ. System Components

4. Facial Recognition Personal Workwear Dispenser

After

Kiosk

Personal workwear box (Auto)

System Configuration

- 2 Sets of Kiosk
- 504 boxes

Ⅲ. System Components

5. RFID Reusable Bag Supplier

Personal ➡ Automatic management using RFID

Before

Supervisor supplies bags directly

원자력발전소 표준 기술행정 절차서

개정 번호 : 1

표준기행 방사선-18 | 방사선관리구역 작업복을 관리 | 페이지: 18 / 18

붙임 7.5 방사선관리구역내 수거백, 덮개 및 깔판 관리대장

○○ 제○발전소 방사선안전팀

일자	품명	입출고	사용목적(장소)	대출자 (근무지)	반납 기한	생산원 반납기한	확인자	입고 일자	반납자	오염도 (Bq/g)	최종 일자	확인자

주1) 방사선관리구역내 수거백, 덮개 및 깔판의 반납기한은 수령일로부터 최대 60일까지 임.
주2) 최초 수령 시의 허가받은 반납기한을 초과할 경우 추가적으로 방사선안전관리원의 허가를 득한 후 최초 수령일로부터 60일 이내까지 반납기한을 연장할 수 있음.

[Purpose of reusable bag use]

- To reduce waste from several types of plastic like carriage bag, working mats, waste collection bags, etc.

[Problems]

- Monitored and managed by Supervisor
  - time delay, overloaded man-power, recording errors, etc.
- Missed and left bags in RCA
  - Lack of ownership

Ⅲ. System Components

5. RFID Reusable Bag Supplier

After

Reusable Bag ⇒ Supply and trace using RFID

Users ⇒ TLD Identification

Kiosk

Supply Unit

Collection Unit

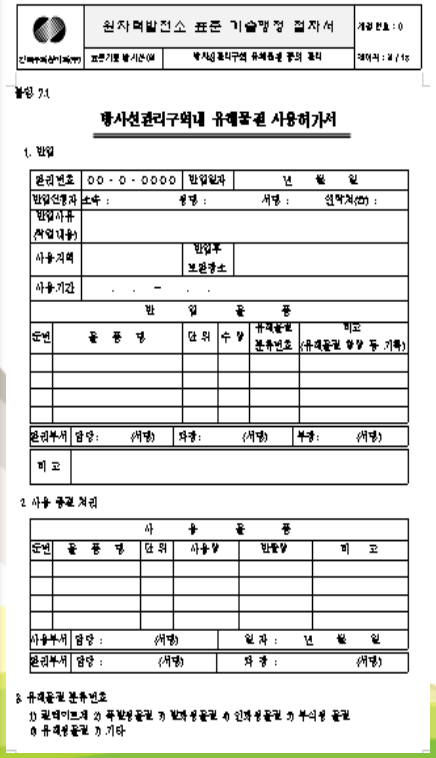
Ⅲ. System Components

6. Hazardous Substances Control Device

Unsystematic ➡ Automatic supply & return using image recognition

Before

Stock in Cabinet & Paper recording



원자력발전소 표준 기술지침 절차서

방사선관리구역내 유해물질 사용허가서

1. 반입

관리번호	00 - 0 - 0000	반입일자	년 월 일
반입신청자 소속 :		성명 :	서명 : 전화번호 :
반입사유 (작업내용)			
사용지역		반입후 보관장소	
사용기간	. . ~ . .		

반 입 물 품

순번	물 품 명	단 위	수 량	유해물질 분류번호	비고 (유해물질 함량 등 기록)

관리부서	담당 : (서명)	과장 : (서명)	부장 : (서명)
비 고			

2. 사용 종료 처리

사 용 물 품

순번	물 품 명	단 위	사용량	반출량	비 고

사용부서	담당 : (서명)	일자 : 년 월 일
관리부서	담당 : (서명)	과장 : (서명)

※ 유해물질 분류번호
1) 폴리머트제 2) 폭발성물질 3) 발화성물질 4) 인화성물질 5) 부식성 물질
6) 유독성물질 7) 기타

Problems

- Missing hazardous substances in RCA caused safety problems
- Oversupplied and overused due to unsystematic control
- No disposal method of hazardous waste substances due to a lack of technical development

* Chemicals (acid/alkaline), Drugs and Paints

Ⅲ. System Components

6. Hazardous Substances Control Device

After

Hazardous substances ⇒ Image scan

Users ⇒ Face Identification & Use of electronic scale

Supply Unit & Kiosk 2 Set

Electronic scale (measured by 1g)

Ⅲ. System Components

7. Tool Box Monitor

Personal ➡ Automatic check

Before

1st check in field

2nd check in access area

Problems

- Unreliable control of surface contamination survey
  - Dependent on worker's skill
  - Sometimes missed contamination survey
- HP Standby and long measuring time

Ⅲ. System Components

7. Tool Box Monitor

After

- Use of six scintillation detectors
  - Quick measurement & enhanced reliability
- Door opens automatically if not contaminated
  - But if contaminated, an alarm sounds and the door locks

Ⅳ. Expected Effect

Components	Effect
Remote Monitoring & Video Telephony Device	Reduced exposure ↑ Efficient communication ↑
Traceable Article-Carrying in & out Control Device	Enhanced control ↑
Individual Fingerprint Locker	Convenience ↑ Efficient management ↑
Facial Recognition Personal workwear Dispenser	Hygienic/Convenient ↑ Radioactive waste ↓
RFID Reusable Bag Supplier	Efficient management ↑ Radioactive waste ↓
Hazardous Substances Control Device	Efficient management ↑ Radioactive waste ↓
Tool Box Monitor	Measurement reliability ↑ Measuring time ↓

Ⅴ. Future Plan

Continuous Improvement & Optimization

- Commercial operation at Unit 3 in 2014

Installation of Integrated Paperless Information Sys.

- **Contents**
  - Install movable kiosk in RCA
    - SAP (KHNP business Portal)
    - search & refer pre-input work procedures, drawings, etc.
  - Provide workers with smart pads used in RCA
- **Schedule**
  - Manufacture: Aug ~ Oct 2013
  - Install & test: Oct ~ Dec 2013


Thank you