Korean Spent Fuel Management: Dilemma and Options

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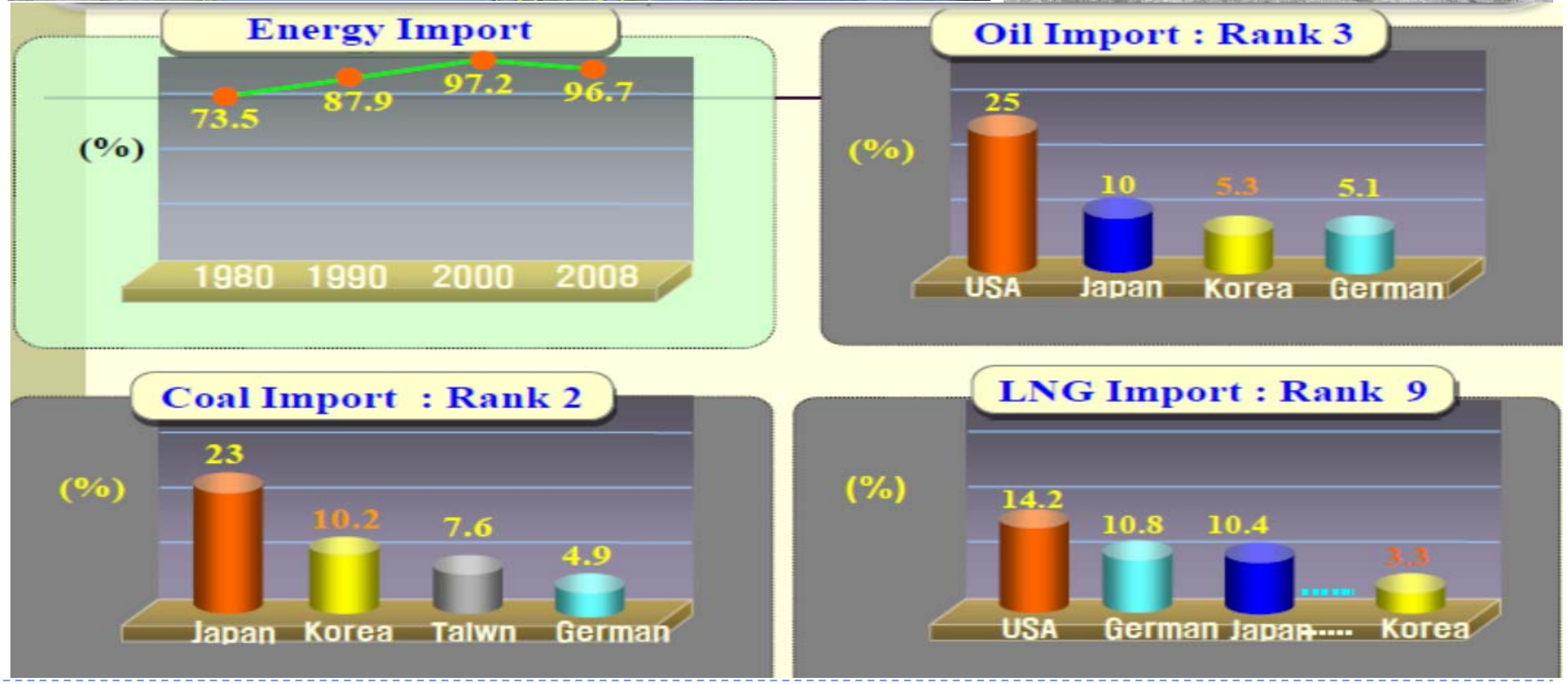
Korean Nuclear Energy Program: Bright Side



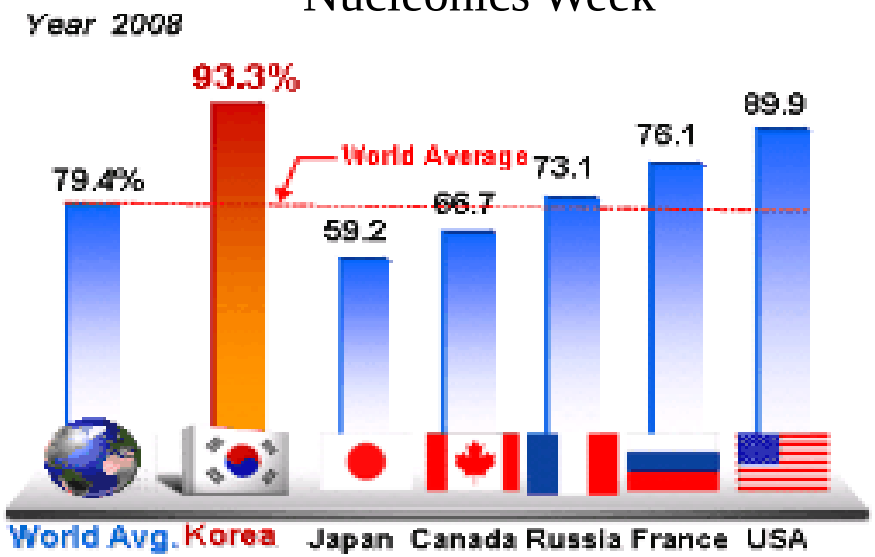
Korean Nuclear Energy Program : Bright Side

Most Korean Presidents Strongly Supported Nuclear Energy Program During Past 60 Years.

