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Evaluation, testing and application of participatory approaches in the Czech Republic

Consensus panel - Spent nuclear fuel management alternatives

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INTRODUCTION

An important part of the ARGONA project is the testing and application of novel participation and dialogue approaches. The Czech Republic is one of the countries where these approaches will be applied and tested. The ways in this is being done include a series of events involving different stakeholders such as a focused science shop, a consensus panel and an interaction panel.

In the framework of these activities in the Czech Republic the consensus panel was held on June 12, 2008 in the Conference room of the Hotel Vltava in Rez, and addressed the theme: “Spent nuclear fuel management alternatives”.

The main goals of this consensus panel were:

1. Identification of the main criteria’s relevant to the assessment of the existing alternatives and determination their importance (weight) from the perspective of all stakeholders;
2. Achieving at least a partial consensus on selecting the most suitable alternative (management of radioactive waste and spent nuclear fuel).

A broader audience was selected with a suitable mixture of specialists and interested technical and non-technical peers including representatives from NRI, universities, Ministry of Industry and Trade, Ministry of the Environment, State Office for Nuclear Safety and Radioactive Waste Repository Authority, representatives of municipalities and NGOs, and waste producers such as CEZ plc etc. The seminar was held with the participation of foreign observers from Sweden, UK and Finland

The meeting was positively received by those who did attend and indicates the beginning of a closer cooperation between all parties concerned. On the basis of the discussion, a significant number of interesting results were obtained.

CONSENSUS PANEL MINUTES

Date: June 12, 2008

Venue: Conference room of the Hotel Vltava in Rez

Theme: „Alternatives of the radioactive waste and spent nuclear fuel management“

The seminary was held within the framework of the EC international project ARGONA (FP-036413) in the connection with the testing and application of new methods of the general public participation in the decision-making processes with regard to the radioactive waste and spent nuclear fuel management.

Main aims of the seminar:

- Launching a discussion concerning various alternatives of the spent nuclear fuel and high-level radioactive waste management;
- Identification of the main criteria pertinent with respect to the assessment of various existing alternatives and determination of their importance (weight) from the point of view of all stakeholders;
- Achievement of at least partial consensus in the problem of the choice of the most suitable alternative for the radioactive waste and spent nuclear fuel management.

Discussion rules

Mr. Antonin Vokal as representative of NRI welcomed the participants and then invited Mr. Marek Valvoda from the company Comnika Ltd., who acted as mediator of the meeting.

Then the mediator presented the basic discussion rules and the main objectives and agenda of the meeting:

- Introduction of the participants – their names, positions, their expectations of the meeting, and listing of individual participants' names
- Methods for minutes distribution, discussion recording
- Time schedule – meeting time frame
- Proposal of working rules:
  - mobile phones – place in silent mode
  - only one participant can speak at a time
  - time limits for one discussion presentation – about 3 minutes per presentation

- method for asking to speak – by putting up one's hand, the right to speak is managed by the moderator

- Information on the program and main aims of the seminar:
  - Introduction into the problems of the SNF and HLW management – Mr. Antonin Vokal
  - Discussion to the individual topics:
    1. What are the main criteria pertinent for the process of the individual alternatives assessment and their importance from the point of view of all stakeholders?
    2. What are the possible or probable alternatives existing in the field of the SNF management? What alternatives are at present taken into account?
    3. What are the reasons leading to different approaches to the SNF management?
    4. How and to whom the relevant information required for the decision-making processes in this field should be offered?
- Presentation of participants – their names, positions, their expectations, listing of individual participants' names

Introduction to the discussion

Antonin Vokal (NRI Rez plc) presented a short information on „Alternatives of the radioactive waste and spent nuclear fuel management.“

- **Alternatives of the fuel cycle end:**
  - Open cycle – direct disposal of the spent fuel in a geological repository;
  - Closed cycle – fuel reprocessing/transmutation and disposal of the reprocessing residues;
  - Long-term storage – the so-called zero variant: *Long-term (infinite) dry storage of SNF in interim stores (on surface or underground)*;
- **Open cycle alternatives:**
  - Direct SNF disposal in a geological repository (DGR) in the territory of the Czech Republic (present alternative)
  - Direct SNF disposal in a regional repository;

  Methods of the SNF geological disposal planned at present (even fuel-reprocessing countries plan to dispose of the MOX-type fuel):
    - **into a granitic rock** in a robust thick-walled or highly corrosion-resistant container (Sweden, Spain, Canada, Finland, Czech Republic);

- **into tufaceous rock** in a robust multi-barrier container (USA);
- **into salt layers** in a robust multi-barrier container (Germany);
- **into argillaceous formations** (France, Belgium, Switzerland, Spain, Hungary).

The legislation of some countries guarantees that within a certain time limit it will be possible to retrieve the SNF for its further use or for re-packing (for instance, in the U. S.). However, in principle this possibility always exists up to the moment of the full rusting of the waste packaging.

- **Closed fuel cycle:**
  - Spent fuel reprocessing in the standard reprocessing units of the PUREX type, utilization of the MOX-type fuel and fixation of the remaining waste in a stable matrix (glass) – used in a number of countries (France, Belgium, United Kingdom, Japan, etc.)
  - Use of the advanced reprocessing methods for the plutonium and minor actinides separation, their transmutation in the IIIrd and IVth generation reactors, and fixation of the remaining fission products into a very stable matrix (ceramics, glass) – planned in a time horizon of about 20 to 40 years.

