Experience of Siting Process for Radwaste Disposal Facility in Korea

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Yong-Rae LEE (Vice President)

Korea Radioactive Waste Management Corporation

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6 LILW REPOSITORY CONSTRUCTION

Chronology

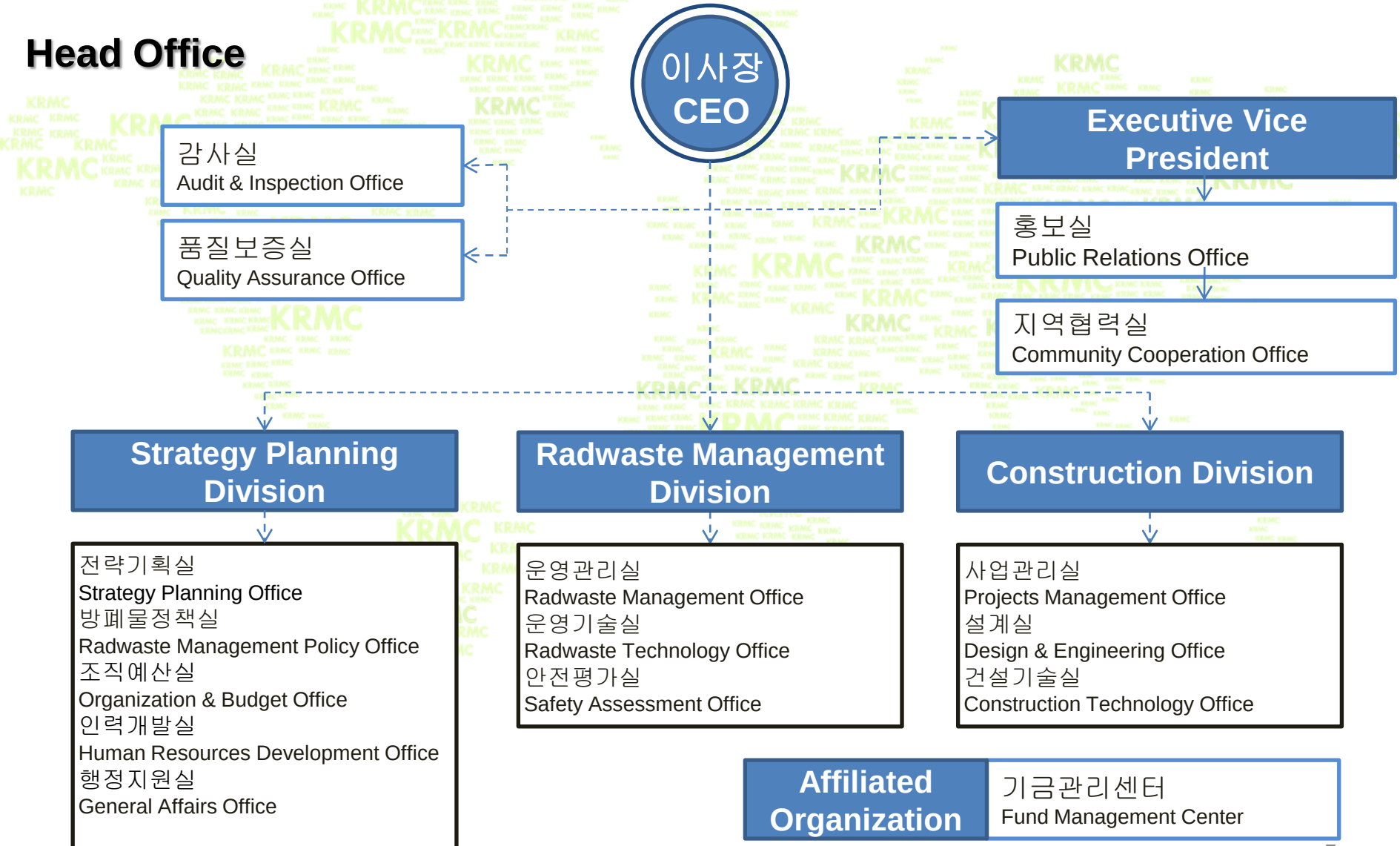
- Nov. 2, 2005 : Designation of the Site for a Radwaste Disposal Facility
- Apr., 2006 : Request for Improvement of Radwaste from the National Board of Audit and Inspection
- Jul. 18, 2007 : Validity Review of Creation of Public Organization (Ministry of Planning and Budget)
- Jul. 25, 2007 : Validity Review of Fund Creation (Ministry of Planning and Budget) Regulation Law (Regulatory Reform Committee)
- Sep. 27, 2007 : Submission of Bill for Creation of Corporation and Fund to National Assembly
- Mar. 28, 2008 : Enactment and Promulgation Act of Radwaste Management
- Jan. 1, 2009 : Establishment of KRMC

Mission & Organization

- **Mission**
  - Transport & Disposal of Low- and Intermediate-Level Wastes
  - Interim Storage & Disposal of Spent Nuclear Fuels
  - Siting, Construction & Operation of Radwaste Management Facilities
  - R&D on Radwaste Disposal and SF Management
  - Administration of Radwaste Management Fund
- **Organization**
  - HQ : 3 Divisions, Fund Management Center
  - Wolsong LILW Disposal Center (Gyeongju)
  - Radwaste Technology Development Center (Daejeon)
- **Employee : 247**

Organization

Head Office



Organization

Operation Site

Wolsong Low and Intermediate Level Radwaste Disposal Center

Construction Management Office
- 공사관리팀
  Construction Control Team
- 기전팀
  Mechanical & Electrical Construction Team
- 토건팀
  Civil & Architectural Construction Team

