

NUMO'S OPEN SOLICITATION OF VOLUNTEERS FOR A POTENTIAL FINAL REPOSITORY FOR HLW

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ABSTRACT

Following legislation entitled the "Specified Radioactive Waste Final Disposal Act" (hereafter "the Act"), the Nuclear Waste Management Organization of Japan (NUMO) was established as the implementing organization in October 2000. The assigned activities of NUMO include repository site selection, developing relevant license applications and construction, operation and closure of the repository. As the first milestone of siting process, NUMO announced to the public start of open solicitation of volunteer municipalities for preliminary investigation areas with four documents published together as an information package on December 19, 2002. The information package is aiming to provide basic information for supporting and promoting discussions of municipalities to decide whether the repository plan can be accepted, and is therefore sent to all (over 3,200) municipalities in Japan. This paper describes NUMO's open solicitation of volunteers for a potential final repository for HLW.

INTRODUCTION

The Act provides that the siting process shall consist of the following stages, shown in Fig.1.

- In the first stage, preliminary investigation areas (PIAs) for potential candidate sites are nominated based on area-specific literature surveys focusing on long-term stability of the geological environment.
- Detailed investigation areas (DIAs) for candidate sites are then selected from PIAs by surface-based investigations including boreholes carried out to evaluate the characteristics of the geological environment.
- In the final third stage, detailed site characterization including underground experimental facilities will lead to selection of the site for repository construction.

The Government (i.e. METI: Ministry of Economy, Trade and Industry) supervises the entire process carried out by NUMO. At every stage, NUMO will call for opinions of local residents and METI will call for opinions of governors and mayors and will respect them as required by the Act. According to the present schedule, repository operation could start in the mid-2030s but no later than the 2040s.

The Act specifies the overall framework for implementation and defines the roles and responsibilities of METI and relevant organizations including NUMO, the funding management organization (i.e. RWMC: Radioactive Waste Management Funding and Research Center) and the owners of the power reactors. Under the Act, METI is responsible for establishing the basic policy and final disposal plan for a 10-year term and renewal of the plan every 5 years.