  In the Czech Republic there is no industrial branch dealing with the SNF reprocessing. The three possibilities of advancement in this case are as follows:

  - To use the reprocessing plants abroad (France, United Kingdom, Russia) and to dispose of the vitrified waste containing also the minor actinides;
  - To store the fuel up to the moment of the availability of the advanced technologies, to build the reactors of the IIIrd and IVth generation, and to exploit the possibility to use plutonium and minor actinides as nuclear fuel and to dispose only of the solidified remaining fission products;
  - To build the reprocessing units and reactors of the IIIrd and IVth generation in the Czech Republic.
- **Main issues for discussion:**
  - What are the main criteria pertinent for the process of the individual alternatives assessment and their importance from the point of view of all stakeholders?
  - What are the possible or probable alternatives existing in the field of the SNF management? What alternatives are at present taken into account?
  - What are the reasons leading to different approaches to the SNF management?

- How and to whom the relevant information required for the decision-making processes in this field should be offered?

Controlled Discussion

A) <u>Comments to the introduction</u>

- The geological repository alternative is a result of the speculations and endeavour of humankind to dispose of the radioactive waste somewhere outside the biosphere, outside the environment.
- At present the general public in the Czech Republic is erroneously convinced that so far there is nowhere in the world a geological repository in operation. However, for already five years the Waste Isolation Pilot Plant (WIPP) repository at Carlsbad, New Mexico, U. S. A. is in operation (also for the spent fuel from submarines and cruisers with nuclear propulsion), the licence of which was newly extended several months ago. Moreover, DOE (U. S. Department of Energy) applied for a licence for the Yucca Mountain repository.

B) <u>Determination of the basic criteria for the assessment of the individual alternatives for the HLW management</u>

The following criteria have been proposed and discussed:

- **Feasibility** from the point of view of the necessary technologies availability.
- **Safety** – the repository safety should be divided to the safety during its operational time and safety after its closure:
  - **Operational safety** – the safety of the repository operation itself and of the staff working in this repository during its operational lifetime.
  - **After-operational safety** (after the repository closure) – the possible permanent surveillance of the repository. Even after closure the given repository can represent a certain risk to the environment.
  - Also the issues of the transport safety, of a possible military or other abuse, etc., fall into this category.

Safety assessment is a very broad and complicated problem comprising a number of aspects. Principally, the general safety, radiation protection, and nuclear safety fall under the criterion of safety. In radiation protection three basic aspects could be distinguished:

- Irradiation optimisation – optimisation and substantiation of the whole facility and of the choice of the given method or technology of the SNF and HLW management;
- Prevention of uncontrolled fission reaction;
- Safe handling with nuclear materials, etc.

These items could be subdivided into other sub-items. Respective experts deal with the individual issues.

Generally, it can be stated that the criteria of radiation protection and nuclear safety are the most important safety criteria. Basically, these are the only criteria by which these facilities (repositories) differ from other constructions. However, there still exist certain differences, for instance in the fact that the decommissioning procedure proceeds after closing a reprocessing plant, the factory will be liquidated, and theoretically any other activity could proceed on its site, whereas in the case of the geological repository this is not the case. An institutional surveillance will proceed for many years after its closure.

- The so-called **institutional surveillance** is therefore closely connected with the safety issues – the criterion of institutional surveillance comprises, among others, the requirement of the elaboration of plans, for what time period the given repository will be functional, how its safe operation will be secured during the next generations and after its closure or decommissioning.
- Minimum impact on the **environment**.
- **Financial costs** (financing ability) and **economic effectiveness** are other important criteria.
- **Public acceptability** – the alternative should be acceptable for the general public and by the residents of the locality where the installation will be situated.
- **Waste volumes** – reduction of the amounts of produced waste – how the given variant will cope with the given waste volumes
- **Time horizon** – in what time horizon the given variant can be realized.

  In some cases a storage of SNF for a certain period of time will be necessary before the given measures will be available – at present many technologies are unavailable, either from the technical or financial points of view.

C) Discussion concerning the possible or probable alternatives of the SNF and HLW management:

The following alternatives of SNF and HLW management viable under the conditions of the Czech Republic were discussed:

- Direct disposal of SNF and HLW in a geological repository in the territory of the Czech Republic.
- SNF and HLW disposal in an international (regional) geological repository, taken into consideration and mentioned in the "Concept of the radioactive waste and spent nuclear fuel management" approved by the government, is another variant. The regional GR means an international repository for a limited group of usually neighbouring countries.
- Disposal of SNF in a geological repository with the possibility of the SNF retrieval and its reuse is another possibility.
- SNF transportation and reprocessing abroad and import of the processed (vitrified) waste with a lower content of Pu and U and of the reprocessed fuel. The HLW would be disposed of in a geological repository. The spent nuclear fuel represents about one quarter of the usable energy of the original nuclear fuel. The remaining fissile material as U-235 and the secondary fissile material (Pu-239, ...) and the fuel raw material are the most valuable components. The choice of the reprocessing method depends on the main aims of the given process. In other words, whether the disposal of dangerous actinides or fission products or the subsequent power production are the main aims. For instance, plutonium could be used for the preparation of the so-called MOX fuel – exploitation of the power-production potential of the waste. However, spent MOX fuel will be produced that will have to be reprocessed again or be directly disposed of in a DGR. In the connection with the SNF disposal in a geological repository the following reasoning has been made: *In the DGR safety analyses of the direct SNF disposal, I-129 is considered the most dangerous radionuclide, all other radionuclides are sometimes by more than two orders of magnitude lower. On the other hand, during the SNF reprocessing about 95 % of iodine is released directly into the atmosphere or water systems. An ethical question arises whether it is correct to release the most dangerous radionuclide immediately or whether it is more proper to put it, for instance, one kilometre underground and leave it there for one million years.*
- Zero variant – long-term storage of SNF – in this case it does not concern SNF disposal. In this variant it is necessary to provide for a long-term safety – permanent surveillance