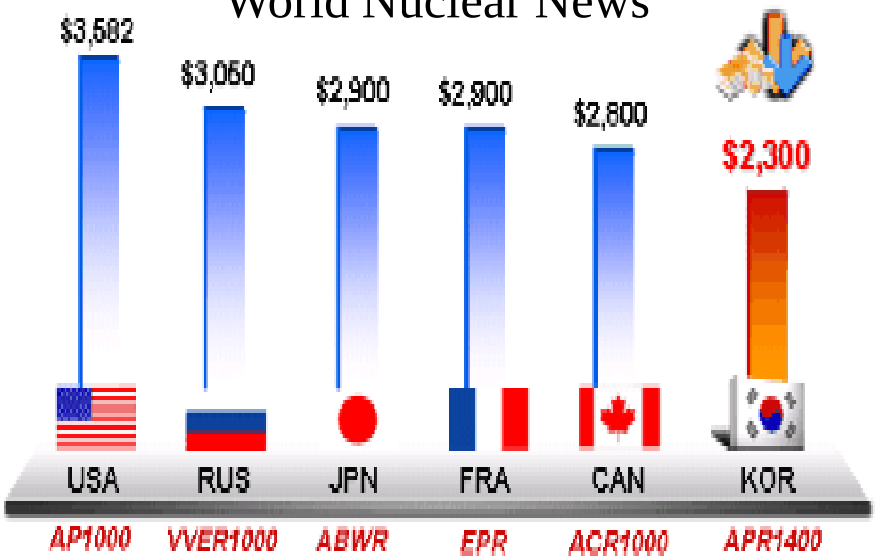
President-elect, Park Geun Hye

Korean Nuclear Energy Program : Bright Side

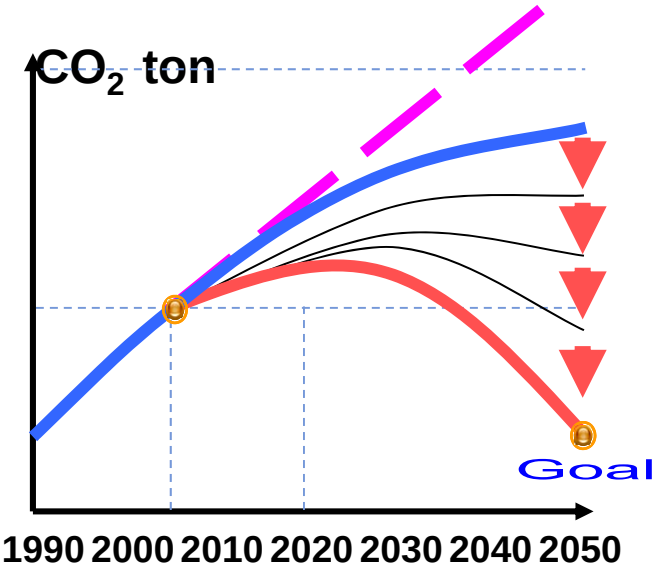
Nucleonics Week



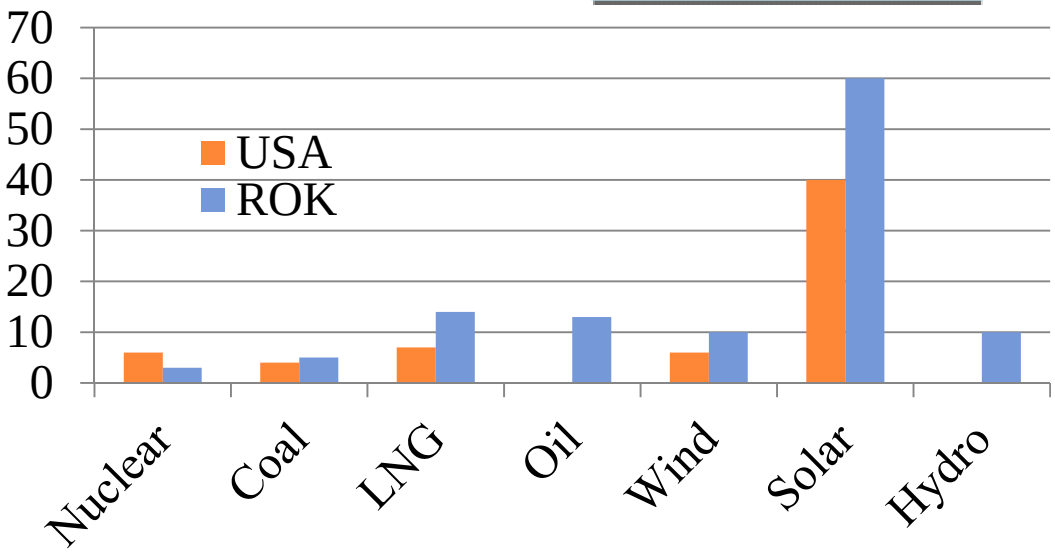
World Nuclear News



as of 2008 **Overnight EPC Cost**

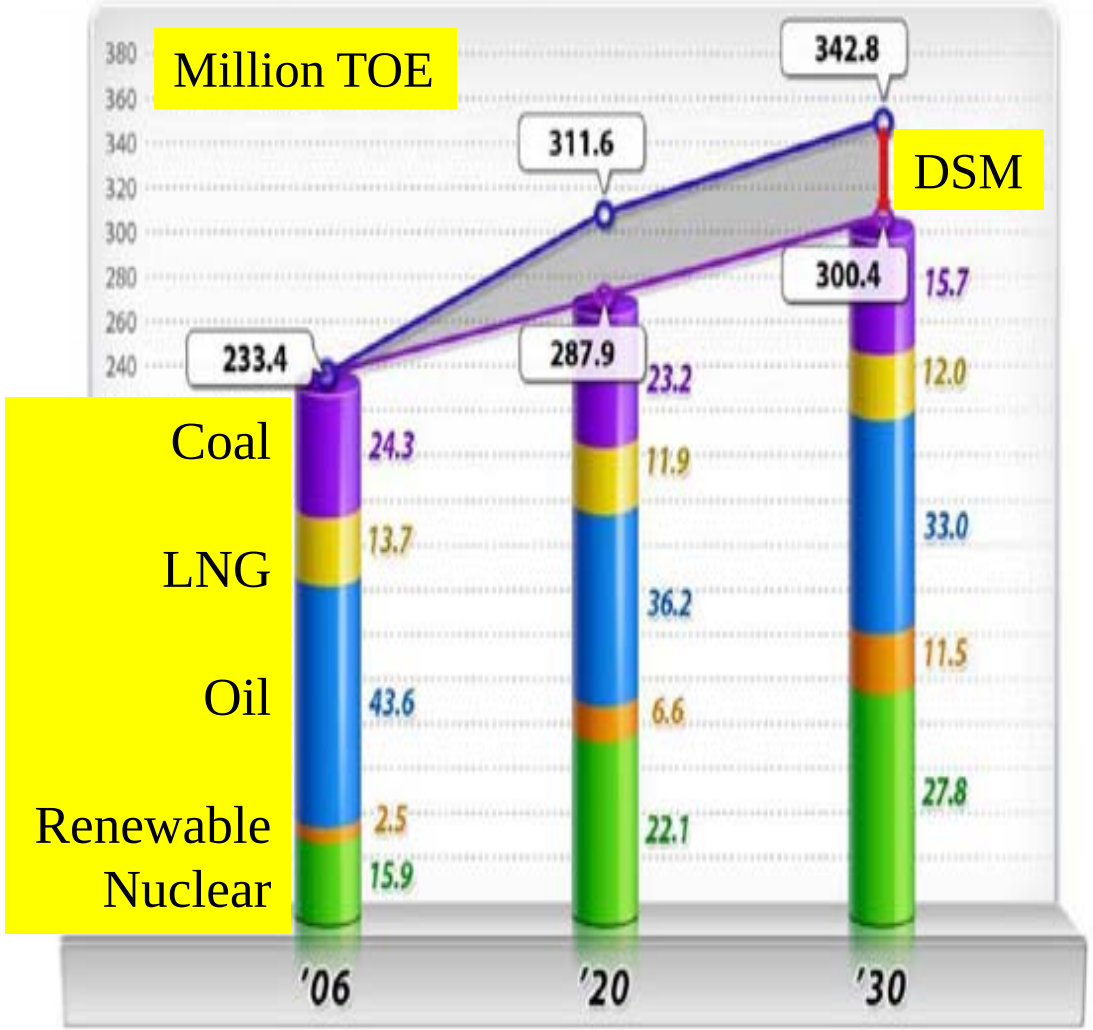


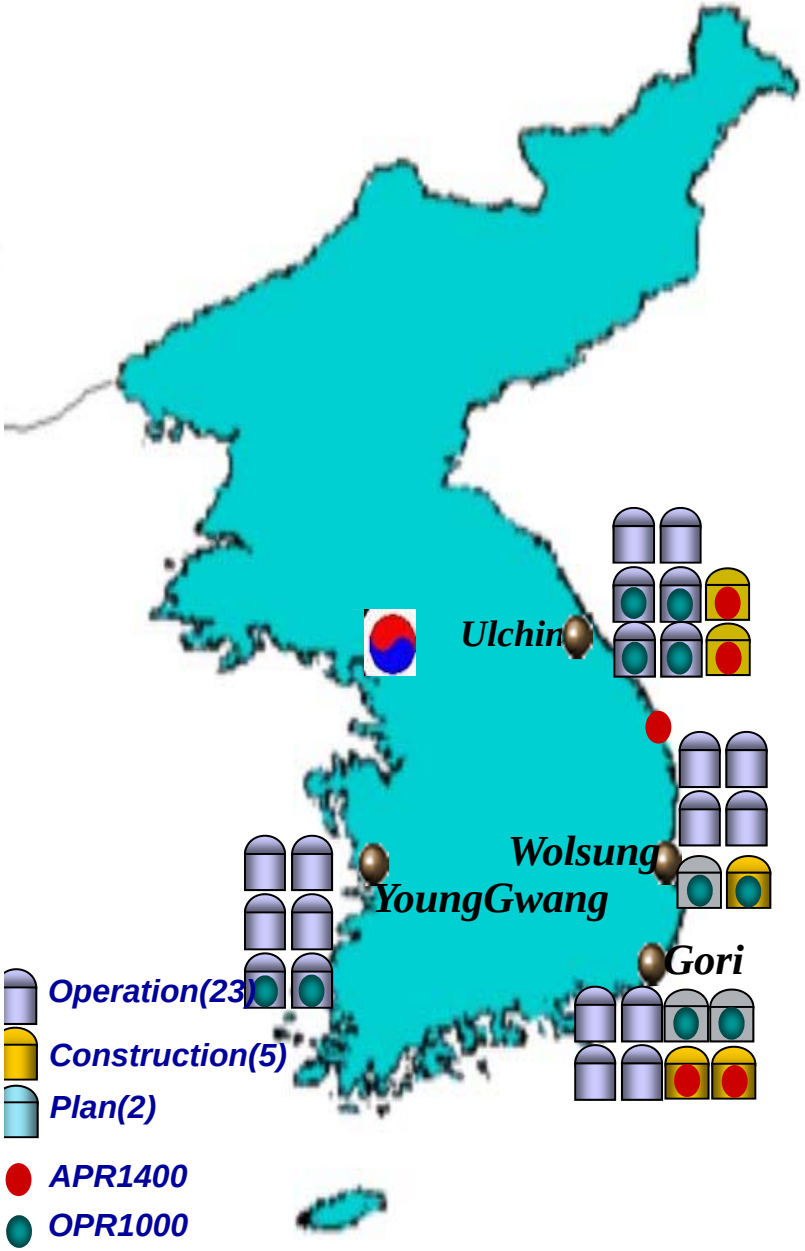
COE cent/ kWh



Korean Nuclear Energy Program : Bright Side

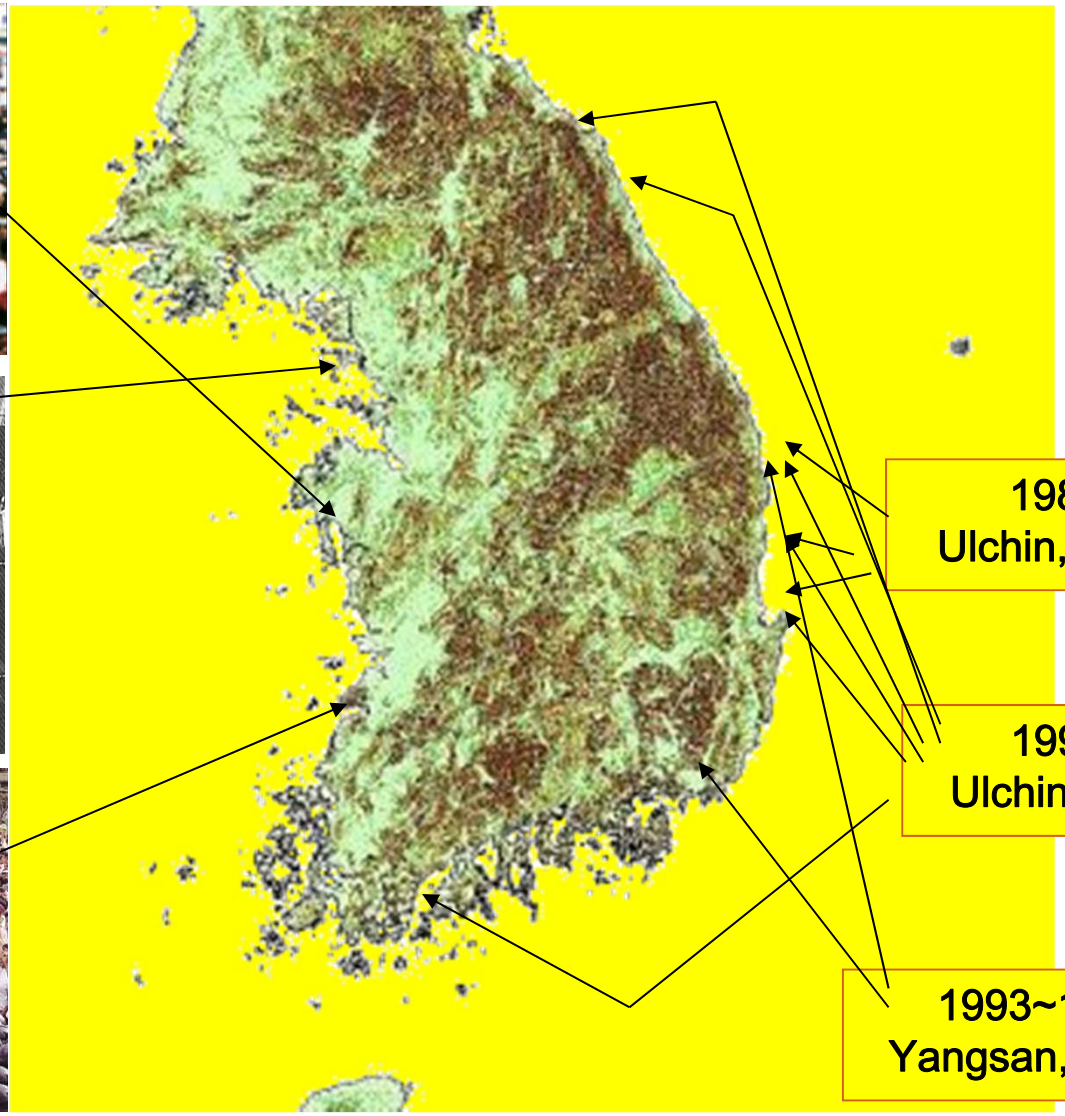
By 2030, Korean Nuclear Fleet will supply
27.8% of Primary Energy
and 59% of Electricity
(National Basic Energy Plan 2008)



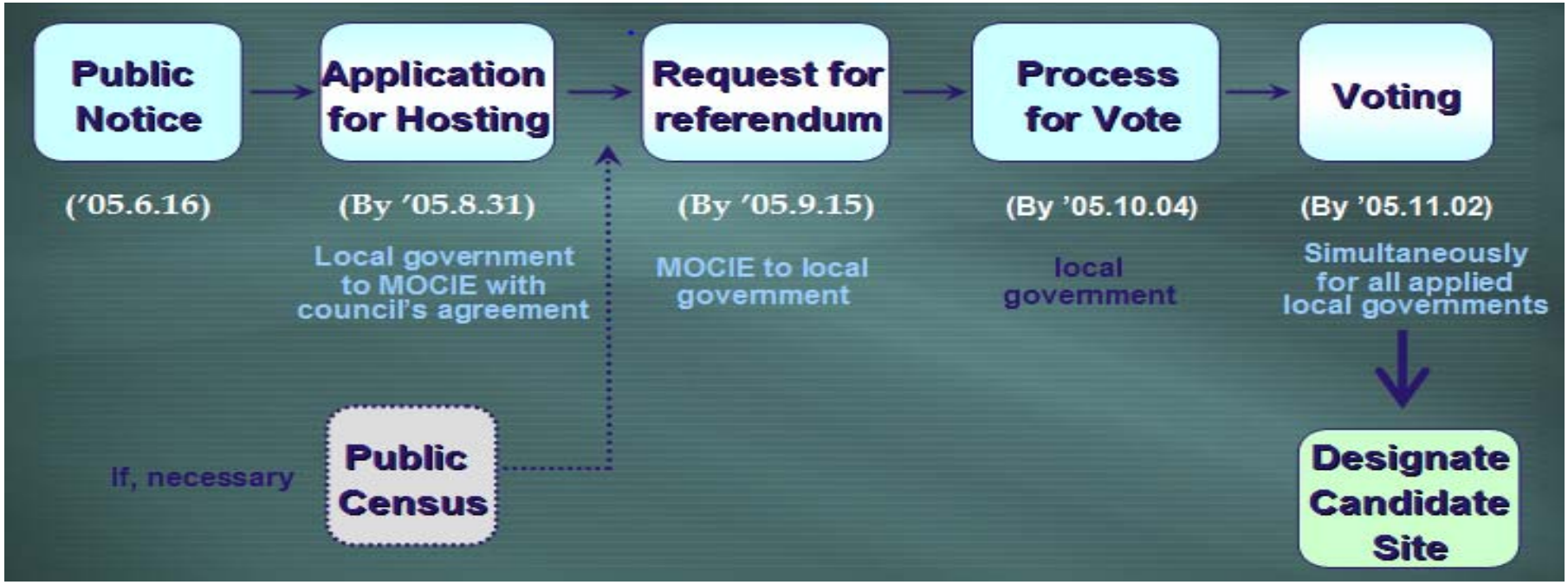


Korean Nuclear Energy Program : Dark Side

