# Present and Future of Nuclear Power in Korea

Oct. 27, 2009

Jong-Shin Kim
President & CEO
Korea Hydro & Nuclear Power Co.

KHNP

# Contents

Chap. I

# Current status of nuclear power program

# The beginning of nuclear power

**Research reactor** TRIGA MARK II('59.7)

**Commercial reactor** Kori #1

- Capacity : 587MW
- Construction period : 7 years ('71.3~'78.4)
- Project type : Turn-Key (Westinghouse/USA)
- Construction cost : 320 million $
  (foreign capital : 170 million $)

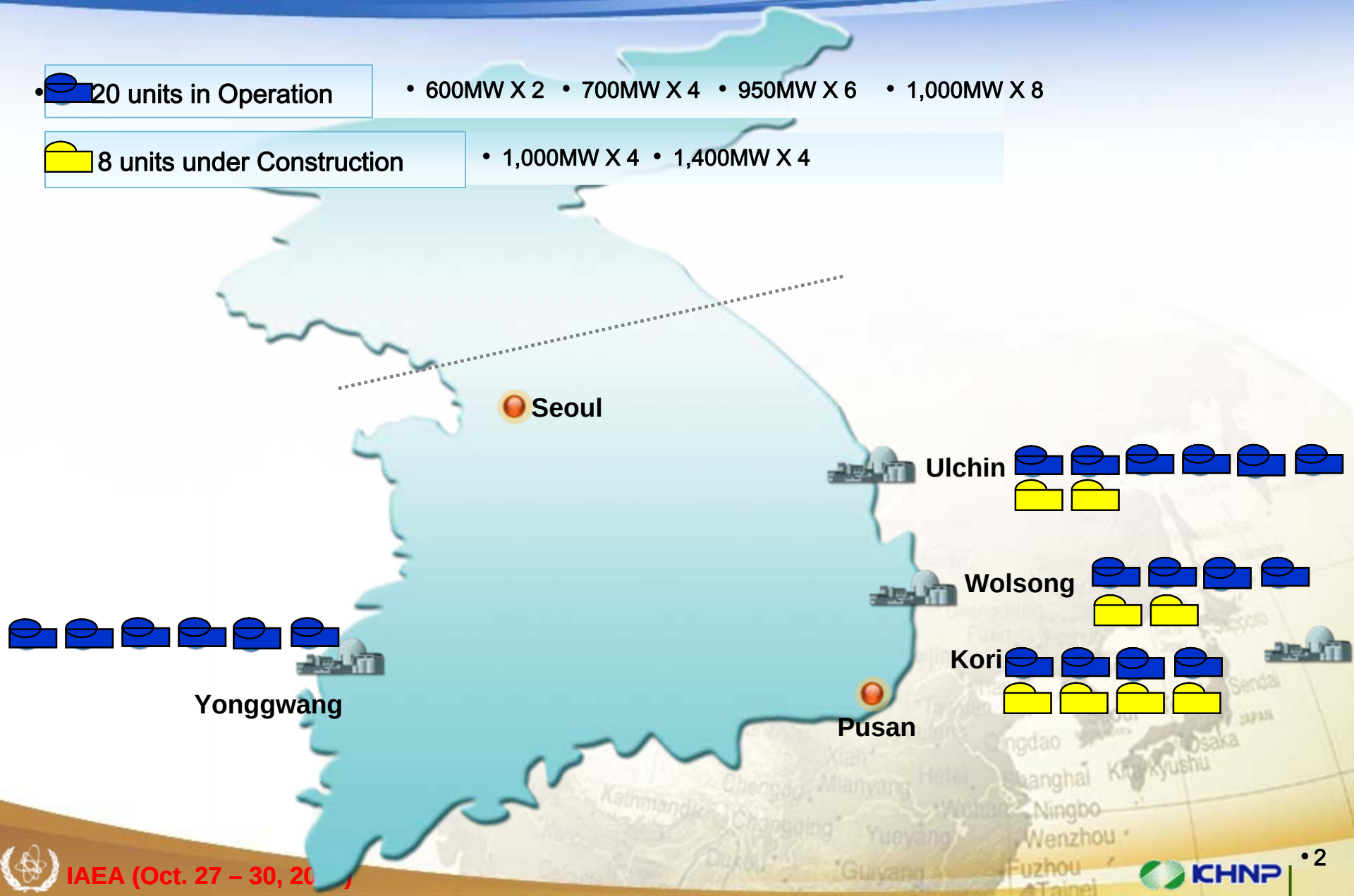
※ Life-extended after 30 years operation ('07.12)

<1971 vs. 2008, Korea>

| | 1971 | 2008 |
|---|---|---|
| GNP per capita | 290 $ | 19,230 $ |
| Export | 1 billion $ | 419 billion $ |
| Power capacity | 2,628 MW | 72,491MW |
| Number of Cars | 0.14 million | 16.8 million |