of the given storage installation. For instance, a permanent surveillance is necessary, the container sealing or whole containers should be exchanged if necessary, etc. SNF is not separated from the biosphere. The zero variant advantage is in the fact that there is a possibility of a permanent check-up of the stored fuel state.

- Use of the advanced reprocessing methods with a maximum reduction of the produced waste volumes that would be disposed of in a DGR. A construction of a geological repository will be necessary even in the case of the HLW volumes minimization. The resulting waste differs from the classical HLW and SNF by lower dangerousness (shorter decay half-lives) and by far lower volumes (amounts). This variant is so far not feasible by the state-of-the-art technologies.
- Whatever SNF management alternative feasible at present is chosen, a DGR will always be necessary. A question arises, how will the criterion of the DGR safety change in the case of the disposal of various SNF and HLW types – which type of repository will be safer, how big it should be in the given variant, how dangerous it will be (decay life-lives), and what will be the resulting waste volumes.

A question was posed, whether to discuss only the actually available variants or whether to take into consideration also the alternatives that are at present only in the state of research and the results of which will be available perhaps within 20 or 40 years. It was proposed not to consider these variants in this discussion. This variant cannot be taken into consideration provided that the discussion concerns an endeavour to solve the problem of the SNF and HLW management by the technologies available at present. It was argued that this question is solved by one of the main criteria for the individual alternative assessment – the feasibility criterion. If possible, all possible alternatives should be taken into consideration. For instance, it is possible to wait for 20 or 40 years until this variant will be feasible. Perhaps then this variant in its final consequences will be evaluated as one of the best from the point of view of the safety criterion.

D) Discussion concerning the determination of the importance of individual criteria, chosen for the assessment of the alternatives of the SNF and HLW management from the point of view of all stakeholders

Based on the preceding discussion a list of the principal criteria important for the assessment of the individual alternatives of the SNF and HLW management was elaborated. During the meeting break all participants had the possibility to give points from 1 to 10 to the criteria

mentioned above, according to the importance that they assign to the individual criteria. The following sequence resulted:

1. Safety during the installation operation
2. Public acceptability
3. Post-operational safety
4. Feasibility
5. Institutional surveillance
6. Financial costs (financing ability) and economic effectiveness
7. Environment impacts
8. Time horizon – horizon of realization
9. Reduction of the waste amounts

Then, after the point assignment of the individual criteria importance from the point of view of all stakeholders, the results were discussed. A brief survey of the conclusions following from this discussion is presented in the following paragraphs.

- The criteria mentioned above could be divided into two groups:
  - Technical criteria that are relatively easy to evaluate and from these results it is possible to draw conclusions and elaborate a certain model that will seem ideal, that will guarantee for the given installation safety and for other technical requirements. The following requirement can be rated among them: operational safety, post-operational safety, financial costs and economic effectiveness, environmental impacts, etc.
  - Social or political criteria – the assessment of these criteria is very complicated and even a precise definition of the content of these criteria will be a very complicated matter. Among these criteria we can rate, for instance, the institutional surveillance in the sense of providing an inspection by social organizations and by the state or political authorities that will be active or will participate on the government at the given moment. The public acceptability is another such criterion. It will be very difficult to determine its precise content, to evaluate the degree of acceptability and to determine the weight (importance) of this criterion. This criterion could be also understood as the civic responsibility for the nuclear power exploitation and for the consequences following from these activities.

It seems that the social and political problems are at present the most important and most burning issues in the field of the SNF and HLW management in the Czech Republic.

- A note to the possibility of creating a set of criteria and subsequent understanding among all stakeholders:

  For already 10 to 15 years there exists an intense attempt among the European countries to launch a meaningful discussion and cooperation among all participants that are denoted by the term stakeholders. All those who are meant by this expression should cooperate on the formation of the basic body formulating these criteria. At present this is accomplished, e.g., under the auspices of OECD (Organisation for Economic Cooperation and Development) in close cooperation with ICRP (International Commission on Radiological Protection). This cooperation is orientated to the formulation of criteria in the connection with radiation protection. General public participates on this process, too. If the general public is a co-author of these criteria, it will also share on the responsibility. In other words, if these criteria are accepted by the general public and if all criteria contained in this apparatus are fulfilled, then the problem assessed in this process and conclusions following from this assessment should be accepted by the broad public. Such approach is now applied in a number of European countries (also the ARGONA project is an example of these endeavours). If such approach is applied also in the Czech Republic, it will be possible to achieve a certain agreement of all stakeholders for the attainment of a certain aim. This is true also for the field of the SNF and HLW management. However, such approach has not been applied in the Czech Republic as yet. This meeting could be taken as an onset of such process, when SONS will reformulate the existing legislative regulations, of course in full compliance with the EU legislative regulations, on the basis of comments following from the discussion with the representatives of the general public and with all stakeholders. In this process a set of criteria can be formed, which could be accepted by the broad public. No argument will exist for the general public to take up a negative attitude provided that these criteria are fulfilled.

