

[Global Technology Commercialization]

Green Radiation Co., Ltd. and its LIRW Projects

June 25, 2024



**A Company for Evergreen Energy
Green Radiation Co., Ltd.**

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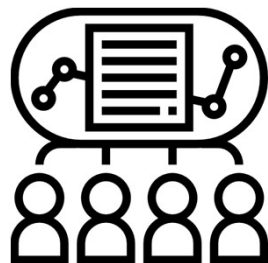
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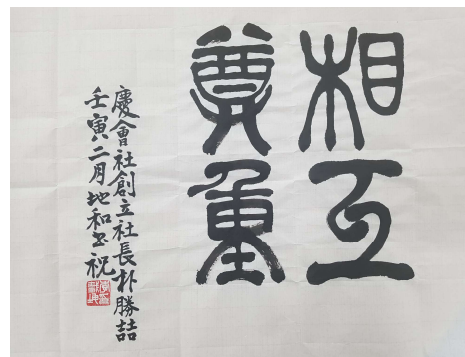
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1. Introduction of Green Radiation Co., Ltd.



Company Motto : Mutual Respect

1-1. Company History

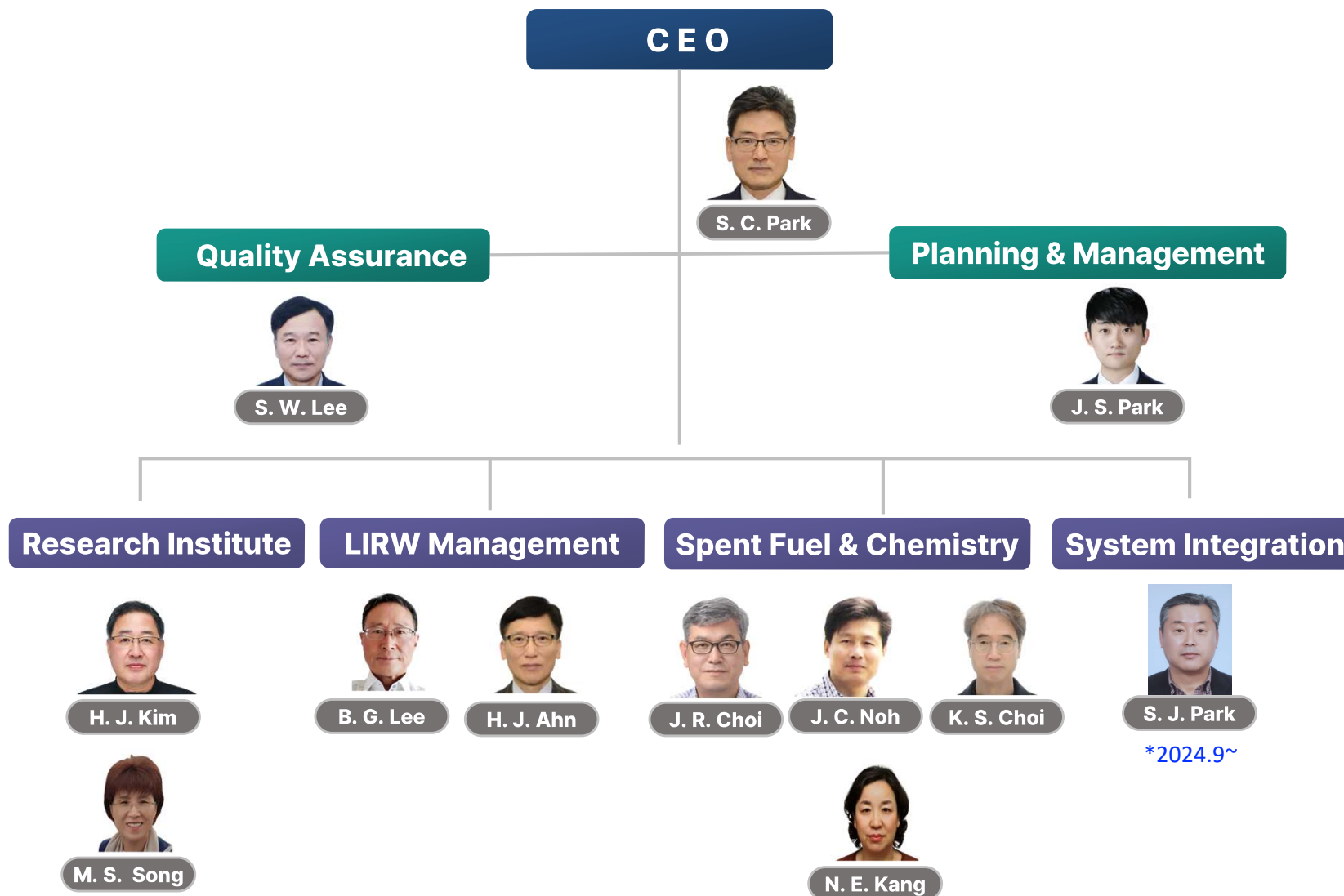
Events

2020	09.17 Agreement of HHNP's 2 nd In-house Venture
2022	02.21 Registration of KHNP's Spin-off Startup 03.02 Registration of a Small & Medium-sized Enterprise 03.12 Startup Company Registration 04.11 Designation as a KAERI-Family Company 07.06 Registration of KHNP's 1st Research Subsidiary 08.22 Engineering Business Registration 08.31 Winner of 3 rd Startup Foundation ESG Competition 10.21 Establishment of Corporate Research Institute 10.26 SBS-Biz broadcasting 『Tomorrow's Champion』 10.27 Winner of the ESG Startup idea competition 12.15 Acquisition of KOLAS Accreditation (KT1074)
2023	02.01 Venture Enterprise Certification (230201030035) 09.12 Factory Registration (302002023060585)
2024	01.01 Relocation of Office 05.27 Certification of Nuclear Power Corporation

Get Investment, Projects

2020	09.17 KHNP's In-house Venture Project
2022	05.01 Government's Early-stage Program 07.06 Got KHNP's In-kind Investment (10% equity stake) 10.11 Technical Evaluation for Investment Purpose (TI-3)
2023	02.22 Policy Financing Loan 07.17 KAIF's Nuclear Enhancement Program 08.07 Radioactivity Analysis of Seafood I (contract) 11.01 Start Development of Microwave Air Purifier Treating Technology (R&D, KHNP) 12.14 Start Characterization of Waste Form (R&D, NRF/MSIT) 12.20 Got Investment from Schmidt (10% equity stake)
2024	02.20 Start Radioactivity Analysis of Seafood II (contract) 04.01 Start Volume Reduction & Stabilization of PHWR Radioactive Wastes (R&D, MTIE/MSIT) 05.06 Start Demonstration MRT 2.1 at Hanbit#4 06.25 IR Presentation at KDB NextRound

1-2. Company Organization



12 Staff members

Degree

Doctoral degree : 3
Master's degree : 2
Bachelor's degree : 7

Field of Study

Nuclear Eng. : 2
Chemistry : 3
Electricity Eng.: 2
Mechanics Eng. : 1
Chemical Eng. : 1
Industrial Eng. : 1
Information Eng. : 1
English Literature : 1

Carrier Institution

from KHNP : 6
from KAERI : 2
from KORAD : 1
from other fields : 2

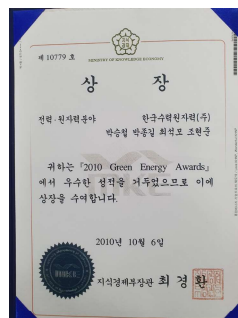
Professional Qualification

Supervisor License for RI : 1
Handling License for RI : 2
Technical Engineer : 4
Industrial Engineers : several

1-3. Company Leader

Core Competencies

- * 38 years of Radwaste Treatment Research
- * KHNP Radwaste Research Group Leader
- * Research on **Vitrification and Plasma Melting**
- * Various Volume Reduction Technologies of liquid waste(IEX, Adsorption/Desorption, UF/RO, evaporation, etc.)
- * **Regulatory exemption of Radioactive Waste** (activated carbon, zeolite)
- * Papers
 - 17 Academic Journal
 - 80 Posters and/or Presentations
- * 23 patents



2010 Green Energy Award
(KETEP/MTIE)



SBS-Biz broadcasting
『Tomorrow's Champion』

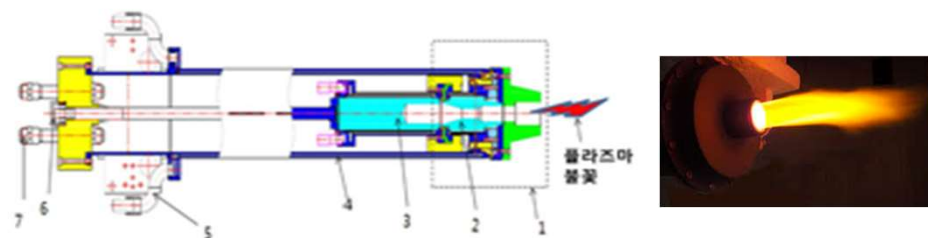


Startup Idea Competition Winner
(Aug. 2022, Korea Innovation Cluster)

