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ON SOME ASPECTS OF IDENTIFYING "GOOD PRACTICES" UNDER THE JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

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The article overviews the experience of applying the definition of "good practice" at the sixth Review Meeting held to discuss the National Reports prepared by the Contracting Parties under the obligations arising out of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

Keywords: *Joint Convention, safety, radioactive waste, spent nuclear fuel, meeting of Contracting Parties, national report.*

Since 2014, in the course of meetings on the review of the national reports prepared by the Contracting Parties under the framework of two international conventions — the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (hereinafter referred to as Joint Convention) attempts have been taken to apply the term of so called "good practice". However, still no convincing success has been achieved to date. The last two Meetings on the Review of the national reports prepared by the Contracting Parties to the Joint Convention (hereinafter referred to as Review Meeting) have demonstrated significant inconsistencies in the identification of such "good practice" cases by the Contracting Parties under the scope of activities covered by the Joint Convention. This issue was discussed by the General Committee of the Review Meetings, but so far, no sufficiently effective solution enabling to coordinate the work of country groups on this issue both during the fifth and sixth Review Meetings has been found. A similar conclusion was drawn following the sixth Review Meeting held under the Convention on Nuclear Safety.

Contracting Parties to the Joint Convention agreed that the very idea of "good practice" and the importance of recognizing the main achievements should be considered beyond doubt. However, the experience shows that with no sufficient degree of certainty it is rather difficult to apply it in practice. The decision of the Fifth Review Meeting states that a uniform definition of "good practice" in all country groups should be developed. The following definition is currently available: "a good practice is either a new or reviewed practice, policy or program providing an important contribution to the safety of radioactive waste and spent nuclear fuel management. Good practice should be applied or tested at least by one Contracting Party, but not being considered of wide use by other Contracting

Parties; it may be applied by other Contracting Parties implementing similar programs."

At the meeting of officials held under the Sixth Meeting of the Contracting Parties, a new term was adopted, "good result", intended for use in a test mode at the Sixth Review Meeting.

"Good result is a new or upgraded practice, policy or program implemented by Contracting Party and deserving approval. For such a Contracting Party, success in this area is seen as a significant achievement, even if such activities have already been implemented or are being implemented by other Contracting Parties. Availability of a good result in a certain area can be demonstrated, for example by attaining key interim results or some improvements as compared to the previous review."

The fifth National Report of the Russian Federation on Compliance with the Obligations of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [1] indicates a number of cases associated with such "good results" achieved, including:

- Deployment of the Unified State System for Radioactive Waste Management (RW), including:
  - Preliminary registration of radioactive waste and RW sites – important and large-scale activities implemented in 2013 – 2014 to verify the data on accumulated RW and relevant sites covering all facilities available in the Russian Federation enabling the decision making on ensuring their long-term safety;
  - Development and approval of key regulatory and organizational framework documents and launching the program on the development of RW disposal facilities (RW DF);
  - Approval of criteria used to categorize waste as RW and enabling RW classification based on disposal route;
  - Commissioning the first start up unit of a near-surface RW DF by FSUE NO RAO in Novouralsk at JSC UECC site;
- Achieving long-term safe configuration of LRW surface storage pools, including:
  - Relevant efforts were completed at B-2 (JSC SCC), № 354 (JSC MCC), V-9 (FSUE PA Mayak);
- Establishment of spent nuclear fuel (SNF) management system, including:
  - Dry SNF storage facility at FSUE MCC (KhOT-2) was completed and commissioned with its capacity providing a space for long-term safe storage of over 20,000 tons of RBMK-1000 SNF and 10,000 tons of WWER-1000 SNF;
  - Development of a start up unit for pilot-demonstration SNF reprocessing center based on innovative technologies (hereinafter, PDC). This facility will enable to test relevant operating procedures based on innovative SNF technologies under its pilot-industrial operation;
  - Shipment of accumulated SNF from NPP sites for centralized storage and reprocessing. Wet storage facility at FSUE MCC site (KhOT-1) has accepted 1,359 WWER-100 SFAs; 3,754 research reactor SFAs and 2,211 FSUE Atomflot SFAs have been delivered to PA Mayak site for reprocessing;
  - Fitting RBMK-1000 NPP sites with SNF cutting complexes. A unified technology for RBMK-100 SNF packaging into containers and their shipment to FSUE MCC site was developed enabling to start practical efforts addressing the challenge of accumulated RBMK-1000 SNF at NPPs. In 2014—2016, KhOT-2 storage facility (FSEU MCC) accepted over 13,000 RBMK-1000 SNF from Leningrad and Kursk NPPs;
  - Transport cask TUK-141O and rail car TK-U-141 designed for WWER-1000 SFA with enhanced enrichment and burnup, as well as similar cask and railway car for WWER-440 SNF (TUK-140 and TK-U-140) were developed and tested;
- Development of federal norms and rules in the field of atomic energy use along with the development of IAEA standards;
- Development of safety requirements for facilities holding non-retrievable RW;
- Development of federal norms and rules setting general RW acceptance criteria for disposal.

