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Editorial

There have been rapid developments over the spring and summer on the global initiatives to promote security in the fuel cycle (GNEP and GNPI). They have enormous potential to drive forward shared and regional back-end solutions, as we discussed in our previous two Newsletters, and we provide a detailed update in this issue. SAPIERR II is in its mid-term, with considerable effort now going in to developing proposals for a European Development Organisation for regional repositories. It is encouraging to see SAPIERR II interacting with the CATT project on sharing technological expertise within Europe. Indeed, current work on the economics of shared European regional repositories in Work Package 3 of SAPIERR II indicates that a large proportion of the multibillion EUR cost savings that can be made by sharing are associated with the possibilities of sharing knowledge and experience, so that work is not repeated unnecessarily in many countries.

Our Topical Article in this issue looks at the 'nuclear renaissance' and its possible impacts on the need for multinational waste management solutions. As nuclear electricity is seen as a key element of the fight to reduce carbon emissions and as more nations look towards nuclear power, the need for shared back-end solutions will certainly accelerate.

*Neil Chapman
Baden-Dättwil*

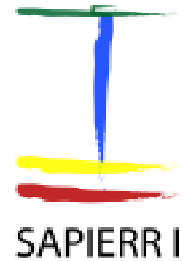
Arius Internal News

2007 Extraordinary Assembly of Members

The 2007 Extraordinary AoM will take place on 25th October 2007 in Vlissingen, Netherlands, at the COVRA headquarters. As usual, this annual meeting takes place towards the end of the year in order to allow Arius members to discuss our plans and budget for the following year, 2008.

Any corporate or individual Member of Arius wishing to attend and who has not already made arrangements with the Secretariat, should contact Sylvia Mieth of Arius and/or Marianne Cornet (marianne.cornet@covra.nl) of COVRA immediately.

SAPIERR II Workshop in the Netherlands



June 6th – 7th saw the 2nd meeting of the team working on the EC Project SAPIERR II (Strategic Action Plan for Implementation of European Regional Repositories: Stage 2), hosted by COVRA at their headquarters in the Netherlands. The main findings and progress of the different work packages were presented and discussed. A key objective was to ensure adequate information flow between Work Packages (WPs) and to agree a common approach to applying project boundary conditions and base scenarios. The seven WPs in SAPIERR-II are:

1. Legal and business options
2. Legal and liability Issues
3. Economic implications
4. Safety and security impacts
5. Public and political attitudes
6. Strategy and Project Plan
7. Management & dissemination of information

The planned joint CATT-SAPIERR workshop (see following item) was discussed towards the end of the meeting. Following the SAPIERR discussions, there was an opportunity for participants to visit some of the COVRA waste management facilities. The workshop was attended by all WP leaders, as well as representatives of all Project partners and of the EC.

Ewoud Verhoef opened the meeting with an overview of the project status, including an update on the status of the SAPIERR Interest Group (SIG) which has been joined by more than ten organisations. A draft document was presented, with three different implementation scenarios:

1. One repository for all HLW/SF and LILW in granite or clay
2. One repository for HLW/SF and one for LILW in granite or clay

3. Two repositories in granite or clay, each containing half of the HLW/SF and half of the LILW inventory

It was decided to include Scenario 3 as an option to look at shared repositories for smaller waste inventories and because two repositories could be preferred for reasons of transport, equity, timing, and security of supply. It was decided to use the SAPIERR-1 inventory despite changes in waste quantities and participating countries, and to make additional comments in the final document on the inventory used. The scenario document is now a 'working document' but will be converted into a 'high-level' publication toward the end of the project.

Introducing WP 1, Piero Risoluti of ENEA presented an overview of possible legal and business options for establishing a European Development Organisation (EDO). Rather than using a single organisational form option for establishment and operation of the EDO, a staged development evolving from one organisational form to another will also be considered. For WP 2, Peter Salzer and Jan Timulak of Deconta, Slovakia presented their work on legal and other responsibilities and financial liabilities. The study will include a review of legal liabilities for long-term waste management in EU countries and suggestions for potential approaches to sharing liabilities for multinational repositories. On the subject of economics (WP 3), Neil Chapman and Charles McCombie of Arius gave presentations on the costs of storage, transport and disposal, while Phil Richardson of Galson Sciences commented on community benefits in comparable projects. Overcoming the "donut effect" (opposition to siting at intermediate level, i.e. between local and national), was identified as an important challenge. Trevor Sumerling, leading WP 4 for SAM, UK, presented an outline examination of the safety and security impacts of implementing only one or two regional stores or repositories rather than many national facilities. For the challenging WP 5 on public and political attitudes, Meritxel Martel of Enviro, Spain, presented progress and topics for the proposed interviews with representative groups. WP 6 on the synthesis of all results will be tackled only in 2008, but a first potential layout of the final document was presented and discussed.

The next full SAPIERR II workshop will take place in Spring 2008, allowing ample time for preparing the final reports, circulating these for comments by SIG and others and discussing with potential members of a European Development Organisation (EDO) that could be started after the SAPIERR-2 project is completed in November 2008.

Upcoming Joint SAPIERR-CATT Workshop

Nuclear waste is produced by a large number of member states of the European Union, but the amounts of high-level waste and spent nuclear fuel differs significantly. Although the responsibility for taking care of the radioactive waste lies with the individual Member State, it is obvious that the implementation of long-term solutions would benefit from working together. Accordingly, the European

Commission has funded three projects specifically on this topic within the 6th EC Framework Programme. These are:

- SAPIERR-1: Support Action: Pilot Initiative for European Regional Repositories www.sapierr.net
- CATT: Co-operation And Technology Transfer on long-term radioactive waste management for Member States with small nuclear programmes <http://catt.jrc.nl>
- SAPIERR-2: Strategic Action Plan for Implementation of European Regional Repositories www.sapierr.net

All are intended to explore how member states with relatively small amounts of nuclear waste can implement long-term waste management solutions through collaboration.

The objective of SAPIERR-1 was to explore the feasibility of regional European solutions for deep geological disposal, based on the concept of shared repositories. SAPIERR-2 commenced in 2006 and its aim is to further develop the feasibility studies of SAPIERR-1 in order to propose a practical implementation strategy and organisational structures to create a formalised, structured organisation for implementing shared EU radioactive waste storage and disposal activities.

The overall objective of CATT is to investigate the feasibility of Member States with small nuclear programmes implementing long-term radioactive waste management solutions within their national borders, through collaboration with, and technology transfer from, those Member States that have advanced disposal concepts. Although CATT assumes that each nuclear member state has its own repository, whereas SAPIERR assumes that there will be both national and shared repositories in Europe, the two studies are complementary.

Future collaborations models to support EU Member States with small amounts of radioactive waste may include:

- shared repositories between partners with equal responsibilities;
- shared repositories, where one EU Member State is the owner, but accepts wastes other Member States;
- national repositories but shared encapsulations plants or encapsulation in a third country on a commercial basis;
- common technical concepts and shared technological know-how.