Operation Office
- 인수운영팀
  Receipt & Operation Team
- 방사선안전환경팀
  Radiation Safety & Environment Team

- 행정지원팀
  General Affairs Team
- 품질관리팀
  Quality Control Team

Radwaste Technology Development Center

Research and Development Office
- 연구기획팀
  Research Management Team
- RI관리팀
  Radioisotope Management Team

Nuclear Power Program in Korea

In Operation	20 Units (17,716MW)
Under Const.	6 Units (6,800MW)
Planning	2 Units (2,800MW)

Daejeon Science Town
: KAERI, KINS, KNF, KRMC Technology Center

Ulchin 1, 2, 3, 4, 5 & 6
Shin Ulchin 1&2(Planning)

LILW Repository

Wolsong 1, 2, 3 & 4
Shin Wolsong 1 & 2
(Under Const.)

Kori 1, 2, 3 & 4
Shin kori 1-4(Under Const.)

Yonggwang
1, 2, 3, 4, 5 & 6

KRMC

Status of LILW Waste Storage

<As of Sep. 2010 / unit: 200 Liter Drum>

Site		Capacity	Current	Rate
NPPs	Kori (PWR)	50,200	40,566	81%
	Yonggwang (PWR)	23,300	21,012	90%
	Wolsong (PHWR)	9,000	10,030	111%
	Ulchin (PWR)	17,400	16,436	94%
	Sub-Total	**99,900**	**88,044**	**88%**
KRMC(RI Waste)		9,750	4,465	46%
KAERI(Refining & Conversion Waste)		27,268	15,203	56%
KNF(Depleted U Waste)		8,900	6,216	70%
TOTAL		**145,818**	**113,930**	**78%**

Status of Spent Nuclear Fuel Storage

- Spent Nuclear Fuels are stored temporarily at 4 NPP sites until 2016 as recommended by AEC in Dec. 2004
- Future national policy for spent fuel management will be decided through public participation taking into consideration of national/international trends on policy and technology development.

<As of Jun. 2010 / unit: Bundle>

Site		Number of NPP	Capacity	Current
NPPs	Kori (PWR)	4	6,004	4,469
	Yonggwang (PWR)	6	7,418	4,272
	Ulchin (PWR)	6	6,572	3,511
	Wolsong (PHWR)	4	508,752	319,768

Experiences of Siting Process

- A Hot Potato for nearly two decades (1986-2005)

Five Times by MOST / KAERI (1986 – 1996)

- 1st attempt : 1986 – 1989
  - Three sites identified through literature survey
- 2nd attempt : 1990 – 1991
  - Ahnmyeon Island selected for site investigation
- 3rd attempt : 1991 - 1993
  - Six sites identified by SNU
- 4th attempt : 1993 - 1994
  - Financial incentives for three sites suggested
- 5th attempt : 1994 - 1995
  - The Gulup Island chosen by the government

Experiences of Siting Process

- A Hot Potato for nearly two decades (1986-2005)

Four Times by MOCIE / KHNP (1997 - 2004)

- **6th attempt : 2000 - 2001**
  - Solicitation opened to 46 local governments
- **7th attempt : 2002 - 2003**
  - Solicitation to four possible cities around NPP
- **8th attempt : 2003**
  - Wido Island in Buan county was selected as a potential candidate
- **9th attempt : Feb. 2004 - Sep. 2004**
  - Financial incentives were offered to 7 cities

Nine attempts from 1986 had all failed

From now on,

A brief overview of each attempt for 20 years

1st Phase Site Selection Attempt

- **DURATION : 1986 ~ 1989**
- **SITE : Ulchin, Youngduk, Youngil, Kyung-buk province**
- **AGENT : KAERI / MOST**
- **SELECTION : Comprehensive Site Selection Study**
- **FAILURE : Strong Protests of Local Residents**
  - Distrust of safety
  - Unilateral site survey without discussion with residents

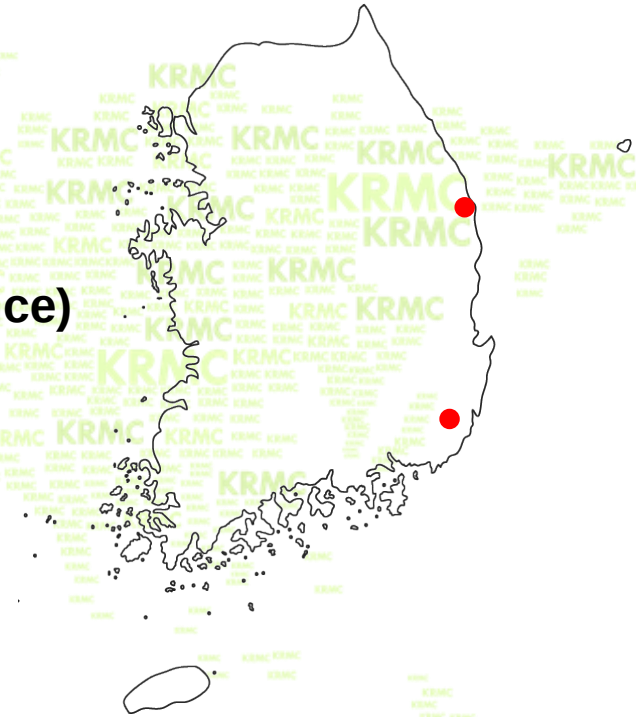
2nd Phase Site Selection Attempt

- **DURATION : 1990 ~ 1991**
- **SITE : Ahnmyeon Island, Tae-an (Chungnam province)**
- **AGENT : KAERI / MOST**
- **SELECTION : Political inference with local provincial government**
- **FAILURE : Strong Protests of Local Residents**
  - Distrust of safety
  - Closed-door administration