- Discussion on the operational safety criteria:
  - It does not concern only the safety of the DGR itself but also the safety of other installations closely connected with it. For instance, a spent fuel reprocessing plant and the following production of the MOX-type fuel will release directly into the environment (into the atmosphere and waters**)** about thousand times more radioactive materials than a nuclear power plant during the same period of time. This means that on one hand after reprocessing the DGR safety will increase due to the disposal of the MOX-type fuel), on the other hand a problem will arise of the enhanced radiation risks

due to the immediate release of radioactive materials (mainly I and Cs) into the environment in the connection with the SNF reprocessing. In other words, the DGR safety will be partly enhanced but at the same time the environment will be burdened by the reprocessing plant operations. The safety risks connected with these activities should be taken into consideration in the overall safety assessment.

- Moreover, also the problems of the transportation safety should be included in these criteria.
- In the connection with the SNF reprocessing problems a question arises whether, for instance, to take into consideration also the global point of view, i.e., to assess also the reprocessing safety in spite of the fact that reprocessing will take place outside the Czech Republic territory, or to take into account only the local problems and not to solve this problem as – in a way – it does not concern directly the Czech Republic. The answer to this question is very important and by far not simple.

- Discussion concerning the public acceptability criteria:

  From the preceding assessment of criteria it followed that from the point of view of all participants the criterion of public acceptability is the second most important one. There was a very vivid discussion on this issue. The following questions have been posed:

  - What can be done to achieve the public acceptability of individual alternatives?
  - The suitable alternative should be chosen by experts. However, how to find the public acceptability of this alternative?
  - What must be done so that the results or technical solutions reach the common people and will be accepted by them?

  – For the residents from the selected localities the criterion of the public acceptability plays the main role. These people have generally a hostile attitude to the DGR siting. This attitude could not be changed in spite of the eight-year efforts of the Radioactive Waste Repository Authority, mainly due to inappropriately chosen methods for persuasion. According to the representatives of the respective communities the poorly launched communication between the responsible authorities and the communities is at present the main problem. If it were otherwise and if already from the very beginning truthful information was offered, an opposite situation will perhaps be created and the individual communities will compete for the DGR siting in their locality (similarly as it happened in Sweden).

  – The public acceptability degree is also a question of the confidence of citizens in the respective authorities (governmental or political). Achievement of confidence in the

institutions is one of the main steps required for the improvement of the general public attitude towards these issues and for the enhancement of the public acceptability degree. Also the contradictory statements of some representatives of the Government are one of the factors negatively influencing the general public confidence in the institutions. *Example*: *Already several times it was declared in the media that the transmutation technology will be the solution of the SNF liquidation and that therefore it will not be necessary to build a geological repository.* Any political statements in the connection with the SNF and HLW management and generally with the nuclear power utilization should be already beforehand very minutely discussed with the experts so that no erroneous or misleading information is provided.

- This mistrust in institutions is in a certain degree transferred also to the professional information sources. In this respect the following remark was expressed: The geological repository preparation is a lengthy process (DGR should be put into operation only in 2065). So far no geological survey was made in the selected localities, only information based on a surface examination of the individual localities is available. In discussions held in the localities the residents often require a precise answer to their questions: "In what depth will be the DGR situated?" "On what area?" etc. At present there are not fully precise answers to these questions. They can be decided only after the geological survey. Often only an orientation answer could be given within a certain range of values. However, such answer is in many cases unsatisfactory for the general public so that people get the feeling that some information is withhold.
- Political responsibility is closely connected with the public acceptability criterion. A long-lasting consistent and clear political attitude of the government and government parties concerning the problems of the SNF and HLW final disposal is lacking. The general public misses the necessary long-term guarantees. In this case the problem of political responsibility consists of the fact that from the point of view of politics these problems are not very popular and there is always the possibility to postpone the problem of the SNF and HLW final disposal, for instance, to the next mandate and thus to shift the political responsibility to the future governments.
- According to the opinion of the representatives of the communities and NGOs the fact that people are lacking guarantees that they will be able to participate fully on the decision-making process is another factor adversely influencing the public acceptability – the right of veto that is not yet incorporated into the Atomic Act as

originally proposed by the ecological and civic organizations. The general public is afraid that in the case that ideal conditions for the DGR siting will be found in a certain locality, the repository will be built even in spite of the local residents' opposition. This is why the individual communities cannot agree with the execution of the geological survey. *From the point of politics it is very complicated for a majority of mayors to express an opinion that he himself would be willing to give an agreement with the siting of DGR in his locality. A majority of residents is under a great stress, following from the dread that any progress will be stopped in the given area – termination of any development programs and a drop of the real estates and properties prices, people will move to other localities, in many localities there are recreation areas that could be influenced, etc.*

- It has been also stated that the quality of information will not help significantly to the elimination of the negative attitude of people to the DGR. The reason why people have a negative attitude towards the construction of DGR is not of the lack of information or their poor quality but rather the so-called NIMBY syndrome. The following example was presented: *In Switzerland two referendums were organized in 1995 and 2002. In the period between the two referendums a large thorough information campaign was launched. In spite of that both referendums turned out the same and negative. In the case of the second referendum the negative attitude was even more pronounced.*

E) Discussion concerning the changes in the list of individual alternatives of the SNF and HLW management in the connection with their subsequent assessment according to the chosen criteria

The individual alternatives of the SNF management were discussed and in this discussion certain unclearness concerning the aspects contained in the individual alternatives has been clarified. Those variants that could be considered as viable under the conditions of the Czech Republic were gradually chosen from the list of all possible alternatives of the SNF and HLW management. These alternatives should be afterwards assessed according to the previously specified criteria.

