



## Arius and the ERDO Working Group

### Joint Annual Report of Activities for 2017

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# 1 Introduction

The prime focus of Arius activities during 2017 continued to be provision of a secretariat for the ERDO Working Group (ERDO-WG), although a new activity - direct support for the USDOE work on multinational repository concepts – has started up. Since the Arius and ERDO-WG activities related to multinational/regional storage and disposal concepts are so closely interrelated, the annual reporting for 2017 is once again in the form of a joint report to both the ERDO-WG and the Arius membership.

## 2 Interactions with the IAEA

### 2.1 INPRO Project

In 2015, the INPRO group at the IAEA got involved with the issue of cooperation at the back-end of the fuel cycle, including consideration of multinational disposal facilities. The INPRO objective is to produce a report on “Cooperative Approaches to the Back End of the nuclear fuel cycle: Drivers and Institutional, Economic and Legal Impediments”.

The current status of the planned report is that authors are working on all sections of the document, whose core chapters are on:

- Cooperative Approaches based on existing Back End Fuel Services
- Cooperative Approaches based on Advanced Recycling options
- Cooperative Approaches based on “take back” service
- Multinational Repository Concept: Opportunities and Incentives for Consideration by Potential Service Providers.

The activities are led by three different IAEA member states: the Russian delegation focuses on fuel cycle cooperation, the French delegation specifically on recycling and the US delegation on multinational repositories. As will be described below, Arius has been rewarded a contract by the US-DoE to support the work of their delegation. The current status is that the outline for the Chapter on Multinational Repository Disposal has been agreed and draft texts are being circulated amongst participants, with a major part of the responsibility being delegated to Arius. A main distinguishing feature of the INPRO study is that – in contrast to the various IAEA reports that concentrate on the “partnering scenario” – INPRO is focussing on a service provider scenario and is exploring the incentives that could lead to the emergence of such providers, the availability of a market for such services and also the practical steps that would need to be undertaken by a potential service provider. Drafting meetings took place in 2017 at the IAEA in Vienna in May and in October.

### 2.2 Further IAEA activities of relevance

At the invitation of the IAEA, Neil Chapman participated from 11-15 December 2017 in Vienna in an IAEA Consultancy Meeting on small inventory disposal. Costs for this are borne directly by the IAEA.

It should be noted that Arius has been a major contributor to IAEA publications on the topic of multinational cooperation for over a decade now. These are listed pro memoria in the footnote below<sup>1</sup>.

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<sup>1</sup> •IAEA (2004), Developing multinational radioactive waste repositories: Infrastructural framework and scenarios of cooperation, IAEA-TECDOC-1413, 2004  
•IAEA (2005), Multilateral Approaches to the Nuclear Fuel Cycle: Expert Group Report to the Director General of the IAEA, 2005  
•IAEA(2005), Technical, economic and institutional aspects of regional spent fuel storage facilities, IAEA-TECDOC-1, 2005  
•IAEA (2011), Viability of Sharing Facilities for the Disposal of Spent Fuel and Nuclear Waste, IAEA-TECDOC-1658, 2011  
•IAEA (2013), Options for Management of SNF and Radioactive Waste for Countries Developing Nuclear Programmes, NW-T-1.24, 2013.  
•IAEA (2016) “Framework and Challenges for Initiating Multinational Cooperation for the Development of a Radioactive Waste Repository” (IAEA Nuclear Energy Series No NW-T-1.5 2016)

## 3 Regional and multinational developments at the EC

### 3.1 Context of current situation

As described in the 2016 Annual Report, the Secretariat of the ERDO-WG had earlier direct discussions with EC staff at DG-ENER, pointing out the fundamental problem of the almost exclusive focus of EC support for radioactive waste management on national research programmes and, in particular, on research programmes into geological disposal by advanced Member States. The response received after our original meeting in 2016 stated *“We will keep you informed about the developments”*. However, no feedback was received from Luxembourg during 2016 and, accordingly, after sidebar discussions with Borislava Batandjieva at the IAEA conference at the end of 2016, the ERDO-WG prepared a letter requesting further discussions, including the new head of waste management at DG-ENER, Ioanna Metaxapoulou. A meeting then took place in Luxembourg on 15th May 2017. From ERDO/Arius side, attendees were Ole Kastbjerg, Neil Chapman and Charles McCombie. From the EC side, the participants were the two ladies mentioned above and Manuel Martin-Ramos from JRC, with Christoph Davies from DG-RTD in Brussels joining by teleconference.