3rd Phase Site Selection Attempt

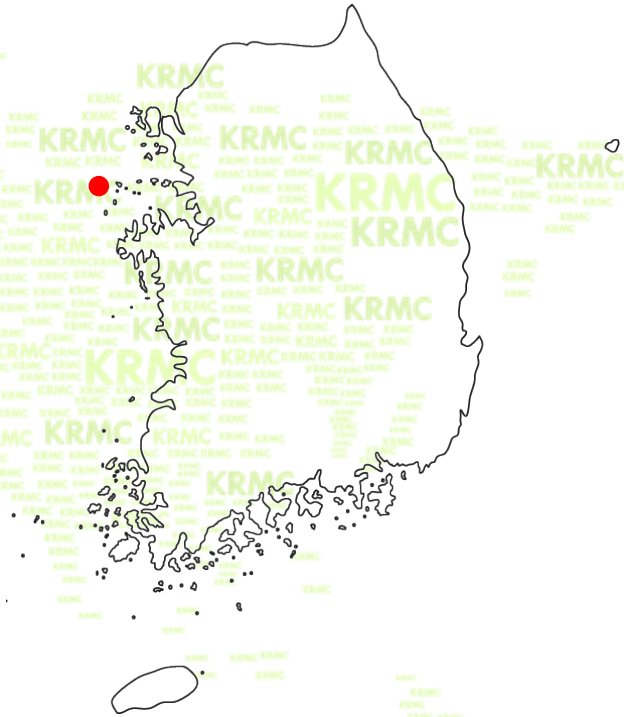
- **DURATION : 1991 ~ 1993**
- **SITE : Gosung, Yangyang (Kangwon province)**
  Uljin, Youngil (Kyoungbuk province)
  Jangheong (Jeonnam province)
  Taean (Chungnam province)
- **AGENT : KAERI / MOST**
- **SELECTION : Institute of Social Studies at SNU**
- **FAILURE : Strong Protests of Local Residents**
  - **Aggressive intervention of anti-nuclear groups**
  - **Political issue of politicians**

4th Phase Site Selection Attempt



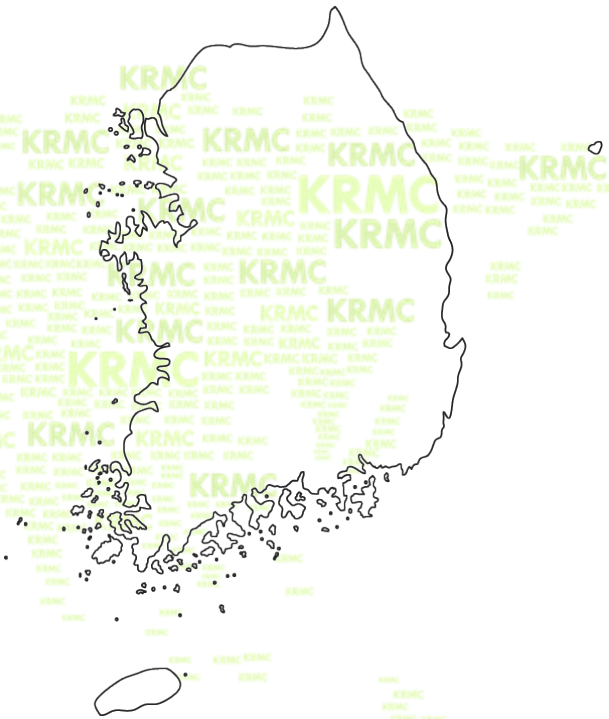
- **DURATION : 1993 ~ 1994**
- **SITE : Yangsan, Jangan (Kyungnam province)**
  Ulchin, Gosung (Kyungbuk province)
- **AGENT : KAERI / MOST**
- **SELECTION : Local Application and Participation Support of Its Regional Community for Compensation (Law of Compensation)**
- **FAILURE : Strong Protests of Local Residents**
  - Distrust of safety
  - Opposition of nearby residents

5th Phase Site Selection Attempt



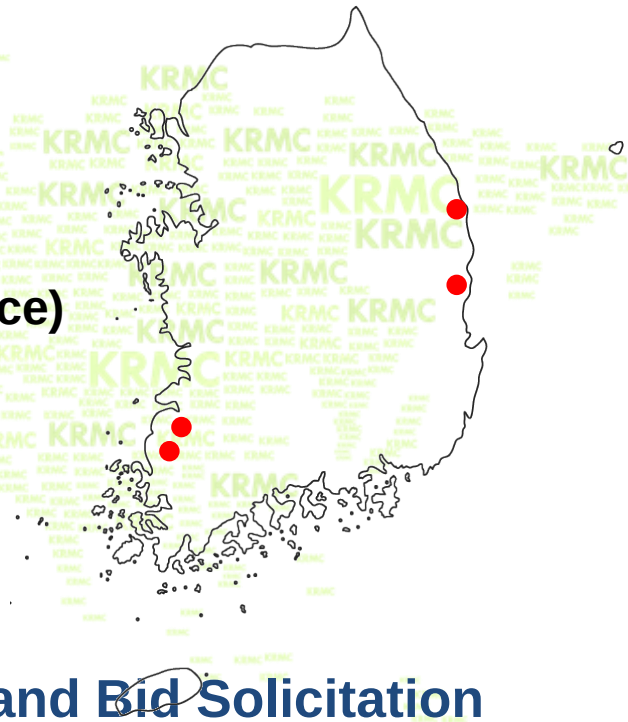
- **DURATION : 1994 ~ 1995**
- **SITE : Gulup Island**
  (Dukjeon, Wongjin, Incheon city)
- **AGENT : KAERI / MOST**
- **SELECTION : Law of Solicitation and Compensation for Radwaste Management**
  - Consideration of Resident Acceptability
- **FAILURE : Technical problem**
  - Discovery of capable faults into the submarine within 3 km of Gulup Island