# Nuclear power plants in Korea

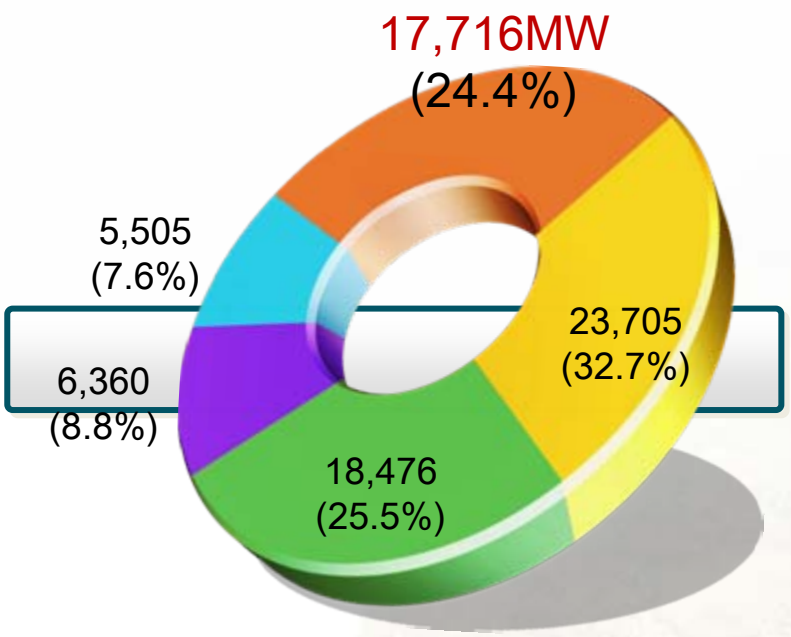
- 20 units in Operation • 600MW X 2 • 700MW X 4 • 950MW X 6 • 1,000MW X 8
- 8 units under Construction • 1,000MW X 4 • 1,400MW X 4



# Status of electric power

Nuclear Coal Gas Oil Hydro (As of the end of 2008)

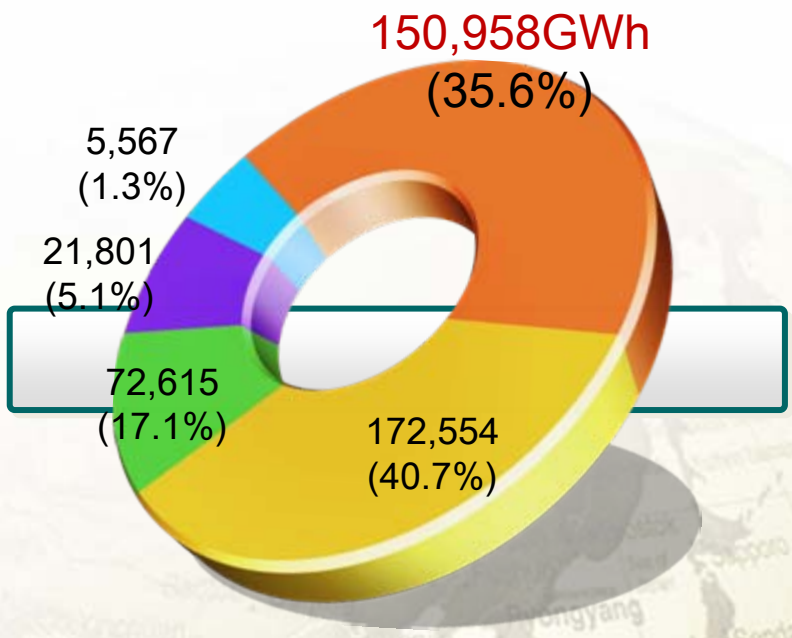
## Installed Capacity




*The others : 728 MW(1.0%)