All the above mentioned cases suggested by the Russian Federations were unconditionally accepted at country group meetings as "good result" examples. It should be noted that, in general, "good results" were found for each Contracting Party. The scope of "good result" definition appeared to be very broad with a too large number of facilities and activities implemented in the field of atomic energy falling under this definition; in fact, any new facility or process can be deemed as a "good result".

A completely opposite effect produced the introduction of the term "good practice". Its adoption actually introduced competition and abolished the declarative principle suggested by the Joint Convention immediately affecting upon the choice of the case studies discussed by the Contracting Parties.

With apparent difficulties, the Sixth Review Meeting of the Contracting Parties managed to identify and agree upon a quite small number of "good practice" examples. Moreover, acceptance of each practice as a "good" one depended exclusively on the country group decision and could not be changed procedurally at the plenary session (in the presence of other Contracting Parties).

Heterogeneity of facilities covered by the definition of "good practice" is viewed as an important,

and perhaps prevalent difficulty associated with its application, thus, processes and nuclear facilities being different in their nature had to be compared. Moreover, the external condition for comparison a priori viewed as an important one in terms of safety assurance, is not strictly formulated and may allow different interpretations. Existing approaches implemented to solve similar problems associated with comparation of heterogenous facilities by relevant hazard level are reduced either to comparing "homogeneous" facilities [2], or segregating groups of "homogeneous" facilities and then collating the facilities from different groups by reducing them to the same scope [3]. Another approach suggests reducing the problem to a substantially multiparameter one with homogeneous parameters used for comparison [4—7]. It should be noted that all the cases [2—7] suggest that the conditions for comparison were to some extent explicitly defined and normally involve those associated with safety assurance (hazard level, complex hazard indicator, etc.), while the conditions set for applying the definition of "good practice" are seen as rather more intuitive.

However, under existing provisions of the Joint Convention some approaches can be found, from the one hand allowing to use a unified application of "good practice" term in all country groups. On the other hand, to provide a less complex application, thus, suggesting that it can be implemented under the Convention procedures.

Two key ideas can be identified based on which relevant approaches may be developed and thanks to which these approaches may result in the development of effective recommendations or mechanisms.

The one similar to conditions applied in [2—5] suggests that current or forecasted level of safety is considered as a criterion. Preference will be given to practices allowing for a higher level of safety.

Certainly, some questions can inevitably arise concerning the meaning that should be put into the definition of safety (for example, radiation, environmental, risk of accidents, etc.). Moreover, non-unfounded fears exist that, in principle, the concept of safety can to be interpreted in different ways by the countries being party to the Joint Convention. Thus, one may find tempting to design a multi-component criterion, to select and formulate these components for further evaluation of practice and to integrate them with predefined weights. Under this complicated approach, the criterion would be nearly impossible to use within the timeframe of the Joint Convention procedures. Provisions stipulated in the objectives of the Convention [8] (paragraph 1 (ii), iii) can be used as a definition explaining the essence of the safety concept being viewed as an accepted one and already defined under the Joint Convention framework:

(ii) to ensure that during all stages of spent fuel and radioactive waste management there are effective defenses against potential hazards so that individuals, society and the environment are protected from harmful effects of ionizing radiation, now and in the future, in such a way that the needs and aspirations of the present generation are met without compromising the ability of future generations to meet their needs and aspirations;

(iii) to prevent accidents with radiological consequences and to mitigate their consequences should they occur during any stage of spent fuel or radioactive waste management.

Certainly, this definition can be viewed to some extent as a quite intuitive-expert in its nature. However, no other definition being that well-defined and at the same time simple in its application is available.

Another idea based on which relevant approaches can be developed suggests segmentation of facilities relevant definition can be applied for. The paradigm "good practice" was introduced for safety regulation purposes in the areas of SNF and RW management and decommissioning (table 1). In the field of SNF and RW management, it seems quite natural to perform facility segmentation based on major waste management stages (Table 1).