- A note before the discussion onset – both the methods of the SNF final disposal, alternatives of management, and various methods of reprocessing are given in the list of alternatives. These variants cannot be simply compared. It should be kept in mind that principally in all alternatives available at present there is a need of final disposal of

selected waste types into a DGR. It is therefore possible to consider only one alternative of the final solution of the SNF and HLW disposal and it is the geological repository. Various routes of reprocessing and treatment of the given materials (wastes) lead to this final solution.

- An idea was proposed to reduce the number of variants, as it is very difficult to simply assess such high number of variants. On the other hand it was argued that just the width and elaboration of the list of individual alternatives could be help for better assessment of the individual alternatives. Voting was held on the preservation or simplification of the list of selected alternatives. A majority of participants voted for the reduction of variants. Several ways of the list reduction were proposed.
- One of the proposed ways is to focus the attention only to the final alternatives of disposal, i.e., to the alternative of the geological repository. Moreover, it was proposed to eliminate the zero variant as it is at present unviable.
- Several arguments were raised against the proposal for the elimination of the zero variant from the list of alternatives:
  - Even though at present this variant is not considered realistic in the Czech Republic, it can be used as a reference alternative;
  - This alternative is frequently mentioned and discussed in media, though only virtually;
  - Netherlands was mentioned as an example, as it decided for the alternative of long-term storage for 100 years. In the course of this period means required for the realization of the final disposal will be accumulated and after this period it will be decided what method of the final disposal will be used.
- It was proposed to focus the attention only to three basic alternatives, namely to the open cycle (direct SNF disposal), closed cycle (various types of SNF reprocessing), and long-term storage (the zero variant). The other alternatives are only sub-variants of these three alternatives. However, to use only these three alternatives for the assessment is rather problematic.

  Examples: From the technical point of view the regional or national DGR is the same alternative, however, for the Czech Republic specifically each variant has different consequences. These consequences concern the approval procedure, the transportation problems, etc. There are great differences in several assessment criteria, e.g., in the field of financing, public acceptability, institutional surveillance, etc. It is also very difficult

to assess all the reprocessing variants. For instance, from the point of view of feasibility it is not possible to compare the reprocessing technologies commonly applied at present with the transmutation technologies.

- Discussion concerning the elimination of the international (regional) repository variant – the international (regional) repository collides with international nuclear weapons proliferation ban, furthermore it means a concentration of enormous amounts of nuclear materials in the territory of a single EU state or outside European Union (as proposed by Ukraine or Russia) and it should also cope with the differences in the national legislative of individual countries. On the other hand, this possibility is more and more discussed in the European Union and at present there proceeds the second round of the international project SAPIERR that deals with this problem. Finally, the variant of the regional DGR variant was left in the list of variants.
- Amalgamation of the international and national geological repository alternatives was also discussed. By voting it was decided to preserve these two alternatives – the alternative of the national and international (regional) repositories. Even in the concept of the RAW and SNF management these two variants are mentioned as two different alternatives. The document states that at present the variant of the direct disposal in a DGR in the territory of the Czech Republic is preferred. However, other alternatives as the alternative of the international DGR and the alternative of reprocessing will be taken into consideration and pursued.
- Discussion concerning the possibility of the SNF retrieval from the geological repository – from the technical point of view there is always a possibility to retrieve this material from the repository, at least during the waste packaging lifetime. The retrieval of these materials will proceed with the aim to obtain U and Pu or other radioactive elements or nuclides. There could be two reasons for it: either it will be economically advantageous or unavoidable as there will be no other way how to obtain these raw materials. *At present the Czech legislation and also the concept of the RAW and SNF management do not take into account the disposed of SNF retrieval. The disposal in a geological repository is defined as a permanent disposal of wastes in a geological repository.*
- Discussion on the topic of the amalgamation of the alternative of the common SNF reprocessing with the alternative of the advanced reprocessing methods (transmutation) – with respect to the fact that it concerns very different methods of reprocessing in different

stages of development, etc., it was finally voted for their preservation as two different alternatives.

The following list of alternatives resulted from these discussions:

1. Direct SNF disposal in a geological repository in territory of the Czech Republic:
   - Without the possibility of retrieval;
   - With the possibility of retrieval.
2. SNF disposal in a regional repository (with or without the possibility of retrieval)
3. Fuel reprocessing abroad and import of the waste from reprocessing
4. Long-term ("infinite") storage – zero variant
5. Application of advanced reprocessing methods (e.g., transmutation technology)

All chosen variants are mentioned and considered in the valid "Conception of the radioactive waste and spent nuclear fuel management".