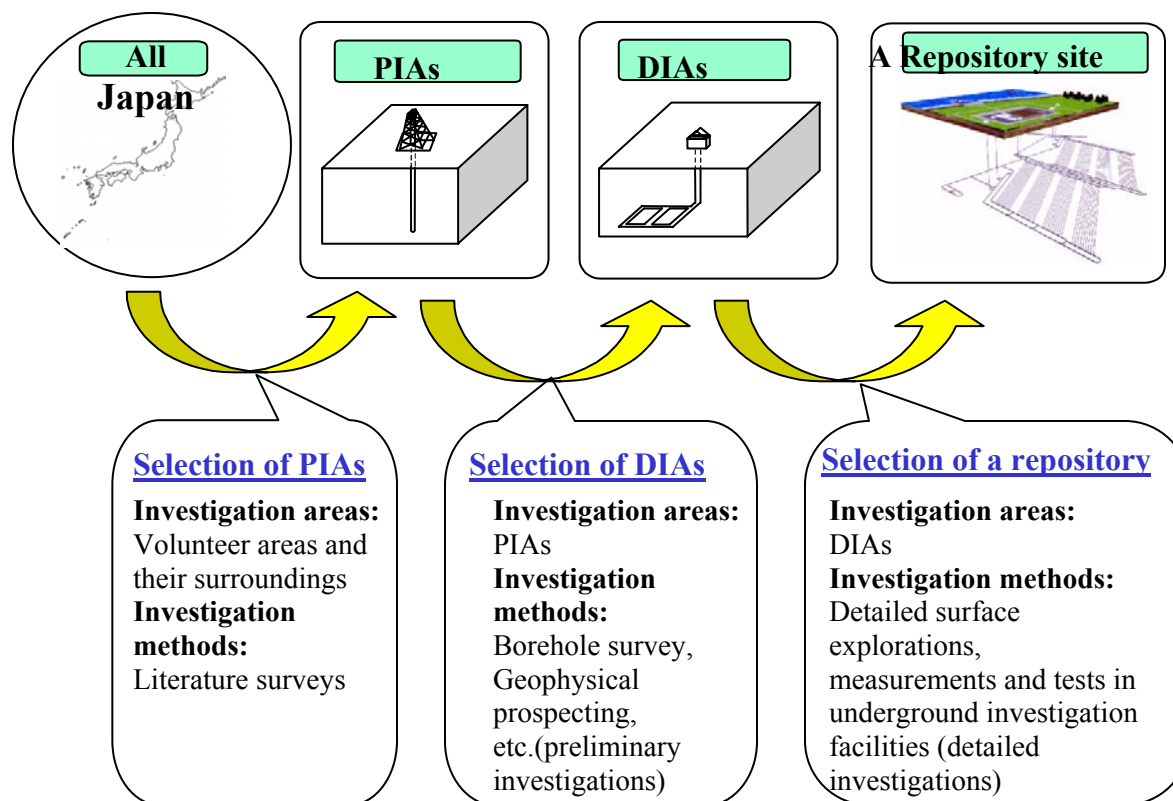


Fig.1 Three Stages of the Selection Process

As producers of HLW, the owners of the nuclear power plants are responsible for bearing the costs of the repository development program. They are required to make contributions to a disposal fund in accordance with the amounts of electricity generated by nuclear power. NUMO commits the management of the collected fund to RWMC. The budget for NUMO's program is allocated from the fund and authorized by METI. Management of the fund by RWMC is also supervised by METI. The total cost of disposal is currently estimated at approximately 3 trillion yen for a repository with 40,000 canisters of vitrified HLW. This corresponds to 27 billion dollars under current exchange rates. This cost is collected as a surcharge on electricity of 0.20yen/kWh (0.13yen/kWh for present generation and 0.07yen/kWh for past generation regained within 15 years).

The Nuclear Safety Commission of Japan (NSC) is responsible for providing guidelines for safety regulations. The NSC published the "First Report on the Basis for Safety Standards for HLW Disposal" [1] in November 2000, followed by the report entitled "Requirements on the Geological Environment for Selecting Preliminary Investigation Areas for HLW Disposal" [2] on September 30, 2002; this should be reflected in PIA selection.

NUMO's SITING ACTIVITIES

The siting procedures carried out by NUMO in accordance with the Act are supervised by METI. As specified in the Act, NUMO is required to submit a report describing the results of the investigations at the end of each stage and before proceeding to the next stage. Publication of the

report will be notified to local residents and the document will be open for comments by them. METI must solicit opinions from the governors and mayors of concerned communities prior to finalizing decisions made during the site selection process. These opinions shall be respected in terms of the decision-making specified in the final disposal plan.

NUMO promotes public involvement in decision-making in the site selection procedure based on its fundamental policies, which consist of “adopting a stepwise approach”, “respecting the voluntarism of municipalities” and “ensuring transparency”. On this basis NUMO has chosen an “open solicitation” approach for finding candidate sites in the belief that the support of local communities is essential to the success of this highly-public, long-term project for more than a century. Therefore, NUMO would like to invite municipalities throughout the country to consider volunteering as candidates for areas to explore the feasibility of constructing a final repository for HLW.

DOCUMENTS OF SITING ACTIVITIES

The structure of the documents for siting activities is shown in Fig.2. The information package contains a general information for open solicitation entitled “Open Solicitation for Candidate Sites for Safety Disposal of High-Level Radioactive Waste” and four separate documents, entitled “Instructions for Application”[3], “Repository Concepts”[4], “Siting Factors for the Selection of Preliminary Investigation Areas”[5], “Outreach Scheme”[6]. NUMO sent an information package to all 3,239 municipalities in Japan at the same time of an official announcement.

