International cooperation activities of KORAD including mid-term and long-term strategy of international cooperation for radioactive waste management

Ou Jeong Yoo[1)], Gyeong Hwan Park[2)]

Korea Radioactive Waste Agency

Chunghyocheong-gil 19, Gyeongju-si, Gyeongsangbuk-do, Republic of Korea

Key words; mid-term and long-term strategy of international cooperation, bilateral cooperation, multilateral cooperation

Abstract

As radioactive waste management has been a challenging issue in every country using nuclear energy, international cooperation is an important tool for competency building of each organization responsible for radioactive waste management and related activities. Efforts have been increasingly made in order to find out the solutions to safe and effective management of radioactive waste by means from information and knowledge sharing to joint work among the nations.

Under this circumstance, KORAD established the mid-term and long-term strategy of international cooperation, consistent with the roadmap and plan of radioactive waste management, assuming that international cooperation activities should have the function of support to the radioactive waste management project. The international strategy was set as result of the analysis of political, economic, social and technical environment, level of competency of KORAD and overseas implementing organizations, and analysis of SWOT (Strength, Weakness, Opportunity and Threat). Based on the strategy, KORAD has carried out various international cooperation activities, such as having cooperation meetings, launching joint works, and initiating IAEA projects by sending the expert and providing extra budgetary contribution to IAEA. Also, the international cooperation strategy is regularly revised to enhance its feasibility by reflecting the changes of internal and external environment regarding radioactive waste management.

The process and result of the international cooperation strategy-setting will be introduced and its implementation will be presented in detail at the paper.

1. Introduction

Within KORAD, international cooperation means the activities planning, carrying out, fostering or supporting the programs for mutual collaboration with overseas organizations including information sharing, staff exchange, joint work, etc.

Under the mission of 'Contribution to safety of the people and protection of the environment by safe and effective management of radioactive waste', KORAD has made a great effort for competence building in order to be fully able to manage radioactive waste in safe and effective manners. As a part of it, international cooperation is one of the tools we adopted for enhancing the capabilities as well as the human resource development program.

From the perspective that international cooperation gives a great impact on the place of KORAD in the international community, we have also paid attention to cooperation with international organizations such as IAEA and OECD/NEA.

International cooperation is one of the support activities helping the primary function of KORAD which includes planning, and construction and operation of the radioactive waste management facilities to achieve the core value of KORAD.

In this regard, as international cooperation contributes to achieving the vision of KORAD, it is important part of our function, covering broad scope of works from setting up the mid-term and long-term strategy to implementing the cooperation program.

2. Mid-term and long-term strategy of international cooperation

In order for effective international cooperation closely linked to the vision and strategy of organization, we have set up and regularly revised the mid-term and long-term strategy of international cooperation since 2015. Based on the analysis of

external and internal environment of organization, ultimate goal and strategic objectives, and Critical Success Factors (CSF) of international cooperation were drawn out. The roadmap and the detailed tasks of international cooperation could be broken down thereby.

2.1 Analysis of external environment

The strategy setting process starts with the analysis of external environment, including political, economic, social & technical environment (PEST), and overseas & domestic situation.

Considering the political changes, social atmosphere, and economic & technical challenges regarding radioactive waste management, the implications could be elicited as follows.

- Needs to establish implementation plan on high level waste management conforming to the government policy
- Needs to enhance the social trust and confidence in developing technology fulfilling safety requirements and efficiency of radioactive waste management
- Needs to build the competency of radioactive waste management in a timely manner, considering the saturation of on-site storage of spent nuclear fuel and the life span of operating reactors
- Needs to use international network for bilateral and multilateral cooperation for competency building of radioactive waste management
- Needs to be competitive in global market, with anticipation of expansion of international nuclear industry
- Needs to closely observe the emerging technologies other than deep geological disposal of high level waste and the current situation on multinational storage/repository project

Also, a few bullet points could be suggested as follows after the review of radioactive waste management of other countries and the comparison of domestic and overseas situation of radioactive waste management.

- Needs to cooperate with other countries having experience in construction of engineered vault type disposal facility and very low level waste disposal facility, closure of the disposal facility and post-closure management of the disposal facility
- Needs to look into the possibility of sharing knowledge and experience in construction and operation of underground silo type facility with other countries, which is one of the strengths of KORAD
- Needs to cooperate with other countries in the area of high level waste management, as well
- Needs to classify the countries developed in radioactive waste management into a few groups whose strength is in common

2.2 Analysis of internal environment

Together with the external environment analysis, the analysis of internal environment, such as corporate vision and strategy, project plan, and competence, is an important factor of the strategy setting process.

