CURRENT STATUS OF DEVELOPMENT OF A NEW LILW REPOSITORY IN ROMANIA

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ABSTRACT

The current nuclear power program in Romania includes: 2 CANDU-6 Canadian PHWR type reactors in operation since 1996, respectively 2007 and another 2 similar units projected on same Cernavoda Nuclear Power Plant site to be commissioned in 2019. For waste generated by Cernavoda NPP, the draft of the revised national radioactive waste management strategy currently under revision will include a new near surface type repository to be commissioned in 2019. The repository will accommodate the Low and Intermediate Level Waste with short lived radio-nuclides and limited quantities of long lived as accepted according to the results of the safety assessment for long term behavior of waste and repository system. The siting process of the new repository started in 1992 and has been developed following the IAEA guidelines and standards. Within its evolution, the siting process was reviewed several times by different IAEA expert missions, mentioning that the selected sites along with a proper design have a good perspective. In 1997, the Saligny site located inside the exclusion zone of Cernavoda NPP was preferred taking into consideration both technical and non-technical factors, including further acceptance of the project implementation by the local communities. In 2008, Nuclear Agency for Radioactive Waste (AN&DR), the owner of the new near surface repository project, obtained a partial siting license, representing a license issued by CNCAN with a conformance program in order to obtain the siting license. In order to issue that license, CNCAN reviewed all process and conclusive safety documentation prepared by the main organizations that supported the R&D process for the new repository between 1992 and 2007. AN&DR coordinated the actions of that conclusive work and mainly completed it asking an IAEA Waste Management Assessment and Technical Review Programme (WATRP) expert mission, acting for addressing experts' observations and recommendations and obtaining the acceptance of the local authorities and local communities that agreed for further work on the repository project. The year 2011 is a very important year in the project development and the preparation of the new investment. AN&DR is the beneficiary of 2 contracts that represent 2 Phare projects approved by the European Commission to support AN&DR to strengthen the development of the repository project. According to the scopes of work, the two contracts provide AN&DR all relevant safety and design support documentation for obtaining the siting and later the construction license for the Saligny repository.

1. INTRODUCTION

In Romania, disposal activities have been in operation since 1985 when a repository dedicated for non-fuel cycle LILW waste constructed in an old uranium mine at Baita Bihor. The repository should manage in the next 20 years the wastes from non-fuel cycle activities and decommissioning activities of a VVR-S research reactor. Of the waste types which the LILW program will manage in the future waste from the operation and decommissioning of the nuclear power plant represents the dominant fraction in terms of volume. This requires in accordance to a timetable that can be adjusted to future decisions that will determine the shut-down and subsequent decommissioning of the nuclear power units.

The political framework for the current stage of the national radioactive waste disposal program was started by the Government Decision in 2002 approving the national nuclear strategy and the national nuclear plan. According on that a new LILW repository dedicated to waste generated by the Cernavoda NPP should be available by 2014.

Following European models of countries with nuclear power programs for clearer allocation of responsibilities within a national waste management system, the National Agency for Radioactive Waste (ANDRAD) was established in 2003 [1]. The other main actors of the national system are: the regulatory body (National Commission for Nuclear Activities Control-CNCAN) and the waste producers. The latest review of ANDRAD's basic legislation was in 2009 and according to the Law no. 329/2009 was established Nuclear Agency for Radioactive Waste (AN&DR), resulted by merging the Nuclear Agency with the National Agency for Radioactive Waste, beeing a public entity under the supervision of the Ministry of Economy and it is responsible for disposal of radioactive waste in Romania and the coordination of the activities on safe radioactive waste management and promotion, development and monitoring the nuclear activities exclusively for peaceful purposes.

The coordinating role of AN&DR arises from the few mains attributions including the elaboration of the national strategy on long term management of spent fuel and radioactive waste, further called National Strategy. According to the provisions of the first issue of the National Strategy in 2004 [2] a near surface repository will be dedicated to specific operational and decommissioning waste generated by operation and decommissioning of Cernavoda NPP.

The paper's objective is to emphasize the main aspects of the development program and the current status for the new surface repository in Romania.

2. R&D AND THE INITIAL PLANNING OF THE REPOSITORY

The R&D research program that introduced and developed the concept of a near surface repository and the siting process of the repository has been developed starting with 1992. In 1998, the former Romanian Electricity Authority was restructured and a reorganization of the nuclear power sector took place. But only in several years a new national radioactive waste management system was established.
The Dobrogea region was selected in a regional mapping stage and the site selection process then identified 37 sites potentially suitable sites. Geological investigations were performed in three of

them (1993-1994) and, later, site characterization was carried out in two candidate sites, Cernavoda and Saligny (1995-1996). Final preference was given to Saligny site in 1997, which is close to the Cernavoda Nuclear Power Plant (NPP).