- **Failures in 1986~2004: Decide-Announce-Defend-Abandon**



Consent-based Process to the First Success



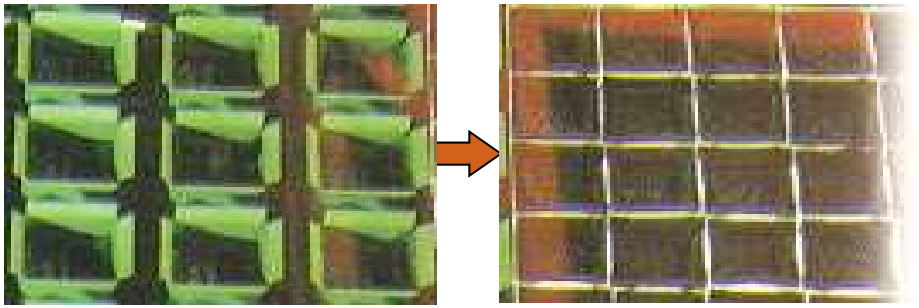
- LLW only
- Huge Compensation

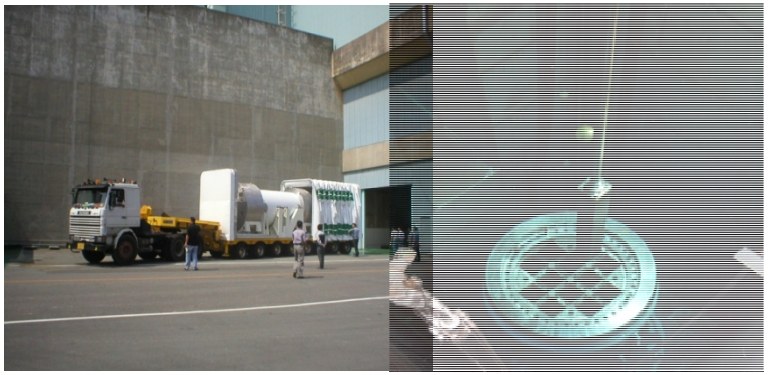
- Spent Nuclear Fuel Management Option is mandated to take similar Consent-based Process

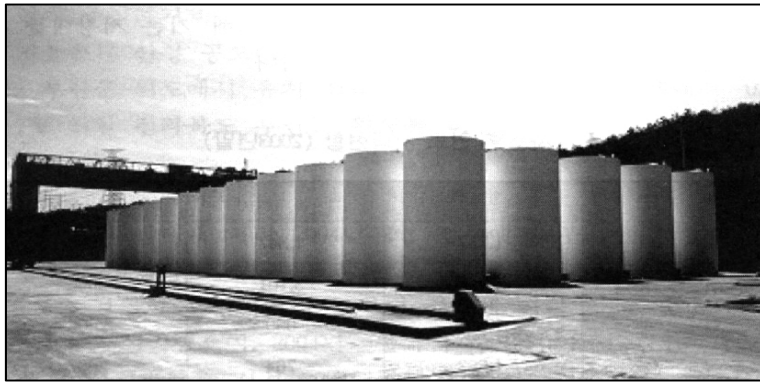
Car Parade led by City Mayor

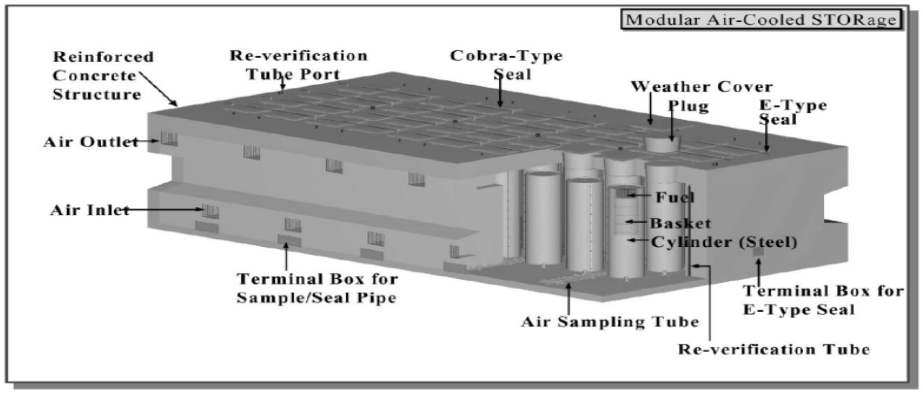
Consent-based Process to SNF Management

- Expansion of storage capacity (since 1990)
  - Replace the low-capacity racks by the high-capacity racks
  - Move SNF in the AR pool of the older unit to that of the younger unit within the same site.
  - Build dry storage & MACSTOR/KN-400 for CANDU SNF.