6th Phase Site Selection Attempt



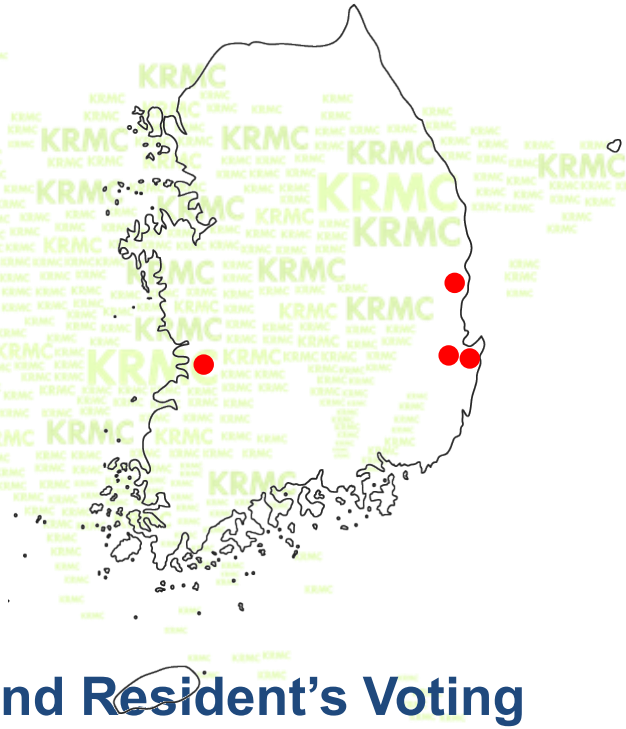
- **DURATION : 2000 ~ 2001**
- **SITE : 46 Coastal Areas**
- **AGENT : KHNP / MOCIE (KAERI → KHNP)**
- **SELECTION : Nationwide Bid Solicitation (46 Local Governments)**
- **FAILURE : No applications and Siting unsuccessful**
  - **Strong arguments for and against residents**

7th ~ 9th Phase Site Selection Attempt



- **DURATION : 2001.7 ~ 2004.11**
- **SITE : Youngduk, Ulchin (Kyungbuk province)**
  Younggwang (Jeonnam province)
  Gochang (Jeonbuk province)
- **AGENT : KHNP / MOCIE**
- **SELECTION METHOD : Agent Selection and Bid Solicitation**
  1. Agent Selection : Each two of the east coast and the west coast based on technical inference
  2. Bid Solicitation : Gunsan, Buan (Jeonbuk province)
- **FAILURE : Strong Protests of Local Residents**
  - Distrust of government policy
  - Aggressive intervention of anti-nuclear groups

10th Phase Site Selection Attempt



- **DURATION : 2004.12 ~ 2006.1**
- **SITE : Gyeongju, Youngduk, Pohang (Kyungbuk province) Gunsan (Jeonnam province)**
- **AGENT : KHNP / MOCIE**
- **SELECTION METHOD : Bid Solicitation and Resident's Voting**
- **SELECTION : Gyeongju-city, Kyungbuk province**

4 Success Factors of Site Selection can be summarized…

Factor to success of radwaste site selection

Causes of Failure	Factors to success of site selection
Disquiet about long-term safety	Separation of LILW and HLW
Lack of transparency of decision making	Organization of site selection committee
Shortage to stakeholder's participation in decision making process	Free decision through resident's vote
Lack of confidence to the proposed incentives by the government and nuclear industry	Enactment of a special law for hosting area support

Siting Process for Gyeongju LILW Repository

- **Amendment of Radwaste Management Policy (2004.12)**
  - **Separation of LILW and HLW**
- **Enactment of a Special Law for Hosting Area Support (2005.3)**
  - **Special Support Fund : 300 billion KRW (272 million USD)**
  - **Local Support Fee : 637,500 KRW (580 USD)/drum (200 liter standard)**
  - **Moving the KHNP Head Office to Gyeongju-city**

  * KHNP : Korea Hydro & Nuclear Power Corporation
  (It operates 20 nuclear power plants)
- **Organization of site selection committee (2005.3)**
  - **Within 20 representatives of all levels (Science, Technology, Culture, Social, Media, Legal and Civil Group) of society**
- **Public Notice for New Site Selection Procedures (2005.6)**
  - **Public notice (‘05.6.16) → Solicitation application (~’05.8.31) → Demand resident’s vote (~‘05.9.15) → Implementation of Resident’s vote → Final candidate site selection**

Siting Process for Gyeongju LILW Repository

- Gyeongju-city was selected among the four volunteered local governments by the resident's vote (Nov. 2, 2005)