Key Achievements

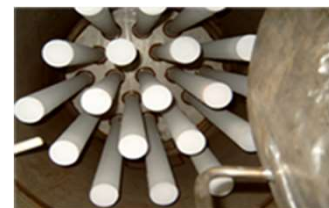
* Development of 0.5MW plasma torch for LIRW treatment

- By adopting graphite material with non-cooling nozzles, a certain lifespan is ensured despite site arcing

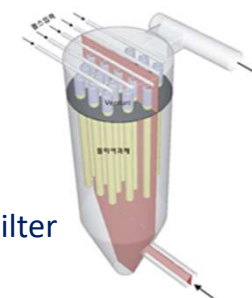


* Development of a metal filter system for LIRW vitrification process

- Compare to ceramic filters(Mullite, SiC), the thin skin layer offers high efficiency in dust removal and excellent pressure recovery



SEM image of Metal Filter



* Others

- Comprehensive design of the Wolsong tritium recycling system
- Development of modular/mobile liquid waste treatment system
- Development of primary system chemical decontamination technology prior to the decommissioning of PWR

1-4. Business Capability(1/4)_Intellectual Property Rights

	IP	status	Application Number	Application date	Registration number	Registration date	Intellectual Property Name	Remarks
1	patent	registered	10-2017-0108870	2017.08.18.	10-2009998	2019.08.06.	Device for Activated Charcoal Treatment Using Microwave Heating Method	KHNP investment
2	patent	registered	10-2020-0166389	2020.12.02.	10-2274665	2021.07.02.	Reactor for Radioactive Waste Treatment Using Microwave Heating	KHNP investment
3	patent	registered	10-2020-0180682	2020.12.22.	10-2329042	2021.11.16.	Method and System for Determining the End Point of Thermal Treatment Reactions Using Desorption Curves of Radioactive Substances	KHNP investment
4	patent	registered	10-2011-0012951	2011.02.14.	10-1254636	2013.04.09.	Method and Device for Manufacturing Radioactive CH ₃ I Tracer	KHNP investment
5	patent	registered	10-2022-0120081	2022.09.22.	10-2552603	2023.07.03.	Method and Device for Manufacturing Radioactive CH ₃ I Tracer	
6	patent	registered	10-2022-0120078	2022.09.22.	10-2584887	2023.09.26.	Counter-Rotating Reactor for Radioactive Waste Treatment Using Microwave Heating	
7	patent	Applied	10-2023-0180162	2023.12.12.			Scrubber and Method for Recovery of Radioactive Carbon	
8	patent	Applied	10-2024-0004556	2024.01.11.			Separation Method for Nb-94 Nuclide Measurement in Radioactive Waste Using Gamma Spectroscopy	
9	patent	Applied	10-2024-0037067	2024.03.18.			Method for Sequential Chemical Separation of Difficult-to-Measure (DTM) Radionuclides from Radioactive Waste	
10	patent	registered	10-2009-0082125	2009.09.01.	10-1068523	2011.09.22.	Methods for Removing Co and Cs from Radioactive Pulmonary Secretions	2024.3.1 trade
11	patent	registered	10-2019-0127127	2019.10.14.	10-2333785	2021.11.26.	Methods for Confirming the Presence of Radioactive Nuclides (C-14, H-3) in Samples	Right of prior use 2024.3.1 agreement
12	program	registered	-	2010.04.11.	2010-01-129-004500	2010.08.16.	Performance Testing Program for Nuclear Grade Charcoal	KHNP investment
13	Trademark right	registered	40-2021-0020650	2021.01.29.	4019021660000	2022.08.24.	Company name of "Green Radiation Co., Ltd."	KHNP investment
14	Trademark right	Applied	40-2022-0174878	2022.09.22.			Trade Mark of Green Radiation	

- Above IPs are Green Radiation's essect. S.C. Park holds more than 30 IPs on vitrification, Plasma Melting, and hot Off-gas Treatment but they all belong to KHNP.

1-4. Business Capability(2/4)_Acquisition of ILAC-KOLAS Certification

Field : Performance Testing of Nuclear Grade Activated Carbon

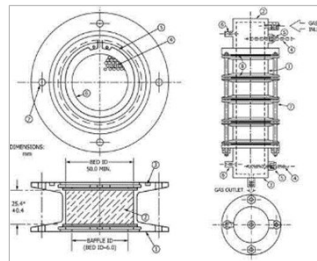
- 01 Test Item/duration : **Nuclear grade charcoal test**/2022.12 ~ 2023.12
- 02 KOLAS Certification Number/field : KT1074/ 02. Chemistry, 02.002 Inorganic item
- **ASTM D3803 I-131 absorption test for Nuclear Grade Charcoal**
- 03 Documents : 1 QA manual 1, 25 QA procedures, 16 QA guidelines
- 04 KOLAS 17025, education of uncertainty estimation



Main Structure of Test Equipment



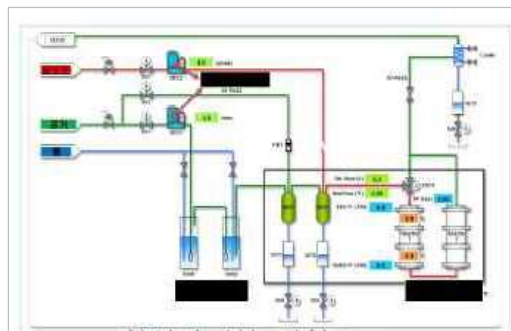
Tracer
(CH₃I¹³¹)



Charcoal Canister



Loading of Charcoal

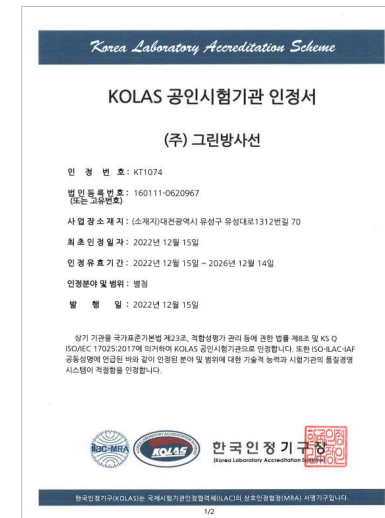


P&ID of Charcoal Test Equipment

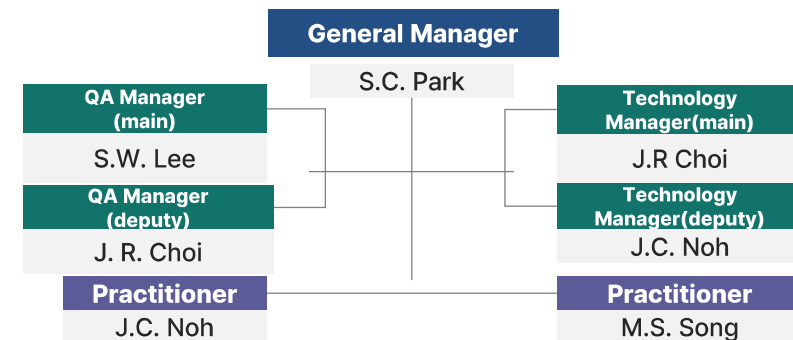


I-131 Analysis

KOLAS Certification (KT1074)



KOLAS Test Organization



1-4. Business Capability(3/4)_Manufacturing Facility

■ 산업집적활성화 및 공장설립에 관한 법률 시행규칙 [별지 제8호의2서식] <개정 2012.10.5> 공장설립관리정보시스템(www.factoryon.go.kr)에서도 신청할 수 있습니다.

공장등록증명(신청)서

※ 바탕색이 어두운 난은 신청인이 적지 않으며, []에는 해당되는 곳에 v표를 합니다. (일부)

접수번호	접수일	처리기간	측시
회사명 (주)그린방사선 대표자 성명 박승철 대표자 주소(법인 소재지) 대전광역시 유성구 유성대로1312번길 69, 한수원중앙연구원 미래동 1층 M106-b호 (장동)		전화번호 042-870-5253 생년월일(법인등록번호) 160111-0620967	
공장 소재지 단지명:대덕테크노밸리지목 도로명: 대전광역시 유성구 유성대로 1428(방현동) 지번: 대전광역시 유성구 방현동 419		보유구분 자가 [] 공장용지 임대 [v]	
공장 등록일 2023-09-12 사업 시작일 공장의 업종(분류번호) 방사선 장치 제조업 외 2종 (27111, 70129, 72122)		종업원 수 남: 6 여: 1	
공장 부지 면적 0 m ² 제조시설 면적 144 m ² 부대시설 면적 60.25 m ²			
등록 조건			
등록변경: 증설등 기재사항 변경내용(변경 날짜 및 내용) 공장관리번호: 302002023060585			
「산업집적활성화 및 공장설립에 관한 법률 시행규칙」 제12조의3에 따라 위와 같이 공장등록증명서를 신청합니다. 2023년 09월 12일 신청인 박승철 (서명 또는 인)			
연구개발특구진흥재단 귀하 수수로 원			
정보서류 없음			
처리절차			
신청서 작성 → 접수 → 등록·인부 확인 → 결재 → 공장등록 증명서 발급 → 통보			
신청인 처리기간 처리기간 처리기간 처리기간 처리기간			
「산업집적활성화 및 공장설립에 관한 법률」 제16조제1항 제2항·제3항에 따라 위와 같이 등록된 공장임을 증명합니다. 2023년 09월 12일			
연구개발특구진흥재단			
210mm×297mm[백상지 80g/m ²]		서한속 / 09월12일 19:07	

Certification of Factory Registration



Factory outside(top) and interior & equipment(bottom) of Green Radiation Co., Ltd.