F) Assessment of the individual alternatives for the SNF and HLW management with respect to the selected criteria

The discussion on the methods of the individual variants assessment on the basis of the selected criteria was held during which also the issue of the assessment of these alternatives only from the national or also from the all-European (global) points of view. Example: national versus regional repository and the problem of the safety criterion fulfilment:

a) Assessment from the national point of view – a regional repository situated outside the Czech Republic will mean a lower safety risk for the Czech citizens as the repository will not be situated in their close vicinity;
b) Assessment from the all-European point of view – the safety of regional and national repositories should be at a comparable level with regard to the fulfilment of the basic requirements on the radiation protection and nuclear safety that are given by the EU legislative regulations.

No consent was achieved on this issue among the participants.

The selected alternatives should then be assessed with respect to the criteria selected in the preceding discussion. At least a partial consensus should be achieved as regards the selection and assessment of the individual variants suitability. However, with the mutual consent of all the participants the intent to assess the selected alternatives of the SNF and HLW

management on the basis of the selected criteria was abandoned. All participants agreed that such assessment of the individual variants is very difficult and at present unviable.

Instead of the individual alternatives assessment it was proposed to use the remaining time for discussing the problem: **How and to whom to offer the relevant information required for the decision-making process in this field?**

1) Openly provide an objective and truthful information
2) It is necessary to improve the communication between RAWRA and the communities and to make it more intense even though the situation already improved in a certain degree and those who wish can find any information
3) Establishment of the public confidence to experts, surveillance bodies, and also to the political representatives – as it has been already stated any public confidence to experts and responsible administration institutions is lacking and in a certain degree there is a fear of corruption. For instance, the general public has a certain worry concerning the given installation safety and the methods for the execution of individual works connected with its construction. (This is also one of the aims of the ARGONA project and also of the application of the so-called RISCOM model.)
4) The experts should strive to provide the information in such form that it will be comprehensible to the general public.
5) In the provision of information not to concentrate only to the selected localities but to address the general public as a whole.
6) To give larger space to these problems in the public media with a high impact effects to the general public.
7) To enhance the communication on these issues on the political level and to enhance the political responsibility with respect to the solution of the given problem.
8) Discussion concerning the right of veto for the communities in the given localities.
9) An attempt to provide an open and meaningful communication on all levels and between all stakeholders, for instance by the application of the RISCOM communication model.

Conclusions from the discussion

Brief summary of the reasons why the planned assessment of the individual alternatives for the HLW and SNF according to the previously specified criteria was not made:

- Every alternative comprises many other sub-variants and possibilities and any too high simplification could be misleading.
- At the present stage of the discussion this assessment would not have any actual value. At present many participants have not enough information concerning the individual alternatives to make a responsible assessment.
- This meeting was the first one of this type on which all the stakeholders participated. A considerable part of the discussion should be therefore given to the mutual elucidation of basic attitudes of all stakeholders to the given topics. A great part of the time for discussion was also dedicated to the definition of criteria for the individual alternatives assessment and to the discussion of the individual alternatives contents and to the elaboration of a list of alternatives that should be considered under the conditions of the Czech Republic and that should be more thoroughly discussed in future. There was not enough time for the selected variants assessment itself.

Partial consensus was achieved only in the following items:

- At present there is evidently no alternative in which no radioactive waste is formed that would need safe disposal in a DGR. The difference could be only in the final amounts of the disposed waste, in its dangerousness, or in the time span necessary for the disposal, i.e., in the half-lives of their decay. With high probability building a geological repository will be a necessity, be it a national or regional repository.
- From the whole meeting it turned out that at present the social and political problems are the most important and most actual problems in the disposal of the SNF and waste management in the Czech Republic.
- All participants agreed that this meeting could mean an onset of a broader discussion across the entire spectrum of stakeholders concerning the topic of the HLW and spent nuclear fuel management. Another feedback from all participants will be obtained by their answers to the questions listed in the attached questionnaire.

List of all participants in the consensus panel is given in Annex No.1.

FEEDBACK

After the consensus panel a questionnaire was distributed to all participants in order to get feedback responses from all participants in the seminar to evaluate the entire course of the seminar in view of all stakeholders and to gather comments and suggestions that could be used in the improvements of organization of the following actions.

Questionnaire to participants in the Consensus panel:

The objective of the questionnaire:

- Obtaining feedback responses from all participants in the seminar to evaluate the entire course of the seminar in view of all stakeholders.
- To gather comments and suggestions that could be used in the improvements of organization of the following actions.

Questions:

1) Were you satisfied with the course of the seminar? If not – why?
2) Do you have any comments to the organization of the seminar: e.g. the duration of the seminar, the matters discussed, the way the discussion was managed?
3) Was the composition of participants good? Were there any important organizations or individuals lacking?
4) Were you satisfied with the work of the moderator, or would you prefer the meeting without his presence? How do you view his role as a facilitator?
5) Was the seminar (meeting) process, according to your opinion, transparent? Do you think the conditions were appropriate enough for participants to understand each other? If not, how can this be improved?
6) Was, in your opinion, ensured the so-called "safe area" for discussion? Did all participants have the same opportunity to express their opinion on issues they were interested in?
7) Are you satisfied with the report from the seminar? If how can the reporting process be improved?

8) What are your expectations about the results of seminar? How will they be useful for the future nuclear waste management in the Czech Republic? What is, in your opinion, the main benefit of this meeting (seminar)?
9) Do you have your own ideas for how the communication about the future nuclear waste management in the Czech Republic can be improved? What do you need to improve or do otherwise for next time?