When it comes to international cooperation strategy of KORAD, internal environment analysis focused on evaluating the competency level of each area of radioactive waste management projects so that the area demanding international cooperation could elaborated. Considering the process and the work scope of radioactive waste management of KORAD, the projects are divided into 4 categories, low and intermediate level waste disposal, high level waste management, decommissioning waste management and trust & confidence building. The result of competency level of each area is shown as below.

Area	Work of Breakdown	Evaluated level
LILW Disposal	Site Selection	High
	Construction of disposal facilities	Medium high
	Operation of disposal facilities	Medium
	Closure and post closure management of disposal facilities	Low
HLW Management	Site Selection	Low
	Transportation &Interim storage	Medium low
	Disposal	Low
Decommissioning Waste Management	Treatment of decommissioning waste	Low
	Disposal of decommissioning waste	Medium low
Trust & Confidence Building	Communication	Medium
	Risk Management	Low

Based on the result of analysis, the implications are elicited as follows.

- Urgently needs to secure the competency of high level waste management
- Needs to be prepared for decommissioning waste management in the long-term perspectives
- Needs to take a proactive approach to closure and post-closure management of low and intermediate level waste disposal facilities
- Needs to develop the communication strategy and to enhance the competency of risk management

2.3 SWOT analysis

SWOT analysis is used as the tool for the 'warm-up' stage of formulating strategy based on

the results of external and internal environment analysis, in general. After defining the Strengths (S) and the Weaknesses (W) of KORAD, and identifying the Opportunities (O) and the Threats (T) of KORAD, four types of strategies were developed as below.

① OS strategy (use strengths to take advantage of opportunities)

- Promotes cooperation with oversea organizations which signed MOU with KORAD, for competency building
- Diversifies the international network
- Watches for the opportunity of technology transfer of LILW disposal to overseas
- Develops the plans for entering to the global market on the basis of close relationship with domestic organizations

② TS strategy (use strengths to avoid threats)

- Develops partnership with overseas organizations to enter into the global market
- Uses the cooperation with international organizations as the tool for gaining trust and confidence
- Makes the opportunities to share the knowledge among domestic and overseas experts, and stakeholders

③ OW strategy (overcome weaknesses by taking advantage of opportunities)

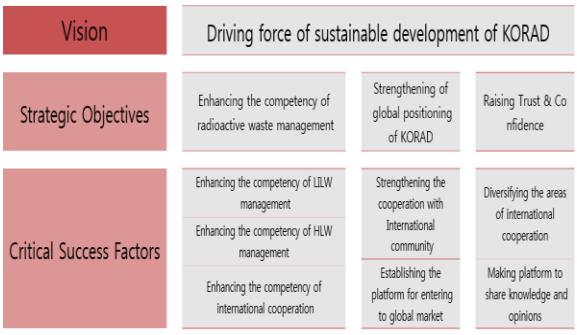
- Broadens the cooperation with the organizations of geographically close countries
- Participates in multinational cooperation projects such as EDRAM
- Benchmarks international cooperation activities of overseas organizations

④ TW strategy (minimize weaknesses and avoid threats)

- Pays much attention to cooperation in the areas of high level waste management and decommissioning waste management

2.4 Vision and strategy of international cooperation of KORAD

Through all the process mentioned above, the vision and strategy of international cooperation was established as below.



In order to make the vision, the ultimate goal of international cooperation, clarified, 3 objectives were specified. Then, 7 Critical Success Factors (CSFs) were identified, which are key tasks to achieve the international cooperation goal.

3. International cooperation activities carried out by KORAD

International cooperation can be divided into 2 parts, bilateral cooperation and multilateral cooperation. Bilateral cooperation is usually focused on cooperation with overseas implementing organizations, and the other is on using multinational platforms such as IAEA and OECD/NEA.

3.1 Bilateral cooperation

As for the bilateral cooperation, KORAD has signed the cooperation agreements, so called MOU, with 11 overseas organizations, promising cooperation in the area of radioactive waste management since 2009. The organizations which signed MOU with KORAD are responsible for radioactive waste management in 9 countries, such as Sweden, France, Japan, Spain, UK, China, Canada, Hungary, and Switzerland. Based on MOU, various cooperation programs have been implemented from information sharing to technical advisory and joint works.

In respect of low and intermediate level waste management, design, construction and operation of near-surface disposal facilities have been main topics of the cooperation with overseas organizations, which already experienced therein, because KORAD has focused on development of the Wolsong Low and Intermediate Level Waste Disposal Center (WLDC) since 2009. The activities most actively done were cooperation meetings with each organization for information sharing on such topics. Furthermore, KORAD sent staff to Nagra to participate in the full scale experiment on Gas Permeable Seal Test, and to Andra and SKB for training programs to learn their experience in construction and operation of the disposal facilities, when being in the initial stage of WLDC. Recently, the joint work on safety assessment has been carried out with Andra since 2012 in order to verify the safety of the rock cavern type disposal facility and the engineered vault type disposal facility of KORAD.