The siting process slowed down after 1998 due to mostly non-technical reasons and was restarted after ANDRAD, the national waste management agency, was legally established and by its attribute appointed to complete the repository development process.

In 2005, former ANDRAD started to conclude the relevant data and information and coordinated the process that ensured the elaboration of a technical and safety documentation that should have been dedicated to support application for a siting approval from CNCAN. On November 2006, former ANDRAD decided that a revision of the technical and safety documentation would be necessary before to get to the Regulatory Body.

A peer review from a WATRP expert mission approved by IAEA that took place on January 2007 made a lot of comments and recommendations that helped ANDRAD and its collaborators to decide issues for revision in the documentation from 2006.

The technical and safety documentation was reviewed to address part of recommendations of the WATRP mission but in the same time for integrating the results of a revision of the geotechnical study and a technical study for foundation solutions since the foundations soil has had lower geotechnical performances. Main aspects in further development of repository [3] included:

- the transfer to ANDRAD and availability of transparent and traceable documentation of the repository;
- the availability of a proper database of the site;
- the availability of the initial radionuclide inventory following characterization of radioactive waste at Cernavoda NPP; and
- pre-feasibility and feasibility studies for treatment and conditioning of NPP´s waste including decision on building a treatment and conditioning facility associated with the repository that should be planned by Cernavoda NPP in agreement with the repository schedule.

In order to conclude on the previous R&D, ANDRAD decided that the first important stage in the repository planning should be the application for a partial siting license from CNCAN in 2008, in accordance with the nuclear law provisions.

3. MAIN ACTIVITIES TO CONFIRM THE REPOSITORY AFTER 2008

In 2008, ANDRAD concentrated its activities for the repository development in two main directions [4] for:

- obtaining a partial siting license, analyzing its conditions issued by CNCAN and developing a multiannual action plan for the confirmation of the Saligny site (the terminology is from the IAEA safety standards and guides on the siting process) in order to obtain the siting license according to Romanian law;

- preparing and supporting the tendering process for 2 Phare projects on completion of the site characterization, feasibility study, elaborating main safety and technical design documentation for supporting the siting and later the construction license to be issued by CNCAN;

According to the initial planning the application for the partial siting license was in June 2007 and the license was obtained on February 2008. Further on, to continue the site characterization and to obtain other documentation needed, AN&DR obtained an extension of the partial siting license until February 2012.

The partial siting license explicitly allows ANDRAD to continue the completion of site characterization, to apply for the environmental agreement, to launch the urban development documentation, and to buy the land if considered by ANDRAD.

The specific aspect of the disposal system at Saligny site is the low geotechnical performance of the site due to the loessoid soil for foundation and R&D concluded in the different studies indicated as expected that a strong improvement of the foundation soil is necessary. New solutions were studied and an experimental polygon (Figure 1) was constructed and tested in 2008. The polygon was made for improving the soil 8 meters in depth by the execution of columns in the local soil- mainly columns of dislocated soil filled by filling local materials (such as loess, granular material and mix of those) and short column on compacted loess.

Figure 1: The execution and testing of a polygon for studying the repository's foundation

To continue site characterization studies for Saligny site, ANDRAD contracted a new study to monitor the operational drills and wells network in the neighborhood of the proposed disposal area.

Better the national radioactive waste inventory is lesser uncertainties in identifying and establishing solutions for disposal of all types of radioactive waste generated in Romania are. While a comprehensive inventory at Cernavoda NPP will be available in the next years, starting with 2008 former ANDRAD has been working intensively on:

- collecting relevant existent information from the past R&D studies on LILW disposal in Romania, by good collaboration with the specialists from the Romanian research institutes;
- concluding as much as possible the previous R&D database of the Saligny repository siting;
- collecting information on waste inventories data from similar NPPs -Canadian type by good collaboration with Cernavoda NPP's owner and operator;
- collecting data and information on good disposal practices in EU countries with nuclear power programs and operational disposal facilities by technical cooperation activities:
    - exchange of information and scientific visits, training courses, expert missions by collaboration with more experienced sister agencies in EU supported by the IAEA inside the Technical Cooperation Project;
    - exchange of information and technical visit at Belgium LILW treatment & conditioning and central storage facility supported Belgium Government and ANDRAD;
- building basis for receiving expert advice and know-how on institutional building, surface disposal, R&D planning, training of personnel, etc. from a more experienced waste disposal organization through a bilateral agreement: ANDRA (France).