**Total : 72,490 MW**

## Electricity Generation



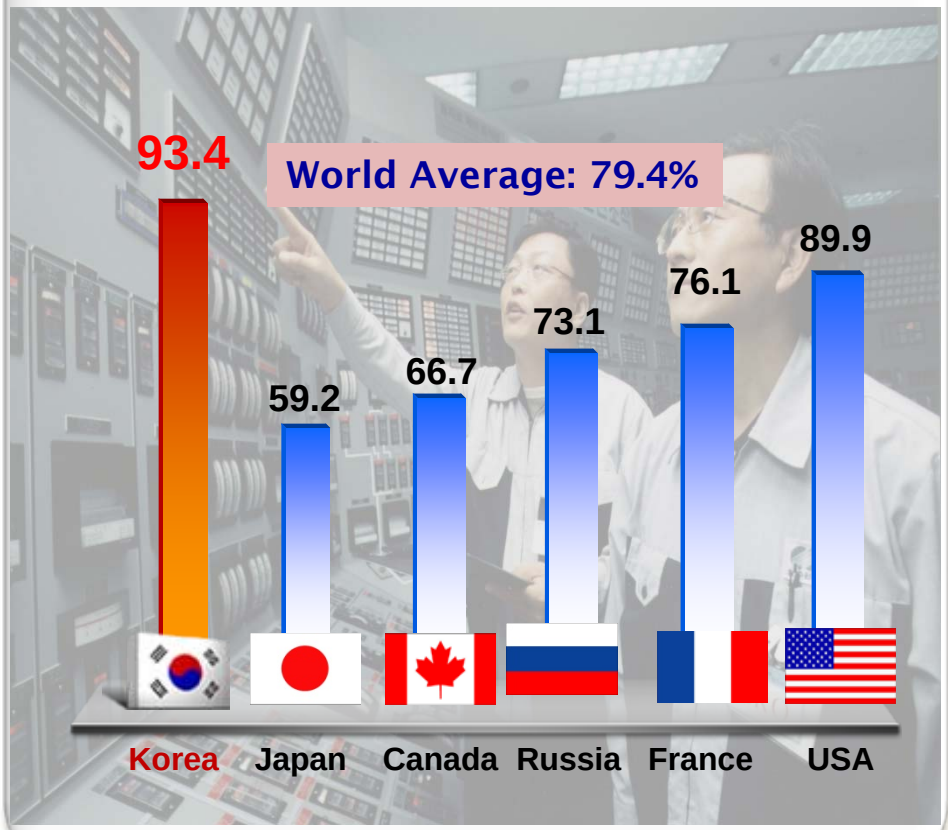

*The others : 928 GWh(0.2%)

**Total : 424,423 GWh**

# Operational performance

## Capacity Factor

(Year 2008, %)




※ Source: *Nucleonics Week* (2009. 3)

## Unplanned Capability Loss

(Year 2008, %)

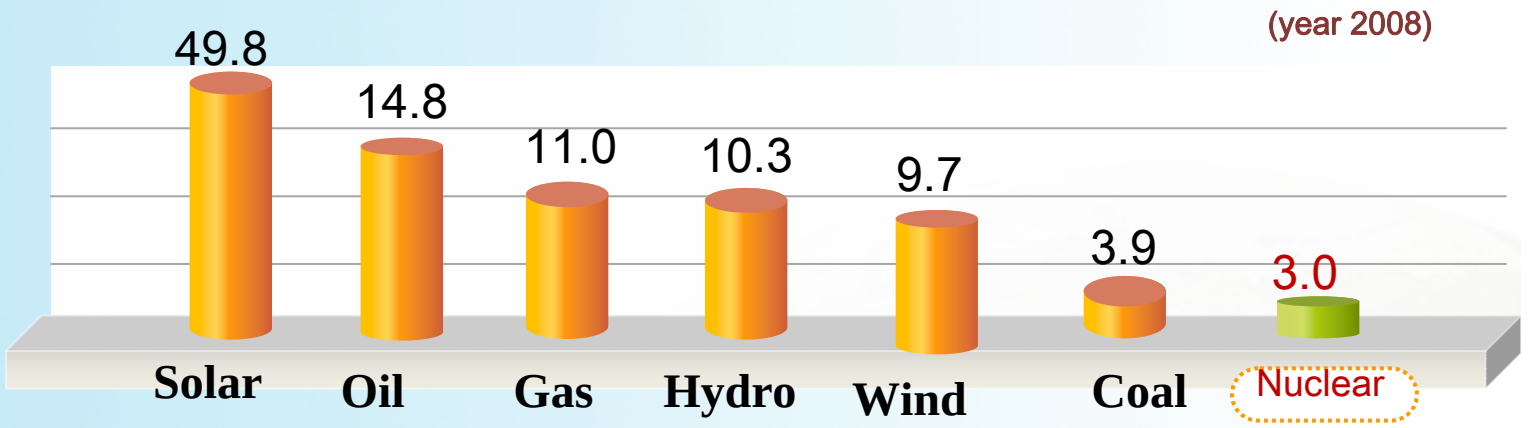



※ Source : IAEA

# Low price of electricity with nuclear power

## Economical efficiency

- Sales price (¢/kWh) : Nuclear is the cheapest




## Contribution to national economy

# Strength of Korea's nuclear power

**Well-organized nuclear infrastructure**

**Strong & consistent government nuclear policy**

**Well-qualified workforce to maintain nuclear power program**


**Close cooperation with international organization**

Chap. Ⅱ

# Construction of advanced nuclear power plants

# Construction of nuclear power plants

| Project | | Reactor Type | Capacity (MW) | Model | Commercial Operation | Remark |
|---|---|---|---|---|---|---|
| Shin-Kori | #1 | PWR | 1,000 | OPR1000 | Dec. 2010 | Under Construction |
| | #2 | PWR | 1,000 | OPR1000 | Dec. 2011 | |
| | #3 | PWR | 1,400 | APR1400 | Sep. 2013 | Under Construction |
| | #4 | PWR | 1,400 | APR1400 | Sep. 2014 | |
| | #5 | PWR | 1,400 | APR1400 | Dec. 2018 | In planning |
| | #6 | PWR | 1,400 | APR1400 | Dec. 2019 | |
| Shin-Wolsong | #1 | PWR | 1,000 | OPR1000 | Mar. 2012 | Under Construction |
| | #2 | PWR | 1,000 | OPR1000 | Jan. 2013 | |
| Shin-Ulchin | #1 | PWR | 1,400 | APR1400 | Dec. 2015 | Under Construction |
| | #2 | PWR | 1,400 | APR1400 | Dec. 2016 | |
| | #3 | PWR | 1,400 | APR1400 | Jun. 2020 | In planning |
| | #4 | PWR | 1,400 | APR1400 | Jun. 2021 | |

# Status of nuclear power construction

## Shin-Kori #1,2

| Rx. type | Advanced OPR1000 |
|---|---|
| Capacity | 1000MW x 2units |
| Duration | ’06.6/’07.6~’10.12/’11.12 |