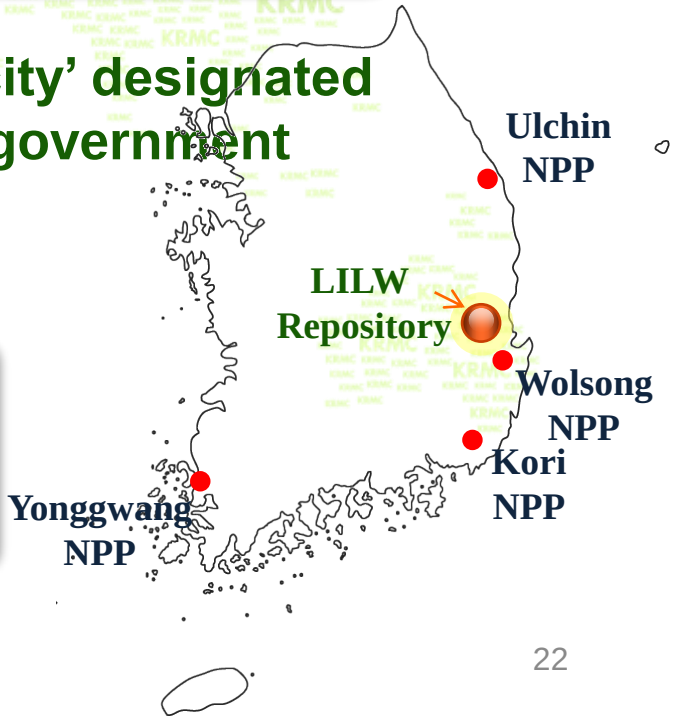
The consent vote rate of four provinces

Gyeongju-city	: 89.5%,	Gunsan-city	: 84.4%,
Youngdok-county	: 79.3%,	Pohang-city	: 67.5%

- 'Bonggil-ri, Yangbuk-myun, Gyeongju-city' designated as a LILW disposal facility site by the government (Jan. 2, 2006)

Location of LILW repository

- 20 km far from downtown in Gyeongju
- Near Wolsong nuclear power plant site
- Near 1st class tourist attraction



Incentives for Gyeongju-city

Financial Support	300 billion KRW (272 million USD) (May 2006)
Moving the KHNP Head Office to Gyeongju-city	KHNP operates 20 nuclear power plants Janghang-ri, Yangbuk-myun, Gyeongju-city - Expected completion date : Dec. 2014
Proton Accelerator Project	Hwachun-ri, Gunchun, Gyeongju-city (Feb. 2006) - Expected completion date : May 2012
Government Support for Local Community Projects	Support plan for local community projects approved by 'Committee for Local Government Support' (Apr. 2007) - 55 Projects (3.2 trillion KRW (2.9 billion USD))

Status of LILW Disposal Facility Construction

Location

- Bonggil-ri, Yangbuk-myun, Gyeongju-city
  (near Wolsong NPP site)

Site Area

- 2,130,104 ㎡

Capacity

- 100,000 Drums(200ℓ) for the 1st Stage
  (Final Capacity : Total 800,000 Drums)