Evaluation of the information obtained:

1) Were you satisfied with the course of the seminar? If not – why?

Eighty percent of respondents expressed satisfaction with the course seminars. Twenty percent were partially satisfied; they reservations and comments are listed below.

- Too short time for the given topics.
- The scope of the seminar was unnecessarily board.
- The first part i.e., the part surveying various possible methods of the SNF and HLW management was an asset for most participants. In the other part i.e., which dealt with the assessment of the individual alternatives for the SNF and HLW management with respect to the selected criteria, the discussion already shifted well away from reality. It is very difficult to make any serious comments to technologies that are from the point of view of present level of knowledge only in the category of wishes and speculations.

2) Do you have any comments to the organization of the seminar: e.g. the duration of the seminar, the matters discussed, the way the discussion was managed?

Most participants had no reserves to the organization of seminars, its duration and to the moderation of discussion. Some of them, however, have comments on the topic chosen (30% of participants) and the objectives of the seminar (20% of participants). Some of the most frequent comments are listed below:

- The scope of the consensus panel was unnecessarily board and quite difficult - more time would be needed for the discussion on this topic.
- Different level of foreknowledge of the participants concerning the discussed topics - Various alternatives of the NSF management were discussed, whereas related problems were remote for many participants. The acceptance for local public is the main problem of the deep repository. In the case of international repository, problems are also in political and legislative spheres (at the national and international level). In case of

reprocessing and transmutation technologies the main issues are (at this stage) at the level of technical solutions, long-term storage problems are economic and ensure continuity. Therefore, there was a tendency to digress from the original topic to theme closer to all participants – e.g. acceptance of deep repository for the local community.

- The topics under discussion concerned the competence of relevant Czech ministries that should send their representatives to this seminar.
- The aims of the seminar have not been fully achieved. Moderator of the meeting tried to assess the individual variants of the SNF and HLW management with respect to the selected criteria in the form of points, but after some time all participants came to the opinion that such assessment "from behind a table" is just impossible. The Consensus panel thus did not reach a **consensus**, but this could be expected with respect to the character of the participants. Even though the participants did achieve hypothetically some consensus, what would follow? Nothing. From whom it would be binding? What would be its merit?

3) Was the composition of participants good? Were there any important organizations or individuals lacking?

Only forty percent of participants were fully satisfied with the composition of audience, around twenty percent were satisfied only partially and most of them had reservations about the absence of the "real decision-makers" such as representatives of relevant ministries ((Ministry of Industry and Trade, Ministry of the Environment, Ministry for Regional Development) or also politicians (e.g. someone from the Committee on Economic Affairs of the Chamber of Deputies, representatives of the region, etc).

4) Were you satisfied with the work of the moderator, or would you prefer the meeting without his presence? How do you view his role as a facilitator?

All participants were satisfied with the work of the moderator and agreed that he was to the benefit of the whole discussion, without him the debate would be likely revolved in a circle and degenerate.

5) Was the seminar (meeting) process, according to your opinion, transparent? Do you think the conditions were appropriate enough for participants to understand each other? If not, how can this be improved?

All participants agreed that whole course of seminar was transparent, correct and with respect to the space for discussion the seminar was fair for the presentations of individual parties. However, understanding between different stakeholders is possible only if there is willingness for understanding.

6) Was, in your opinion, ensured the so-called "safe area" for discussion? Did all participants have the same opportunity to express their opinion on issues they were interested in?

In opinion of all participants, there was a “safe space” for debate ensured and everyone had the same opportunity to express their opinion.

7) Are you satisfied with the report from the seminar? If how can the reporting process be improved?

Majority of participants were satisfied with the minutes. Only one respondent expressed an opinion that it could be shorter, not so descriptive but rather summarising the outcomes.

8) What are your expectations about the results of seminar? How will they be useful for the future nuclear waste management in the Czech Republic? What is, in your opinion, the main benefit of this meeting (seminar)?

- The main benefit of this meeting in the opinion of majority participants is that very miscellaneous group of stakeholders - representatives of communities, responsible administration bodies (State Office for Nuclear Safety, Radioactive Waste Repository Authority), producers (CEZ company) and researchers - met around the same table and they have the opportunity to discuss given subjects and express their views.
- Many participants also believe that the impact of such events is rather small in view of the conclusions and results of discussion are not binding on “real decision makers" that decide on this.
- Politicians (even at the local level) are rather susceptible to the media and the information media are not able to present any serious arguments and to lead a cool-headed discussion about them.

9) Do you have your own ideas for how the communication about the future nuclear waste management in the Czech Republic can be improved? What do you need to improve or do otherwise for next time?