## Shin-wolsong #1,2

| Rx. type | Advanced OPR1000 |
|---|---|
| Capacity | 1000MW x 2units |
| Duration | ’07.11/’08.9~’12.3/’13.1 |

* OPR1000 : Optimazed Power Reactor 1000

# Status of nuclear power construction

## Shin-Kori #3,4

| Rx. type | APR1400 |
|---|---|
| Capacity | 1400MW x 2units |
| Duration | ’08.10/’09.8~’13.9/’14.9 |

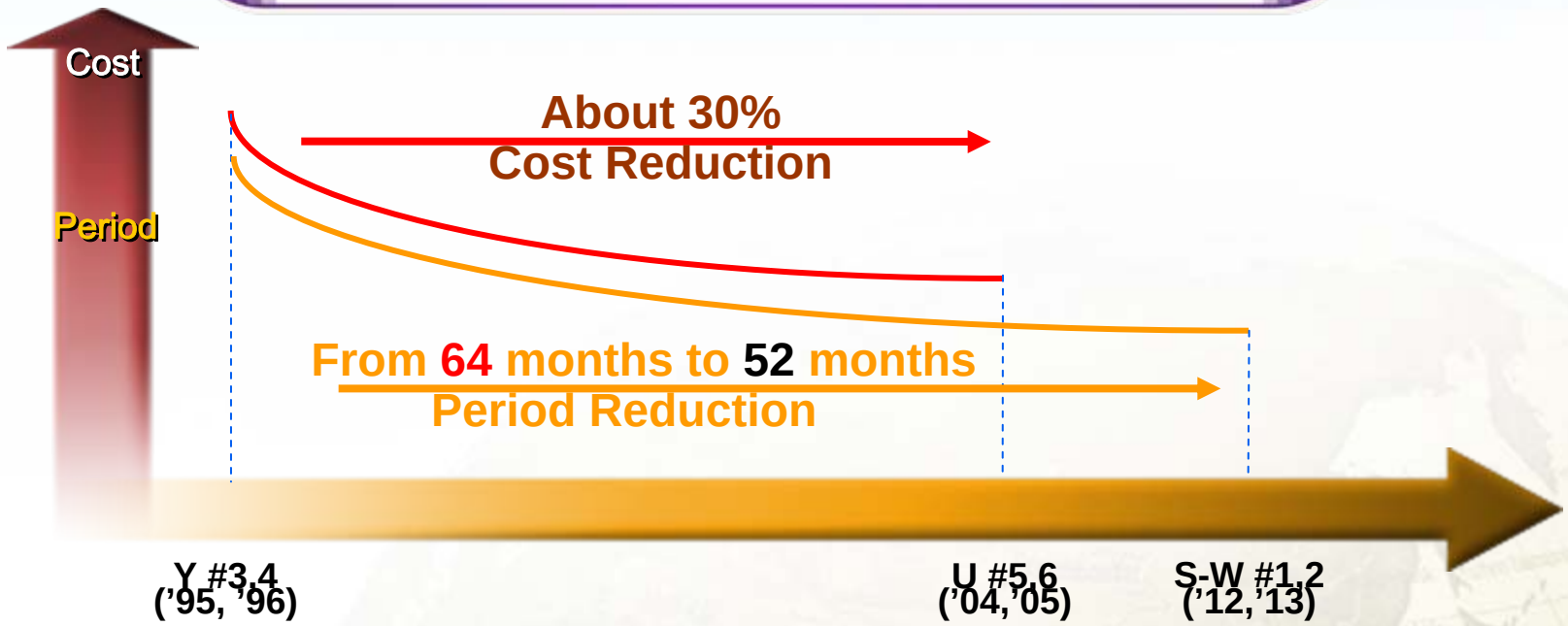
## Shin-Ulchin #1,2


| Rx. type | APR1400 |
|---|---|
| Capacity | 1400MW x 2units |
| Duration | ’11.3/’12.3~’15.12/’16.12 |

* APR1400 : Advanced Power Reactor 1400

# Economic efficiency in construction

## Project Cost & Period Reduction




Korea has completed 20 NPP projects within the planned schedule & costs.

# Key players of Korea's nuclear industry

- Korea is one of a few countries in the world that have continuously and aggressively implemented NPP projects up to now since 1970s.

Chap. III

# Advance in reactor technology

# History of reactor technology development

**1970s**

Completion of Kori Unit1 ('78)

Introduction of Nuclear Power

The first unit

**1980s**

Technology Accumulation

Units complete: 8 units

**1990s**

Completion of First OPR1000 ('95)