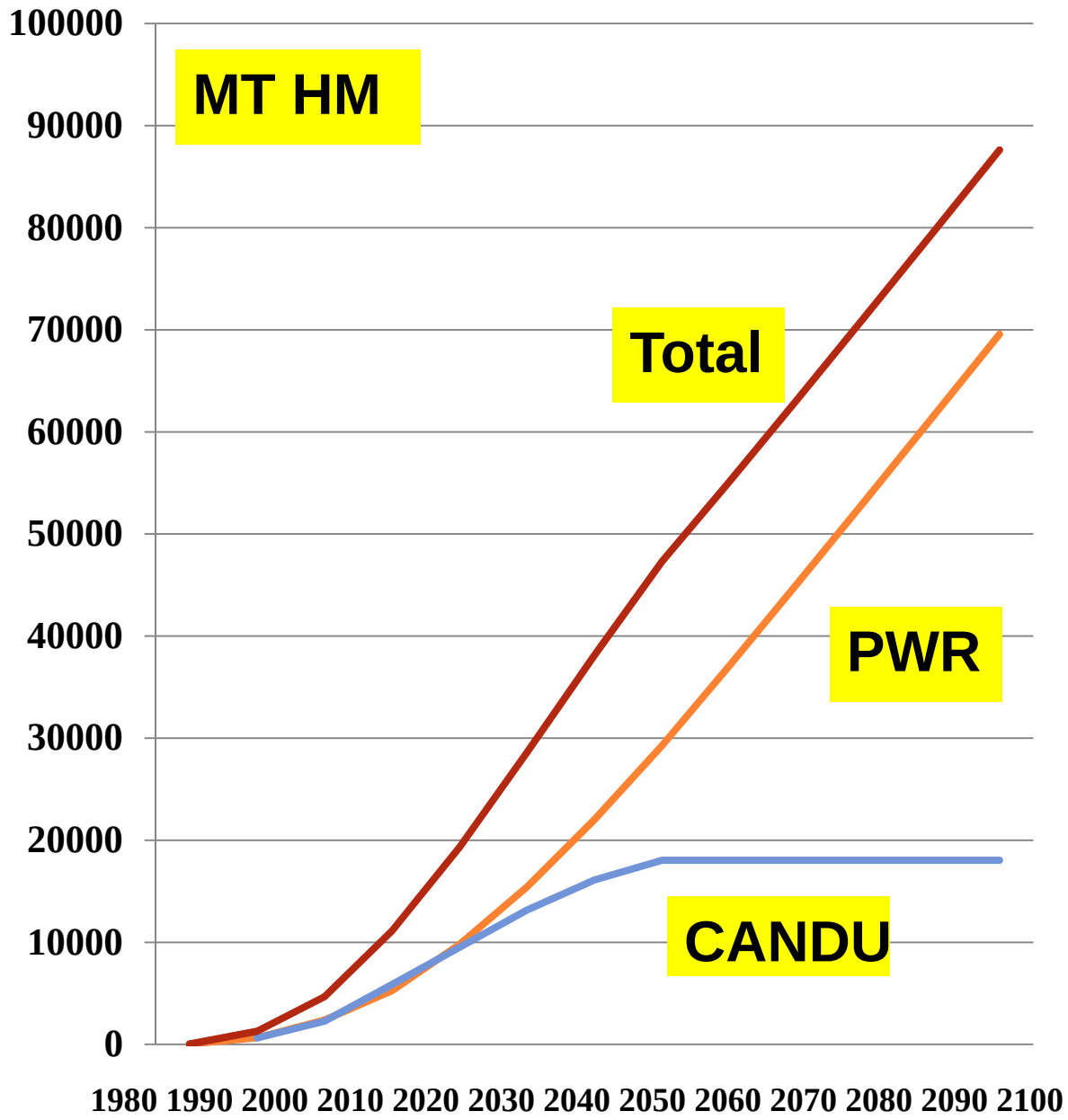


<그림 2> 조밀 건식 저장 시스템(MACSTOR/KN-400)

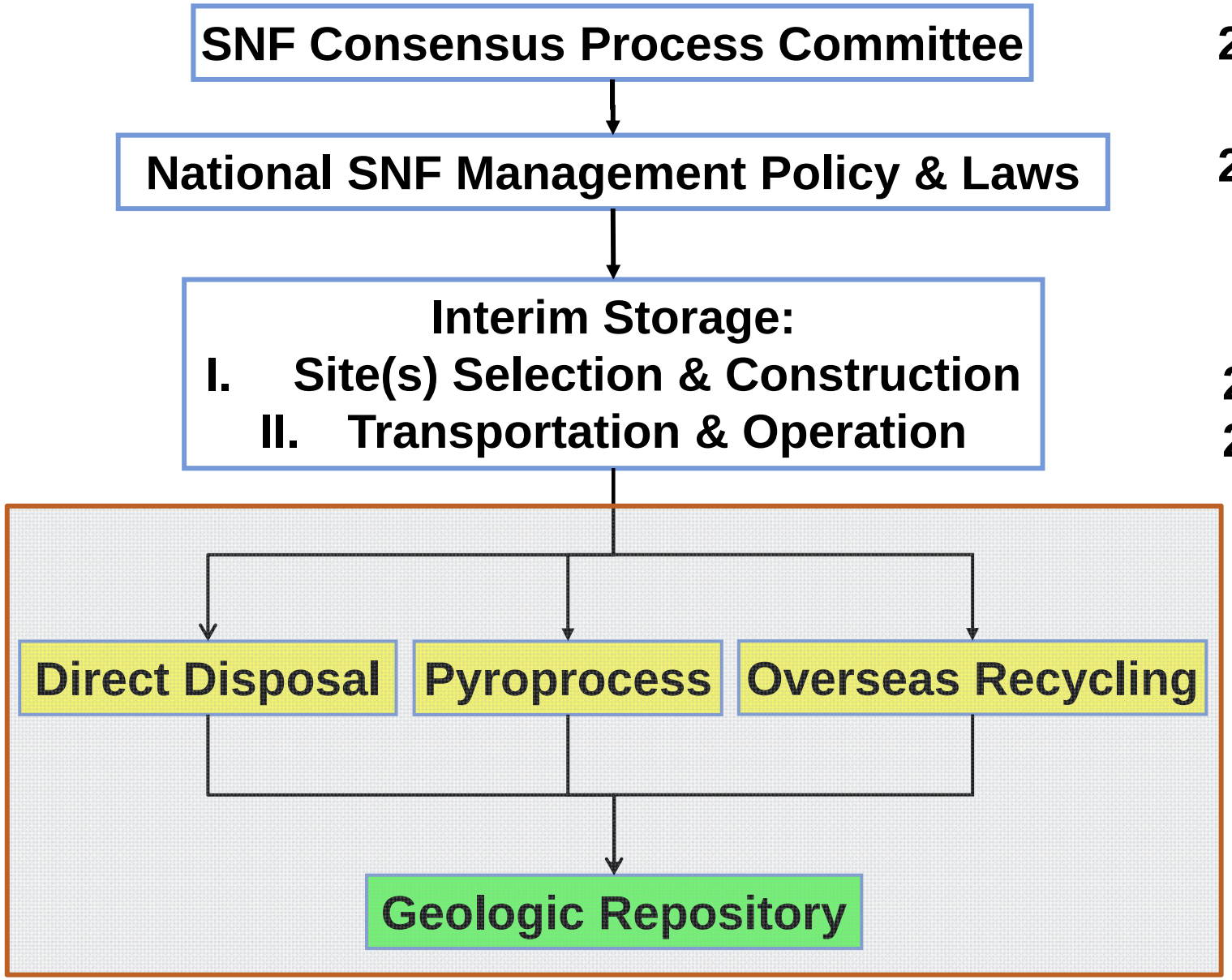
Consent-based Process to SNF Management

Near-term Challenge

NPP sites (no. units)	Sat. Year	Re-racking Pool-sharing
Gori (4) Shin-Gori(4)	2016	Y(1990+) In Progress
Yonggwang (6)	2024	In progress
Ulchin (6) Shin-Ulchin(2)	2018	In Progress Planned
Wolsong (4) Shin-Wolsung(2)	2017	Expansion + MACSTOR
Total 28 Units	2016	2024



