

THE IMPORTANCE FOR BULGARIA OF MULTILATERAL APPROACHES TO THE BACK-END OF THE NUCLEAR FUEL CYCLE

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Abstract

Bulgaria has a comparatively small nuclear program, but this provides a significant contribution of about 45% to the total electricity production in the country. There are 4 VVER units in operation at Kozloduy NPP and the national energy policy foresees construction of a further plant, Belene NPP. Further development of the nuclear option is dependent on the assurance of both fresh nuclear fuel supply and long-term management of spent fuel and high level waste. Because of the technical and economic challenges involved, international co-operation (bilateral and multilateral) in the back-end of the nuclear fuel cycle is a strategic issue of prime importance. This approach is very politically and socially sensitive at home and abroad and requires international consensus on the legal framework. For Bulgaria, as a producer of nuclear energy which relies on imported fresh nuclear fuel, an option of major interest is to seek a final solution for dealing with spent fuel in co-operation with the supplier of fresh fuel, i.e. Russia at present. But Bulgaria does not address only this option. In parallel, Kozloduy NPP is one of the founding organizational members of the international association ARIUS, established in 2002 in Baden, Switzerland. Thus the country also directly supports the mission of ARIUS, namely the promotion of concepts for safe, secure, economic and politically and socially acceptable regional and international storage and disposal of spent fuel and high level waste. Bulgaria also participates directly in the SAPIERR project that was initiated by ARIUS under the 6th Framework Programme of the European Commission in order to study the concept of regional repositories to be shared by European partners. The range of Bulgarian waste management activities - including practical issues at the power plants, national studies on waste treatment, and involvement in the bilateral and multinational approaches described above - ensures that the country continues to maintain the necessary technical expertise for input to future decision making in this key area of the nuclear fuel cycle.

Introduction

The Bulgarian nuclear power production program started in the 1960s, based on the scientific and technological achievements of the former Soviet Union. The program has involved construction and operation of 4 VVER-440 and 2 VVER-1000 units at Kozloduy Nuclear Power Plant (KNPP). The construction of a second Bulgarian NPP started in 1980 near the town of Belene, but was stopped in 1991 for financial and political reasons. According to the agreements between the Bulgarian Government and the European Institutions, the first two VVER-440 units were shut down in 2002 and the operation of the other VVER-440 units should be terminated at the end of 2006. Consequently, in 2004 and 2005 the Government took decisions in principle and for construction of two 1000 MW units at Belene NPP. The decisions are in compliance with the national Energy Strategy, in particular for keeping the contribution of the nuclear power production at about 45% to the total electricity production in the country.

The management of spent fuel (SF) from Kozloduy NPP is a part of the sustained safe and effective operation of the NPP. The approaches for safe, environmentally acceptable and efficient management of SF and/or high level waste (HLW) from fuel reprocessing are

determined by the options available for their long-term storage and disposal. Prior to 1988 the spent fuel was accepted back in the Soviet Union without commitment for return of HLW to Bulgaria. Since 1998, the acceptance of spent fuel from KNPP in Russia has been conditional upon the future return of the HLW from reprocessing of the fuel. For the future strategy, two main approaches have been undertaken:

- Further co-operation with the fresh fuel supplier, i.e. Russia - At present, governmental negotiations on the reconsideration of the obligation for HLW return are being carried out;
- Looking for solutions at international/regional level – Kozloduy NPP has been an organizational member of the international association ARIUS, since its establishment in 2002 in Switzerland. The mission of ARIUS is the promotion of concept for safe, secure, economic and politically and socially acceptable regional and international storage and disposal of SF and HLW.

The potentially mutually beneficial results of bilateral and multilateral international cooperation were considered during the updating of the national Strategy for Management of Spent Fuel and Radioactive Waste, adopted by the Bulgarian Government in 2004. Regarding the long-term management of SF and HLW the strategy foresees:

- coupling commercial contracts for fresh fuel supply with spent fuel return, and
- continuing studies on international repositories.

International cooperation

The concept of shared facilities (international, regional, multinational, etc.) for radioactive waste management is not new. The issue has been discussed internationally for many years and a number of initiatives have promoted advantages of international disposal – Non-Proliferation Trust (based in the USA), Pangea Project, Minatom (Russian) Initiative, ARIUS association, etc. There is a wide and growing acceptance that regional and international repositories can bring environmental and economic benefits and can help to improve global safety and security. They will not replace national repositories, some of which are moving ahead towards implementation. Both national and multinational facilities will be needed. The development of a geological repository is a very long term project and requires considerable scientific, technical and financial resources. Many countries, especially those with comparatively small nuclear programs like Bulgaria, recognize that regional repositories may be the only feasible option for them to solve the problem of safe and economic disposal of SF and HLW (and of other long lived wastes) and thus to continue using the benefits that nuclear energy offer. This option has been deliberately kept open in the EC proposals for a Directive on the Management of spent Fuel and Radioactive waste, and this is the reason EC that the Commission supports the SAPIERR project (Support Action: Pilot Initiative on European Regional Repositories).

The SAPIERR project (www.sapier.net) was initiated by Arius under the 6th Framework Programme of the European Commission in order to study the concept of regional repositories to be shared by European partners. The project is managed by a consortium composed of DECOM Slovakia and ARIUS, and involves a working group including 21 organizations from 14 different countries across Europe. Bulgaria also participates directly in the project.