1-4. Business Capability(4/4)_Certifications and Memberships



Korean Association of
Radioactivity Analysis Members



Corporate Research Institute



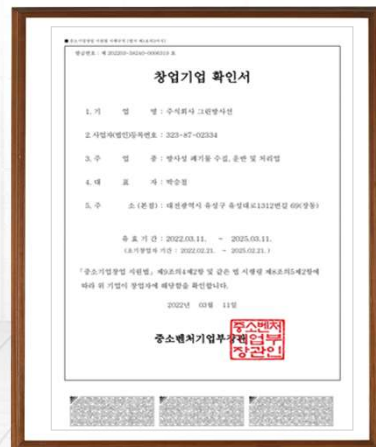
Institute Enterprise



Venture Enterprise



Certification of Nuclear
Power Corporate



Startup Enterprise



KAERI-Family Enterprise



Member of Korea Atomic
Industrial Forum



2. Market Trends

2-1. Nuclear Plants

2-2. Nuclear Wastes

2-1. Nuclear Plants(1/4)_Restoration of Nuclear Power

◆ Reevaluation of Nuclear Power in the Energy Market

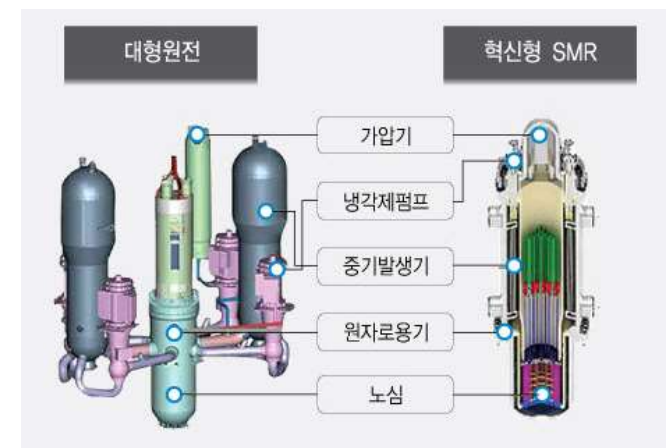
- Inclusion of Nuclear Power in the **Green Taxonomy**, aligning with Environmental and Climate Goals
- Importance of Nuclear Power highlighted in terms of **Energy Security** following the Ukraine War
- The Role of Nuclear Power as a Bridge Energy will be continued until the Advent of Nuclear Fusion

◆ Globally, SMRs are emerging as a blue ocean in the nuclear power market

- With innovations in safety, SMRs are being developed over 70 models, offering strengths such as **decentralized power**, **seawater desalination**, and nuclear **hydrogen production**
- Korea's SMART™, which received the world's first design certification in 2012, is strengthening its competitiveness through collaboration with Canada, and **i-SMR™** is partnering with Nuscale Power in the U.S.
- SMR market is projected to reach 640 trillion won by 2035 (Aju Business Newspaper, 2022.06.14.)

◆ Korea is one of the leading suppliers of Western-style Nuclear Power Plant

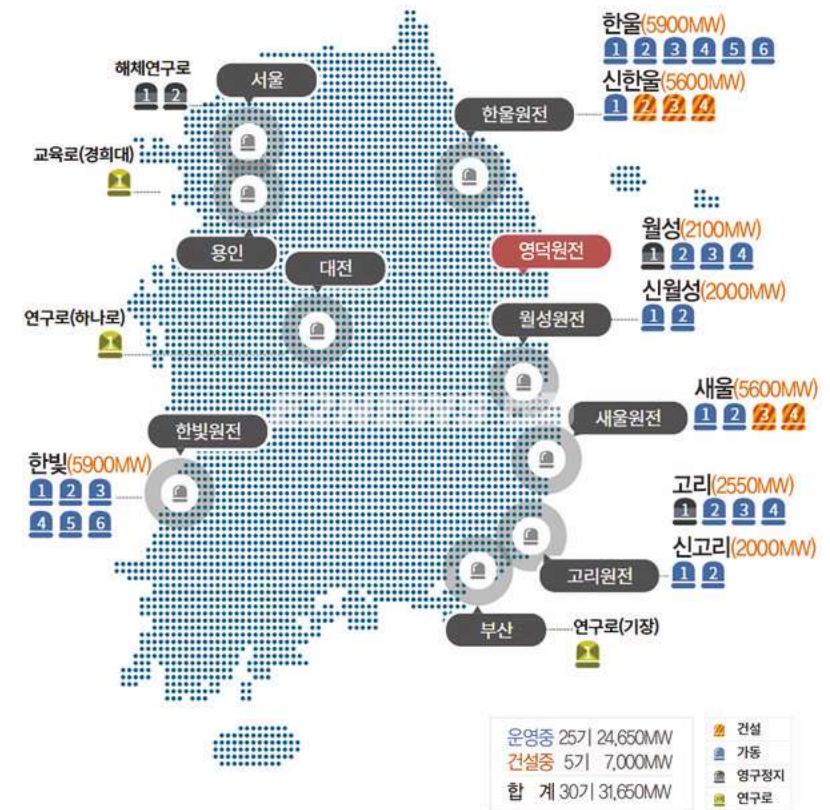
- In the atmosphere of Western disarmament of nuclear power, **Russia's Rosatom and China's CGN supply 80% of global NPPs construction**
- **The era of 30 operating NPPs in Korea** has arrived due to the restoration of Nuclear Power and **Korea aims to export 10 NPPs by 2030**
- Global market of NPP is expected to reach 800 trillion won by 2035 based on 95 plants (Aju Business Newspaper, 2022.06.14.)



[source : <http://www.inpnews.kr>]

2-1. Nuclear Plants(2/4)_Restoration of NPPs in Korea

		Plant Number	Reactor Type	Capacity (MW)	Commercial Operation	Remarks
1	Kori	Kori #1	PWR	650	1978.04.29.	2017.06.18. permanent shut down
2		Kori #2	PWR	650	1983.07.25.	
3		Kori #3	PWR	950	1985.09.30.	
4		Kori #4	PWR	950	1986.04.29.	
5		Shin Kori #1	PWR	1000	2011.02.28.	
6		Shin Kori #2	PWR	1000	2012.07.20.	UAE type
7	Saeul	Saeul #1 (Shin Kori #3)	PWR	1400	2016.12.20.	
8		Saeul#2 (Shin Kori #4)	PWR	1400	2019.08.29.	
9		Saeul#3 (Shin Kori #5)	PWR	1400	Under construction	Resumption of construction
10		Saeul#4 (Shin Kori #6)	PWR	1400		
11	Wolsong	Wolsong #1	PHWR	700	1983.04.22.	2019.12.24. . permanent shut down
12		Wolsong #2	PHWR	700	1997.07.01.	
13		Wolsong #3	PHWR	700	1998.07.01.	
14		Wolsong #4	PHWR	700	1999.10.01.	
15		Shin Wolsong #1	PWR	1000	2012.07.31.	Hanbit
16		Shin Wolsong #2	PWR	1000	2015.07.24.	
17		Hanbit #1	PWR	950	1986.08.25.	
18		Hanbit #2	PWR	1000	1987.06.10.	
19		Hanbit #3	PWR	1000	1995.03.31.	
20		Hanbit #4	PWR	1000	1996.01.01.	
21		Hanbit #5	PWR	1000	2002.05.21.	Hanul
22		Hanbit #6	PWR	1000	2002.12.24.	
23		Hanul #1	PWR	950	1988.09.10.	
24		Hanul #2	PWR	950	1989.09.30.	
25		Hanul #3	PWR	1000	1998.08.11.	
26		Hanul #4	PWR	1000	1999.12.31.	
27		Hanul #5	PWR	1000	2004.07.29.	Shin Hanul
28		Hanul #6	PWR	1000	2005.04.22.	
29		Shin Hanul #1	PWR	1400	2022.12.07.	
30		Shin Hanul #2	PWR	1400	Under testing	
31		Shin Hanul #3	PWR	1400	Under construction	Cancel the cancellation
32		Shin Hanul #4	PWR	1400		
33	New site	NEW #1	PWR	1400	Under planning	
34		NEW #2	PWR	1400	Under planning	



Current status of NPPs in Korea

[Source: KHNP home, KAIF home, 2023.06.05.]