The majority of respondents reported the following comments and suggestions:

- Discussion would be relevant only under certain conditions such as the involvement of the entire spectrum of all stakeholders (including the participation of responsible state organizations such as relevant Czech ministries and representatives of political parties) and follow-up step that benefited from the results of this discussion (60 % of participants)
- For the future, it was recommend to set down “less ambitious” but actually achievable aims.
- Organization of seminars with precisely defined topics, higher specialization to individual aspects of HLW and SNF handling. It would be very useful to organize a debate (a similar composition as it was on the consensus panel) also on topic how should look the decision-making process in the siting of deep repository (what is the role of experts, local people, the supervisory authorities act.).
- Monitoring the press and other media to see how the public is informed (Either as a record, or possibly with an analysis that would be available for another seminars).
- It should be the government that will decide on the future development of nuclear power applications and on the methods of the waste disposal, on the basis of a widespread expert assessment. Thereafter, a well-prepared and well-argued concept should be presented to the general public. The present approach, when there is given a space to emotional discussions over not fully elaborated plans, is purposeless.
- In the connection with the announcement of the preparation of the basic documents for the construction of new nuclear power sources it will be necessary to principally reconsider the present concepts of handling with HLW and SNF in the Czech Republic. It solves only the situation with the existing power sources. It will mean a basic reconsideration not only of the deep geological repository, it will be necessary to take into consideration also the low and medium-level wastes that do not comply with the criteria for disposal in the present repositories.

Thirty percent of respondents had not their own particular idea of how it would be possible to increase and improve communication in the field of nuclear waste management.

MAIN FINDINGS AND RECOMMENDATIONS

The main benefit of this meeting is that all stakeholders could meet around the same table and they had the opportunity to discuss given subjects and express their views. All interested parties were willing to discuss even NWM controversial issues, such as identification of the main criteria relevant to the assessment of various NWM alternatives or deep repository siting. This poses a great shift in the direction to open and meaningful communication among all stakeholders.

In opinion of all participants, there was a "safe space" for debate ensured and everyone had the same opportunity to express his opinion. All participants also agreed that the whole course of seminar was transparent and correct. From this perspective, the chosen format of dialogue seems appropriate to ensure the exchange of new information and mutual discussion among the interested parties on the contentious issues in the NWM and nuclear energy in general.

It was also found, however, that at present the social and political problems are the most important and the most urgent problems in the field of the nuclear waste management in the Czech Republic. It is very important not only to ensure a safe space for meaningful communication, but also:

- To increase the activities of relevant state institutions in communication with the public in the field of NWM and enhance public confidence in the state institutions.
- To develop motivation programs as another way how to incite the public interest and to positively influence their attitude towards the radioactive waste disposal, siting of the geological repository, and nuclear power production in general.
- To strengthen the political responsibility - a long-lasting consistent and clear political attitude of the government and government parties concerning the problems of the final disposal of spent fuel is lacking in the Czech Republic. The general public misses the necessary long-term guarantees.

<u>Recommendations for the organization of further activities</u>:

- To select appropriate topics with clearly formulated questions taking into account the character of participants - other issues can be discussed within the scientific community and others in the wider discussion with the public participation.

- To use service a professional mediator (as an impartial and independent person managing the whole course of the discussion) to facilitate communication among interested parties during the discussion. This applies mainly in the discussions on contentious issues such as selection of appropriate nuclear waste management alternative or the deep repository siting.
- To ensure participation of representatives of state institution such as Ministry of Environment, Ministry of Industry and Trade, Ministry for Regional Development and also representatives of government parties. This is one of the most important prerequisites in order that discussion would be relevant and meaningful and the conclusions obtained could be used practically.
- To proceed step by step and set smaller goals - The current situation in the field of NWM in the Czech Republic makes it impossible to achieve consensus among all stakeholders on controversial issues, such as the siting of the deep repository or selecting the optimal alternative to nuclear waste management. Therefore in the present stage it is important to ensure a space for open and meaningful dialogue about these issues, exchange views and explain the positions among all stakeholders rather than to try to achieve consensus upon any terms.

Abbreviations used:

SNF – spent nuclear fuel

HLW – high-level waste

RAW – radioactive waste

NWM – nuclear waste management

MF – Ministry of Finance of the Czech Republic

SONS – State Office for Nuclear Safety

RAWRA – Radioactive Waste Repository Authority

CTU-FNSPE – Czech Technical University - Faculty of Nuclear Science and Physical Engineering

NRI Rez plc – Nuclear Research Institute Rez, plc

CEZ plc – Czech Electricity Company

NP Dukovany – Nuclear Power Dokovany

Calla - Association for Preservation of the Environment (NGO)

ANNEX No.1

List of Participants:

Number of participants	Name and Surname	Company / Institution
1	Zdenka Vojtiskova	MF
2	Jan Rezabek	MF
3	Karel Jindrich	SONS
4	Martin Brezina	SONS
5	Vera Sumberova	RAWRA
6	Jiri Dvorak	Municipality of Lodherov
7	Karel Picek	Municipality of Lodherov
8	Frantisek Lastovka	Municipality of Lodherov
9	Bohumil Peterka	Municipality of Lubenec
10	Dusan Vopalka	CTU - FNSPE
11	Antonin Vokal	NRI Rez plc
12	Jiri Landa	NRI Rez plc
13	Petr Kopecky	CEZ plc – NP Dukovany
14	Jaroslav Peterka	CEZ plc – NP Dukovany
15	Vojtech Pravda	CEZ plc
16	Hana Gabrielova	Calla
17	Zdenka Vajdová	Institute of sociology of the ASCR, v.v.i.
18	Josef Pritrsky	DECONTA (Slovakia)
19	Matti Kojo	University of Tampere (Finland)
20	Ole Andreas Engen	University of Stavanger (Norway)
21	Phil Richardson	Galson Sciences (UK)
22	Kjell Andersson	Karita Research (Sweden)