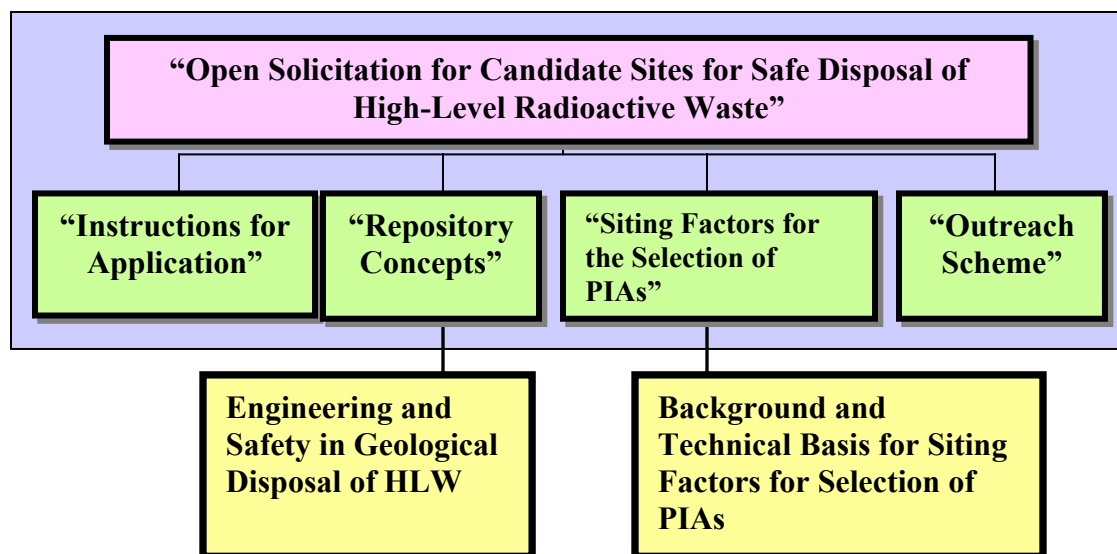


Fig.2 Structure of documents for siting activities

Two detailed technical documents are compiled, “Engineering and Safety in Geological Disposal of HLW” supporting of “Repository Concepts” and “Background and Technical Basis for Siting Factors for Selection of Preliminary Investigation Areas” supporting of “Siting Factors for the Selection of Preliminary Investigation Areas”. The reader of these documents is expected to be stakeholders with more specialist, knowledge and interest, looking to understand the scientific /

technical (and economic) basis for the assertions made by information package. The detailed technical documents will be published soon. The English version of them will be documented and published after the publication of Japanese version.

Instructions for Application

This document includes an application form and general information for applicants, including the approximate extent of the volunteered area, prior confirmation of the geological conditions of the volunteered area and the response after receipt of the application. This document outlines the following procedure for the selection of PIAs.

- With acceptance from a volunteer municipality, NUMO will conduct a regional literature survey of records of geo-tectonic history, such as seismic and volcanic activity, uplift and erosion for the area where the volunteer municipality is located. The evaluation of each area will be conducted in compliance with NUMO's Siting Factors[5].
- The result of the evaluation of each area based on the literature survey will be documented in a report and submitted to the governors and mayors of the relevant municipalities. NUMO will publish the report for comments from the public in relevant communities.
- NUMO will respect and consider all comments on the report and prepare a document that lists all the comments as well as NUMO's responses to these comments and submit this to the governors and mayors of the municipalities.
- In accordance with the Act, NUMO will select PIAs from areas covered by the regional literature survey and submit an application to METI for approval.
- In compliance with the Act, METI has to solicit comments from the governors and mayors of relevant municipalities. METI also has to respect and consider these comments in approving the selection of PIAs. METI will authorize the PIAs by revising the Final Disposal Plan [7].

Repository Concepts

This document is aimed at providing information on what the planned repository is and how it will be developed for siting environments at potential candidate sites selected taking into account the Siting Factors. An overview of the performance of different repository concepts is also provided in the document. One of the repository concepts is shown in Fig.3.

