arius Newsletter

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Editorial

Happy New Year! 2003 will take Arius into its second year, with an increased membership and budget to promote our activities. In November, a mid-term assembly of members reviewed progress over the first part of our inaugural year, along with the proposed focus for this year – described later in this Newsletter. One issue that came up for discussion, and which often gets raised at international meetings, is the ethical justification for multinational waste disposal solutions. Consequently, we chose this as the theme for our Topical Article in this issue – an issue that is somewhat slimmer than usual, in recognition of the slow pace of the recent festive season!

Neil Chapman
Baden

Arius Internal News

Assembly of Members, November 2002: The first AoM since the inauguration of the Association last February took place on 19th November 2002 and was attended by representatives of the six organisational members, by four of our individual members (see photograph on next page). Observers were present from the IAEA and the World Nuclear Association, and the EU representative, present at the inaugural meeting, sent his apologies. The meeting welcomed Valentin Stanchev, who replaces Christina Necheva in 2003, when she leaves Kozloduy NPP. The main items discussed at the AoM are covered in the following paragraphs.

IAEA TECDOC: Shaheed Hossain of the IAEA reported on the IAEA project on developing and implementing multinational repositories and on the status of the TECDOC (report) currently in preparation. This will give an infrastructural framework, illustrate potential co-operation scenarios to achieve shared solutions and will define the requirements to be followed by interested member states. The project considers all kinds of radioactive wastes, with an emphasis on HLW and SF, and all disposal options, with a focus on geological disposal. Specific host-partner scenarios that might lead to multinational repositories are being developed. One of the requirements on the different stakeholders is that a convergence of ethical views must be achieved. The ethics issue caused discussion at the AoM, as it has been mis-used in the past. It was concluded that Arius should intensify public debate and clearly present its overall ethical position.

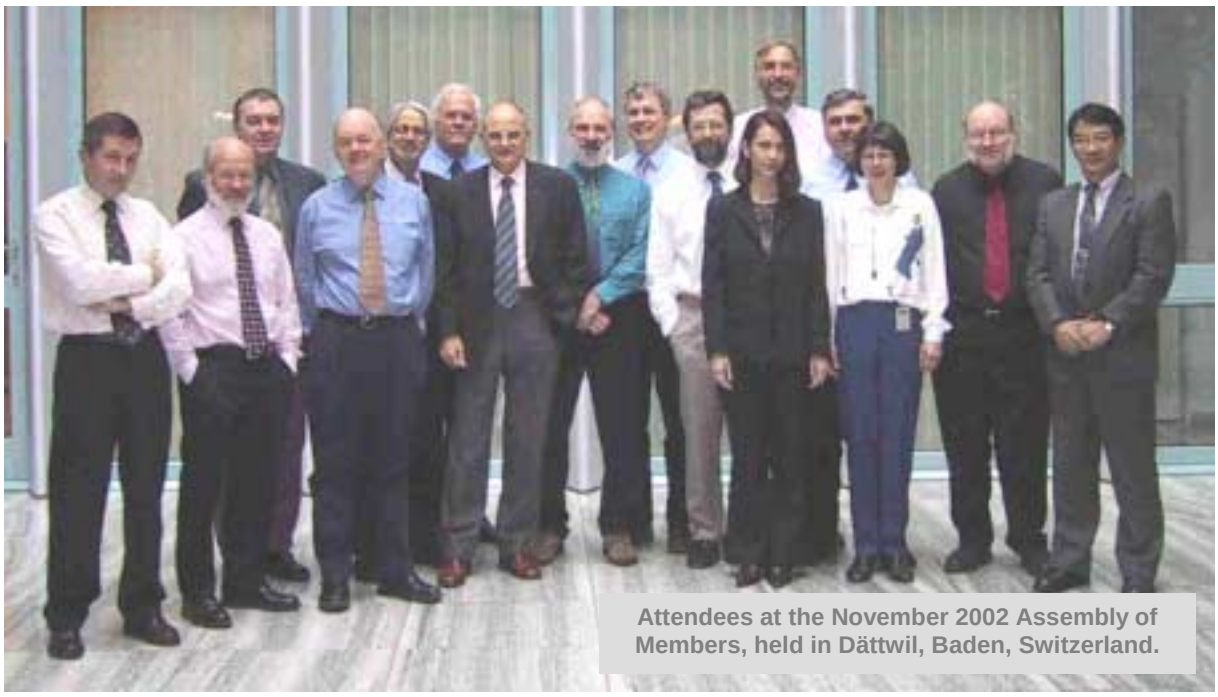
WNA Membership: Following discussions at the AoM, an agreement has been reached with the World Nuclear Association whereby Arius becomes a member of WNA, and WNA will attend Arius meetings as an observer. Membership is from the start of 2003, and Arius will become involved in WNA activities immediately, participating in the Waste Management and Decommissioning Strategy Group in January.