Consent-based Process to SNF Management



2013~2014

2015~2016

2017~2024
2025~

Long-term Plan to be Decided by Consent-based Process

Interim Storage Site Selection & Construction

Gori

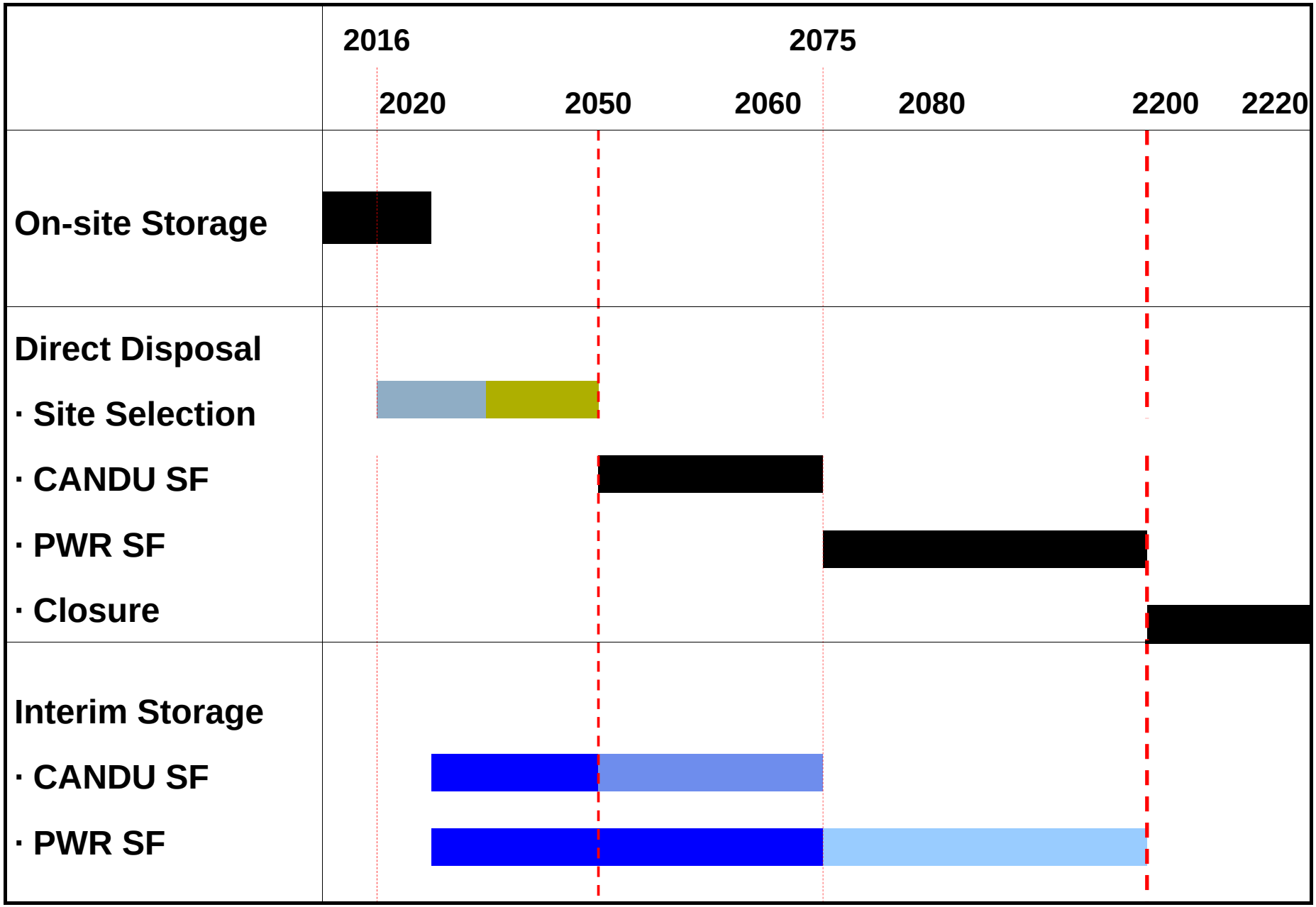
Wolsung

AR
vs.
AFR
Interim
Storage

Younggwang

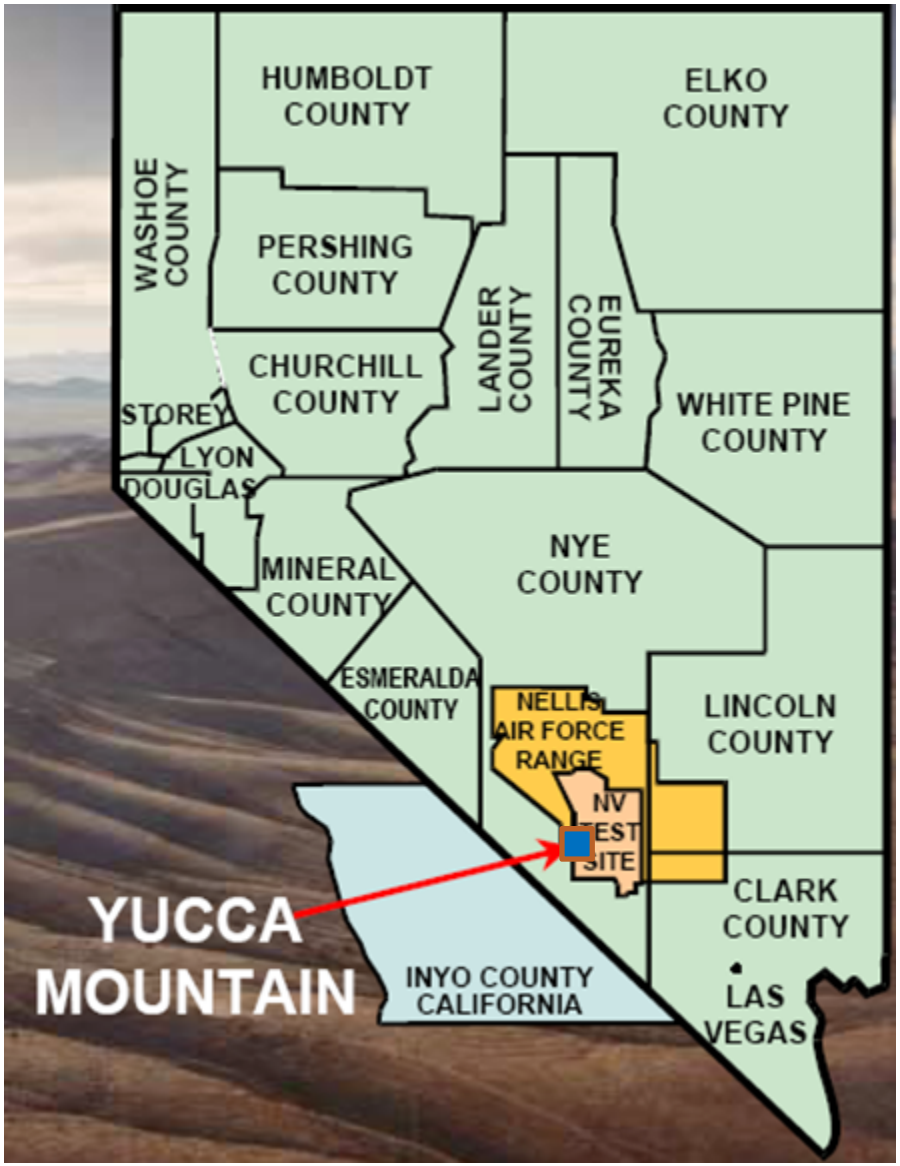
Ulchin

Direct Disposal Option (PWR & CANDU SNF)