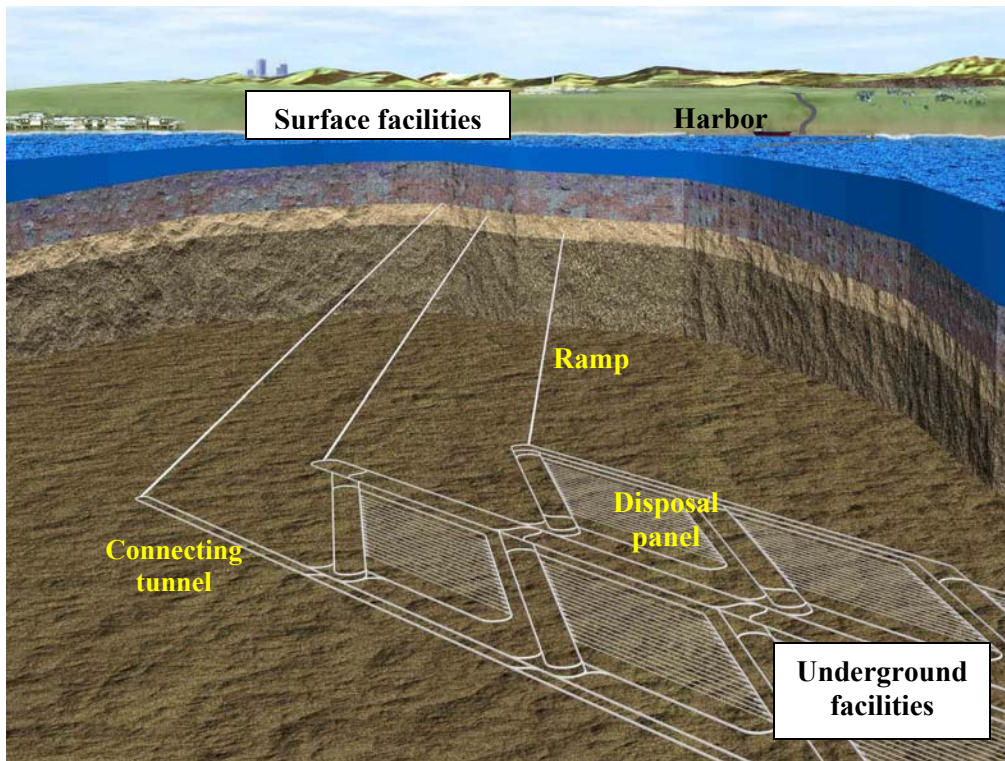


Fig. 3 One of the repository concepts (costal/sedimentary rock)

This document states the following:

Appropriate repository locations can be found throughout Japan

NUMO plans to dispose of at least 40,000 canisters of vitrified waste in a repository consisting of surface facilities (estimated to approximately 1 km²) and underground facilities (estimated to approximately 10 km² or less). There is a range of potential environments for repository construction in Japan. They have different characteristics, for example, inland and coastal areas (geographic aspects), mountainous, hilly and plain areas (topographic aspects) and areas with crystalline or sedimentary rocks (geological aspects).

Safe containment of HLW

The underground facilities will be constructed in stable rock formations at least 300 m below the surface. The rock formations themselves function as a natural barrier between the waste and humans for a long time period. The waste is vitrified and encapsulated in an overpack (steel container), which is also surrounded by compacted clay, and emplaced in tunnels in the repository. The vitrified waste, overpack and claybuffer are termed “the engineered barrier system”.

To ensure long-term safety, a rigorous stepwise selection procedure for identifying a suitable site in a stable geological environment is carried out.

Construction using established technologies

Although constructing a large-scale facility deep underground may appear to be a very difficult task, Japan has extensive experience in mining and underground hydroelectric power station and tunnel construction at depths in excess of several hundred meters. The repository will be constructed using current technology, such as Tunnel Boring Machines (TBM), like those used to excavate the Channel Tunnel in Europe, and will not require completely new technology.

Siting Factors for the Selection of Preliminary Investigation Areas

This document provides guidance for area-specific surveys for PIAs. They include factors specified in the Act, the NSC first report and the NSC environmental requirements, such as no record of significant tectonic movement, no evidence of unconsolidated sediments and no mineral resources.