Progress over first nine months: Arius staff reported on the achievements of the first nine months of operation. Four papers have been presented at international conferences during this period and there has been good coverage of Arius in the trade press, with articles on or by Arius in Nuclear News, WNA Newsletter, Nuclear Fuel, Energy Daily and Nuclear Engineering International. Continued contacts with the EC and IAEA have been maintained and Arius participates in the IAEA project mentioned above.

The most concrete success was the entry of ENEA, Italy, to Arius in our inaugural year. This is important not just for financial reasons but also politically. Winning further organisational members is not proving easy. In many countries, the issue of international disposal is still sensitive – especially in countries that are just trying to start national programmes. This is the case, for example, in the Czech Republic, where – although a new policy document indicates that international options should be followed – most weight is currently being put on initiating a national programme.

A similar sensitivity still exists in Taiwan and South Korea, with whom contacts have been made since Arius start-up. The most promising negotiations at present are with organisations in Lithuania, Poland and Slovakia, which have expressed interest in joining Arius. The responsible national organisations or government agencies in several other countries have also been contacted during the year, but with no direct feedback (i.e. neither open rejection, nor readiness to discuss in detail).

A possible route to supporting Arius and/or European member applications is via the EBRD (European Bank for Reconstruction & Development), which is providing funding for decommissioning and other waste management activities in some European countries. This is currently being explored, initially via contacts with BIDSF (Bohunice International Decommissioning Support Fund) in Slovakia.



Attendees at the November 2002 Assembly of Members, held in Dättwil, Baden, Switzerland.

The quarterly Newsletters are now well-established. Back numbers are on the Arius web site, and it was decided at the meeting that, in future, the Newsletter will go straight onto the web as soon as it is published. The web site was expanded and updated after the first six months of Arius' existence. It now includes additional pages for the Newsletter, downloadable Arius publications and the database. The web site receives a significant numbers of 'hits' from numerous countries.

Significant effort has been invested in building and maintaining the library and database of information that can be accessed by Members (so far as copyright rules permit). The database software has been developed in collaboration with Nagra as a joint project. This is now accessible with individual passwords on the website and a test phase is completed. There were several modifications and improvements based on the first few weeks experience of use. The database is updated regularly.

Individual members in Switzerland have requested, and directly financed, effort from Arius. The UAK committee that includes representatives from the Swiss nuclear utilities has requested a specific study on international options and their relevance in the Swiss situation. Work on this is nearing completion and a draft was submitted at the beginning of this year. The other activities bringing additional resources to Arius have been co-operative work with Nagra. At a project level this involves the databank activities described above. In addition, Nagra has co-financed the participation of Arius in the IAEA working group on multinational repositories.

Membership growth strategy: Obviously, further organisational members of the type already represented are crucial. Potential small nuclear power programme members include countries in Western and Central Europe, in South America, Asia and Africa. Specific countries with which there have already been contacts to varying degrees are Austria, the Netherlands, Norway, Lithuania, Slovakia, Slovenia, the Czech Republic, Argentina, South Africa and South Korea. Further possibilities are Mexico, Brazil, Romania and Armenia. In addition, Arius must continue to nurture relationships with countries with larger nuclear programmes, but with potential difficulties in implementing national solutions. These include Taiwan, which has already been approached several times, and Spain.