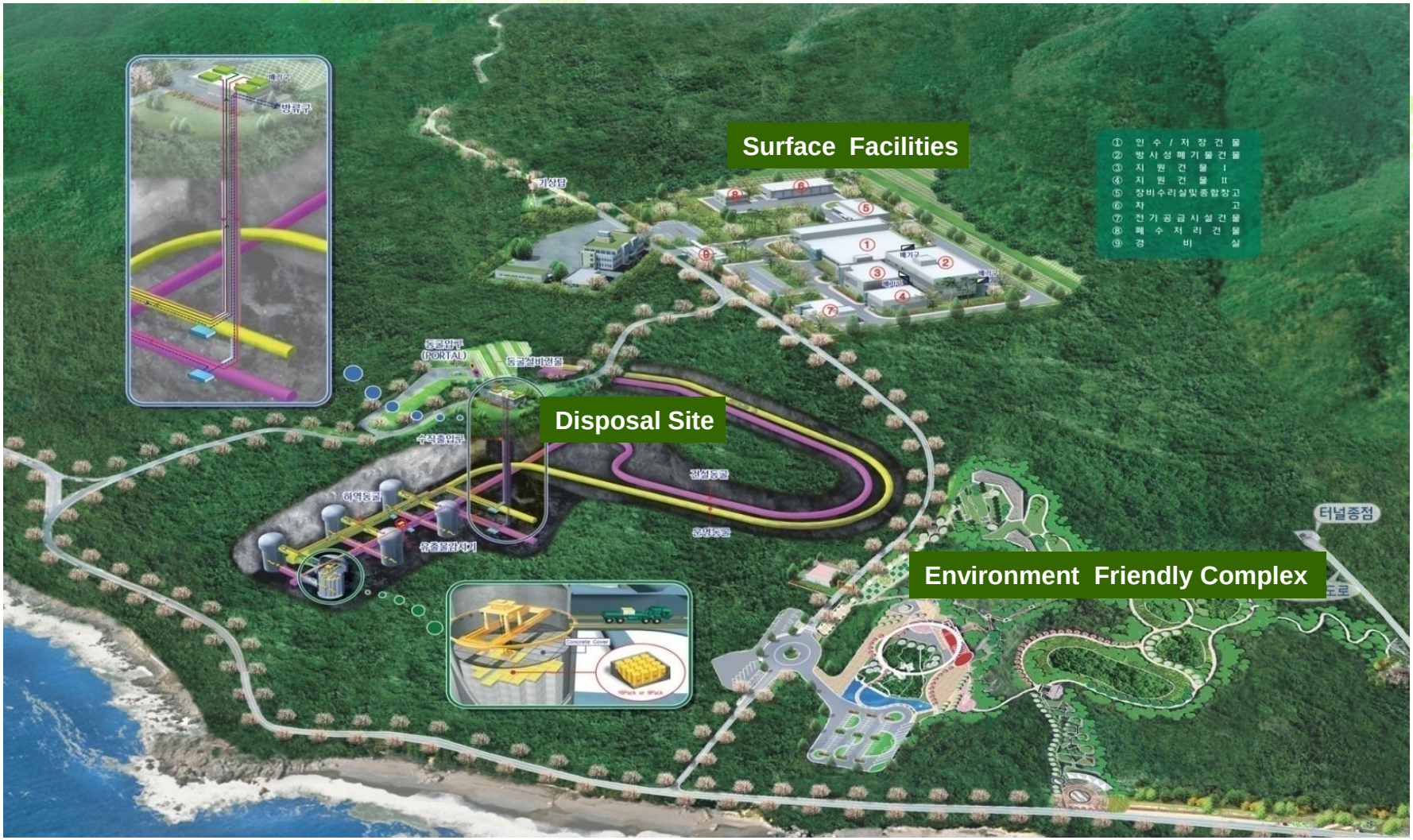
Disposal Method

- Underground Silo Type / 80m~130m below surface (1st Stage)
  * 2nd stage is considering the near-surface disposal
    as well as the cavern type disposal

Duration

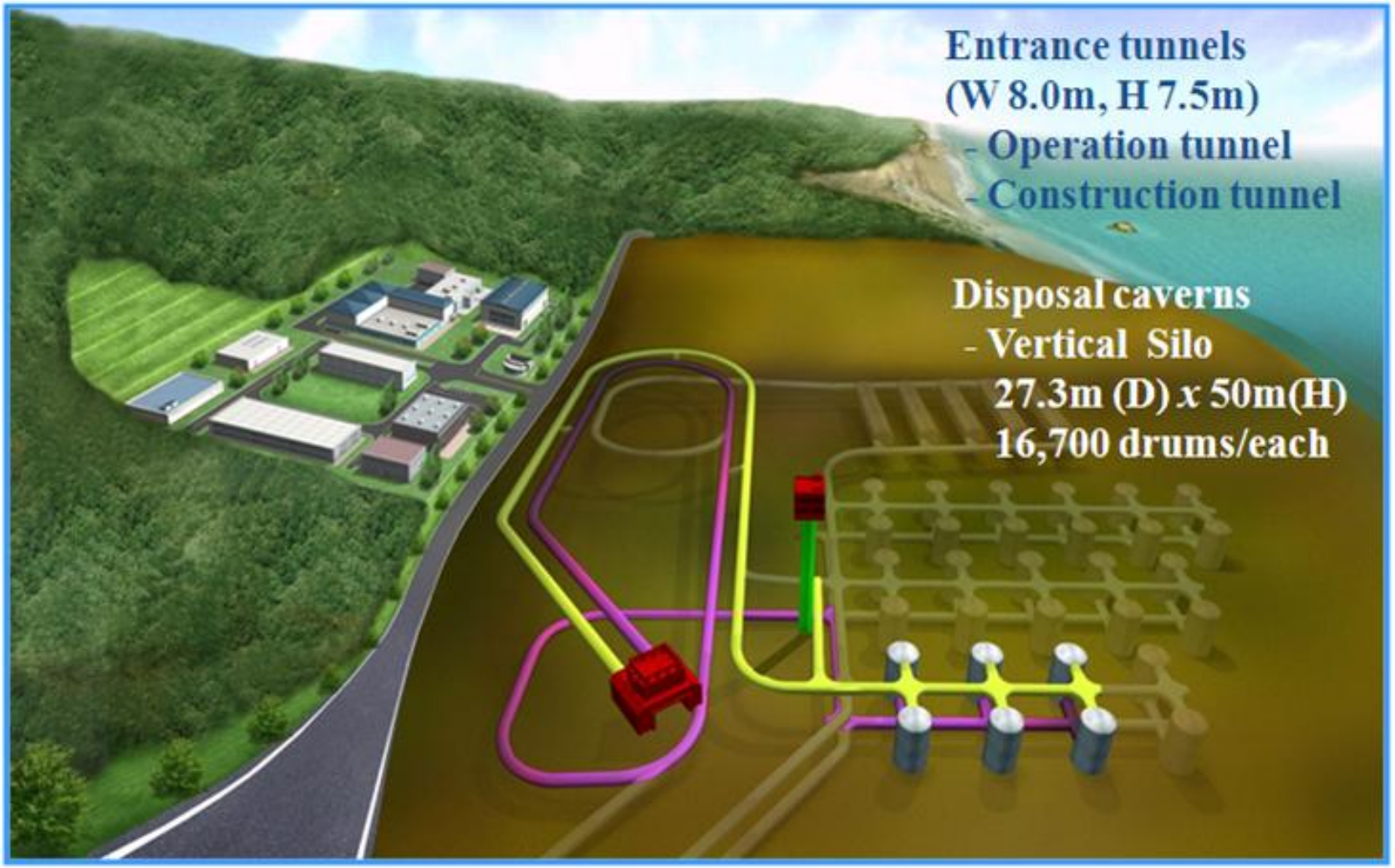
- Jan. 2006 ~ Dec. 2012 (1st Stage)