A report of the meeting has been published on the ERDO and Arius websites. The most positive development was that the Evaluation Report of the EC on Waste Directive submissions (which came out on the day of the meeting) included in its first “Conclusion” the following text<sup>2</sup>.

*“The Commission will continue supporting Member States in addressing the relevant challenges as follows:*

*– Discussion on options for radioactive waste and spent fuel disposal, including shared solutions and the role of public participation in the decision-making process. The Commission stands ready to support the Member States in assessing the economic, legal and social impacts of shared repositories, given that the sharing of facilities for spent fuel and radioactive waste management, including disposal facilities, may be a potentially beneficial, safe and cost-effective option.”*

The more disappointing result was that the discussions confirmed the main conclusion that the ERDO-WG has drawn from previous interactions with EC officials in DG-ENER and DG-RTD, namely that a continuing problem is the lack of mechanisms in DG-ENER to provide support funding to less advanced programmes (LAPs) that have more strategic needs than R&D requirements. The support of DG-RTD continues to be strongly focussed on advanced R&D activities that are of most benefit to leading national radioactive waste management programmes in the EU. This situation has been described recently in a publication by ERDO-WG secretariat members to be published in Nuclear Engineering International in February 2018. The text of this paper is included as Appendix 2 of the present report.

Further interactions with EC officials have taken place in 2017 in the scope of the JOPRAD project and the proposed European Joint Programming which should follow-on from JOPRAD. These initiatives are described below.

### 3.2 The TRACK proposal to Horizon 2020

It was decided in 2016 that the strategic type issues which the ERDO group had proposed to the RC in the COMS-WD project, but were rejected as being “out of scope”, could potentially be integrated into the TRACK proposal coordinated by RAWRA from the Czech Republic (Tracking and sharing radioactive waste management knowledge). ERDO-WG involvement was proposed primarily through the participation of COVRA and ARAO. Providing input during the preparation of TRACK involved significant effort in 2016 from the ERDO-WG Secretariat, and in particular from Ewoud Verhoef and Tomaž Žagar, who were direct participants in meetings leading up to the final proposal submitted at the beginning of October 2016. In early 2017, the EC informed the TRACK coordinators from RAWRA that the proposal had been rejected – not because it failed to reach the required qualification score, but because insufficient funding was available. (Side remark – it appears that only about 12% of proposals are funded, which makes questionable the large effort needed to submit a

<sup>2</sup> The report is available in multiple languages at <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017DC0236>

proposal). It appears that DG-RTD of the EC intends to focus on implementing a European Joint Programme as a vehicle for coordination its support of radioactive waste management research, as described below.

### 3.3 European Joint Programming (EJP)

The JOPRAD EC Project has concluded. JOPRAD was intended to assess the feasibility of European Joint Programming in radioactive waste management - but the EC appears to have already decided before completion of the project that this is the way to go. A JOPRAD meeting was held in London on 4 April 2017 to present the results on the prioritisation of research topics; this task was undertaken mostly by MCM of the UK which analysed the numerous questionnaires returned by WMOs, Technical Support Organisations (TSOs) and Research Entities (REs). The prioritised list of potential activities is intended to serve as basis for a Strategic Research Agenda which would underpin a European Joint Programming (EJP) effort. Accordingly, the overall EURATOM work programme 2018<sup>3</sup> includes a call for EJP proposals (Euratom-NFRP-2018) aiming to support early start-up of *“the world’s first geological disposal facilities”* for HLW, and also *“to improve, innovate and develop science and technology for the management and disposal of other radioactive waste categories; and to manage and transfer knowledge and competences between generations and across Member States’ national programmes”*. Interesting for ERDO and Arius is that the call states that *“the EJP should cover all related activities: common research and strategic studies, sharing of facilities, knowledge management, mobility and training of researchers”*. The call opens on 15<sup>th</sup> May 2018 and the sum available can be up to 32.5M EUR

An ad-hoc Core Group, established under ANDRA leadership already during the execution of the JOPRAD project, is seeking participants and proposals for an EJP submission. The ad-hoc Core Group has made a proposal for the organisation and governance of the EJP including rules for submission of projects. Each project in the EJP should involve at least 5 countries and two actor groups (e.g. WMO, TSO), be ‘owned’ by Ministries and comprise Mandated Organisations (WMOs, TSOs, REs) and Linked 3rd Parties (e.g. Civil Society organisations – i.e., NGOs). Based on the unweighted preferences of contributors to the JOPRAD project, the Core Group has identified 6 R&D projects that should be in a first wave of work (budgeted at around 17M EUR) together with a 2 Networking Work Packages (WPs), with a very limited part of the budget allocated to the Networking.