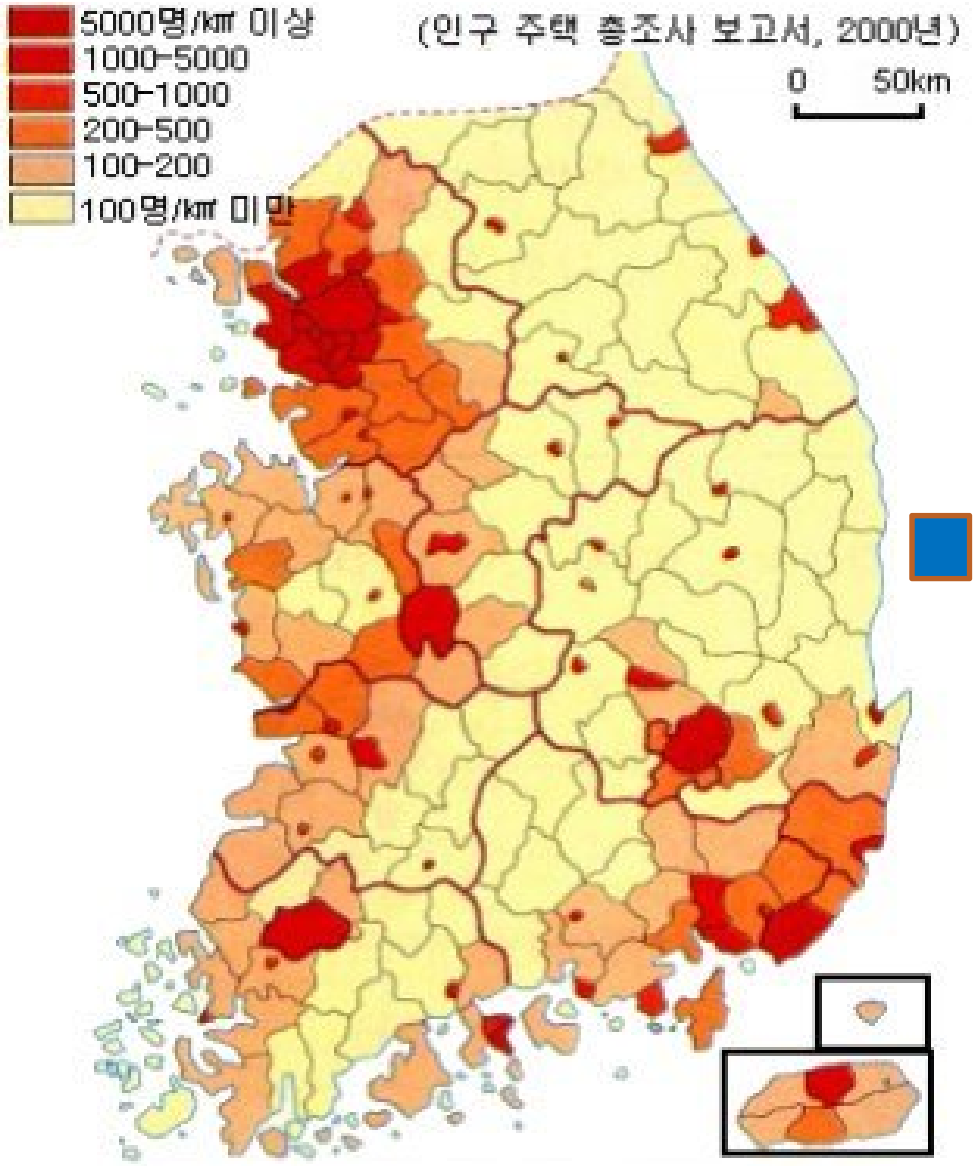


Direct Disposal Option (PWR & CANDU SNF)

25persons /km2

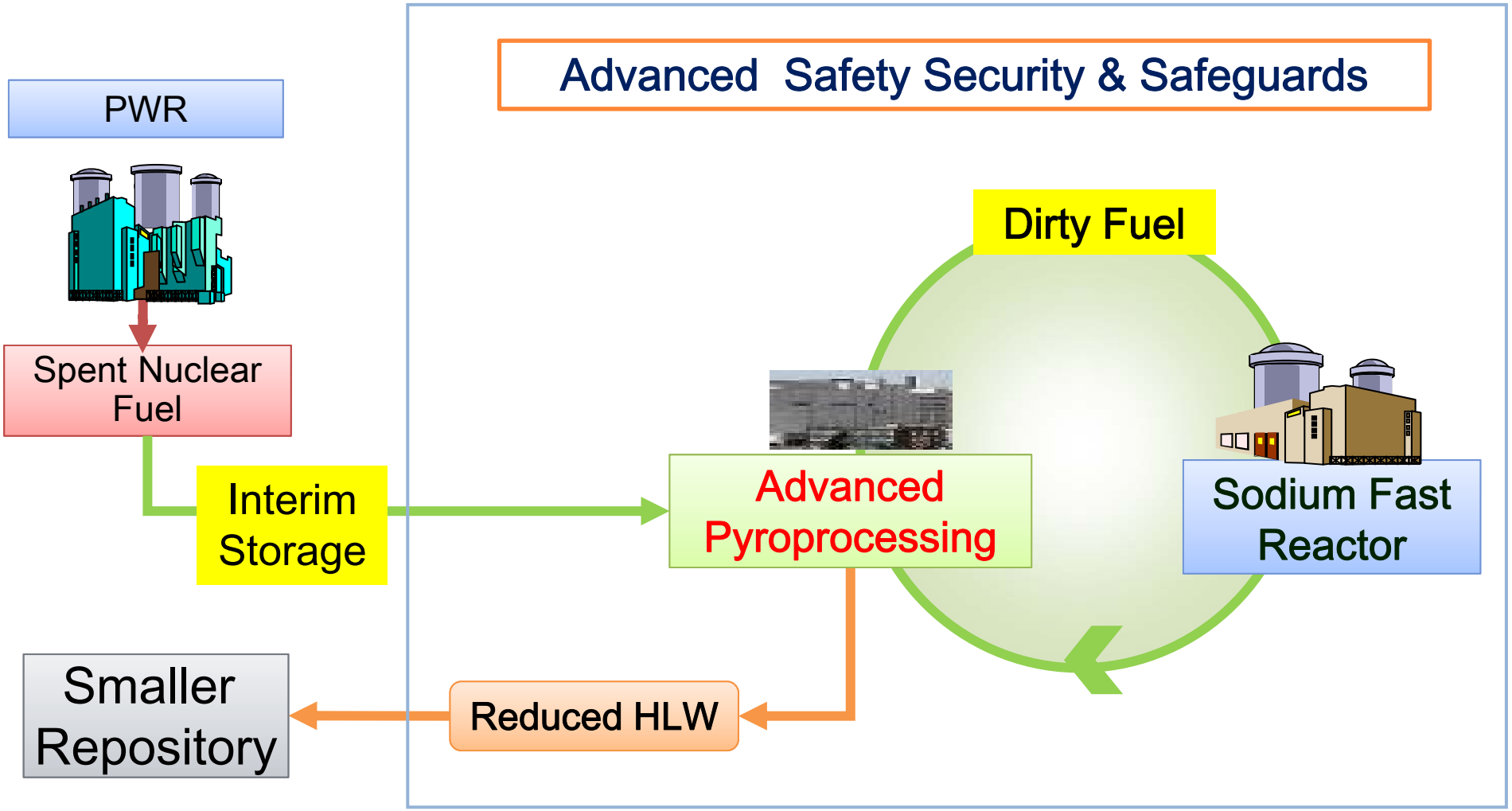


503persons /km2



Recycling Option for HLW Volume Reduction

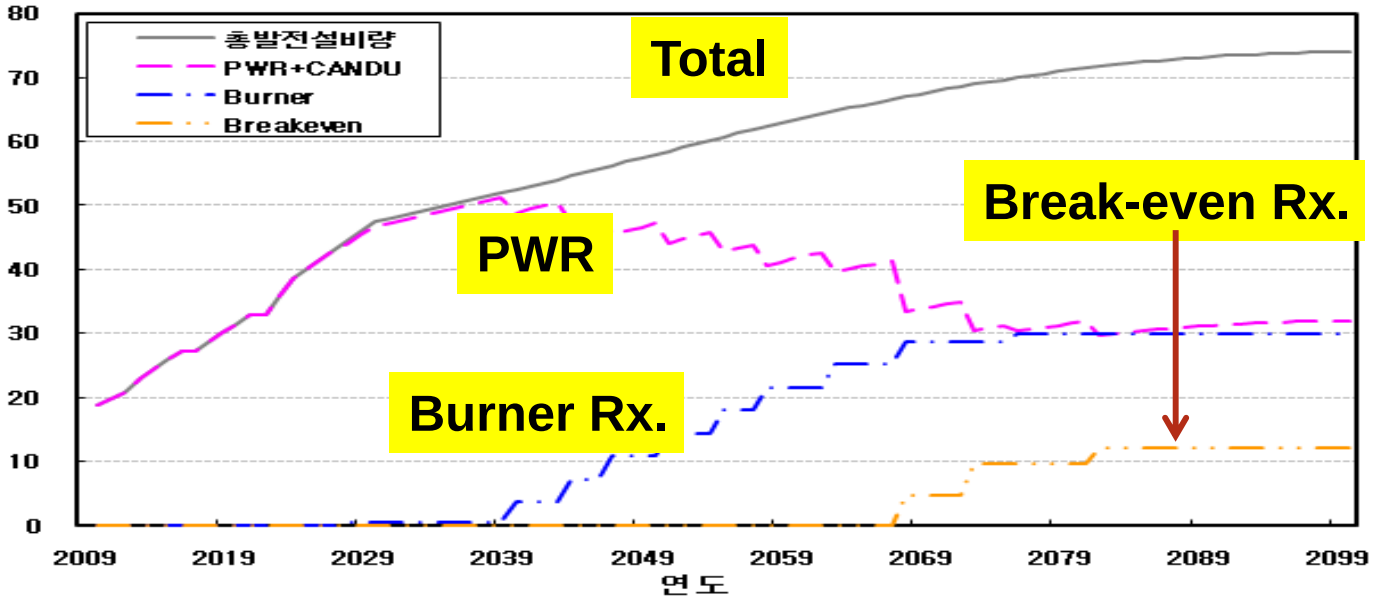
- **CANDU Units will be completely phased out by around 2050.**
- **PWR Fleet will be Continued and Expanded.**