A Bird's – eye View of Wolsong LILW Disposal Facility

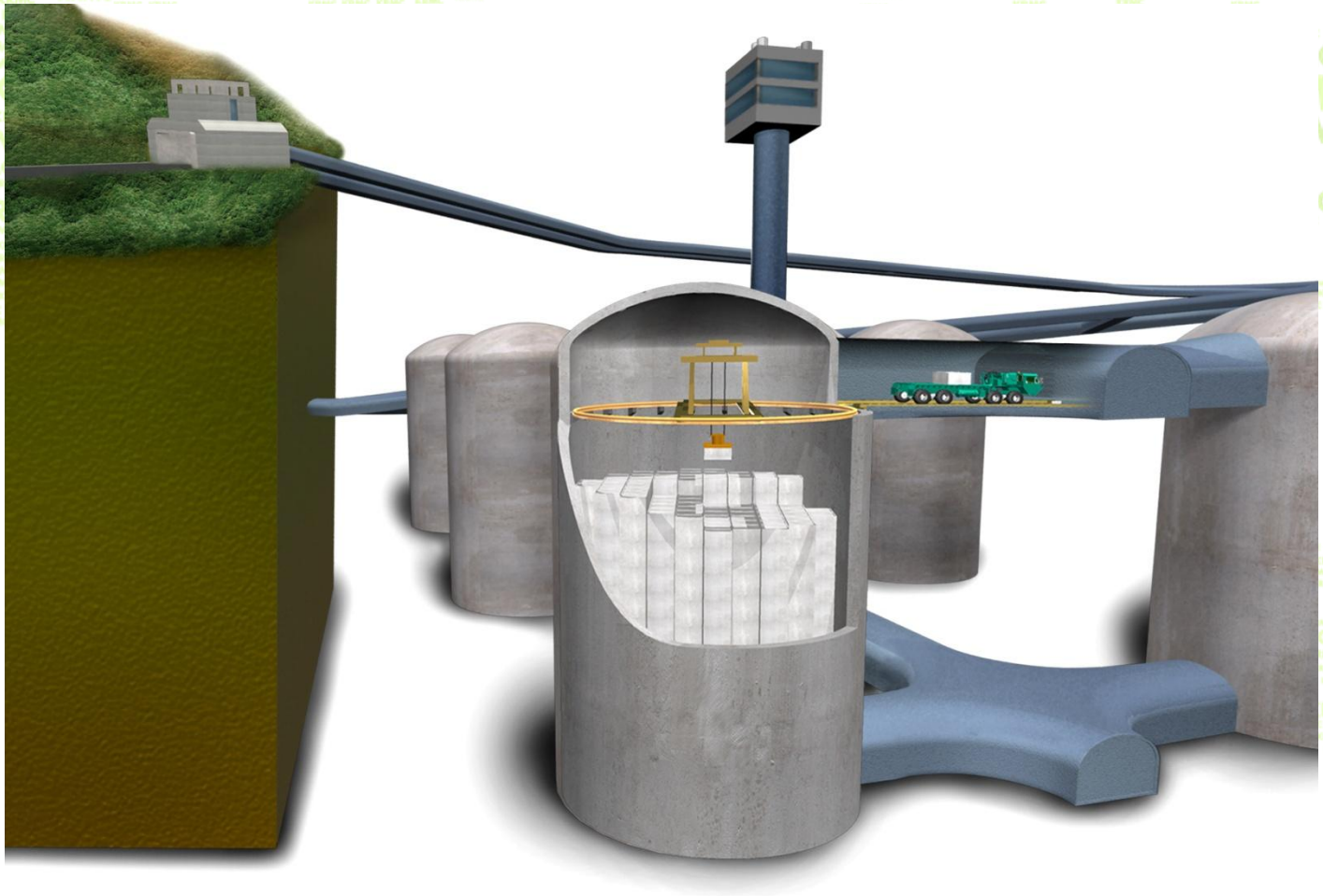


Design of the disposal facility (1st stage)