Irrespective of whether the repositories are shared or national, it is likely that the implementation will take advantage of the concepts that are already being developed for different geological formations. The scope for direct collaboration through, for instance, shared facilities or technology transfer from EU Member States with more mature concepts, will

depend on technical aspects (such as type and amount of radioactive waste, available geological formations), economic factors (such as costs of transport, storage and disposal), legal and regulatory aspects (such as intellectual property rights, contractual and business options for international collaboration, waste transfer and export/import licences), planning and scheduling (such as the timing for disposal and long-term storage), and, importantly, on the public and political acceptability.

To share information between the complementary projects and to consider whether future collaboration can be arranged, the EC is funding a joint Workshop on "European Collaboration for Implementation of Long-Term Management Solutions for Spent Nuclear Fuel and Radioactive Waste". This event, which will take place on December 10th – 11th 2007 in Sofia, Bulgaria, is organised by the Joint Research Centre, Institute for Energy in The Netherlands and DPRAO in Bulgaria.

The aims of the workshop are to:

- bring together the SAPIERR and CATT project partners, as well as other stakeholders, in order to explore the complementary aspects of the initiatives;
- facilitate the sharing of the main results of CATT (which is due to end in July 2007) and the interim findings of SAPIERR II (which runs until November 2008), as well as the conclusions and experience of other organizations regarding EU Member State collaboration for waste management;
- discuss the state of knowledge and future needs and propose collaboration on:
 - the technical and economic requirements for implementation of shared facilities (disposal, storage and encapsulation);
 - the technical and economic aspects for implementation of technology transfer between Member States for storage, encapsulation and disposal;
 - non-technical aspects of shared facilities and technology transfer (national and international legislation, public acceptance, commercial aspects etc.).

The ultimate goal is to arrive at an agreed catalogue of issues and opportunities that can be used to shape future collaborative actions.

The workshop will consist of technical presentations by CATT and SAPIERR partners as well as presentations by technical experts and policy makers covering other aspects. Invitations will also be extended to representatives of the major US and Russian projects that are considering offering fuel take back services to smaller countries. Presentations by European Commission and by the IAEA will also be included.

The partners in the two projects will meet to see where there is common ground and to consider how best to collaborate in future.

International News

Continuing IAEA Support for Multinational Initiatives

Support of the IAEA for multinational initiatives that can enhance safety and security in the nuclear fuel cycle has been documented in many speeches and publications and has been reported on in earlier Arius Newsletters. Milestones in the IAEA work over the last few years have been the publication of TECDOC 1314 on *Developing Multinational Radioactive Waste Repositories: Infra-structural Framework and Scenarios of Cooperation* (in which Arius was involved), various speeches and publications by the DG El Baradei, the issue by the IAEA in February 2005 of a high level report on *Multilateral Approaches to the Nuclear Fuel Cycle* (in which Arius is acknowledged as an invited expert), and the organisation in September 2006 of a Special Event on the subject during its annual General Conference. Through 2007, this consistent support has continued, as outlined below.

The 2007 General Conference

The following extract from DG El Baradei's opening speech at the 2007 General Conference illustrates the continuing emphasis on multinational efforts, including initiatives for the back end:

"The expected expansion in nuclear power will drive a commensurate increase in demand for nuclear fuel cycle services and the need for an assurance of supply mechanism. This could also increase the potential proliferation risks created by the spread of sensitive nuclear technology, particularly if more countries decide to create independent uranium enrichment and plutonium separation facilities. These trends point clearly to the urgent need for the development of a new, multilateral framework for the nuclear fuel cycle, both the front and the back end."

The DG also informed delegates that, in June, he had presented to the Agency's Board of Governors a new IAEA report on a multilateral framework for nuclear energy. This presents a range of options intended to guarantee supplies of nuclear fuel while minimising proliferation risks. The report (*Possible New Framework for the Utilization of Nuclear Energy: Options for Assurance of Supply of Nuclear Fuel*) addresses proposals put forward over the past two years by various States and institutions.

The emphasis is again primarily on assuring the supply of fuel for nuclear power plants and limiting future enrichment and reprocessing to multilateral operations – but in a way which ensures that no rights of States would be compromised. While Arius acknowledges that these are the prime security and non-proliferation concerns, we are also concerned

that the storage and disposal of nuclear wastes and spent fuel are not neglected issues. For this reason, it is reassuring to see that the IAEA is also active in examining multinational approaches for the back end, as is demonstrated by the project described below.

A further technical document specifically on disposal aspects

Beginning in November 2007, the IAEA intends to prepare a new report, provisionally titled, *Viability of sharing facilities for disposal of spent nuclear fuel - technical and institutional considerations*. The objective of the document is to examine in more detail than has been done previously the viability of proposed scenarios, specifically in connection with the disposal of spent nuclear fuel. The link will be made with other international initiatives developing similar studies – which, of course, include the SAPIERR II project in which Arius is currently involved.

The issues on which the new document is intended to focus are legal aspects such as long-term liabilities, waste ownership, compliance of multinational facilities with international conventions, licensing, technical considerations e.g. compliance of waste from many different origins, control and inspections, financial aspects for sharing a multinational facility, including the financial risk associated with the development phase. The document will be aimed at providing a better perspective of all past and present initiatives related to regional or multinational disposal options and scenarios for spent nuclear fuel. It should help in developing further possible roadmaps and milestones linked to realistic options for sharing disposal facilities.

It is intended that the document will be published in 2009, which will be shortly after the SAPIERR II final report is available.

Direct Arius interactions with the IAEA

Arius has been directly involved in many of the IAEA initiatives in this area. As mentioned above, the involvement includes participation in the drafting of TECDOC 1314 and discussions with the MNA expert group. In addition Arius has been represented at both the joint meetings on Russian back-end initiatives held at the IAEA by the US National Academies and the Russian Academy of Sciences. Exchanges of information and opinions have also taken place with IAEA staff at various conference venues and, most recently, the Arius President and Executive Director have proposed to the Agency that a direct discussion be arranged in Vienna.

In his reply, the DDG for Nuclear Energy *"acknowledges the innovative work that is performed by Arius ... and the contributions that Arius representatives have made in earlier IAEA activities"*. He informs that the IAEA is exploring the possibilities for regional cooperation and is interested in the experience that Arius has gained through the SAPIERR project and its other activities. An informal discussion in Vienna on these topics is foreseen when Arius representatives are at the Agency in connection with the new report described above.

GNEP Developments in mid-2007

During 2007, the GNEP initiative of the US government has made some significant progress. However, concrete actions are still outstanding, funding problems continue in the USA and some countries are taking a wary stance.

GNEP started as a US initiative in February 2006 and had its first meeting in May 2007 in Washington, when the United States hosted fellow members China, France, Japan and Russia, with the UK present as observer. The United States is seeking to promote nuclear power while guarding against the danger of the spread of nuclear weapons. This arises when states develop strategic technologies such as uranium enrichment, which not only produces nuclear reactor fuel but also ingredients for nuclear fission weapons. The United States would like GNEP to organize countries that have secure, advanced nuclear capabilities so as to provide fuel to other nations that agree to use nuclear energy only for power generation. From an Arius point of view, a key feature of GNEP is that it also contains suggestions that the spent fuel supplied to user countries could be taken back to the producer, or else moved for disposal to a third party host country that is also a GNEP member.