Development of OPR1000

Units complete : 7 units

**2000s**

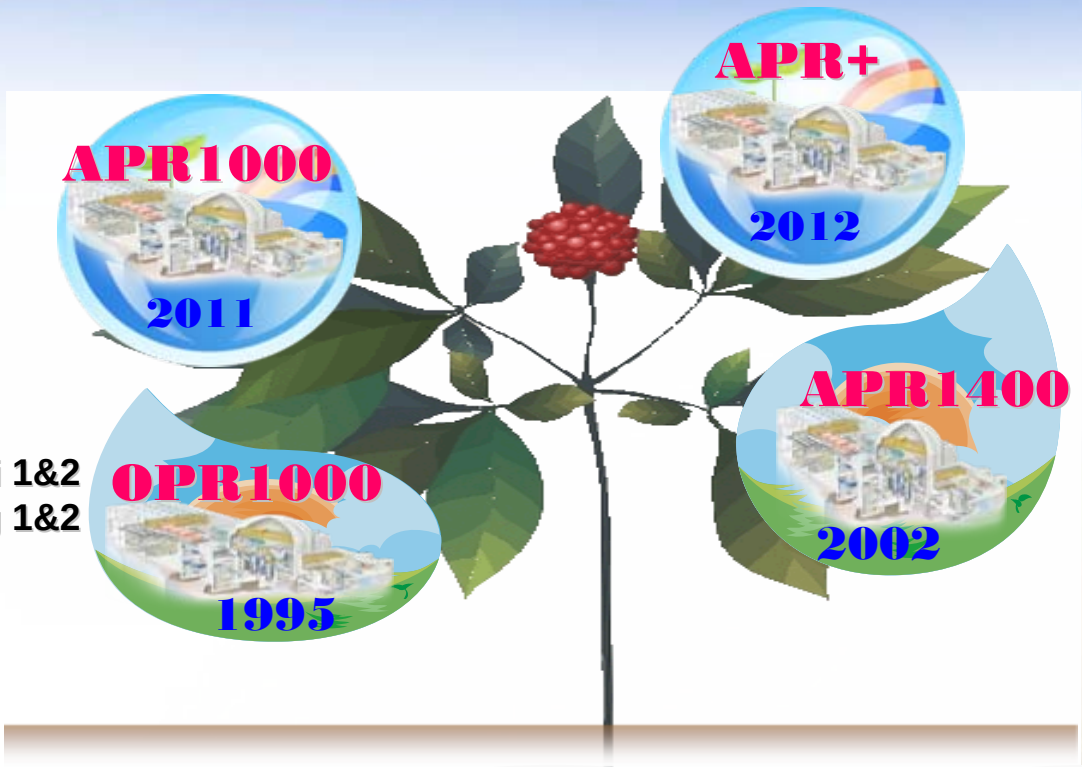
Completion of First APR1400 ('13)