For the ERDO-WG, the most relevant Networking WP is “WM Routes in Europe” and the WG developed two outline project proposals for submission to the EC for inclusion in the Joint Programming schedule. These were ERDOS-1: Impact of different small-scale (geological) disposal options on operational LAP waste management routes and ERDOS-2: Routes to shared storage and disposal facilities for LAPs in Europe. After iterations with COSMAR (a consortium of further LAPs) a Task 5 based on ERDOS-2, was submitted with the title “Shared regional facilities for conditioning, storage and disposal of wastes”, with COVRA as the proposed task leader. Eleven MS supported the task. ERDOS-1 was used as input for Task 4: “RWM solutions for countries with small waste inventories: Identifying inventory-specific solutions for small-scale disposal and their impacts on waste management routes”, with the lead allocated to the Greek participant, Demokritos from the COSMAR consortium.

Neil Chapman represented the ERDO–WG proposals at a meeting held at IRSN in France on 28th of September 2017. A further overview meeting organised by the EJP Core Group leader at ANDRA on the status of all Work Packages in the EJP planning was attended by Ole Kastbjerg and Charles McCombie on 18 October 2017. Neither meeting brought much clarity concerning the proposed Task 5. The views of the Core Group seemed to indicate that very little funding would be available and that mention of MNRs was viewed as “political” and possibly out of scope. A further meeting was held in Madrid on 20th November on the “Networking WP on waste management routes in Europe from collection to disposal”; this was attended by Ewoud Verhoef. Following this, there was still no agreement on Tasks and subtasks. On 3<sup>rd</sup> December 2017, however, the Coordinating Group circulated a revised WP description, with Task 5 still included and with requests for further detailed input. It was suggested, however, that the Task should be reduced and might be initiated only 2 years into

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<sup>3</sup> Downloadable at [http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/euratom/h2020-wp1820-  
euratom\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/euratom/h2020-wp1820-euratom_en.pdf)

the EJP. On behalf of the ERDO-WG and the other Task5 supporters, the Secretariat produced a version with a reduced scope but argued that the work on documenting experience and interest in shared facilities in Europe should not be delayed. This was submitted in January 2018. The next step in the EJP proposal process is a special meeting on WMOs organised by the IGD-TP to review all of the Work Packages. From the ERDO-WG, COVRA, DEKM and ARAO are invited to attend.

### 3.4 First submissions to the Waste Directive

During 2016 and 2017 the EC reviewed the first series of annual Waste Directive reports submitted by national waste management programmes. It also appears that around half of Member States have referred to the possibility of multinational/regional disposal facilities. The full results of the EC analysis have now been published in the report from which conclusions are quoted in section 3.1 above. Accordingly, a further EC event which appeared to be very relevant for ERDO-WG was a Workshop held in Brussels on 7th November 2017 on the Implementation of Council Directive 2011/70/EURATOM Establishing a Community Framework for the Responsible and Safe Management of Spent Fuel and Radioactive Waste – Lessons Learned and Way Forward. Invitations to this event went through the European Parliament Working Group on Atomic Questions. Leon Kegel from ARAO was present at the meeting. Mrs. Joanna Metaxopoulou, European Commission DG ENERGY – Head of Unit D2: Nuclear Energy, Nuclear Waste and Decommissioning, stated in session 1 on National policies and inventories for spent fuel and radioactive waste that around half of MS consider shared disposal solutions, but without specifying specific measures that they are undertaking in this respect. In the same session Marco Brugmans from ANVS in the Netherlands presented the Dutch National policy and programme with its explicit dual track approach to repository implementation.

### 3.5 The way ahead for ERDO in the EC framework

Currently, the only open path for interacting with the EC appears to be through the EJP, despite the fact that this is focussed on R&D issues rather than strategic approaches to sharing facilities. Although only minor levels of direct support can be expected even if the Task proposed by ERDO Members in the EJP finally is funded, and although a disproportionate amount of preparatory work by ERDO-WG may be required, it is considered worthwhile to pursue this approach in order to ensure that multinational disposal approaches are formally included in EC activities.