The US Government has been making efforts to increase the membership of GNEP and, in particular, to include countries that – unlike the initial grouping – are not weapons states or potential major suppliers of fuel cycle services. Of special interest is the stance taken by Australia and Canada, which together produce more than 60% of the world's uranium. Discussion between the Prime Ministers of these countries and the US President took place at the Asia-Pacific Economic Co-operation forum (APEC) in Australia at the beginning of September. Australia took its first step towards joining GNEP through a new bilateral nuclear collaboration agreement announced in Sydney by John Howard and George Bush. Participation was then formalised at the mid-September meeting of nuclear officials in Vienna, described below. However, the Australian Government made it clear that it has signed up only on the basis that Australia can not be compelled to import nuclear waste and that it reserves its right to enrich uranium. The former issue, repatriation of foreign spent fuel, has also led to debate in Canada. Advocates of hosting international disposal facilities can be found in both countries, but the governments are aware of the significant public opposition that would arise to such a proposal at present. Accordingly, Canada has opted only for observer status at present.

A much wider circle of potential GNEP partners was addressed soon after the APEC discussion, at ministerial talks held at the IAEA in Vienna on 12th September. Almost two-dozen nations were introduced as potential candidates or observers, including Canada, Libya, Turkey, South Korea, Britain and other large EU states. On September 16th, eleven countries signed a statement of principles for GNEP, calling for the *"the expansion of nuclear energy for peaceful purposes worldwide in a safe and secure*

manner". The new signatories were Australia, Bulgaria, Ghana, Hungary, Jordan, Kazakhstan, Lithuania, Poland, Romania, Slovenia and the Ukraine. Some of these new countries do not yet have nuclear power but wish to develop it. It was stressed that GNEP is not directed against any state developing nuclear technology for peaceful purposes. Also, it would not require developing states to renounce fuel production on their own soil, since one principle is that *"States participating in this cooperation would not give up any rights"*.

In practice, South Africa is considering restarting its uranium enrichment programme, while Argentina, Canada and Australia have suggested that they might also enrich uranium. Consequently, on September 19th South Africa announced that it would not participate in GNEP, stating that *"It is a sovereignty issue, to do with our own nuclear fuel reserves and fuel supply."* In a closed session after the signing ceremony in Vienna, ministers agreed to set up working groups on creating reliable nuclear fuel services and infrastructure to support new technology, and decided to admit new members only by consensus.

The expansion of GNEP is a positive development, but much remains to be done if the initiative is to be successful. US Energy Secretary Samuel Bodman admitted that GNEP had no specific international projects as yet. He announced that *"our task today is to formally commit to the principles espoused by GNEP and to begin discussions with like-minded countries that seek to develop civilian nuclear power in a safe and secure manner and who, not coincidentally, have been reaching out to us."*

To make real progress, funding is needed and this continues to be a problem. GNEP has been controversial in Congress, with little support in the House, where only token funding has been approved. For instance, the US administration requested approximately \$250 million in FY 2007 for GNEP, but the programme will likely receive only around \$80 million this year. In spite of this, the President's FY 2008 request for GNEP was \$395 million. The House Appropriations Committee voted to cut the administration's nuclear energy request, including a 50% reduction on the GNEP request. In doing so, the Committee sharply criticized the GNEP proposal for lacking sufficient detail to support the level of funding requested. Perhaps the growing membership in GNEP will encourage politicians to devote adequate funding to the initiative and (we remark, hopefully) any such funding will be used to address key issues – including advancing concepts for securing the back-end of the nuclear fuel cycle.

Finally, from an Arius perspective – as has been pointed out in a number of our submissions and presentations on GNEP – the issue of disposal of used nuclear fuel, or of HLW resulting from reprocessing of fuel, must be addressed directly if GNEP is to be attractive for small and new nuclear power countries.

Russia and USA Sign Nuclear Energy Cooperation Agreement

In July, the USA and Russia issued a bilateral statement that brings together co-operation on the parallel Russian GNPI (Global Nuclear Power Infrastructure) and US GNEP concepts. The agreement also envisages close involvement with the IAEA-led projects on innovative reactor designs and the Generation IV International Forum (GIF).

The joint statements put considerable emphasis on the original non-proliferation and provision of stable fuel supply chain aspects of both GNEP and GNPI. However, as discussed in our previous Newsletter, the back-end continues to attract little or no apparent attention. Waste management is only indirectly alluded to within one of the aims of the agreement: *"developing solutions to deal with the management of spent fuel and radioactive waste, including options for leasing of fuel, storage of spent fuel, and over time development of technology for recycling spent fuel"*.

As noted in the previous item, Arius believes that these global initiatives will only be successful if they offer user countries a complete solution to their fuel cycle requirements, which includes offering disposal. Whilst applauding the security objectives, we believe that, at present, the concepts are heavily skewed towards the commercial, strategic and political interests and views of the providers, rather than towards the benefits for the users.

Itinerant Thorium: from Germany to UK to Peru and back to Scotland

The potential difficulties of trans-boundary movement of radioactive materials that will eventually be disposed of as waste are often raised as an argument against the feasibility of multi-national waste management solutions. However, there are many examples of just such arrangements taking place, often with little publicity and attracting little attention. Here is another.

A shipment of several tonnes of unwanted, impure thorium has been returned to Dounreay (Scotland) from a commercial organisation in Peru that had bought it from Nukem almost a decade ago, to manufacture gas mantles. The thorium originated from processing of unburned, German-origin, high-temperature reactor fuel in the late 1980s at Dounreay. It was sold for manufacturing use but was found to be unsuitable, owing to impurities. It has now been returned from Peru to Scotland to be included with other thorium that had been retained from the original processing activities, with the apparent intention that it will be added to existing ILW stocks.

As Scotland has recently announced that it will look after its own radioactive wastes separately from those of the rest of the UK and that it will not consider geological disposal, it is tempting to ask how it plans to manage this imported material, beyond simply storing it.

Misinformation Campaign on International Solutions Begins in Germany

During March and April the local anti-nuclear activist group located near Gorleben in Germany turned its attentions to European shared disposal solutions with a high profile attempt to raise fears through a campaign of misinformation. The activist group Bürgerinitiative Umweltschutz Lüchow Dannenberg made a protest visit to Brussels, using the opportunity to assert that the substitution of wastes associated with German-UK reprocessing contracts resulted in more highly radioactive wastes being returned to Germany than had been sent for reprocessing to the UK. They also claimed that the ILW that would remain in the UK would be disposed of unsafely at the UK's LLW disposal site near Drigg.

The spokesman also said that the 'multinational atomic waste dump' project SAPIERR was likely to be used in a 'sleazy' way by politicians and was favouring disposal of wastes in Russia, against a background where other disposal locations across Europe were being considered in a 'random' manner. It was also claimed that the proposed Gorleben repository in Germany would become an international repository because of waste substitution agreements that are already in place.