2-2. Nuclear Wastes(3/4)_Management of LIRW

- ◆ With the advent of the 30 domestic NPPs, **the generation of radwaste will also accelerate**
 - Radwaste generation in non-power generation sectors including nuclear cycle, RI usage, depleted uranium catalysts, is also experiencing an increase.
- ◆ Large amount of the LIRW drums generated prior to the Gyeongju disposal facility **require reprocessing to meet WAC standards**
 - The increase in waste storage volume in NPPs poses challenges such as decrease nuclear safety, financial burden due to disposal costs(approximately 16 million won per 200 liters), shortened lifespan of disposal facilities.
- ◆ Therefore , **a strong need for high-intensity volume reduction technology exists.**

Amount of LIRW stored in interim Storage in NPPs in Korea

Site	Kori	Saeul	Wolsong	Hanbit	Hanul	Daejeon	Seoul	Sum
LIRW (200L drum)	40,600	603	16,761	22,006	17,212	30,501	587	128,270

[source: KINS WACID, 2023.09.01]



Interim storage of LIRW in NPPs

2-2. Nuclear Wastes(4/4)_Radwastes from Decommissioning

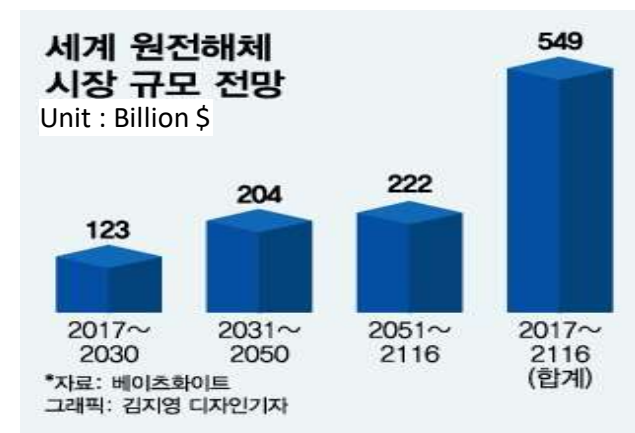
◆ Nuclear Power Plant Decommissioning Waste

- Total of 204 NPPs including two of Korea's reactors (Kori #1, Wolsong#1) are awaiting decommissioning
- Approximately **40% of the decommissioning cost** (about 1 trillion won for one reactor) is allocated to **radwaste management expenses**
- Given the capacity limit of LIRW disposal facility of Korea, innovative volume reduction technologies are required to achieve **the high-intensity compaction goal (from about 80,000 drums to 14,500 drums per reactor)**
- While companies like U.S. based Energy Solution, UK's AMEC, Germany's Siempelcamp, and France's Orano dominate the global market for PWR decommissioning, **Korea is focusing on enhancing its competitiveness in PHWR** based on the decommissioning of Wolsong #1.



Estimated amount of waste generated during decommissioning(left) and the cost(wright)

[https://www.hani.co.kr/arti/science/science_general/799208.html]



Outlook on the global decommissioning market

[source: Money Today Newspaper, 2022.11.27.]



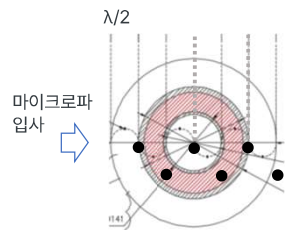
3. Current LIRW Projects

- 3-1. A Project on Gas Purifier Waste Management
- 3-2. A Project on Thermal Volume Reduction

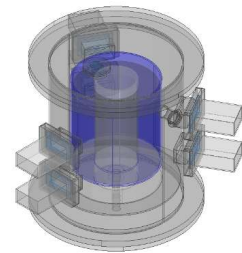
3-1. Gas Purifier Waste Project(2/6)_Microwave Desorption Process

☑ Microwave heating Process for the treatment of Air Purifier Wastes

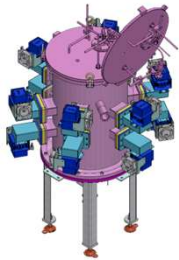
▶ Design of Microwave Reactor



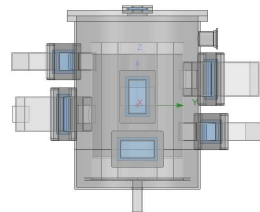
Quartz Crucible Design Considering Microwave Penetration Depth



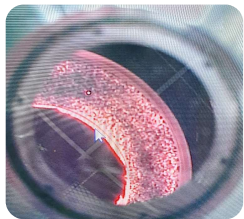
3D Design of Heating Reactor



3D Rendering of Microwave Heating Reactor with Technical Drawing



Design of Doppler Tube Connection Considering Vacuum Pressure

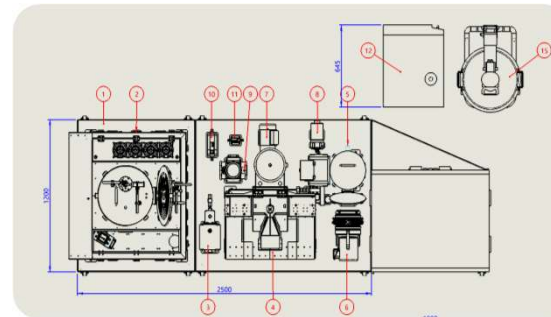


Heated Activated Charcoal (900°C)

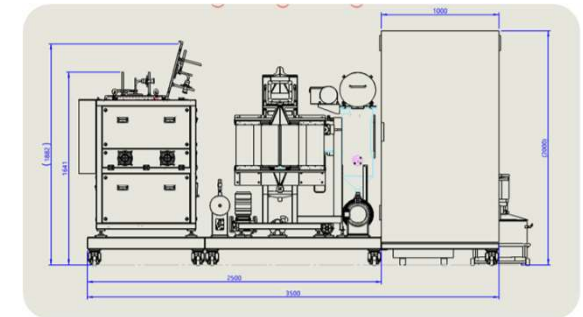


Actual Microwave Heating Reactor

▶ Fabrication and Operation of Microwave System



Overall Layout Diagram of the Processing Unit



Side View Diagram of the Processing Unit



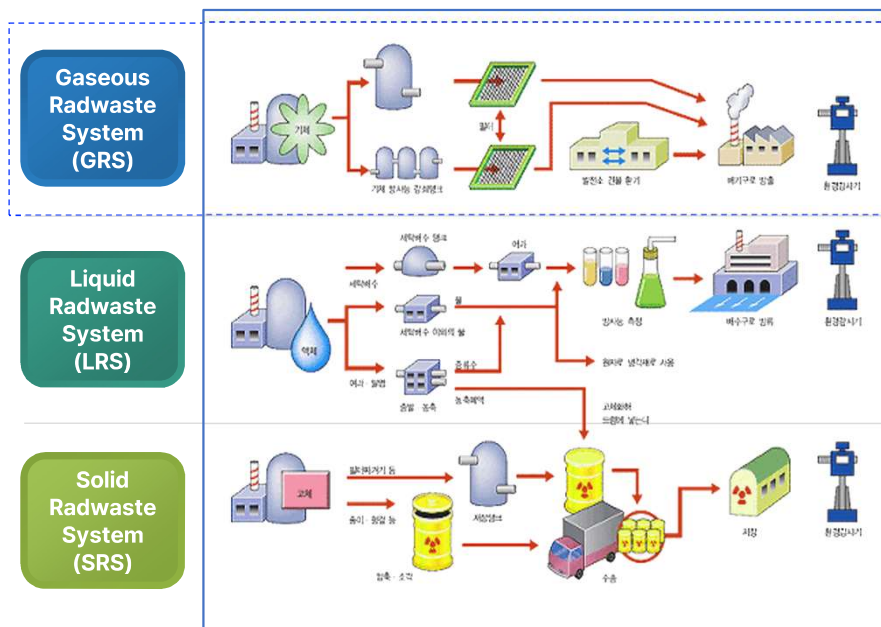
View of actual Microwave System

- **Electric Capacity** : 12kW
- **Throughput of Waste** :
 - 7 ℓ/batch(donut type)
 - 20 ℓ /batch(cylinder type)
- **Weight** : 1.5 ton
- **Size** : 1.2m(W) x 3.5m(L) x 2.0m(H)
- **Utility** : 380V, 3 phase, N2, chiller

Specification of the System

3-1. Gas Purification Waste Project(1/6)_Waste Characteristics

Radwaste Systems in NPPs



Types of Wastes

- * GRS : charcoal, desiccant(zeolite), HEPA filter, etc.
- * LRS : evaporator bottom, sludge, etc.
- * SRS : filter cartridge, ion-exchange resin, DAWs, etc.