Table 1. Segments indicated for applying "good practice" definition in the field of SNF and RW management and nuclear decommissioning

SNF			
Open nuclear fuel cycle		Closed nuclear fuel cycle	
RW			
Pre-disposal treatment		Disposal	
Country with no nuclear facilities in place	Country with nuclear facilities	Country with no nuclear facilities in place	Country with nuclear facilities
Decommissioning			
Nuclear facilities		Other facilities for atomic energy uses	

SNF management. Storage and reprocessing stages can be considered as segments. Potential variations in the managed SNF amounts can be omitted as compared will be the activities implemented in countries with nuclear facilities, i.e. in countries with rather developed nuclear fuel cycle. SNF disposal stage is used by countries considering SNF as radioactive waste. Thus, only two segments can be considered for our purposes — SNF storage and SNF reprocessing.

RW management. Two key stages can be singled out — pre-disposal treatment and RW disposal (thus, the pre-disposal management stage should include

all relevant activities, i.e. collection, segregation, processing, conditioning, transportation and storage). Obviously, to compare "good practices" in the field of RW management, segments demonstrating the scale of implemented activities should be identified. As parameter for compared segment identification, actual annual amount of generation seems to be quite applicable supposing that the correlation of generated amounts and hazard level associated with RW management is high. The latter is not always feasible as the hazard level depends significantly on the considered RW class (for example, high-level vitrified RW from radiochemical SNF reprocessing and low-level RW from uranium mining). Therefore, despite the fact that actual annual amounts of RW generation can be considered as a quite lure and to some extent obvious segment for comparison, only two segments were proposed – availability or absence of nuclear facilities. Thus, four segments can be identified for RW management sector.

Decommissioning covers nuclear facility decommissioning and decommissioning of other facilities operated in nuclear power sector.

At the sixth Review Meeting, several facilities and types of activities were proposed by the Russian Federation as case studies of "good practice" application:

- Establishment of an integrated centralized complex for SNF management at FSUE MCC involving "dry" and "wet" centralized storage facilities, as well as facilities for SNF reprocessing and uranium-plutonium fuel fabrication;
- Priority principle in arranging decommissioning activities based on the evaluation of the facility's state and its site (these activities were primarily implemented at most hazardous sites located inside city boundaries, for example, decommissioning of B building at VNIINM site in Moscow);
- Standardized principle for arranging activities (for example, development of a facility for non-retrievable waste storage at the basis of decommissioned uranium-graphite reactor EI-2 at JSC PDC UGR site (Seversk)).

However, at country group meetings the above-mentioned case studies were only considered as "good practices". Discussion of FSUE MCC site facilities turned to be the one in which the Russian Federation was particularly sharply opposed by Australia and Spain.

Key objections were associated with the following:

- Uncompleted construction activities at the site;
- Availability of individual components in other countries;
- Possible increase in the hazard level of the facility due to the centralization of its components;
- Incomplete understanding of the facility's extent;
- Lack of interest among group members.

Given the experience gained, to achieve the desired results, the Russian Federation (State Corporation Rosatom, Rostekhnadkhor, IBRAE RAN, FBU SEC NRC) should make additional efforts to ensure strict adherence to the definition, in particular in terms of using exact wordings and providing reasoned responses to opponent objections. Moreover, it seems necessary to carry out preliminary awareness-building and explanatory efforts (publications, references in the national report, answers to the questions, and etc.).

In addition, let's discuss two more aspects of the desired changes in the application of "good practice" concept.

Firstly, as it comes to examples of "good practices" in each country, experience on identifying the best case studies at country group sessions has shown that there are no obvious indications suggesting who, in which composition and how should select the best practice in a particular country. Following the declarative principle for data transfer adopted under the Joint Convention, it seems possible that countries themselves select examples of "good practice" within their country (no more than 1—3 examples) similar to the way they are submitting relevant information in the National reports. In this case, these should be provided with a description at the stage of national report submittal to IAEA. Probably, we can confine ourselves to this without being engaged into a consensual, but apparently professionally biased discussion.

Secondly, specific feature of the procedure considered as an almost insuperable difficulty in the decision making on the best examples of "good practices" and which should be transformed into workable one, was also the fact that the right to choose the best examples among countries was also given to group session representatives with national reports being submitted by countries with radically different levels of atomic industry development. Another issue that has manifested itself during the Meeting, was the lack of sufficient knowledge of countries with highly developed nuclear power sector (USA, France, Russia, China, UK, Japan and others) on the problems of countries with less developed nuclear industry, not to mention the "new comer" countries, and vice versa. These aspects do not allow to choose equally competitive facilities or processes, and to select the best one or the best ones out of them. Apparently, it seems more objective and effective to make such comparison among countries being characterized with comparable levels of nuclear power development, or not to compare the practices at all.

In conclusion, it can be stated once again that there is no rejection to the idea of "good practice"

and emphasizing the results of advanced activities aimed at ensuring safety among the Contracting Parties. However, this concept urgently requires some creative upgrading in terms of its application procedure.

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