Development of APR1400

Units complete : 4 units

Units under construction: 8 units

# Development of Korean reactors




Shin-Kori 1&2
Shin-Wolsong 1&2

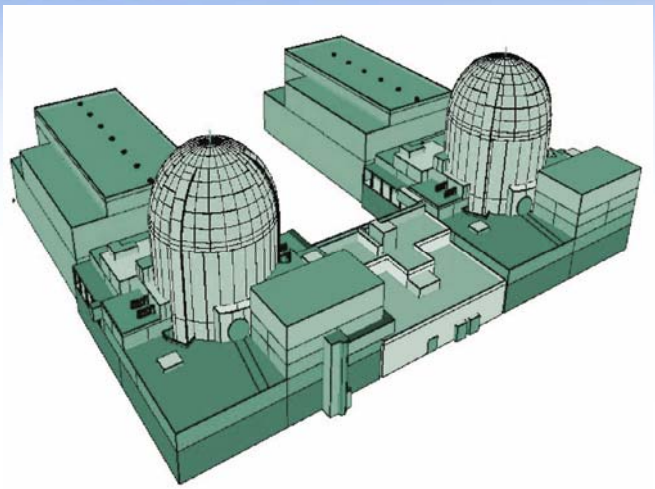
Shin-Kori 3&4
Shin-Ulchin 1&2

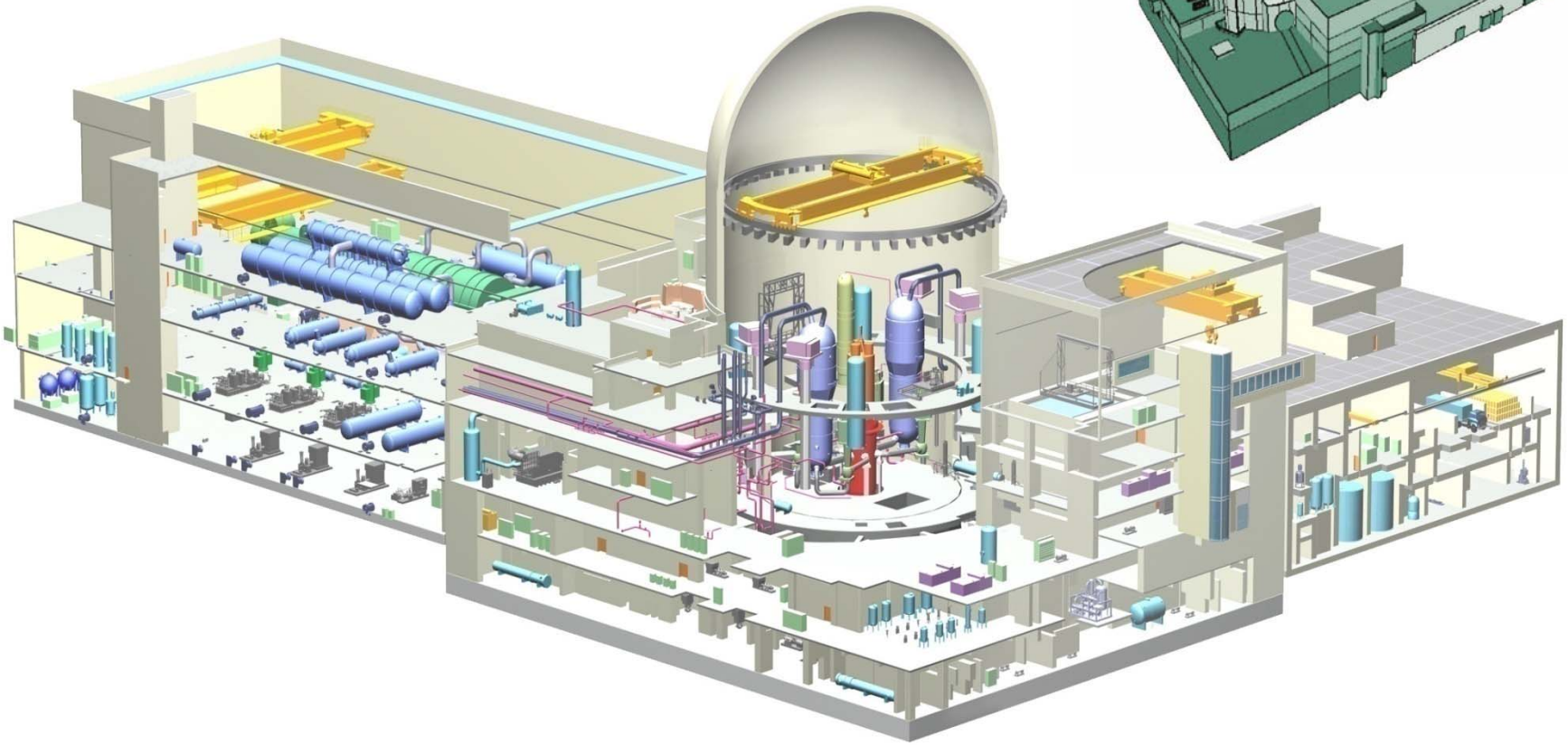
Experienced Engineers

Advanced Technology

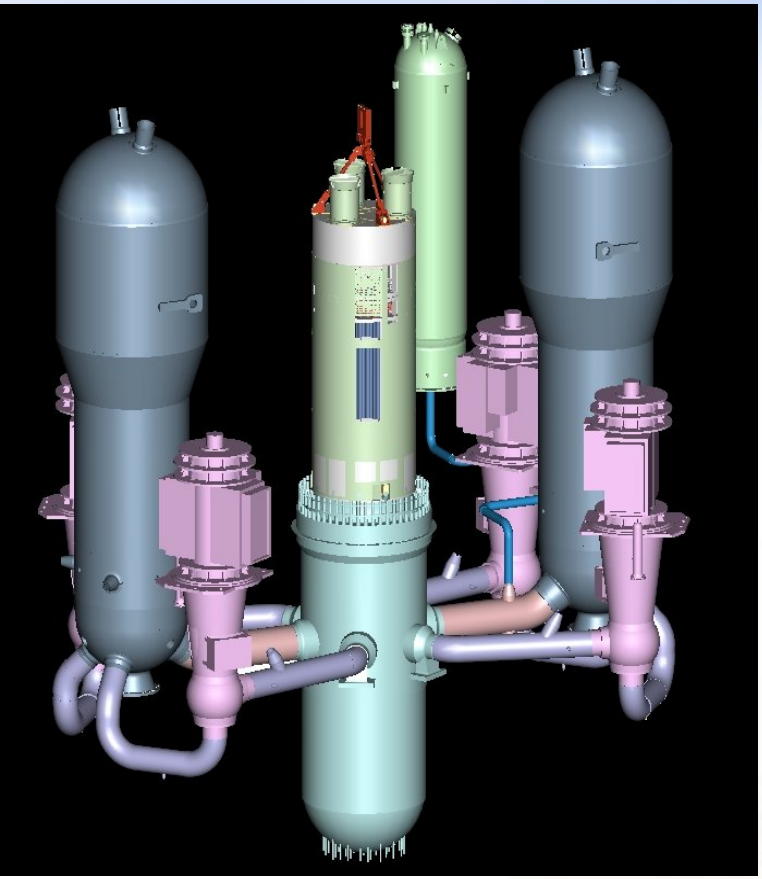