[Radwaste Management Process]

volume reduction → solidify/stabilization → storage → disposal



Used Activated Carbon
(charcoal)



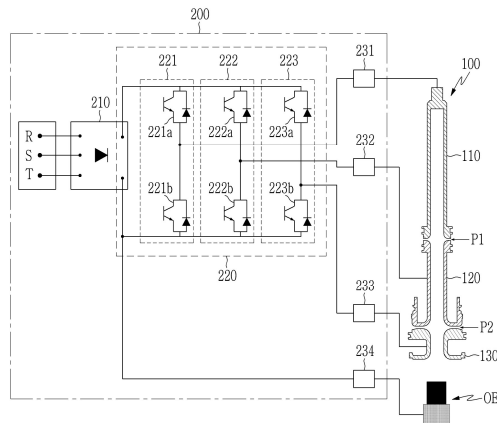
Used Adsorbent
(desiccant)

◆ Properties of Gas Purifier Wastes

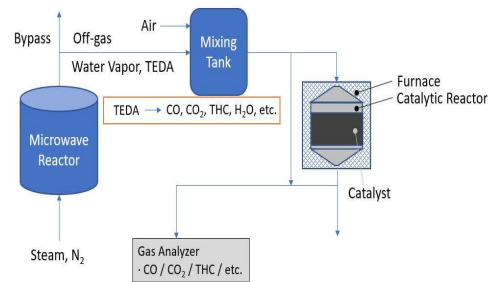
- Contaminated with **trace amounts of radioactive** materials
- Mainly contaminated **with volatile beta-emitting radionuclides such as C-14, H-3**
- Included **organic agent (5wt% of TEDA)** is volatile and flammable, and interfere negatively to the process
- Fortunately, if the long-lived C-14 could be desorbed, the **other nuclide are ignorable**
- The desorbed C-14 should be recovered with high efficiency **in a small volume as disposable form**

3-1. Gas Purifier Waste Project(3/6)_Fabrication of Operation Program

Core Control Logic



[Control Logic]



[Off-gas Catalytic System]

Design of Control Screen



[HMI Main Monitor]



[HMI History Trend]

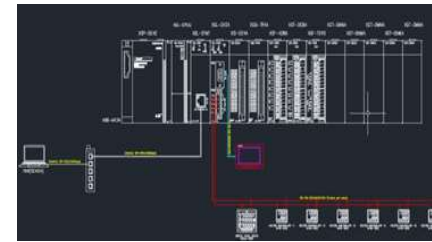


[Alarm & Event]

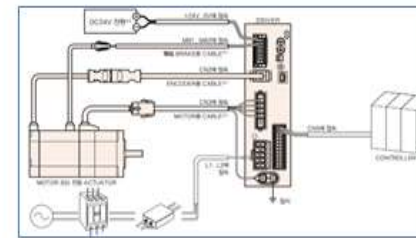


[Auxiliary Control]

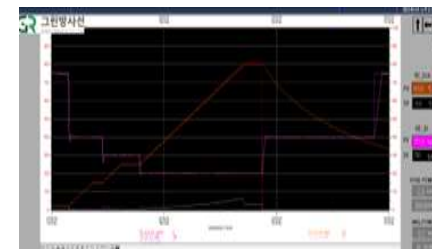
Programming



Configuration of Microwave Activated Charcoal Treatment Plant Control System]



[Stepping Motor Configuration Diagram]



[Acquisition of Historical Data (Temperature, Pressure)]

Installing and Testing



[Control Panel Configuration]

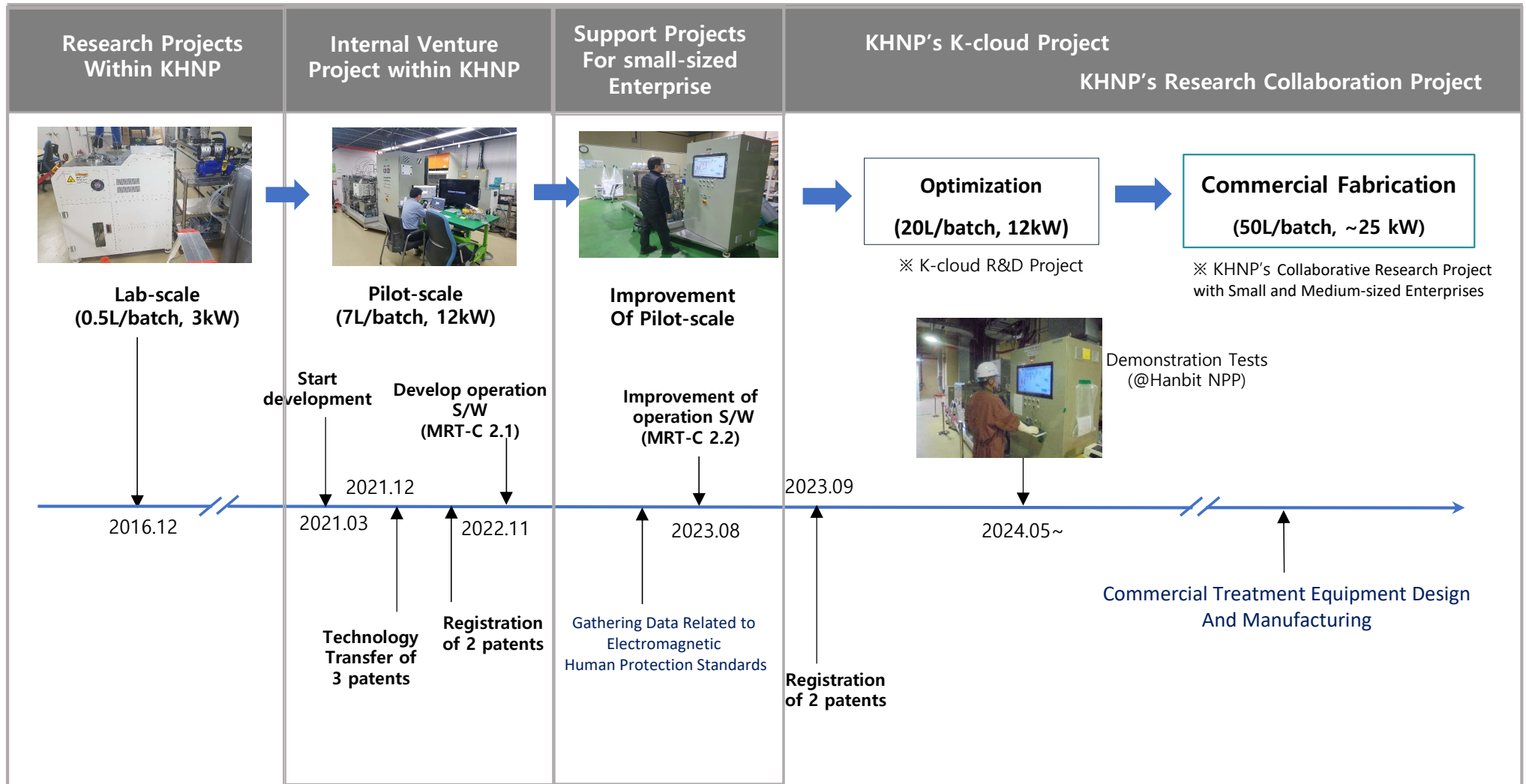


[Embedded Control PC]



[Touchscreen Control and Operation]