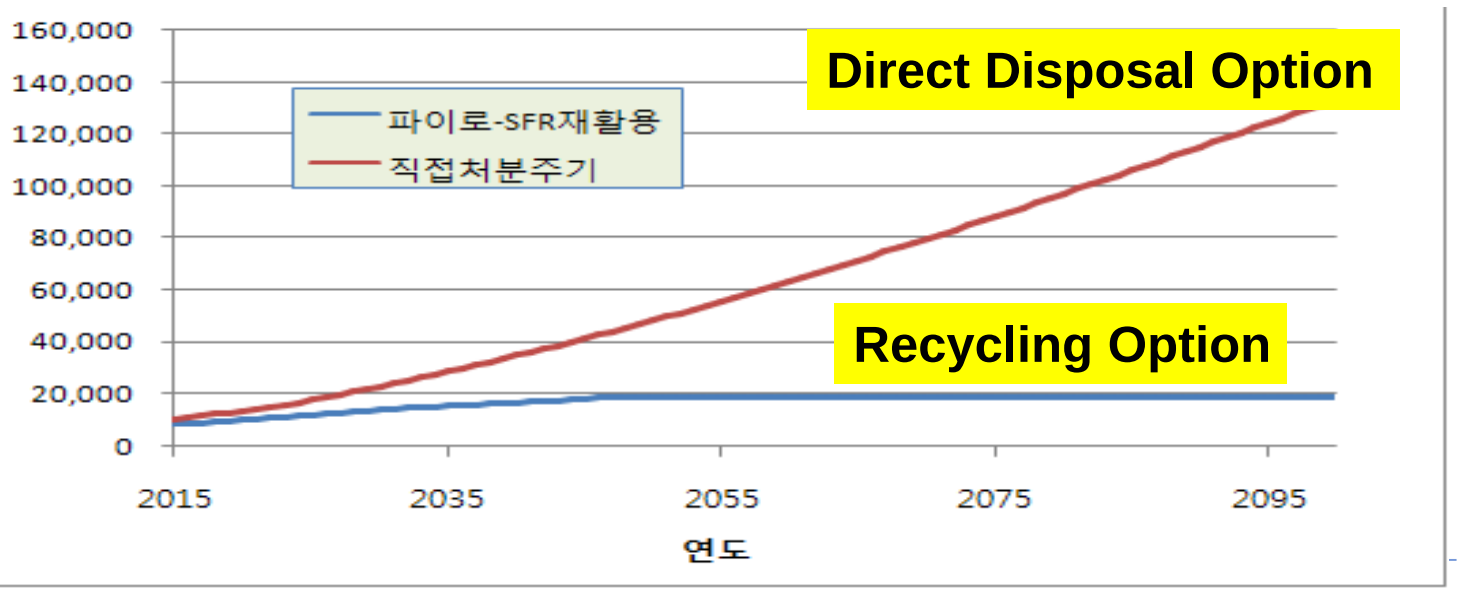
Recycling Option for HLW Volume Reduction

PWR + Fast Reactor Scenario for up to Year 2100

Nuclear Generation Capacity (GWe)



Cum. HLW (m3)



ILW Option utilizing WIPP Experience

EM Environmental Management

Greater-Than-Class C Low-Level Radioactive Waste
An online public information and involvement resource
Environmental Impact Statement

Home | About the EIS | Getting Involved | Guide to GTCC Waste | EIS Documents | News | FAQs | Glossary | E-Mail Services

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Disposal Methods for Greater-Than-Class C Waste

Several disposal options for GTCC waste are being evaluated in the EIS.

Disposal Methods

The Draft GTCC EIS evaluates a range of disposal methods: geologic repository (Waste Isolation Pilot Plant); intermediate depth borehole; enhanced near surface trench, and above-grade vault. These methods are described as follows:

US GTCC-Like (TRU) Low Level Waste
- **-Ambient temperature**
- **-very low TRU concentration**
- **-public acceptance**

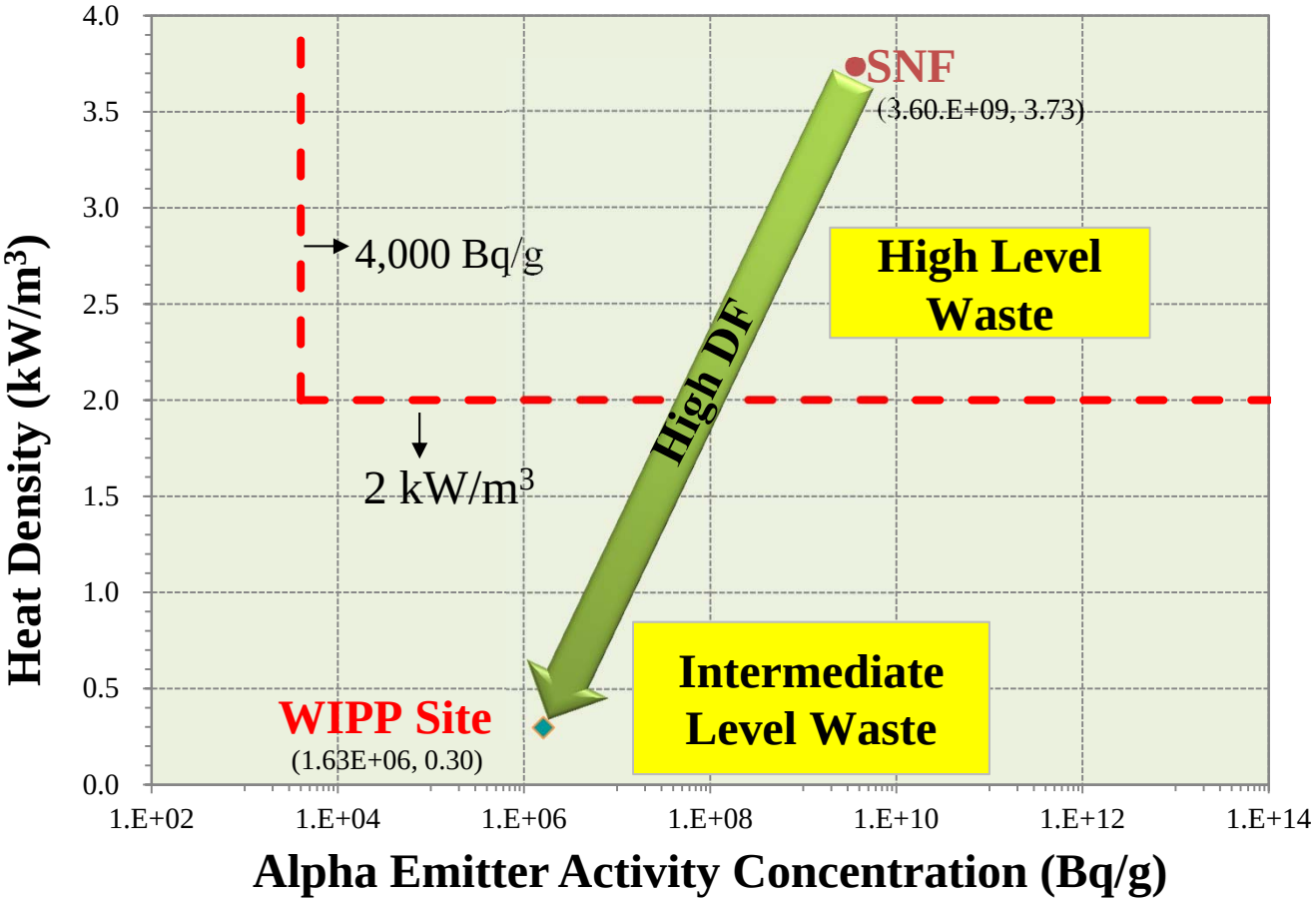

Excavation at WIPP


TRU Handling


TRU Waste Disposal

ILW Option utilizing WIPP Experience

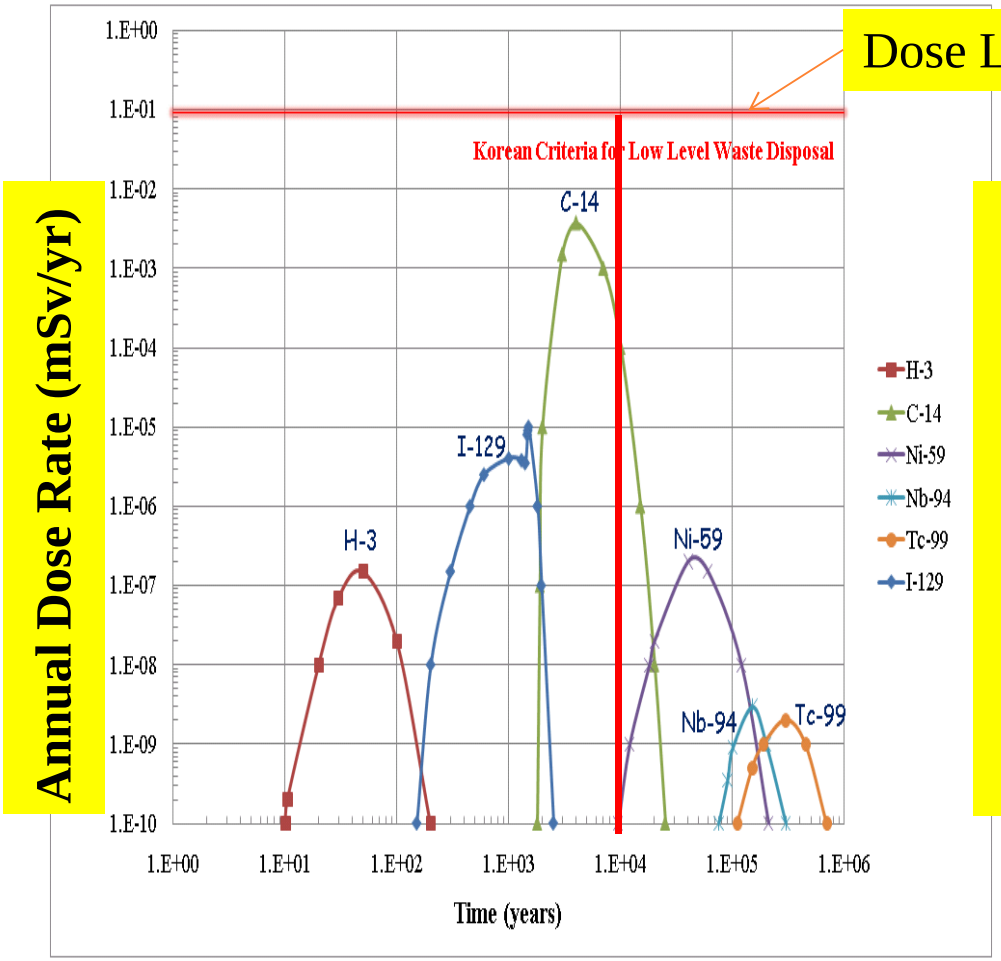
- **Two-Step Recycling to Achieve 20 Times Higher Decontamination Factor (20,000),**
- **Already Demonstrated on Lab-scale*.**