From outside the country, the activities of German anti-nuclear groups, often politically-driven, look more and more outdated and anti-environmental, especially given compelling concerns about carbon-based energy systems. They have long been known for their success in spreading alarm and fear in the most cynical manner, usually with little opposition from knowledgeable scientists. Their selective use of information and wilful misrepresentation of the facts are a major hindrance to national and global efforts to find safe and secure energy solutions for all. No doubt we shall hear more from them as discussions on regional European solutions continue. Arius must be prepared to counter false assertions by objective, well-founded facts and figures.

International Meetings

US and Russian National Academies Meet Again in Vienna

A further joint workshop of the US National Academies and the Russian Academy of Sciences was held from 23rd – 24th April in Vienna to discuss ideas and impediments in further internationalising the fuel cycle. The views of selected States were canvassed, these being a sample of non-nuclear weapon states that will be nuclear fuel cycle users and suppliers: Armenia, Argentina, Australia, Brazil, Bulgaria, Egypt, Korea and Indonesia. Arius was in attendance as an observer organisation, represented by our individual member Julian Kelly.

Spent fuel management was a prominent theme throughout the workshop. Waste storage was generally discussed hand-in-hand with spent fuel. Enrichment was the other major area on which

internationalisation was discussed. This synopsis reports only on discussion germane to spent fuel and waste.

Security and diversity of electricity supply was a backdrop theme for the Workshop. Most national presentations described scenes of increasing electricity demand and need for increases in reliable nuclear generating capacity. The proliferation threat posed by larger nuclear NPP fleets is of far less concern to Governments than providing for their country's national energy needs.

The IAEA came through as an important and trusted body in most (if not all) suggestions for establishing international nuclear fuel cycle centres. Including the IAEA can lend credibility to such proposals.

Regarding the incentive that a spent fuel/waste takeback offer would present to an incipient NPP country, there was a clear and strong message that this would be enormous. Indeed some RAS and NAS members remarked that this would be the single-most significant incentive that could be offered by the major nuclear power nations.

GNEP was barely mentioned explicitly. However, in GNEP language, the need to avoid splits between the have/have-not with respect to country's nuclear fuel cycle standing was recognised as vitally important. Also reconfirmed was the futility and inappropriateness of proposing that IAEA member states give up their 'rights' to using nuclear technologies.

The Russian proposal for taking back spent fuel for reprocessing was a key discussion topic. It should be noted that there is an underlying note of 'work in progress' to this and other initiatives. Several elements of the strategy are still being refined, and are tied up with the development of the fast reactor program. The legal basis for other aspects of Russian international fuel cycle proposals is still being worked on.

Country specific views and policies regarding spent fuel management were solicited and the following positions concerning the fuel cycle back-end were reported:

Armenia is planning for the medium term entry of new nuclear power capacity after Metsamor closes around 2017. Final disposal for Metsamor spent fuel was not mentioned. Armenia confirmed upon questioning that a take-back arrangement for spent fuel from any proposed new NPP would be a major incentive in enabling the project to proceed.

Bulgaria was the most emphatic of national representatives in pointing out the importance of having a strategy for spent fuel and waste. It is in this back-end area that international cooperation will be useful, so Russian proposals on spent fuel takeback are indeed attractive.

Egypt focussed on front-end supply. Reference was made to a dormant nuclear cooperation agreement

with the US (from 1982) and if spent fuel take-back was included in any future nuclear energy cooperation with the US, this would be regarded favourably by Egypt. There was a message of strong support for the IAEA taking a role in any regional supply assurance mechanism.

Indonesia has a well-reported roadmap for installing its first nuclear generating unit by 2016. Their strategy for spent nuclear fuel management is to establish a centralised 'interim storage' facility at some point. Details of a spent fuel policy (such as timeframe and responsibilities) seem to remain undetermined. Defining the spent fuel strategy seems of a lower priority than getting the NPP programme started. Indonesia would regard as attractive any regional approaches to effectively managing spent fuel and waste from nuclear power programs. Indonesia also sees merit in the concept of fuel leasing.

Republic of Korea intends that by 2016 there will be an interim storage facility for spent fuel 'somewhere', but that siting and licensing for such will be very difficult (drawing on the fact that it took 20 years to establish a LLW facility). Public opposition is strong. The KNFL representative made the point that Korea cannot yet cost the spent fuel management services that might be offered by an international partner. The implication was that they would like to be able to do so.

Brazil has a policy of long-term interim storage for its spent nuclear fuel, which, upon questioning, was said to mean of the order of 500 years. There are no current plans to reprocess spent fuel. Public acceptance dictates what can be done and presents a major hurdle in Brazil.

The Argentina and Brazil representatives were asked whether they could contemplate pioneering the set-up and operation of fuel cycle facilities (including waste storage) for the South American Region. The answer was no, not at this stage. Argentina pointed out that they had not detected interest from other South American countries, which is consistent with the incipient nature of nuclear power programs outside Argentina and Brazil. Brazil informed the Workshop that there is no constitutional prohibition regarding the acceptance of foreign radioactive waste, but that the possibility is effectively precluded by strongly negative public opinion.

Russian RAS delegates pointed out that the international 'INPRO' project has produced much relevant material. Waste is one the seven key INPRO topical areas. This source of information should be taken into account and used when planning international fuel cycle centers, such as for waste.

RAS member Petrov spoke of the importance of dealing with the 'tail' of the fuel cycle and that accumulated spent fuel will 'brake' the development of nuclear power. In this regard it is vital to train more professional people for working in spent fuel and waste management. Petrov proposed an 'international centre' where technical expertise relating to

underground disposal and storage could be expanded.

RAS Member Byschkov pointed out that any international centre for receiving spent fuel must assure the safe transport and handling of irradiated fuel. Extending this idea he proposed a "System of Guarantees" to be a (compulsory?) element of the supply of front-end fuel services such as enrichment. Thus, the handling, transport and storage of material would be defined when enrichment services were negotiated. The implication was that such a 'System' could also talk about spent fuel and waste takeback services when arranging the supply of front-end nuclear fuel components from the (Russian) international enrichment centre. This would offer a greater incentive to a smaller pre-nuclear power country. RAS Member Bezzubtsev presented some salient points from a regulatory stance. The model of 'International Centres' could serve spent fuel and waste management needs well. Regulations developed by individual countries clearly present impediments to their own "free use of nuclear material". The ability to send spent nuclear fuel to Russia, or indeed to any international spent fuel center, removes this impediment, and for this reason that the Russian proposal/s are significant. Waste is still an area of major concern. There is no law in Russia permitting the takeback of waste, however a law is being prepared regarding the 'handling' of waste, and this will solve 'some of the problems'. RAS Member Libonov described the significance of recent Russian legislative changes concerning the ownership of nuclear material, including that in waste. Now, any entity in Russia can own fissionable material, but that these must be on a 'President's List'. Foreign organisations are now able to 'own' such material in Russia.