However, the prime thrust of ERDO-WG efforts should be devoted to engaging with DG-ENER rather than DG-RTD. The evaluation report presented by the EC to the European Parliament includes the following clear text:

*Moreover, half of Member States are considering the possibility of shared solutions for disposal either as a preferred or as an alternative option (the 'dual track' approach). However, none of the Member States' programmes or reports set out concrete milestones or measures towards the implementation of such a solution. While the Directive allows shared disposal solutions to be developed, a policy based only on this option, without a clear path towards implementation, cannot be regarded as being in line with the aims of the Directive.*

The conclusion to be drawn from this is that the ERDO-WG could usefully work towards a) establishing a more formalised structure, preferably domiciled in one of the Member countries, b) expanding membership, c) reviewing and updating its earlier work on structuring a multinational disposal organisation and d) developing the required "clear path towards implementation" which will need a multi-year project plan and an adequate budget.

## 4 Other Interactions

### 4.1 IFNEC (International Framework for Nuclear Energy Cooperation)

The Reliable Nuclear Fuel Services Working Group (RNFSWG) of the IFNEC project held a meeting in Paris in May 2016 to try to advance the document being prepared on "Practical

Considerations to Begin Resolving the Final Spent Fuel Disposal Pathway for Countries with Small Nuclear Programs”<sup>4</sup>.

RNFSWG meetings took place in Paris in June and in November 2017. A survey of the IFNEC members was carried out to assess the priorities which they allocate to a list of potential activities which they had developed. After some iteration, the Spring 2018 meeting of IFNEC will look at:

- Financial issues: assist member countries in understanding costs associated with the development of a multinational repository
- Long term storage: technological issues, comparison of different technologies, the feasibility, costs and issues associated with a program committed to long-term storage.

Tomaz Zagar, formerly of ARAO, remains the co-chair of the IFNEC sub-group so that multinational issues will not be excluded from the discussions.

## **4.2 UK Nuclear Institute Young Generation**

On 15th June 2017, the Young Generation Forum of the Nuclear Institute held a meeting in Manchester, UK. This included a workshop entitled “Looking at Multinational Approaches for the Back End of the Fuel Cycle”. Charles McCombie took part for one day, made a presentation on this topic (complemented by a video presentation from the South Australian group) and helped organise a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis of the multi-national option. The young participants were strongly in favour of the concept, although the opinions on the practical feasibility were less unanimous.

## **4.3 South Australia MNR initiative**

The decision in 2015 by the government of South Australia to set up a Royal Commission charged with examining the business cases for South Australia expanding its activities in the nuclear fuel cycle was recognised as an exciting new development globally. Significant input to the Royal Commission was given from Arius/ERDO-WG. Following the publication of the Commission’s report, the South Australian government set up a special Agency to develop its response. The agency initiated a complex public consultation process involving stakeholder juries. This culminated in a negative response from the final jury, based largely on objections from indigenous peoples and on questions raised about the financial risks that South Australia might have to accept. One important result of this setback was that the State Government no longer could count on political support from the political opposition and therefore did not repeal existing legislation which prevents resources being spent on further examination of the multinational repository concept. Nevertheless, representatives from the South Australian government have taken an active part in the INPRO activities mentioned above. Any further actions in the short time are unlikely, but the South Australian government continues to monitor developments on this topic.

## **4.4 US Organisations: Stimson Foundation, AAAS, NTI**

For several years up to 2016, Arius work on promoting multinational repository concepts was directly supported by the US Sloan and Hewlett foundations, with emphasis on examining how the work being done in Europe could be applied in Asian regions. As described in the previous annual report, this work was completed to the satisfaction of the funding bodies and publications were produced on the results. Currently a further US organisation, the Stimson foundation, is preparing a project on MNRs, with emphasis being on security, non-proliferation and public acceptance issues. Arius has been invited to participate in this project and is currently negotiating the terms under which this could be possible. Further participants in the project would be the University of Queensland, the American Academy of Arts and Science (AAAS) and the Nuclear Threat Initiative (NTI).

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<sup>4</sup> The report is available on the Internet at: [https://www.ifnec.org/ifnec/upload/docs/application/pdf/2016-11/ifnec\\_rnfswg.pdf](https://www.ifnec.org/ifnec/upload/docs/application/pdf/2016-11/ifnec_rnfswg.pdf)

Arius has been involved in the past with the AAAS in the scope of its ongoing its Global Nuclear Futures project and also with the NTI in its studies of the back-end of the fuel cycle.