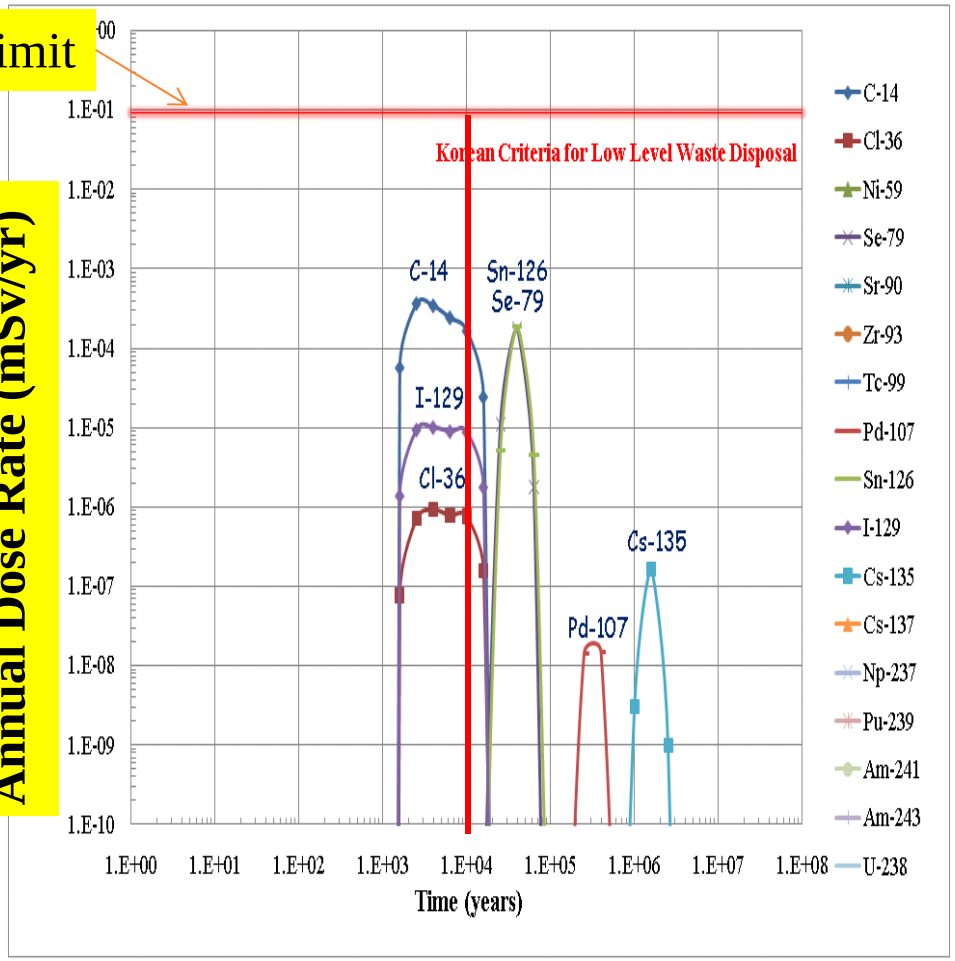
* HS Jung, SY Choi, IS Hwang, MJ Song, Prog. In Nucl. Energy 58(2012)27-38z

ILW Option utilizing WIPP Experience

LLW: Gyongju Repository



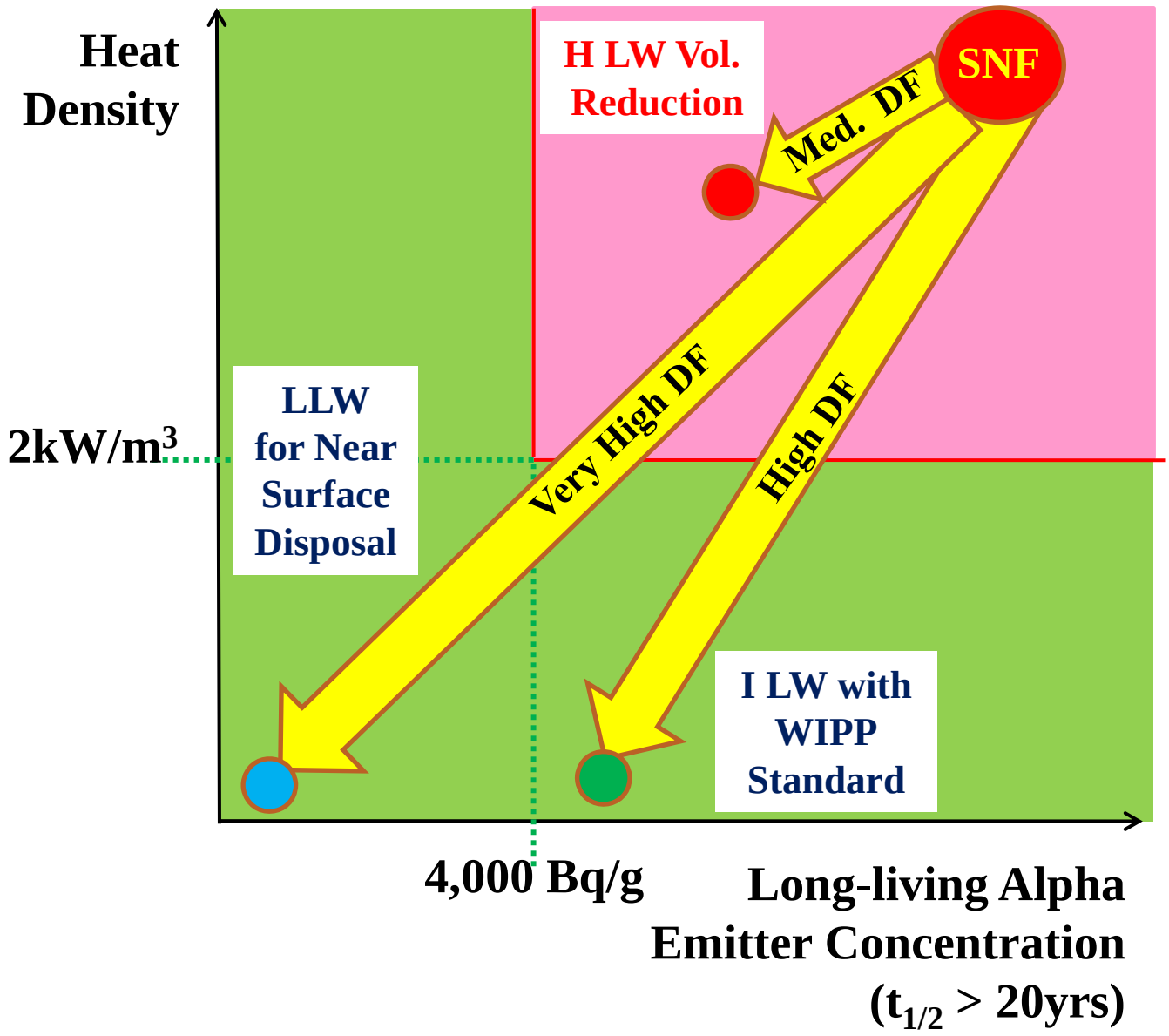
ILW: WIPP Standard



*Reference: (1) Joo Wan Park et al., A Safety Assessment for the Wolsong LILW Disposal Center: As a part of safety case for the first stage disposal, Journal of the Korean Radioactive Waste Society, Vol. 6(4), P. 329-346, 2008.
(2) Il Soon Hwang, Waste Management 2011, Phoenix, AZ, 2011, Panel #89. Other panelist: D. Warin (France), H.A. Abderrahim (Belgium), P. Brady (U.S.A.), M.J. Song (ROK)

Summary : Korean SNF Management Options

- Direct Disposal Option – Most Economical for Now.
- HLW Volume Reduction Option.
- ILW Option using WIPP Experience and Laboratory Demonstrated Two-step Recycling Technology.
- LLW Option by Future Game-changing Innovation.



Summary : Options for Future Generations

Economy

Proliferation

Environment

Climate Change

Accident

Proliferation-resistance

Environment-friendliness

Accident-tolerance

Climate-protection

Economy

“PEACE”