Several NAS Members referred to spent fuel takeback as the most significant incentive that could be provided to those smaller countries newly seeking to establish a nuclear power capacity, or to augment their current NPP fleets. The offering of international spent fuel and waste management strategies, including those incorporated within fuel leasing arrangements is the most promising avenue to get such incentives in place. However, nothing more concrete was proposed. In summary:

- The high significance of the spent fuel management and waste aspects of the fuel cycle was unanimously recognised, as was the need for international cooperation in working toward spent fuel & waste solutions. Solutions in this area would be a major breakthrough and would present the strongest incentives for countries to proceed with new (or further) nuclear power units as they seek to meet future high electricity demand scenarios.
- Russian RAS Members made some interesting suggestions and comments that could form a focus of any follow-up activity. US NAS Members acknowledged that the US has brought less to the table in terms of internationalised solutions in the area of spent

fuel and waste, but they unanimously agreed that this needs to happen.

- There were no clear conclusions produced at the end of the Workshop. There was also no discussion about possible future steps or practical actions that might be taken by various organisations. Nevertheless, these events – and the multiple parallel GNEP discussions in the USA – illustrate the ever-increasing interest in multinational cooperation and shared solutions to spent fuel management.

(Reporter: Julian Kelly)

Finnish Nuclear Regulator Organises Workshop on Multinational Cooperation

On May 16th – 17th 2007, the Finnish regulatory body, STUK, organised a meeting on multinational cooperation in the back-end of the nuclear fuel cycle at their headquarters in Helsinki. The agenda was agreed with S. Kirienko, Head of Rosatom and the Russian delegation (ten members) was led by A. Malyshev, the Deputy Head. The agenda included presentations on the status in Russia of plans for international services, input from the French, UK and Finnish national programmes, and invited presentations by the international organisations, IAEA, NEA and Arius.

The Russian presentations were mostly highly technical, describing in some detail the present waste management system in Russia and plans for developing advanced reprocessing technologies at a proposed Experimental Demonstration Radiochemical Centre at the MCC site. A policy-based talk laid out the Russian legislation most relevant to the issue of provision of international fuel cycle services.

This talk, by Valery Bezzubtsev of Rostekhnadzor, first clarified the roles of Techsnabexport and TVEL. The latter is concerned with temporary storage and reprocessing of spent fuel supplied by TVEL to foreign nuclear power plants; the former is responsible for temporary storage and reprocessing of spent fuel from foreign research reactors and for fuel supplied by TENEX to former Soviet Union countries. A key point is that wastes arising from reprocessing foreign fuels are to be returned to the foreign country when the fuel is not of Russian origin. The Laws and Regulations and Decrees governing import of spent fuel to Russia were summarised:

- The first relevant Law is No. 94 of 10/07/01 on "Amendments to the Federal Law on Utilization of Atomic Energy.
- Federal Law No. 7 of 10/01/02 states that import for temporary technical storage and/or reprocessing is feasible only in the scope of a "Unified Project" which covers cost issues, fees to be paid into ecological programmes and requirement for demonstrating net radiological and environmental benefits.
- The Presidential Decree No. 380 of 19/03/02 authorizes the special company permitted to be involved in managing spent fuel from foreign reactors.

- Regulation No. 418 of 11/07/03 specifies the procedure for import of irradiated fuel assemblies.

- Regulation No. 587 of 22/09/03 defines the cost requirements.

- Regulation No. 588 of 22/09/03 covers the financing of the ecological programmes.

The IAEA presentation by the Director of Nuclear Fuel Cycle and Waste Technology, Hans Forsstrom, gave a comprehensive overview of the numerous initiatives of the Agency to encourage multinational cooperation in the fuel cycle. The potential benefits of multinational cooperation in the areas of safety, security, non-proliferation and economy were clearly stated. It was acknowledged that the present main emphasis at the Agency is on assurance of fuel supply – but it was recognised that other aspects of the fuel cycle must follow, so that the present back-end initiative was welcomed.

From the NEA, Hans Riotte gave the usual guarded views of the larger nuclear countries, emphasising the need to avoid prejudicing leading national disposal programmes by highlighting multinational options. The Arius presentation focussed on the message that proposals (Russian or American) for accepting spent fuel for reprocessing are not very attractive to small countries if they include a provision for return of wastes.

In fact, there were marked differences in opinion at the meeting concerning the attractiveness at present of reprocessing services. The Russian delegation appeared convinced that there would be customers for reprocessing, especially if advanced technologies are developed. Others pointed out that there is today already unused reprocessing capacity in the world. Given the high cost/price of reprocessing there seems to be little hope of demand increasing in the near future. The single factor that could most dramatically change this picture would be reprocessing contracts with no return of wastes. Even if these are possible, as pointed out by Arius, an offer to take-back future Russian fuel would remain unattractive to countries that have long term storage capacities or that have existing stocks of spent fuel. That would not be accepted by Russia.

The Backend Implications of GNEP at the INMM Annual Meeting

Among the many events at which GNEP is being "showcased" at present was the Annual Meeting of the Institute for Nuclear Materials Management (INMM) in Tucson in July. Three special sessions on GNEP were organised and Arius was invited to present a paper there on possible implications for small countries.

The July annual meeting of the INMM was its 48th. It is a large organisation with many chapters in the USA and other countries. The activities cover all policy and technical aspects related to enhancing the safety, safeguards and security of handling nuclear materials.

The meeting topics were strongly influenced by the current “nuclear renaissance” (see our Topical Article in this issue) and by the impact on it of the GNEP initiative. The remarks in this item are based on attendance at the key sessions related to GNEP.

The opening plenary speaker, Paul Lisowski, Deputy Program Manager for GNEP, acknowledged that provision of “reliable international fuel services” should include return to the supplier country of the spent fuel from the user country. He highlighted the May 2007 Meeting that had formalised the partnership of GNEP, including the USA, France, Japan, China, Russia and the UK. In response to a question, however, he acknowledged that this partnership has to be expanded to include user countries, not only supplier countries. Although a number of small countries had been contacted, there was at that time no formal agreement with any. As noted in an earlier item further countries signed up later in Vienna at the time of the IAEA General Conference.

Special sessions were devoted to the Global Threat Reduction Initiative (GTR) run by the National Nuclear Security Administration (NNSA) within USDOE. The mission of GTR is threefold: convert research reactors from HEU to LEU, remove nuclear and radioactive materials to more secure locations and protect those materials that cannot be removed. The GTR, working in forty countries at 540 sites, has already achieved a lot, including taking back three tonnes of Pu and ten tonnes of HEU from Russia. But it has identified 3300 high-priority radiological sites and quotes the IAEA estimate of “millions of sources at tens of thousands of sites”. Matt Bunn extended the list of issues of concern by pointing out that there are still around 140 reactors with HEU in around forty countries

A further session on GTR work detailed the concerns with research reactors and with radiological sources. This included information on work in Indonesia, Egypt and Africa. In the last case, around 67 orphan sources had been recovered with the help of NECSA and then repatriated to the USA. A paper by a LANL worker presented information on the documented cases of nefarious uses of radioactive materials. Although some of the cases presented were shocking, it was remarkable how few examples there were, compared to the innumerable cases of misuse of other toxic substances.