Meanwhile, international cooperation in the area of high level waste management had been mostly made on information sharing before the national policy was established. Information on various situations of different countries, including national policy, technology development, site selection process, construction and operation of management facilities, stakeholder engagement and other issues, was useful to establish the national policy on high level waste management in Korea, by comparing, analyzing and benchmarking case of each country. Training program was developed and executed with Andra so that staff of KORAD could learn hands-on

experience in high level waste management of France.

According to the mid-term and long-term strategy of R&D on radioactive waste management of KORAD, efforts have been made to develop the dual-purpose cask for transportation and interim storage of spent nuclear fuel. In order to evaluate the safety of the cask under development, KORAD is participating in the joint test of spent nuclear fuel transportation with USA and Spain at the moment.

In addition, it was agreed to make the regular cooperation meeting between KORAD-JAEA, KORAD-NUMO, and KORAD-RWMC respectively in 2016, based on the idea to take advantage of geographic proximity which could make cooperation more effective.

3.2 Multilateral cooperation

In terms of multilateral cooperation, KORAD has largely adopted 2 ways, participating in international cooperation platform such as IAEA, OECD/NEA, and other types of multinational cooperation form, and organizing the international symposium by itself.

Since 2009, KORAD has participated in activities of IAEA including DISPONET, URF and other technical meetings regarding radioactive waste management, as well as those of OECD/NEA such as RWMC and its sub-ordinated working parties. In 2015, the practical arrangement between IAEA and KORAD was made, resulting in launching the IAEA projects on high level waste management funded by KORAD. Three projects have been in progress under the initiative of IAEA and KORAD, of which themes are management of site investigation for radioactive waste management facilities, roadmap for developing geological disposal facility and compendium of results of research, development and demonstration activities carried out at underground research for geological disposal, since 2016.

Also, the cooperation agreement was made between OECD/NEA and KORAD in 2016, expecting the more close cooperation on radioactive waste management issues with NEA and its member states in the future.

There is the other platform KORAD has actively participated, which is East Asia Forum on Radioactive Waste Management, so called EAFROM, founded in 2006 for motivating the cooperation among the countries in East Asia.

On the other hand, KORAD has hosted the international symposium on radioactive waste management by inviting the experts of overseas and domestic organizations and stakeholders. The purpose of the symposium is to enhance the trust and confidence in radioactive waste management by making the opportunities for the public and stakeholders to listen to and share various experts' experience and insightful opinions. From the symposium, KORAD could also learn lessons from overseas experiences and get to know what the stakeholders think of radioactive waste management issues. Considering the international symposium has been held for 4 years consecutively since 2014, it is getting internationally recognized event to share diverse experience and opinions regarding radioactive waste management.

4. Future plan

Current regime, inaugurated in May this year, announced the new energy policy, reducing the nuclear energy and expanding the renewable energy in the long-term perspectives. Accordingly, the corporate strategy of KORAD was revised recently and revision of the international cooperation strategy has been in progress at the moment. After the review of the performance of each activities linked to the CSFs of international cooperation strategy, it would be also required to come up with the new approach for what needs to be amended. When the implementation plan on high level waste management is established, detailed project milestone will come out, meaning that international cooperation strategy of KORAD will be revised again. It would be also considered that areas of international cooperation should be differentiated depending on the level of its competency.

As the decommissioning of reactor will start in 2020's, demand on cooperation in the area of decommissioning waste management is growing within KORAD. And it is expected that the demand on cooperation in the area of high level waste management will be increasing as well in the near future. Therefore, the international cooperation programs need to be more diversified and focused more on competency building to be fully prepared for future project of KORAD.

Lastly, cross-cutting issues such as the co-relation between the 4th industrial revolution and radioactive waste management could be themed in the international symposium of KORAD, expecting that providing all kinds of stakeholders in radioactive waste management with opportunities to think about how radioactive waste management could be adapted into environment constantly changing.

5. Conclusion

International cooperation strategy was made based on analysis of external environment of nuclear industry and radioactive waste management area, and internal environment of KORAD, such as competence of radioactive waste management. The strategy has been applied to cooperation activities with overseas organizations in forms of bilateral and multilateral cooperation, and will be revised conforming to the political changes and internal demands.

Various international cooperation programs have been one of tools not only for competency building of KORAD, also for trust and confidence building. More strategic and sophisticated international programs would be developed because international cooperation is a critical factor to achieve the corporate goal in timely manner.