3-1. Gas Purifier Waste Project(4/6)_Project Milestone



Current position

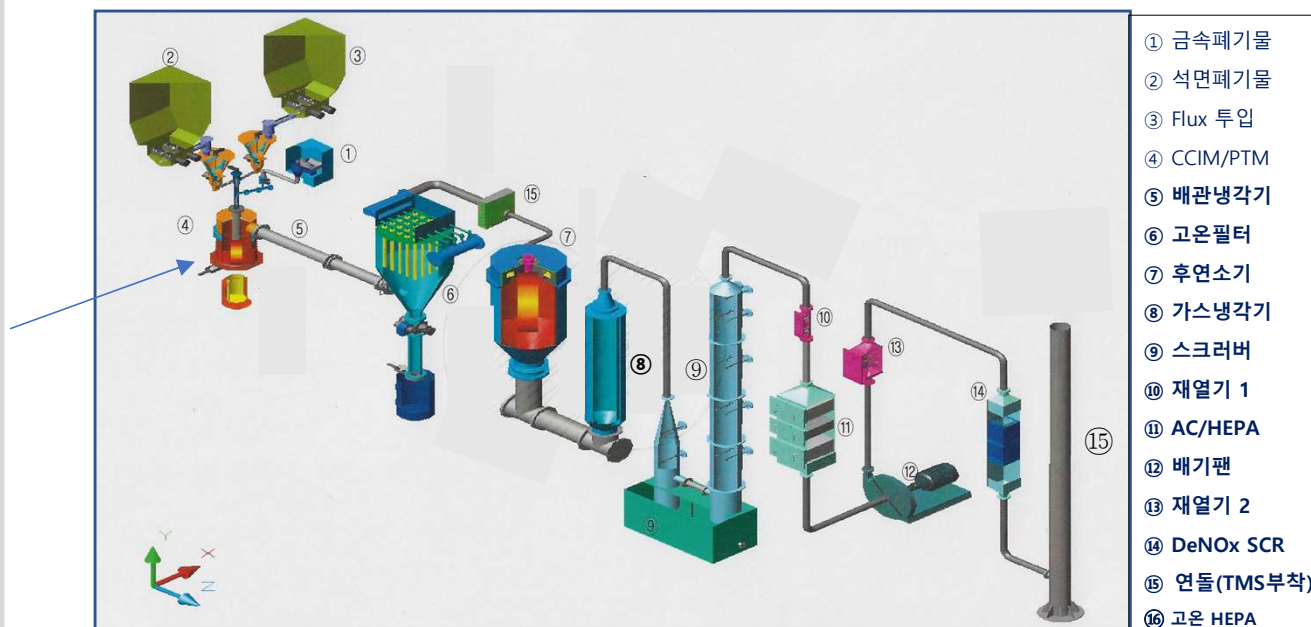
3-2. Thermal Volume Reduction Project(2/4)_Status of CCIM and PTM



CCIM for combustible

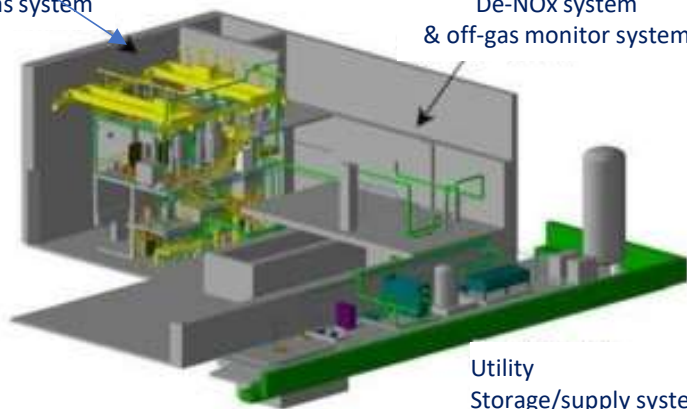


PTM for non-combustible



Glass Melter
& off-gas system

De-NOx system
& off-gas monitor system



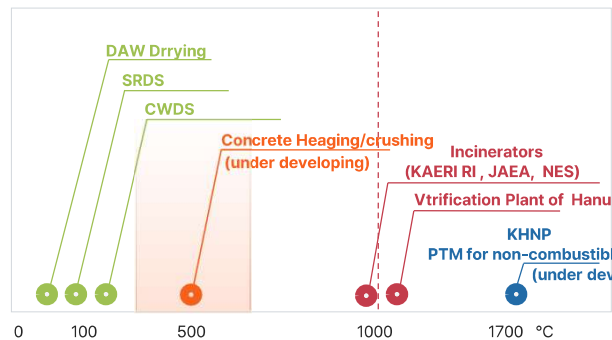
3D Design
of the Hanul Vitrification Plant
(CCIM System)

3-2. Thermal Volume Reduction Project(3/4)_Low-to Moderate Thermal Tech.

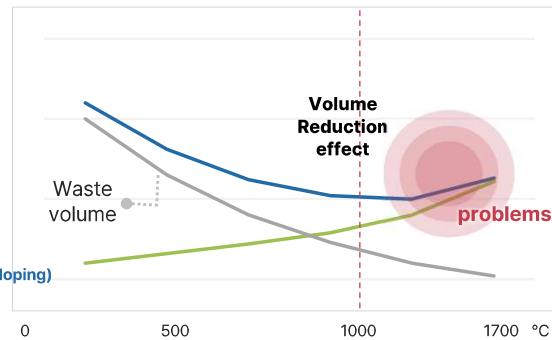
☑ Thermal Treatment Technologies for Radwaste

	Below 100 °C	DAW Drying, CWDS, SRDS
	Near 500 °C	No commercial process Concrete Waste Heating and Grinding (Under Development)
	600~800 °C	No cases found
	Above 1000 °C	Japan JAEA Incineration, KAERI RI Incineration, Hanul Vitrification, Austria NES Incineration

Temperature Range of Domestic Thermal Technologies



Secondary wastes and other technical issues



- * **Problems:** Short Lifespan of High-Temperature Components (Melting Furnace Refractory, Torch, etc.) , Cs volatilization, Difficulty in identifying/handling/disposal of the melt vitrified product, Challenges in the solidification/stabilization of secondary waste (ash, cleaning salts, etc.).

☑ Advantages of Low-to Moderate Temp. Technology

- ☑ Near 500°C low to medium temperature treatment technologies can handle most of the waste that high-temperature technologies used to target. **They generate less secondary waste and allow for long-term stable operation**
- ☑ Drawing upon the element technologies and development experiences secured from past high-temperature technologies, developing low to medium temperature thermal treatment **technologies around 500°C can significantly reduce technological development risks while securing practical technologies with ease.**

🔄 Recent High-temperature Projects

Research Organization	Topic of Thermal Technology	Supporting Agencies (Research Period)
Jeonju Univ.	Development of Hospital and Hazardous Waste Treatment Systems Using Plasma	ME ('01.8.1.~'04.5.31.)
	Development of Thermal Decomposition Melting Technology for Asbestos-Containing Hazardous Waste Treatment	ME ('04.6.1.~'06.5.31.)
	Development of Thermal Decomposition Melting Technology and Systems for PCB-Containing Waste Treatment	ME ('07.4.1.~'09.3.31.)
Young Eng.	Commercialization of Thermal Decomposition Melting Facilities for Infectious and Hazardous Waste Using Plasma	ME ('05.6.1.~'07.5.31.)
KITECH	Development of Integrated and Optimized Plasma Bombardment Melting Systems	MTIE ('07.10.1.~'10.09.30.)
	Development of High-Efficiency Plasma Bombardment Melting Systems	MTIE ('10.10.1.~'12.12.31.)
AD Platech	Development of Hydrogen Recovery Technology through Plasma Thermal Decomposition Gasification of Waste	MTIE ('08.11)
GS Platech	Establishment of Waste Plasma Gasification Melting-Hydrogen Recovery-Fuel Cell Power Generation Demonstration Facility	MTIE ('09.6.01.~'11.9.30.)
KHNP	Plasma System for Immobilization Melting of Radioactive Waste	KHNP (2008)
		KHNP (2018)
		KHNP (2022)
Orion E&C	Research and Development of Mobile Immobilization Facilities for Non-Combustible Nuclear Power Plant Decommissioning Waste	MTIE ('19.10.1.~'22.9.30.)
Oribi Tech	Demonstration of High-Level Immobilization Process based on Heating and Crushing of Radioactive Concrete Waste	MTIE (2023.~2027)
	Induction Heating and Plasma Melting for Non-Combustible Materials	MSIT/MTIE (2023.~2027)
Green Radiation	Development of Physical And Chemical Separation/Reduction and Stabilization for PHWR NPP's Decommissioning Special Waste	MSIT/MTIE (2024.~2029)

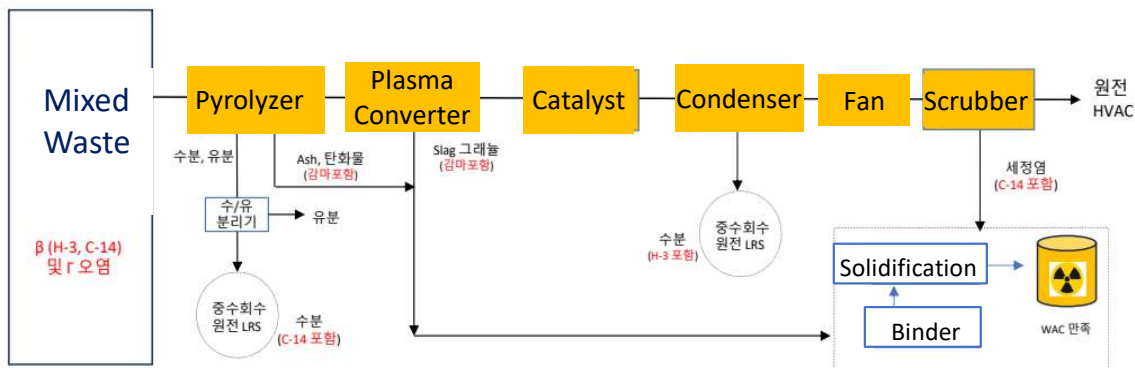
* ME(Ministry of Environment), MSIT(Ministry of Science and ICT), MTIE(Ministry of Trade, Industry and Energy)

3-2. Thermal Volume Reduction Project(4/4)_A Current Thermal Project

- ◆ **Project Title** : Development of Commercial-scale Volume Reduction and Stabilization of PHWR's Special Wastes
- ◆ **Project Budget** : 8.6 billion won(Government 7 billion won)
- ◆ **Project Duration** : 69 months (2024.4.~2029.12.)
- ◆ **Participating Organization** : Consortium of 6 organizations
 - Overall Responsible Organization : Green Radiation Co., Ltd.