Good Infrastructure

# APR1400

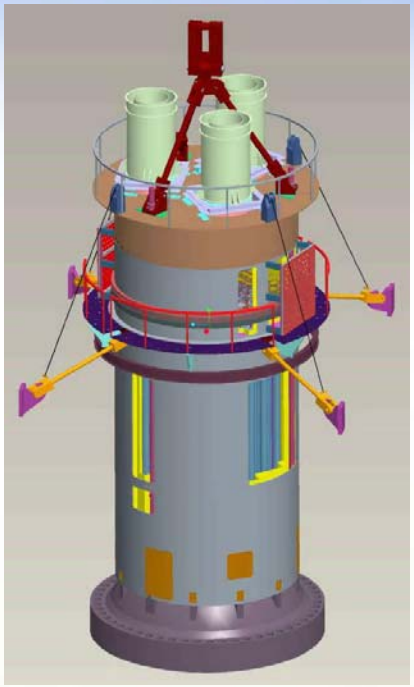




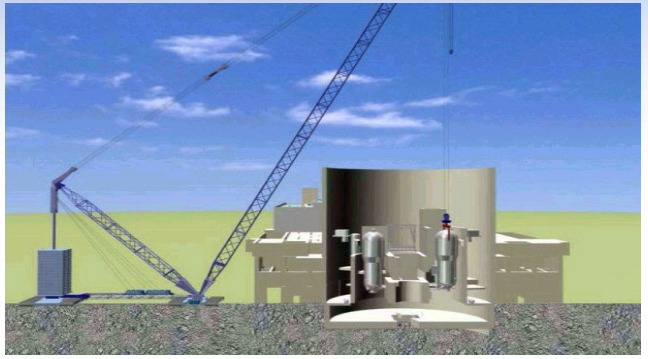
# Major design features of APR1400



**NSSS**



**Integrated Head Ass'y**

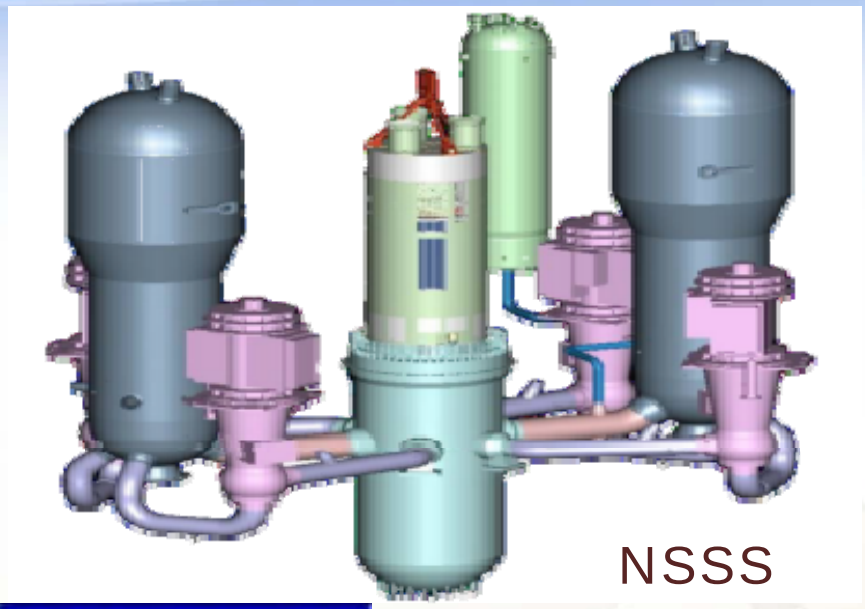


**Over the top method**

**Digital I&C**

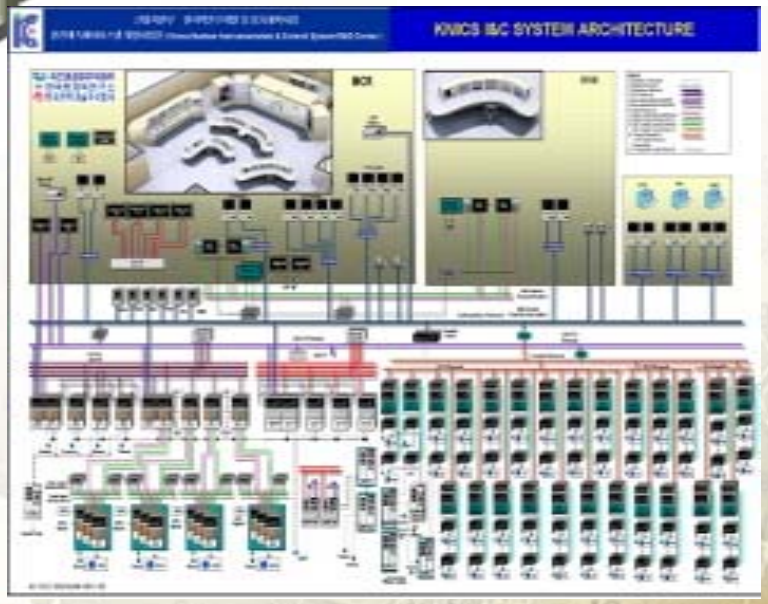
# APR+ “to the Future, to the World”