In January 2008, ANDRAD received the pre-feasibility study (SPF) for the new repository elaborated by SITON Bucharest. The pre-feasibility study was amended and received by ANDRAD, in December 2008, in conformity with the stakeholders' remarks and commentaries. The study presents the technical versions which were analyzed in order to implement the new repository project at Saligny. At the same time, this study presents elements which allow the justification of the repository's necessity and opportunity, which include: data on the estimated waste volumes which shall be generated by Cernavoda NPP during the entire life time and due to decommissioning, data and information regarding the achievement, in different scenarios, of the solid waste interim storage capacity, data and information which justify the commissioning term, respectively the investment's cost data as well as the manner in which the costs could be covered from the funds collected by ANDRAD in conformity with GD 1080/2007.

On May 2008, ANDRAD and Cernavoda NPP established and signed a Joint Action Plan on the safe management and long term integrated coordination of activities for all radioactive waste generated by the nuclear power plant. This presents major directions and actions which have to contribute to develop the LILW repository program.

4. MAIN CURRENT ASPECTS OF THE REPOSITORY PROGRAM

The general features of the new proposed repository as they are presented in the technical documentation (e.g. waste inventory and conceptual design) are as follows:

- **Siting:** Saligny site inside the exclusion zone of the NPP;
- **Land owners:** Saligny Local Council and private owners; ANDRAD has legal permission from land owners for issuing the feasibility study;
- **Disposal area:** about 42 ha;

- **Disposal concept:** Surface facility with multiple barriers (Figure 2); the conceptual design is similar with those of L'Aube (France), El Cabril (Spain) or Mohovce (Slovakia) repositories;
- **Waste inventory:** Operational and decommissioning LILW-short lived with limited quantities of long lived radio-nuclides generated by 4 units at Cernavoda NPP (2 scenarios were considered: 30 and 40 years/unit lifetime);
- **Waste volume**: 120,000 m^3 (scenario with 40 years lifetime/unit);
- **Development features:** Staged development of the repository considering the characteristics of the construction works on loess soil and further development of new units on Cernavoda NPP site;

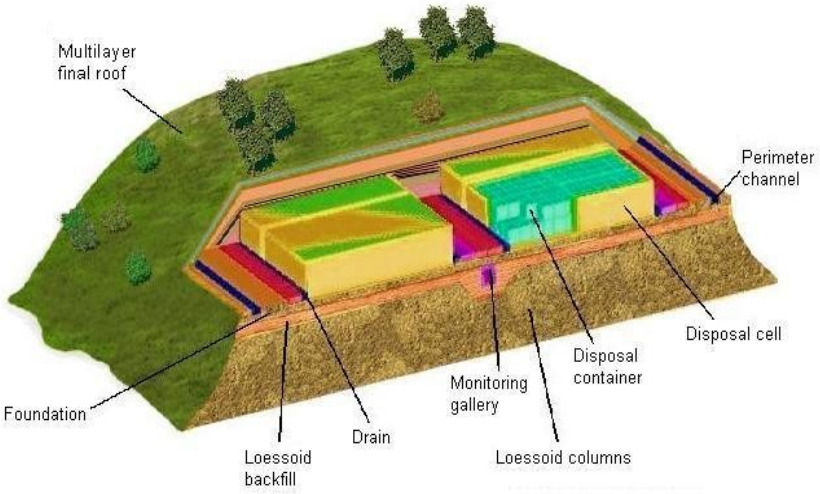

Figure 2: Conceptual design of Saligny repository

During this very important stage of repository project development, AN&DR has to solve technical and administrative aspects, which are going to increase confidence of the governmental, political and, very important, public starting with local communities, on the long term safe evolution of the repository and the results of the safety evaluation.

In the next future, the safety strategy of the Saligny repository [5], will be developed to implement the following objectives:

- Strategy and approach to manage the different development phases of the facility (e.g. siting, construction, operation, closure);
- How the adopted strategies adhere to good engineering principles and practices;
- Handling and reduction of uncertainties;
- Degree of caution exercised when making decisions and use of multiple lines of reasoning;
- Safety features embedded in the design of the facility and multiple barriers used;
- Robustness of the disposal system.

In order to achieve these objectives, AN&DR will continue the integrated monitoring and characterization program on Saligny site, to introduce new data about the radioactive wastes to be disposed, and information on the treatment and conditioning methods, in the review of the safety assessment, and to consider adequate and modern technical solutions for the engineered

barriers of disposal system. All these activities will allow the improvement of the conceptual design and further basic technical design, safety assessment and confidence building regarding the source term for repository, evolution scenario system, boundary conditions, development of performance analysis for engineered barriers, and will constitute a new stage in the development of Saligny Project.

Within the siting process of the near surface repository several IAEA expert missions took place:

- IAEA ROM/9/014, 'Evaluation of candidate sites based on characteristics and suitable disposal options', 1994
- IAEA ROM/4/021, 'Design and Site Evaluation Assessment', 1997
- IAEA ROM/3/004 'Sustainability of the national nuclear waste management' , 2005
- IAEA ROM/3/005 „Waste Assessment Technical Review Programme. International Review Team", Romania, 2007 (beneficiary: ANDRAD)

In general, the conclusions of the recommendations said that the site together with a proper design has good perspective to be constructed. To continue the site characterization and associated activities the repository programme needs involvement of important resources from the radioactive waste management fund starting with 2011.