The content of this document is as follows:

PIA selection

NUMO will conduct literature surveys to collect and assess existing information for volunteer areas and will then select PIAs. Prior to this selection, information on volunteer sites gathered through literature survey will be used to identify areas unsuitable for repository construction. These areas will be excluded. In cases where it is difficult to make a conclusive judgment of suitability, follow-up investigations will be carried out at later stages for further clarification.

Siting factors

There are two sets of factors or site conditions that can be used to screen volunteers and select potential PIAs. First are factors that must be met as required by the Act. Second are factors that would indicate more favorable site. The Act specifies that areas with certain characteristic defined in the literature survey will be excluded from consideration as PIAs. In addition to the legal requirements, there are favorable characteristics that, if present, would help to ensure safety, simplify characterization and analysis, reduce project costs and ease implementation; these include groundwater and host rock properties, availability of land, efficiency of transportation, etc. They will be evaluated to allow comparison of potentially suitable candidate areas. Siting factors are summarized in Table I.

Table I. Siting Factors

Evaluation Factors for Qualification (Areas excluded as PIAs)	
-	Clearly identified active faults
-	Within a 15 km radius of the center of Quaternary volcanoes
-	Uplift more than 300 m during the last 100,000 years
-	Unconsolidated Quaternary deposits
-	Economically valuable mineral resources
Favorable Factors	
-	Geological formations
-	Hydraulic properties
-	Geological environment
-	Natural disasters
-	Procurement of land
-	Transportation

Outreach Scheme

This document is aimed at providing benefits to volunteer municipalities, not only from a financial viewpoint but also other positive social aspects. NUMO will conduct consultations with local residents regarding measures which are appropriate to the conditions in an area and will make serious effort to implement these measures.

The content of this document is as follows:

Outreach policy

It is important for the relationship between NUMO and the municipality that has accepted the project to grow and develop through time. NUMO's outreach scheme is intended to build a relationship involving integration of NUMO activities with community need, communicating with all interested parties and earning the community's trust.

Approach for outreach scheme planning

NUMO will establish a system that gives first priority to the area's wishes and thus creates a forum where local residents and NUMO will proceed with the implementation of the final disposal project with a view to ensuring that maximum economic benefits are achieved in the prefecture, including the municipality, over the duration of the long-term project.

Aiming towards outreach to the municipality

NUMO will establish a working relationship and system to facilitate joint activities, to adjust various conditions, secure necessary budgets and interact together with the Japanese government and the electric power companies.

ACTIVITIES WITH RESPECT TO PUBLIC RELATIONS AND INVOLVEMENT

To promote public understanding, NUMO has carried out various publicity activities. NUMO assumes that the initial and critical milestone in the process is the first applicant for a PIA. To encourage application, it is essential to evoke and develop nation-wide discussion on HLW issues, in particular sufficient understanding of the characteristics of HLW and disposal options.

Once these are understood, the following discussion may become more smooth and constructive. In spring 2001 NUMO visited all 47 prefectures to inform them of its assignments within the national HLW disposal project. In spring 2002, NUMO repeatedly visited the 47 prefectures to explain the current status of its activities and the program leading towards the launch of open solicitation.

NUMO organized forums at 31 different locations out of a total 47 prefectures during the period between December 2001 and November 2002, with a total of approximately 5,000 participants from the public. Local media at each location jointly hosted the forums and reported the events as feature articles. These forums provided NUMO with a better understanding of what the general public think and feel about HLW issues.

Since June 2003, NUMO and local newspaper jointly hosted table round talk with local opinion leaders at 17 locations up to now. The objectives of the table round talk were to inform HLW

issues and to maintain a dialogue with the public. Local newspaper reported the results of this activity as feature articles.

In order to promote public understanding, NUMO has been conducting information campaigns in leading newspapers, on TV, in magazines and so forth. The TV campaign has been broadcasted since October 2002 and NUMO's program has been advertised in magazines and major newspapers, including more than 40 local newspapers, corresponding in total to more 80% of Japan's total readership. The example of newspaper campaign is shown in Fig.4. A poster campaign was developed at major train stations October 2002 and May 2003. Currently, NUMO is planning to develop an interactive website for public dialogue.