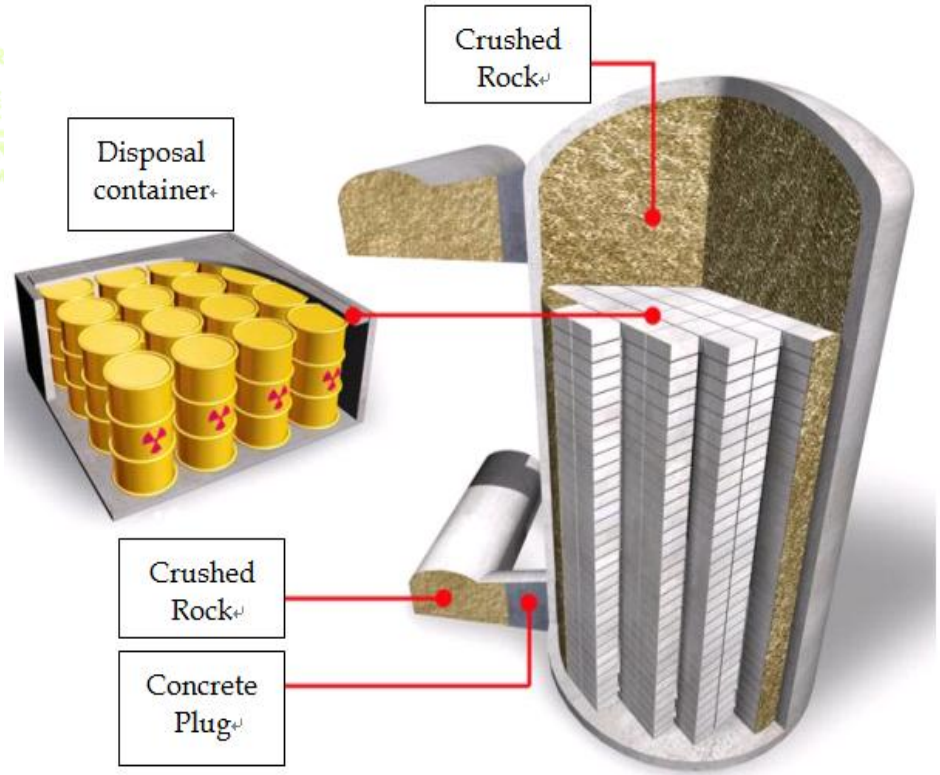
- **Facility Profile**

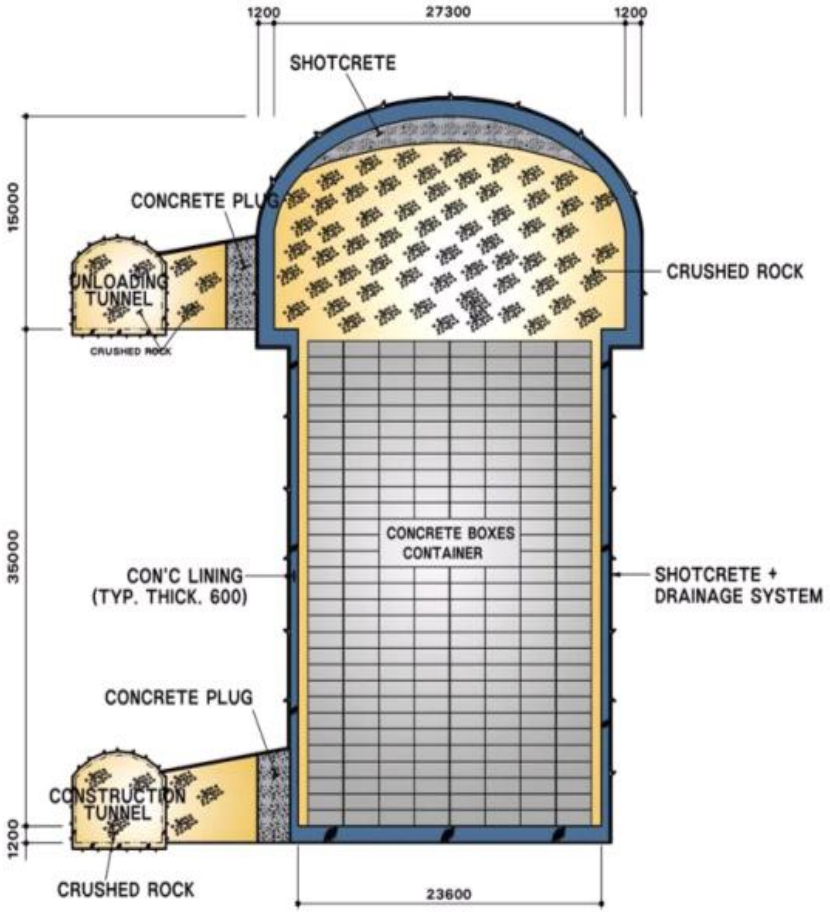


Operation of Underground Silo



Concept of Underground Silo after Closure





MOVIE

KRMC

Surface Facility

- Waste Reception & Storage Building
- Waste Treatment Building
- Equipment Maintenance Shop
- Service Building

Underground Facility

Underground Facility

- Operation Tunnel : Transportation of radwaste
- Construction Tunnel : Transportation of construction equipment and materials
- Shaft : Entrance for workers
- Silo : Final disposal of radwaste

[Portal]

[Shaft Entrance]

LILW Disposal Facility Construction

■ Overall Process Rate : 72 % (Dec. 31, 2010)

■ Operation Tunnel

Excavation rate : 97%, (1,378 m / 1,415 m)

■ Construction Tunnel

Excavation rate : 62%, (1,216 m / 1,950 m)

Transport Ship - HJ CHEONGJEONGNURI

<Apr. 15, 2009>

SPECIFICATIONS

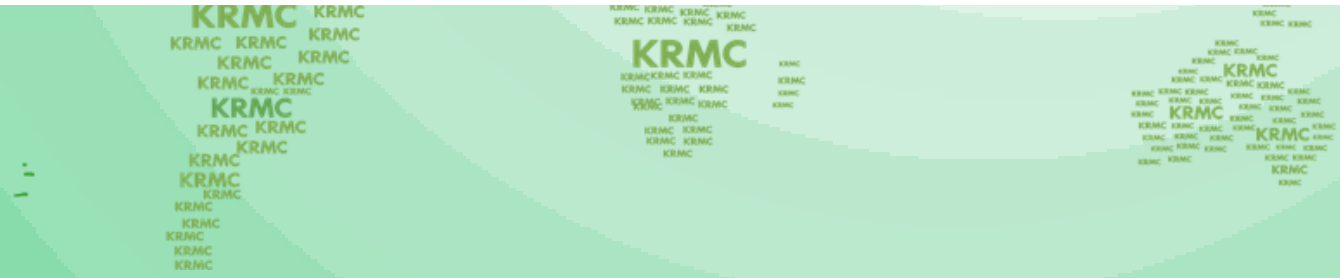
- ○ Length : 78.6 M
- ○ Width : 15.8 M
- ○ Gross Tonnage : 2,600 Ton
- ○ Speed : 12.0 Knots
- ○ Engine : Diesel×2(1632 HP×2)
- ○ Capacity : Max. 1,520 Drums

Environment Friendly Complex

Restricted Visit Area

Free Visit Area

- Painful Experiences for 20 years
- Upgraded Nuclear Industry
- NIMBY became WIMBY
- Communication, Transparency, Trust



Thank you for your attention!

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