Other GTR sessions were devoted to describing the accomplishments in recovering civilian HEU, and radiological sources. One open issue relates to “gap” materials that do not satisfy the acceptance conditions for return to the USA. These materials include non-US and non-Russian materials as well as separated Pu. The hope was that the commercial sector could help here and an Areva spokesperson gave examples of French treatment of materials from Australia and Belgium. It was acknowledged that the French situation was different since the residual HLW is returned to the country from which the fuel for reprocessing has come. The Areva speaker agreed that the returned materials could still represent a security risk, but pointed out that removal of the fissile components did reduce proliferation concerns.

Further sessions were devoted to reviewing 50 years of IAEA experience with safeguards. A thoughtful overview was provided by Laura Rockwood of the IAEA, who divided the history into periods during which the primary concerns of the Agency differed. In the ‘50s and ‘60s the worry was that proliferation could result from sensitive materials supplied by weapons States. In the ‘70s and ‘80s the concern was the growth of indigenous fuel cycle activities in various countries. The ‘90s were characterised by problems with undeclared nuclear activities in countries such as Iraq, South Africa, and North Korea. Today the principal focus is on black market transfers, break-out of states from the NPT and the too slow disarmament of weapons states.

GNEP sessions

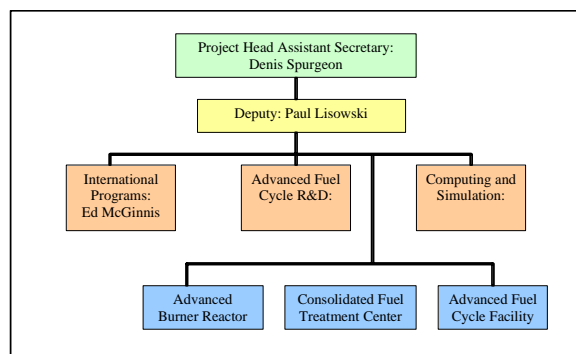
The prime objective for Arius attendance at the INMM meeting was to learn more about the GNEP initiative and to press home the message that back-end services must be a key aspect of GNEP (and of parallel Russian proposals). Three half-day sessions focussed on GNEP, and the topic was also raised in the initial and final plenary sessions. In an introductory talk on non-proliferation aspects, Dunbar Lockwood of NNSA emphasised that the foreseen ‘cradle to grave’ services must include take-back of spent fuel, possibly through a leasing arrangement, and he pointed out that the back-end issues were much more challenging. Burrus Carnahan of the State Department (substituting for Alex Burkart who was in China discussing GNEP) agreed with this view and pointed out that back-end services would be open to negotiation. In his personal view, the possibility that existing commercial spent fuel already in storage in small countries might also be accepted by the USA could not be excluded.

This was contrasted with the situation in other potential GNEP supplier States (such as France) where not even the residual wastes from reprocessing can be retained by the service provider. Tom Shea of PNNL emphasised that the take-back of spent fuel to any country will depend on public and political recognition that the gain in global security outweighs any perceived disadvantages.

Dorothy Davidson of Areva confirmed the French position concerning return of wastes and asserted that “storing and disposal should be the responsibility of the customer State”. The argument that this removes any real incentive for potential GNEP user States was put in a question from Arius and was accepted by the audience. Melissa Krupa of NNSA *expanded the discussion to cover return of spent fuel not necessarily to the supplier but also to “another country if such a country should become host to a regional or international repository”*. This concept, of course, is closely related to work being done by Arius.

Further GNEP papers dealt specifically with the technical aspects of the plans for enrichment, reprocessing, actinide partitioning and advanced burner reactors. These are clearly the key aspects that are exciting the US National Laboratories. Funding is being granted by the US Congress for this work – but at a significantly lower level than was

requested. The details of the projects are less important here than the overall organisation and allocation of responsibilities. This was described by Mike Lawrence of PNNL. The structure is given below:



Technical integration with the National Laboratories is based in Idaho, where seven separate campaigns are to be coordinated (Fuels, Separations, Systems Analysis, Burner Reactor, Waste Forms, Safeguards, Small & Medium Reactors). There is also a Science & Engineering Council, which reports directly to Paul Lisowski.

In the Final Plenary Session, the key talk was given by Adam Scheinman of NNSA, who restated many of the GNEP goals. He recognised the fact that GNEP could be seen as discriminatory by small user States and acknowledged that more must be done to include these States in the “Partnership” – which was originally limited to the few large supplier countries. The upcoming major GNEP milestone will be the 2008 decision by Energy Secretary Bodeman on the future of the programme. By then, more concrete plans for a broader partnership and more specific details of incentives for user States must be clarified.

32nd Annual WNA Symposium

The WNA annual conference held in London on 3rd to 5th September 2007 was characterised by its positive Motto “*Our Nuclear Future: Converting Vision to Reality*”. Optimistic views on the future of nuclear energy were expressed by uranium producers, reactor constructors and fuel cycle companies. At the opening ceremony, awards were presented to Mohammed ElBaradei, Director General of the IAEA, and to James Lovelock, environmentalist and creator of the Gaia Theory – both being honoured for their support of clean, nuclear energy. Although most presentations were on new reactor front-end developments, the importance of progress in the back-end of the fuel cycle was recognised. The key disposal-related items at the Conference are the focus of this item – and, in particular, those issues are highlighted which are related to multinational cooperation in waste management.

The topic was raised prominently and early in the meeting by Dennis Spurgeon, US Assistant Secretary for Nuclear Energy, who put the spent fuel/nuclear waste issue as number one on his four item list of barriers that GNEP faces. In fact, GNEP and its

current expansion were topics often addressed in exchanges at the Conference. This was in part due to the concurrent meetings between the leaders of the USA, Canada and Australia at the APEC Conference in Australia. The GNEP developments are discussed in a separate note in this Newsletter.

In the sessions not explicitly on back-end issues, the most interesting paper for Arius was that by Gerd Claassen of the South African PBMR project. He gave a thoughtful and comprehensive list of the challenges facing new countries that wish to introduce nuclear power. His list naturally included development of a long-term waste management strategy. His written paper concluded that, since storage for decades was straightforward, a “wait and see” approach would be best. This led to some discussion, during which the necessity to have a strategy beyond only storage was recognised. Mr. Claassen too, in response to a question, agreed that PBMR would be interested in future in a fuel-leasing system for its pebble-bed fuel. This fuel type was also acknowledged to require further R&D to explore the options for its recycling or disposal, primarily because of the high ¹⁴C content.

In the dedicated back-end session, which was chaired by Charles McCombie of Arius, four papers were presented, covering widely different programmes. Nathalie Hubert of Areva, probably the world’s leading nuclear company today, presented the French achievements and developments in the fuel cycle. A USDOE paper by Robin Sampson emphasised the necessity of implementing the Yucca Mountain repository in order to give confidence in the availability of disposal solutions. The huge clean-up task facing the UK were described by Peter Lutwyche of Sellafield Ltd. Insights into the nuclear waste strategy and projects in Pakistan was given by Tariq Bin Tahir, of the Atomic Energy Authority. An interesting part of this last paper was the strong appeal it made for more international collaboration in the back-end, including consideration of multinational repositories.