SAPIERR is a pilot initiative to help the EC to begin to establish the boundaries of the issue, collating and integrating information in sufficient depth to allow concepts for potential regional options to be identified and the new RTD needs to be scoped. Specific proposals for

regional facilities, including potential siting are not part of this initial pilot study. The first deliverables from the project regarding the legal and political aspects and the SF/waste inventory overview are completed and available on the SAPIERR website. The project is currently in the middle of Work Package 2, which involves analysis of the data gathered so far to make a first set of observations on feasibility issues for a shared, regional European repository. In many ways, this is the major element of the project, as it is where the first quantitative implications of a European shared storage and disposal scheme can be defined. The work is evaluating the nature and scale of shared repositories for HLW/SF with and without co-disposal of long-lived intermediate level wastes (LL-ILW). This will be presented in terms of design options, size, transport and siting implications, and economics. It is already clear from the preliminary findings that the project will identify considerable savings of European resources. Arius and the SAPIERR partners will also be preparing a follow-on proposal for the EC to be submitted this October. The current SAPIERR project has only been able to evaluate a relatively restricted number of issues and in only a superficial manner. There are many, already well-identified topics, that will need to be looked into in much more detail if adequate information is to feed into decisions on the principle of European shared solutions.

During recent years the IAEA has also expressed an encouragingly clear position on the topic of multinational repositories. In 2004 the Agency published *TECDOC-1314, Developing multinational radioactive waste repositories: Infrastructural framework and scenarios of cooperation*, prepared with considerable input from ARIUS. Two basic scenarios that could lead to shared repositories have been defined by the IAEA and Arius is directly involved with initiatives corresponding to both approaches. The first is the “cooperative scenario”, in which a number of generally small countries collaborate to identify siting possibilities for one or more shared repositories within their combined territories. The SAPIERR project has started down this avenue. The second main IAEA scenario is the “add-on” option, which involves one, generally large, nuclear programme accepting wastes for disposal from other countries. Various large countries have been suggested as potential hosts, but the most realistic prospect at present is Russia, where the Government favours consideration of hosting an international repository. Here Arius also keeps a finger on the pulse, most recently by its invited participation in meetings in Vienna and Moscow on the Russian initiative. Bulgarian experience of Russian cooperation in this field could be very useful not only to Bulgaria, but to the other countries.

The IAEA has also been supportive in other ways – for example, inclusion of the issue in various IAEA conference contributions. Most prominently, however, the position of the IAEA is reflected in the numerous public statements of its Director General on the potential safety and security aspects of multinational repositories. Most explicit are the following remarks made at the Forty-eighth Regular Session of the IAEA General Conference on 20 th September 2004:

"The Agency continues to assist Member States in developing waste management and disposal strategies — and I am pleased to see the renewed interest in multinational approaches to spent fuel management and disposal. More than 50 countries now have spent nuclear fuel, including fuel from research reactors, stored in temporary sites, awaiting disposal or reprocessing. I am encouraged that the Russian Federation has expressed interest in an international approach to spent fuel storage and reprocessing, and has agreed to work with the Agency in giving consideration to its feasibility. We intend to hold a conference in Russia next year to discuss ways of moving forward with international cooperation on such an initiative."

Multinational alternatives to national storage and disposal of spent nuclear fuel are one of the approaches to tighten up the Non-Proliferation of Nuclear Weapons. In this respect, IAEA Director General Mohamed ElBaradei appointed in 2004 an international group of experts to consider possible multilateral approaches to the nuclear fuel cycle. The Group was chaired by Bruno Pellaud, ex-DDG for Safeguards, and included senior representatives from 26 countries. The group held 4 meetings, each a week long, within its year of operation and presented its final recommendations to the DG on 22 nd February 2005. The topics covered by the Group included all aspects of the nuclear fuel cycle, with most emphasis on the especially sensitive technologies such as uranium enrichment and fuel reprocessing. The topics of storage and disposal of sent fuel and radioactive wastes were also prominent, however. In the Expert Group report “Multinational approaches to the nuclear fuel cycle”, five multilateral nuclear approaches are suggested and these directly concerning SF and HLW are following:

“The objective of increasing non-proliferation assurances concerning the civilian nuclear fuel cycles, while preserving assurances of supply and services around the world, could be achieved through a set of gradually introduced multilateral nuclear approaches (MNA):

1. Reinforcing existing commercial market mechanisms on a case-by-case basis through long-term contracts and transparent suppliers’ arrangements with government backing. Examples could be: fuel leasing and fuel take-back offers, commercial offers to store and dispose of spent fuel, as well as commercial fuel banks.

3.Promoting voluntary conversion of existing facilities to MNAs, and pursuing them as confidence-building measures, with the participation of NPT non-nuclear-weapon States and nuclear-weapon States, and non-NPT States.

4. Creating, through voluntary agreements and contracts, multinational, and in particular regional, MNAs for new facilities based on joint ownership, drawing rights or co-management for front-end and back-end nuclear facilities, such as uranium enrichment; fuel reprocessing; disposal and storage of spent fuel (and combinations thereof).....”

Arius has followed the work closely and is developing back end strategies in accordance with the MNA group recommendations. In fact, the external support provided by Arius through the appearance before the Group of the Executive Director is acknowledged in the report.

Conclusions

The bilateral and multilateral approaches to long-term management of the SF from Kozloduy NPP indicate the importance for Bulgaria of the multilateral approaches to back-end of the nuclear fuel cycle. With all of these activities for international cooperation, Bulgaria intends to contribute to, and benefit from, finding a final solution for SF and HLW from Bulgarian nuclear power production and thus helping prepare the way for the future development of the Bulgarian nuclear programme, including construction of new nuclear power units.

With the recent formation of a Bulgarian state enterprise directly responsible for long-term waste management, the duty of supporting further initiatives such as those described is shared with KNPP. It is important for Bulgaria and for the international community that Bulgarian support for multinational initiatives is seen to continue.