	Sub-1 Project	Sub-2 Project
Target Waste	Mixed Waste	Air Absorbents
Budget (gov + consortium)	5.3 billion (4.3 billion + 1.6 billion)	3.3 billion (2.7 billion + 0.6 billion)
Technology	Low-to Moderate Temperature Pyrolyzing	Dry Decontamination
Participating Organization		

Commercial-scale Process under developing (Sub-1 Project)



「학술·연구의 생태계 혁신을 이끄는 글로벌 리더」

한국연구재단

수신자 (주)그린방사선 대표이사
(경유)

제 목 2024년 원전해체경쟁력강화기술개발사업 선정평가 결과 알림

1. 귀 기관의 무궁한 발전을 기원합니다.

2. 2024년 원전해체 경쟁력 강화 기술개발사업 선정평가 결과를 다음과 같이 알려드리오니, 협약용 연구계획서 제출(수정·보완 요구사항 반영) 등 후속조치가 원활히 진행될 수 있도록 협조하여 주시기 바랍니다.

가. 평가결과

총괄연구개발명	총괄주관연구기관 (연구책임자)	총 연구기간	총 정부출연금 (백만원)	평가 결과
원전해체 경쟁력 강화 기술개발사업	주식회사 그린방사선 (박승철)	2024.4.1. ~ 2029.12.31. (69개월)	7,000백만원	선정

* 연도별 예산은 추진 상황 등에 따라 변동 가능

나. 후속조치

- 협약 체결 : 범부처통합연구지원시스템(IRIS) - 협약 - 협약체결
 - 협약용 계획서 : 기 제출한 계획서 마지막 페이지에 [붙임]을 추가하고 본문을 수정한 후, 연구사업통합지원시스템(IRIS)에 업로드 요망
- 다. 제출기한 : 2024.5.7.(화) 18:00까지(총괄/주관연구개발기관 승인 포함)

붙임 수정·보완 요구사항 반영내역 서식 1부. 끝.

한국연구재단 이사장



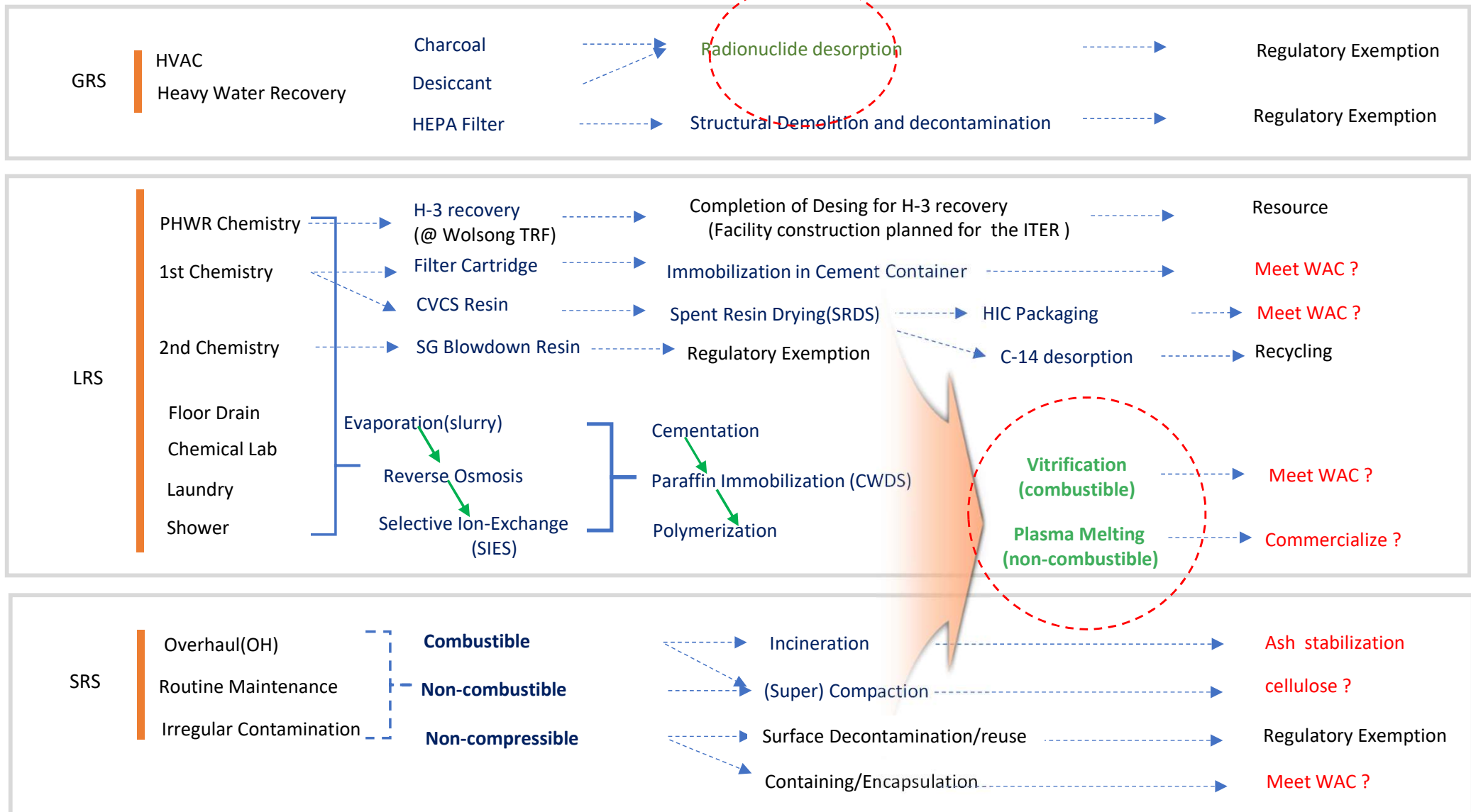
★PO 구자필 단장 황재현

협 조 자

시 행 원자력단-11509 (2024.04.30) 점 수 ()
주 소 (우) 34113 대전광역시 유성구 가정로 201 / <http://www.nrf.re.kr>
전 화 042-869-7811 전 송 / jkoo@nrf.re.kr / 비공개(5,6)
「한국연구재단의 핵심가치 : 창의(Creativity) · 개방(Openness) · 책무(Responsibility) · 탁월(Excellence)」

Supporting Agencies :
MTIE(Ministry of Trade, Industry and Energy) MSIT(Ministry of Science and ICT)

3-2. Thermal Volume Reduction Project(1/4)_Current LRW Processes





4. Future Business Plan

4-1. The Company's Target Market

◆ Early Stage (2024-2025)

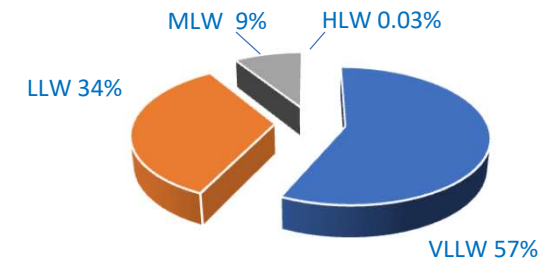
- **Beta-contaminated LIRW waste disposal projects**(charcoal, desiccant etc.)
- Recycling project(as a measure of Regulatory Exemption)
- Performance testing project of nuclear grade charcoal

◆ Mid-term Stage (2026-2027)

- **LIRW management projects of domestic NPPs**
- Radiation management contracting business for domestic NPPs
- Periodic Safety Review(PSR) contracting business
- Radiochemical analysis business

◆ Long-term Stage (2028-2030)