Topical Article

The Nuclear Renaissance and Waste Management

Charles McCombie, Arius

The nuclear renaissance is real. There are currently 437 nuclear power plants (NPP) in operation in 30 countries¹. These reactors supply about 15% of the global electrical energy consumed today. In the western world, nuclear programmes have been stagnant or decreasing for two decades, although construction of new plants continued in some parts of the world such as East Asia. A resurgence of nuclear power has been predicted at various times in the past,

¹ The data in this article are taken largely from the World Nuclear Association website: www.world-nuclear.org

but the current increase in activity and interest appears more than at any time in the past to herald a real "renaissance". The drivers are energy security, fossil energy costs, and concerns about carbon dioxide contributions to climate change.

Countries with operating nuclear plants are seeking to replace old reactors as well as expand capacity, countries that have shut down plants or have planned to do so are re-thinking, and many new countries are considering or firmly planning to make nuclear energy part of their national power supply. All parts of the world are involved in this development

The nuclear renaissance is global

Most of the recent expansion has been centred in Asia. The Chinese government plans to increase nuclear generating capacity to 40 GWe by 2020. China has completed construction and commenced operation of eight nuclear power plants within the last five years, and there are currently eight more units that are under construction or about to start construction and that are planned to be connected to the grid within five years. At least eight more reactors will start construction within the next few years. India's target is to construct 20 to 30 new reactors by 2020 as part of its national energy policy. Seven power reactors are under construction, of both indigenous and foreign design. Pakistan is expanding its nuclear fleet with Chinese designed reactors, and its 2005 Energy Security Plan includes construction of an additional 8 GWe of nuclear capacity by 2030. Russia plans to build 40 GWe of new nuclear power by 2025, using domestically designed light water reactors. Construction of a large fast breeder unit has been prioritised, and development proceeds on others, aiming for significant exports. Japan has plans or placed orders for 11 new nuclear power plants and is also involved in intense research on future reactor designs. The Republic of Korea already has 20 operating power reactors, supplying about 40% of electricity demand. One nuclear plant is under construction and seven more are planned.

The expansion of existing nuclear power programmes is not, however, limited to Asia. In Europe, Finland and France are both building new 1600 MWe EPR plants from Areva. The UK government whilst still consulting on the issue, has indicated strong support for the replacement of the country's ageing fleet of nuclear reactors with new nuclear build. Several countries in Eastern Europe are currently constructing (Romania) or have firm plans to build new nuclear power plants (Bulgaria, Czech Republic, Romania, Slovakia, Slovenia and Turkey). Sweden has abandoned its plans to decommission its nuclear power capability prematurely and is now investing heavily in life extensions and in up-rating existing plants. Hungary, Slovakia and Spain are all planning for life extensions on existing plants. Italy is considering a revival of its scrapped nuclear programme, and has already invested in reactors in Slovakia.

Nuclear power countries in the western hemisphere are also seeking to expand their programmes. In the

USA, notices of application for joint construction and operating licences have been submitted for 19 new units, and it is clear that there will be substantial new nuclear capacity by 2020. In Canada, the Ontario government has decided to refurbish and restart four reactors, adding 25 years to operating lifetime as a step in its plan to expand its nuclear fleet. Two more reactors will be needed for Ontario under mid-2006 policy. Alberta is now considering using nuclear power to extract oil from its northern deposits of oil sands. Argentina and Brazil both have commercial nuclear reactors generating electricity, and additional reactors are planned or under construction. Chile has a research reactor in operation and has the infrastructure and intention to build commercial reactors.

Finally, in South Africa, currently the only nuclear power country in Africa, a feasibility study for a third conventional nuclear power unit is being conducted and there are plans to construct a demonstration Pebble Bed Modular Reactor (PBMR) and then a fleet of these plants.

New entrants into the nuclear energy club

In fact, South Africa may be joined as a nuclear power nation by other African countries that are currently showing interest in introducing new, clean base load energy. Nigeria has sought the support of the International Atomic Energy Agency to develop plans for two 1000 MWe reactors, and Egypt has revived its plans for a combined nuclear power and desalination plant. Morocco and Algeria are further African countries considering nuclear energy.

Entry into nuclear energy production is also being considered by several other nations. In Europe, these include Poland, Estonia and Latvia, which are looking into a joint project with established nuclear power producer, Lithuania. Jordan and Turkey are seriously considering or planning for the introduction of nuclear power programmes. In Asia, Vietnam intends to begin construction of its first nuclear power plant in 2015. Indonesia plans to build two 1000 megawatt reactors in central Java. Thailand has announced plans to build two large nuclear plants, with construction to begin in 2015. Bangladesh signed an agreement with China in 2005 regarding nuclear cooperation and plans. In Malaysia, a comprehensive energy policy study - including consideration of nuclear power - is to be completed by 2010.

Implications for Waste Management and Disposal²

Impact on National Programmes

The growth in existing nuclear programmes and the spread of nuclear technology to new countries will have a serious effect on the back-end of the fuel cycle owing to the increased concerns about proliferation

² Based on a panel discussion at ICM07 in Bruges, Belgium

and about waste management. To counter the fears about proliferation, countries will have to assure the global nuclear community that sensitive materials (in particular spent fuel) are being carefully safeguarded. Various multinational proposals have also been made (e.g. by Russia and the USA) with the objective of returning spent fuel to its country of origin.

The effort expended on planning and implementing waste management strategies – especially for waste disposal – may increase or decrease over the coming years. An increase in intensity and in the resources devoted to waste management will result if the proof of a viable disposal option is a prerequisite for new build of power stations. Given the variety of new NPP designs that are being pushed on the market, more attention might be focussed on waste issues if these directly influence the choice of reactor vendor. On the other hand, it is also conceivable that the ‘rush to nuclear’ will reduce interest in waste issues. These may be judged less urgent when compared with the key goals of increasing dependable energy supplies or of reducing CO₂ emissions. A recent fuel cycle issue that can also affect the effort devoted specifically to disposal of spent fuel is the revival of interest in recycling. If nuclear power is to be sustainable, or at least useable for hundreds of years rather than as a transition energy source, then it becomes imperative to recover the useful materials in the spent fuel. This may increase the attraction of long-term storage rather than moving to disposal of spent fuel. Finally, at a more mundane level, the recognised shortage of nuclear specialists in general may mean that there are too few who wish to work in the waste area, rather than in the more exciting and urgent tasks of building and operating power plants.

It will be a serious risk, however, if the expected future rapid increase in nuclear power is attempted without proper regard for the waste issues – as was the case during the initial build up of nuclear in the 1960s and 1970s. Attempts to initiate new NPP programmes without a back-end strategy will open nuclear power to criticism and will intensify disposal-based opposition by environmental groups. The so-called ‘waste problem’ must be recognised as being solved if adequate public acceptance of nuclear is to be achieved. In particular, acceptance of the safety of the disposal of the spent fuel/HLW will be a key to success.