電気先進国の宿題。

パソコンに向かって、子どもたちは目を輝かせています。
やわらかい明かりの下には、家族の笑顔があります。
便利さも、快適さも、日本の活力も、
みんな電気なしでは考えられません。
日本の電力の約3分の1を支えている原子力発電。
その使用済燃料は、リサイクルに努めても
高レベル放射性廃棄物が残ります。
その処分は、電気を使う私たちの宿題です。

みなさんと考えたい、
日本の答え。

高レベル放射性廃棄物は、
安全確保を最優先に、
安定した深い地層に埋蔵します。
原子力発電の副産物である高レベル放射性廃棄物は、
光や放射線などの害しい影響が予想される
地層を避け、奥す300メートルを深い、安定した
地層に埋蔵します。廃棄物のまわりには人工的
なバリアを敷き、地下水にふれにくくするなど、
自然環境に影響を及ぼさないように配慮します。

【高レベル放射性廃棄物のマージン】

最終処分場建設地選定の
選定は、3つの段階を経て
行います。NUMO(ニュー
ムオ)では、第1段階の概要
調査地区(ボーリング等)
による調査を行う地区(第
2段階)と、第2段階の
選定にあたり、「高レベル
放射性廃棄物の最終処分
場建設の可能性を調査
する区域」を全国の各都
府から公表しています。

最終処分場建設地選定の
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府から公表しています。

NUMO
原子力発電環境整備機構

NUMO(ニュームオ)は、原子力発電、
原子力発電環境整備機構(独立行政法人)として
1997年設立。東京事務所(〒100-8555) 東京都千代田区千代田
〒100-8555 東京都千代田区千代田 1-1-1 10F
ホームページ <http://www.numo.or.jp>

Fig. 4 Example of newspaper campaign

INTERNATIONAL COLLABORATION

NUMO has concluded general agreements for collaboration with domestic and overseas organizations, for example Posiva (May 2001), Nagra (June 2001), SKB (September 2001), ANDRA (December 2001) and U.S.DOE (July 2002). The collaboration areas for these agreements are as below:

- Approach to site selection
- Methodology and techniques for characterization of geological formations, repository design and performance assessment
- Quality assurance
- Public acceptance and confidence building

NUMO joined a member of EDRAM (The International Association for Environmentally Safe Disposal of Radioactive Materials) in May 2001. NUMO's project activities will also be discussed with international experts who have specific knowledge and expertise in relevant subject areas. The output from such collaborations is very valuable in improving NUMO's repository program, by identifying areas of strength and weakness and in generally ensuring a sound technical basis. This will also be the case in confidence-building for implementation of HLW geological disposal because the repository development program will continue over a long time period. Bearing this in mind and recognizing that success in one country's program is positive for other countries, NUMO will further promote international collaboration in its program, sharing its experience with other programs in moving towards the final goal.

CONCLUSION

The Japanese siting process depends strongly on discussions and decisions of municipalities. It is therefore particularly important to promote public understanding of geological disposal and to obtain and maintain public trust. In order to ensure that the decision-making process is transparent, NUMO will make available a variety of information relevant to its siting activities through the publication of documents, website, etc., and provide opportunities for residents around the PIAs to voice their opinion. To promote this communication, NUMO has so far been carrying out various types of public relations activities.

REFERENCES

- 1 NSC, The Basis for Safety Standards for HLW Disposal, First Report (in Japanese), (2002)
- 2 NSC, Special Advisory Board on High-Level Radioactive Waste Disposal Safety, Requirements on the Geological Environment for Selecting Preliminary Investigation Areas (PIAs) for High-Level Radioactive Waste (HLW) Disposal (in Japanese), (2002)
- 3 NUMO, Instructions for Application, (2002)
- 4 NUMO, Repository Concepts, (2002)
- 5 NUMO, Siting Factors for the Selection of Preliminary Investigation Areas, (2002)
- 6 NUMO, Outreach Scheme, (2002)
- 7 MITI (now METI), Final Disposal Plan for Specified Radioactive Waste, MITI's Notification No.592 (in Japanese), (2000)