5. NEXT STEPS IN THE DEVELOPMENT OF THE REPOSITORY PROGRAM

In the period 2009-2011 years, ANDRAD obtained EC support with 2 Phare project (started in 2009) mentioned before and a Transition Facility project (in 2009-2010) to help ANDRAD to review and coordinate for appropriate treatment and conditioning technologies for waste dedicated to the repository. Complementary to the EC support, expert advice, scientific and technical visits have been developed and would continue within a Technical Cooperation Programme supported by IAEA.

AN&DR integrates the results of the projects supported by EC and IAEA in one of its main objectives of the repository programme planning in the next three years, namely to obtain the full siting license from the Regulatory Body (including the environmental agreement).

It is necessary to mention that the siting license issued by CNCAN can be finally obtained only based on the environmental agreement which is issued by the national environmental authority and includes an Environmental Impact Assessment (EIA) process. The EIA debate could last more than two years since the procedure include neighbor countries consultation in accordance with Espoo convention. However, in order to avoid charge of the future investment costs, AN&DR has to make efforts to conclude work on site confirmation/characterization by addressing main CNCAN's requirements from partial siting license and observations and recommendations and last IAEA missions, and main uncertainties from the siting process in 2009. To act like that, AN&DR planned actions that sustain and correlate the activities from Phare projects with complementary legal aspects that need to be done to conclude the work for licensing the siting of the repository, initiating the environmental agreement procedure and preparing the investment according to the law.

The prefeasibility study was finally agreed in December 2008. The feasibility study is planned to be obtained in 2011 and further approved in 2012.

In order to optimize the resources and keep at minimum level the costs of the waste management programme, AN&DR keeps in attention that the planning of the repository and launch of the investment should be correlated with the development of the Romanian Governmental associated programs. Thus, the schedule and factors influencing on it for commissioning the Units 3 and 4 at Cernavoda NPP together with the schedule to extend actual Unit 1 lifetime are very important since they might change the reference scenario of the repository program evolution and need debates with the Governmental stakeholders. In addition, Romanian Government has announced in 2008 its intention for building one new nuclear power plant in Romania but a confirmation should be expected in 2011-2012.
The public information and communication program will become crucial in the next years since AN&DR will start the legal procedures (public debates) on consulting the public. Before the construction of the near surface repository, legal instruments impose few important steps for public debates included in the following:

- the procedure for obtaining the environmental permit for the Urban Zone Plan (inclusion of the repository in the General Plan of Saligny host community); the procedure includes a Strategic Environmental Assessment process;
- the procedure for obtaining the environmental agreement; the procedure includes an EIA process;
- the procedure of obtaining the Parliament approval on the repository siting based on license issued by the Regulatory body CNCAN;
- the procedure of obtaining the Governmental approval for the repository construction.

The process of public information and consultation are made in the framework of legal procedures, carried out by the different national authorities mentioned by law including the National Authority for Environmental Protection and the Ministry of Economy. During these procedures, the motivated problems raised by public are assessed by the AN&DR and solutions to solve them are forwarded case by case, to the different authorities that are in charged.

Currently, AN&DR has the acceptance of local community and local authorities to continue with the feasibility study of the repository and to investigate/characterize the site. However, the community has asked that benefits should be available by the time that a decision on repository construction will be made.

Detailed information was collected, allowing AN&DR to review the new repository project planning. Within this reviewing process, AN&DR must prove ability and flexibility due to the changes of the specific legislative frame as well as to the service market's dynamics (the repository's development requires a multi-disciplinary approach). Currently, AN&DR has a team involved in the new repository program which covers the following subjects: hydrogeology, safety assessment, chemistry, nuclear engineering, authorization and investments. In order to continue to promote and develop the new repository program, the necessity of expanding this team with staff from the geology, civil engineering, design, constructions field was identified, as AN&DR is continuously aiming to carry out the correct sizing and to insure human resources for this program's development.

To keep confidence in its work AN&DR maintains in attention the status of foreign research and construction projects for new disposal facilities. For that but more important for being able to

manage its responsibilities AN&DR needs to look and obtain collaboration with more experienced organizations.

6. CONCLUSIONS

Significant technical progress has been made in recent years, against a background of resource limitations. But there are still outstanding uncertainties to be addressed before the safety of the Saligny site and the proposed engineered disposal facility can be confidently demonstrated to all stakeholders. Based on results of works performed by date, nothing indicates that construction of a safely engineered near-surface disposal facility would not be possible at Saligny.

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