## **5 Papers and Presentations 2017**

There have been fewer papers and presentations in 2017, in part because of the unusually large resources that were needed for preparing for and participating in events such as the two ERDO-WG meetings and external meetings with EC officials and with potential participants in the EJP. The NEI paper summarising progress with multinational initiatives is appended. Presentations have been prepared by all participants at the ERDO-WG meetings in May and November, by the secretariat for the DG-ENER meeting in May and by Tomaz Zagar, Leon Kegel and Charles McCombie for the YG Manchester in June. All of these presentations are available on demand from the secretariat.

## **6 Specific ERDO-WG Activities**

Since its inception in 2009, a total of 11 EU Member States have participated directly in ERDO-WG activities, although some of these have subsequently withdrawn, primarily because of the financial requirements. Currently, there are six full Members. ERDO-WG meetings have taken place over the past years in the Netherlands, Italy, Slovenia, and Poland. The limited resources available to ERDO-WG have increasingly restricted the opportunities for full face-to-face meetings, but exceptionally two such meetings took place in 2017.

An ERDO working group meeting took place in Vlissingen in the Netherlands on 8/9th May 2017. The main objectives of the meeting were to discuss the WG relationship to EC projects that might be identified for European Joint Programming. Following an update on National positions within the ERDO countries, the outline projects, ERDOS-1 and ERDOS-2, mentioned above, were agreed upon. A further key agenda item involved a pre-discussion on approaches to be used in discussions with DG ENER in Luxembourg in the following week.

A further ERDO-WG meeting was hosted by the Austrian Ministry in Vienna on 24/25th October 2017. Key agenda items were discussing and agreeing the mechanism for involvement in the EJP and also the content of proposals to be put by the ERDO-WG. COVRA and DEKOM both agreed to volunteer as Task leaders in the EJP proposals being put forward by ERDO-WG. It was also decided at the meeting to update the ERDO-WG website and this has since been done.

## **7 Specific Arius Activities**

Arius has a broader mission to promote multinational storage and disposal concepts globally. The most intensive work of Arius, however, has been in Europe, because the established framework of the EU was more conducive to the early setup of a dedicated body which became the self-financing ERDO-WG. Interest in ensuring that Arius activities and initiatives also extend to other global regions has proven to be sufficiently high in the past that significant support was provided by the US Sloan and Hewlett Foundations. Currently the USDOE is financing an advisory contract to Arius to support the Department in its various current activities related to multinational repositories, in particular in the scope of the INPRO project and the IFNEC studies described earlier in this report.

Pending administrative issues at Arius include finalising and submitting the new Constitution. This should abolish fees for individual Members and acknowledge that ERDO-WG Members are automatically Arius Members, without having to pay additional fees. In addition, the domicile of Arius in Switzerland has changed following the closing down of the MCM Consulting Company in Switzerland which, until the end of 2016, provided office infrastructure.

### **7.1 Financial Issues**

#### **7.1.1 ERDO-WG funding**

Members of the ERDO-WG are nominated by the governments of EU Member States, each of which commits to provide annual funding. These funds are transferred to the Netherlands

waste management organisation COVRA which then manages and dispenses them as required. The total funding is sufficient to maintain a part-time Secretariat and this is provided by Arius. The resources, however, are not adequate for financing of specific project work; if such work is undertaken it must be funded by external organisations. Efforts to obtain some financial support from the EC have so far not been successful.

### 7.1.2 Other sources of Arius funding

Over its lifetime, Arius has been fortunate to receive higher funding through other contracts, all of which must by definition be related to the issue of multinational cooperation in radioactive waste management. Originally, Arius was funded by Organisational Members, and by modest annual fees from individual Members. In the early years, the SAPIERR projects were made possible by significant funding from the EC. Smaller contracts have also been carried out for individual national programmes interested in specific aspects of multinational cooperation. Examples of such contracts have been from Switzerland, Italy, the Republic of Korea and the UAE.

With the establishment of the ERDO-WG, which included several organisations that were already in Arius, the Organisational Member fees for Arius were significantly reduced. The new Arius Constitution currently being developed proposes that ERDO-WG members automatically become Arius members, with a portion of the contribution being used for Arius infrastructure, that and Organisational Member fee be retained for other bodies that may be in Arius but not in the ERDO-WG, and that the Individual Member fee be dropped, since the administrative efforts in collecting and managing the small amounts do not justify the resulting revenue.

The funding mechanisms for Arius and ERDO are illustrated graphically below. Detailed financial reporting is a legal necessity for the Arius Association and this will be prepared for the approval of members, as has been done in past years.