Impacts on multinational repository initiatives

Of particular relevance to Arius activities are the influences of the nuclear renaissance on multinational initiatives for storage and disposal. The potential impacts can be considered under three headings, each related to a recognised benefit of shared nuclear facilities: economics, safety and security, and political/public support.

The high cost of repositories means that new or small NPP programmes will not be able to afford a national repository and must be interested in prospects for cost sharing. It may even be that there are so many small nuclear countries looking for a disposal route that there is a market for competing multinational repositories. On the other hand, some currently small

programmes may grow large enough to make national disposal a feasible strategy – particularly if repository implementation is in the far future. The economics of the back-end may also be directly connected with front-end costs if competition to supply reactor fuel or uranium leads to offers of leasing either of those as a sales argument. A final point related to economics is that increased use of nuclear energy may result in spent fuel inventories that grow quickly enough to make new interim storage facilities necessary so that the financial benefits of pooling such facilities may be re-examined.

International concerns about safety and security have already led to pressure to concentrate nuclear materials at fewer, well-controlled locations. The list of potential new nuclear countries given at the beginning of this article makes it obvious that pressures of this sort may well increase. This can lead to more support for facilities shared by smaller countries or else to growth in importance of the ‘add-on scenarios’ defined by the IAEA and proposed now in the US GNEP and the Russian GNPI. In any case, the spread of nuclear power will certainly result in increased international control of multinational initiatives. It may even increase the possibility of ‘supranational scenarios’ in which a direct, operational role in waste storage and disposal is taken by the IAEA or the EC. In the area of nuclear security, there is again a danger that governments and the industry will neglect the back-end relative to more critical risk areas such as NPP operation, uranium enrichment and fuel reprocessing. In the back-end itself, there is also a danger that proliferation concerns will lead to neglect of HLW and ILW issues relative to spent fuel, although disposal plans for all long-lived wastes should be moved ahead simultaneously.

For multinational storage or disposal initiatives, as for national programmes, the biggest challenge today is winning sufficient political and public support for siting facilities. Increased support at the international level (IAEA, EC) is to be expected – primarily for the safety and security reasons mentioned above. For small or new programmes increased support for multinational strategies may result if the waste issue is judged crucial; a decrease in interest and support may occur if the waste issue is postponed for decades. In the past, large, established, waste disposal programmes have often expressed concerns that, despite legislation or policies forbidding waste import, multinational initiatives could harm public acceptance of their own programmes. It is difficult to judge whether these concerns will increase or decrease as more countries turn to nuclear. Large programmes may feel under increased pressure to provide ‘add-on’ solutions requiring them to accept wastes from other countries and nuclear opposition groups will certainly use such arguments. The GNEP proposals have already led to debate of this sort in the USA and in Canada. On the other hand, the many countries aiming to become nuclear energy users could lead to an increase in the numbers of those willing actively to pursue the option of shared disposal. This could lead to new, formalised multinational or regional groupings being founded and the existence of such groups would serve as evidence that new nuclear nations are acting responsibly to develop waste disposal solutions

that are based on siting only in willing and capable host countries.

Conclusions

A renaissance has been prophesied by the nuclear industry at various times over the past 20 or more years – with no visible result. However, the current surge of interest in expanding or initiating nuclear programmes appears more concrete than on any previous occasion. Avoiding energy shortages, reducing future energy costs and mitigating global climate change are all powerful arguments. The resurgence of nuclear can have positive or negative effects on the global efforts devoted to implementing safe and acceptable waste management strategies. It is imperative that the positive impulses dominate if the nuclear renaissance is to succeed.

In its original period of expansion, the nuclear industry paid too little attention to waste disposal, working under the understandable assumption that ample time remained for developing solutions. This led to waste management becoming identified by the public as the Achilles heel of nuclear power. From a technical point of view, the urgent tasks in rapidly expanding nuclear power are again not waste specific. They are related to building (or rebuilding) engineering capacities, ensuring supplies of large components, accelerating licensing processes, educating personnel, etc. But the industry cannot afford to ignore non-technical aspects nor to decide again that waste management tasks have lower priority and can be put on the back-burner.

Upcoming Conferences

Below, we highlight upcoming conferences that are specifically relevant to Arius activities and objectives.

June 2007	
11 th – 12 th	IBC Radioactive Waste Management, Lonon, UK (www.safetyevents.com) <i>Arius invited speaker</i>
11 th – 14 th	GNR2 – Global Nuclear Fuel Reprocessing & Recycling, Seattle, WA, USA (www.gnr2.org)
September 2007	
2 nd – 6 th	ICEM'07 – 11 th Int'l Conference on Environmental Remediation & Radioactive Waste Management, Bruges, Belgium (www.icemconf.com) <i>Arius paper</i>
9 th – 13 th	Global 2007 – Advanced Nuclear Fuel Cycles & Systems, Boise, USA (http://nuclear.inl.gov/global07)
16 th – 19 th	ENC 2007 – European Nuclear Conference, Brussels, Belgium (www.enc2007.org)

October 2007	
21 st – 23 rd	ISC2007, Enabling Safe, Secure and Peaceful Nuclear Energy: The Role of International Cooperation, Singapore, Malaysia (www.isc2007.sandia.gov/frontpage_82907.pdf) <i>Arius represented</i>
15 th – 17 th	International Conference on Radioactive Waste Disposal – Geological Repositories: A Common Objective, A Variety of Paths, Nagra, Berne, Switzerland (www.icgr2007.org)
22 nd – 26 th	International Seminar on Nuclear Waste Management, Saclay, France (www.enen-assoc.org)
29 th – 31 st	Enabling New Nuclear Summit; London, UK (www.enabling-new-nuclear-build.com)
December 2007	
10 th – 11 th	European Collaboration for Implementation of Long-Term Management Solutions for Spent Nuclear Fuel and Radioactive Waste (joint SAPIERR-CATT workshop), Sofia, Bulgaria (http://ie.jrc.cec.eu.int/events/2007/CATT-SAPIERR%20WS_Sofia_Dec2007.pdf) <i>Arius co-organiser</i>
February 2008	
24 th – 28 th	WM2008, "Phoenix Rising: Moving Forward in Waste Management", Phoenix, AZ, USA (www.wmsym.org/html/wm_conference.cfm)
September 2008	
7 th – 11 th	2008 IIHLRW, Steps Toward Reality for Safe Disposal", Las Vegas, NV, USA (www.ans.org/meetings/index)
October 2008	
13 th – 18 th	The 16 th Pacific Basin Nuclear Conference (16PBNC) "Pacific Partnership toward a Sustainable Nuclear Future", Aomori, Japan (www.pbnc2008.org)
20 th – 23 rd	EURADWASTE'08: 7th European Commission Conference on the Management and Disposal of Radioactive Waste; Luxembourg (www.radwastegovernance.eu/)