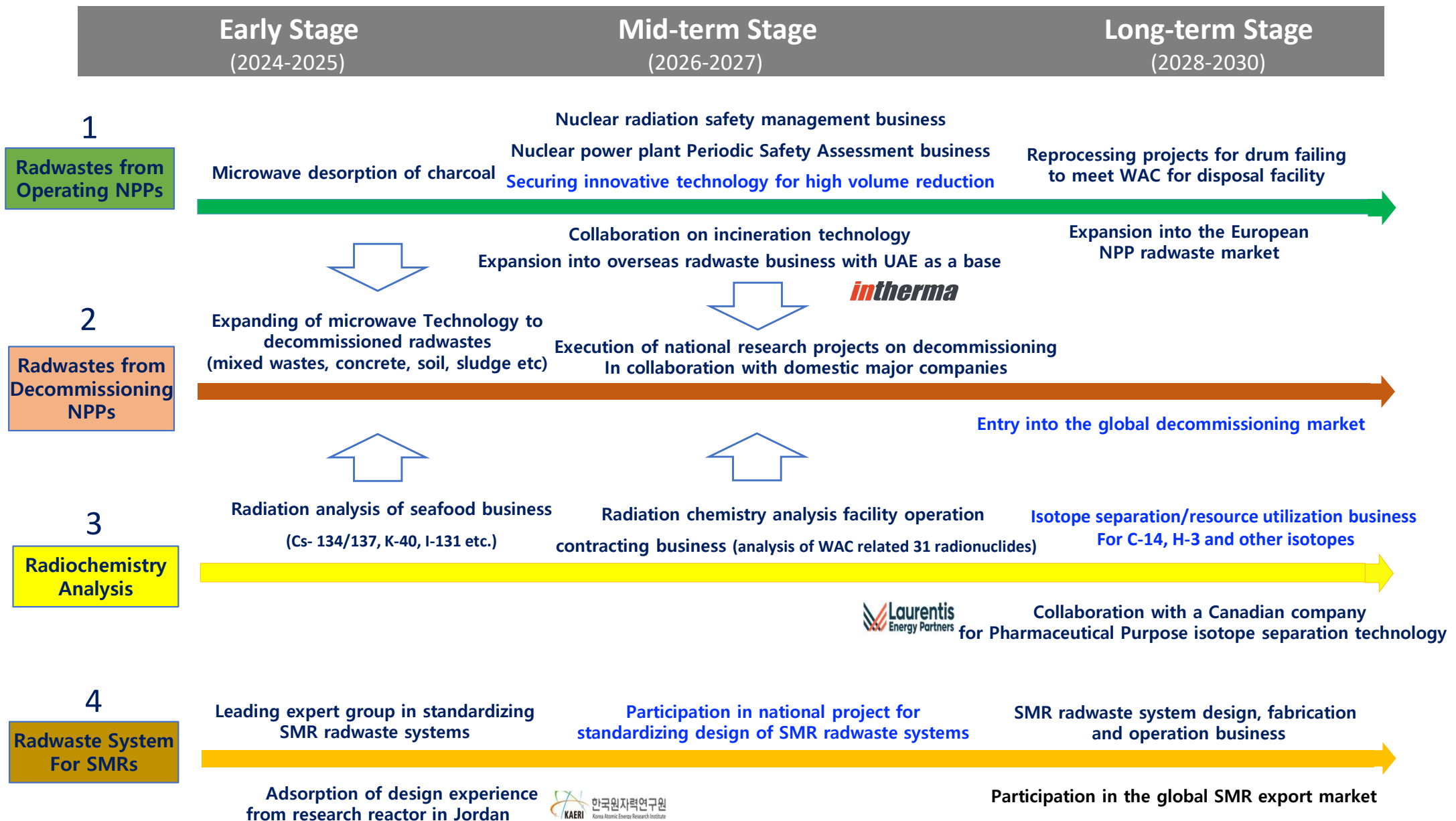
- Domestic LIRW Radwaste reprocessing business
(satisfying waste acceptance criteria for disposal facility)
- Management of LIRW management for exported NPPs(e.g. UAE)
- **Global LIRW management for decommissioned NPPs**
(North America and Europe)
- **Exporting the standard design, manufacturing and supply of SMR**



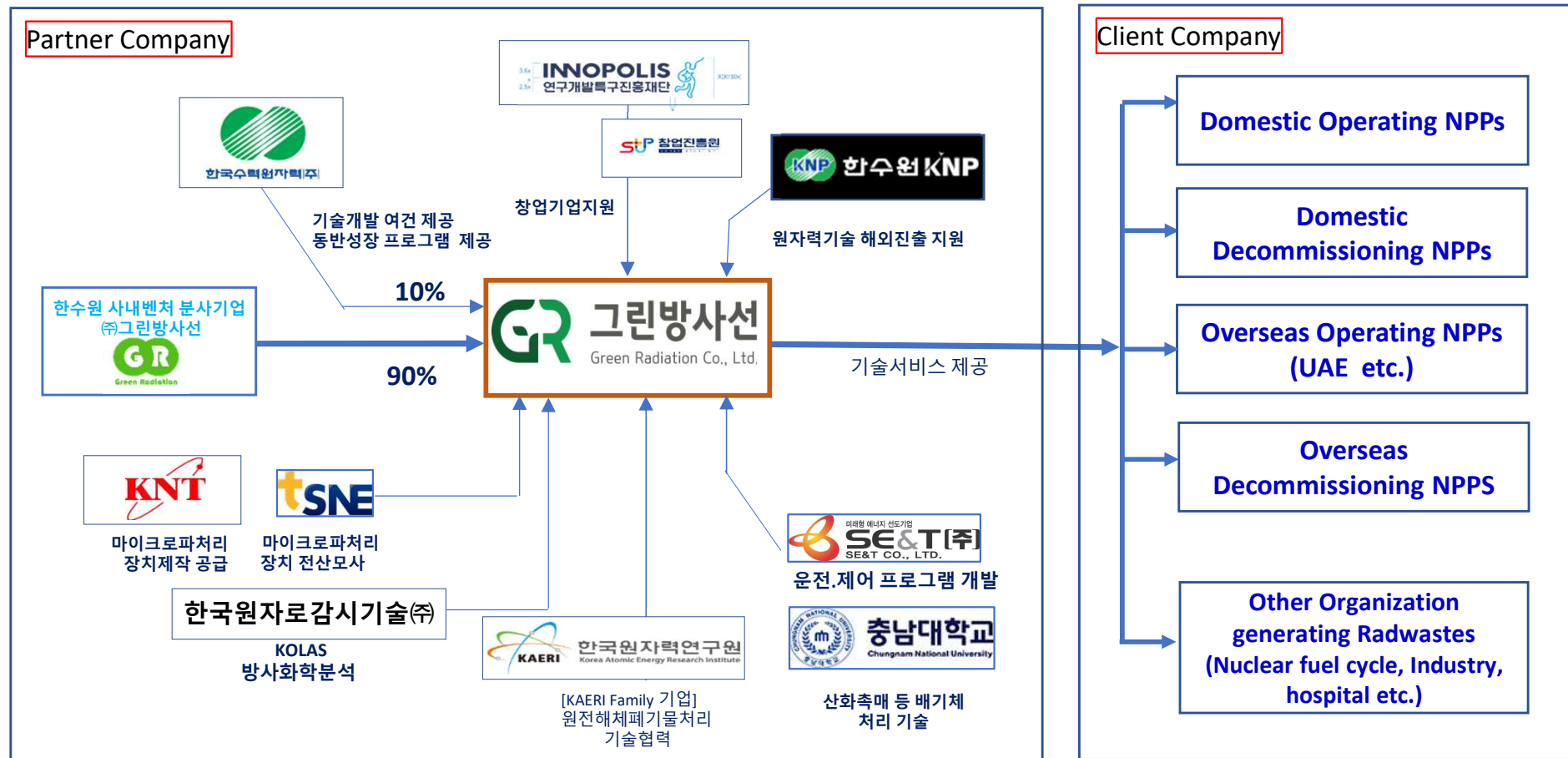
Decommissioning Waste Management Costs by Category
[source: MSIT TR 2017M2B2B1072830]



4-2. The Company's Business Sectors



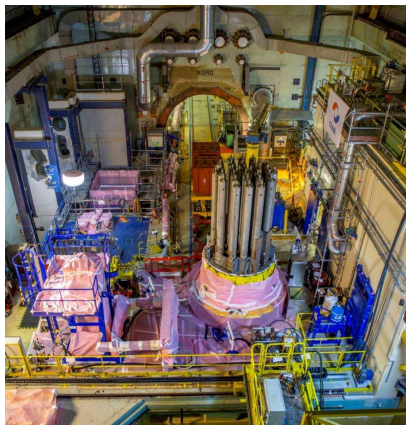
4-3. Value Chain of the Company



* Overseas Partners(under planning) : Germany **intherma**, Canada **Laurentis Energy Partners**, France **NUVIA**

4-4. Global Collaboration Plan

- ◆ Creating domestic business opportunities via **the licensed(proven) thermal technologies in Europe**
- ◆ Expanding participation in the **overseas operational radwaste market** through a base in the UAE
- ◆ Expanding participation in the **North American and European decommissioning waste markets** through a consortium with domestic/multi-national large enterprises
- ◆ Securing future business on **pharmaceutical RI separation/resource recovery** through technical collaboration with a Canadian company



Decommissioning of CHOOZ
PWR



Mobile Combustion Chamber of **Irⁱⁿtherma**
(This picture is just an example)



Advanced He-3 Technology of **Laurentis**
Energy Partners
(This picture is just an example)