General Arrangement

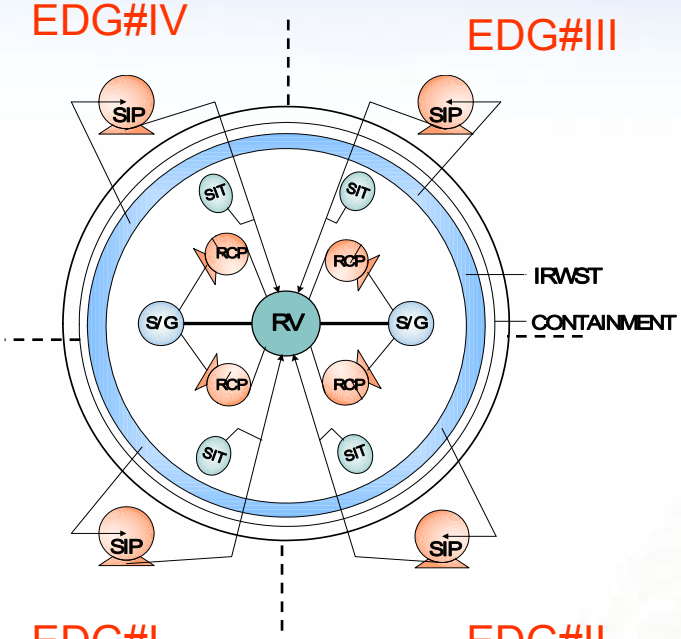


NSSS

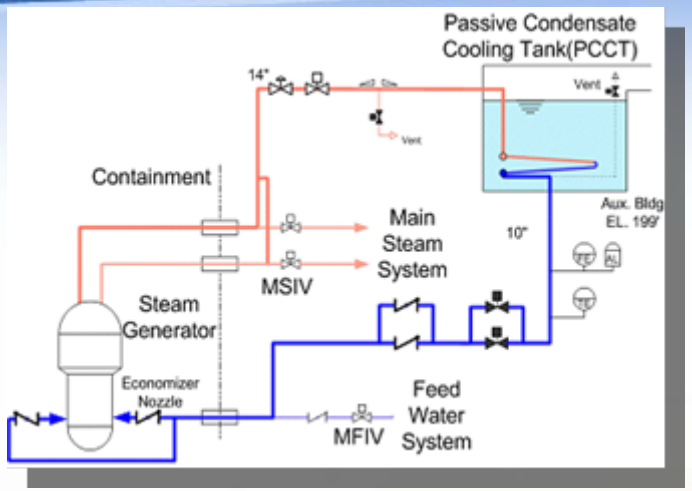
Digital I&C



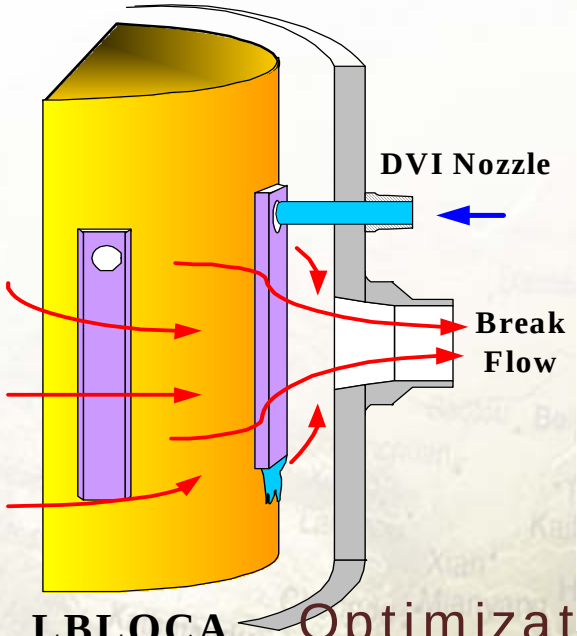
# Major design features of APR+

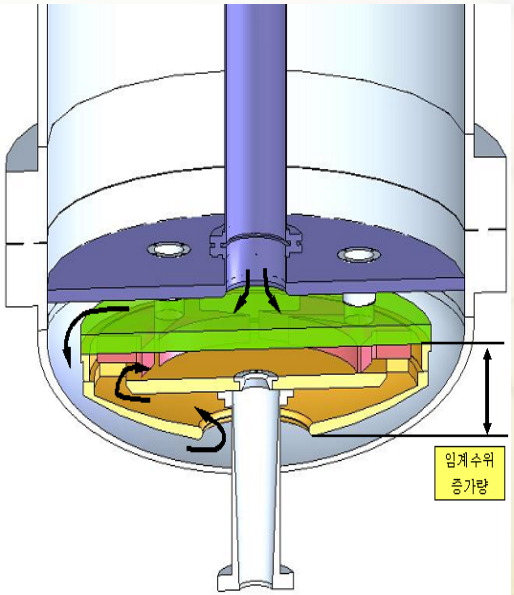



4 train Safety Injection Sys. (4 EDGs)




Passive AFWS




Optimization of Safety Injection Flow

Chap. 

# Vision and challenges

# Long-term National Energy Plan

**Low-carbon, green growth is mapped out as Korea's new national vision for a post-oil era**

**< 4 Strategies>**

- Low energy consumption
- Increasing clean energy
- Boosting green energy industry
- Affordable Supply of energy

**Increasing the share of nuclear power generation**

**36% ('08) → 59% ('30)**

**Some 40 nuclear power plants will be in operation in 2030**

# Vision and challenges of nuclear power

## Vision

Nuclear is Driving force of Green Growth

- **Core energy source for energy security**
- **Measures against climate change**
- **Contribution to national economy development and enhancement of citizen's life standards**

## Challenges

- **Securing new plant sites**
- **Sustainable nuclear fuel supply system**
- **Promoting Public acceptance**
- **Advancing the nuclear technology**

# Global green future with nuclear power

**Ensuring the safety of operating NPPs**

**Closer International Collaboration**

**Helping infrastructure for new comers**

**Global Green future**


# Thank you !