Separate consideration of countries with no nuclear power programmes, but with research reactors, is also appropriate, if there are cases where fuel or decommissioned reactor materials cannot be returned to a country of origin. To date, Arius has not pursued this issue, as it is more complex, both technically and politically.

The potential to use regional solutions for geological disposal of spent radiation sources (industry, medicine, etc) is a further area that could be explored, but progress in this area is likely to be of limited interest to present members and could be demanding in terms of our limited resources. This issue could be actively pursued if funding from an international body can be found.

A further potential category of organisational members includes those countries that have offered, or may offer, themselves independently as potential hosts for a shared facility. The most obvious candidate here is Russia, but similar arguments might apply to Kazakhstan or China. This is a sensitive issue and members discussed the potential pros and cons of having such countries as members, relative to the concept of having Arius representing members in discussions with potential host countries.

Agreement was reached that information exchange should also be established with potential hosts, that all contacts must be open and acknowledgeable, and that Arius should establish and communicate clear boundary conditions for exchanges, both technical and ethical. The boundary conditions for countries to be in consideration as host countries should be published on the Arius web site.

Concerning industrial members of Arius, efforts can also be made to identify further potentially interested companies and to provide these with arguments for supporting Arius. Nuclear-based companies are the most promising. Recent exchanges with Areva (France) and British Energy (UK) revealed interest and support for the principle but did not lead to their participation. Since Arius has become a member of the WNA, this might increase the chances of further useful connections. In principle, further approaches are possible, but care is needed to ensure that the right balance of organisational members is maintained, if the non-commercial nature of Arius is to continue to be a distinguishing characteristic.

Regional studies: The most sensitive question faced by Arius concerns potential host countries. Unilaterally bringing the names of specific countries into discussion will provoke instant opposition (as illustrated by the Pangea experience in Australia). However, studies on regional repositories may be credibly supported by geographically grouped countries without specifying in advance any potential hosts. Ideally, the countries involved should have at the outset an open mind with respect to siting – that is, in principle, any country in the region could be a candidate. The most likely region of the globe for such studies to be initiated would be Europe - including both the current and the applicant members of the EU. A specific Expression of Interest was submitted in mid-2002 to the EC in Brussels. The requests for proposals for FP6 projects appeared in December, but there was no 'window' in the programme for a proposal of this nature and it was judged necessary to approach the EC at a different level or via a different 'instrument' (see later item). Undoubtedly any such proposal would be met with opposition by some EU member countries, but the Commission itself is supportive of the regional repository concept.

Other regions of the globe where the idea could be launched include East Asia, South America and, perhaps, Africa. The chances of a positive reaction in any of these areas would be enhanced if a European initiative were started first.

The progress of any regional studies would mirror that sketched in the EU option documented in the Expression of Interest. This involves an initial phase studying institutional and legal issues and the planning of subsequent phases. The first phase has no specific work on siting, but it is followed by an assessment of technical siting possibilities, involving representatives from all countries. This path, in the most positive scenario, could lead in some years to Arius having a central role in organising a supra-national siting campaign and ultimately in directly supporting the siting efforts of a national implementing organisation in a specific host country. It is not, however, within the current objectives of Arius to be directly involved as a repository implementer.

Move to New Offices: After managing in 15m^2 of office space for our first year of existence, Arius will be moving to new offices at the beginning of March. The move is necessary because Colenco, with whom we currently share offices, are moving to new premises, but it also gives us chance to expand a little, so that all members of Arius staff will be able to breathe simultaneously!

The new offices are in the building shown above, just across the road from our present building in Dättwil. The new address (from March 1st 2003) will be:

Täfernstrasse, 11
Dättwil
4505 Baden
Switzerland

We shall advise readers of the new phone and fax contact details next month.

European Commission, EPSRR and FP6: In 2002, Arius submitted an Expression of Interest for a European Pilot Study for Regional Repositories (EPSRR), to be considered in the 6th Framework Programme. The finally published programme of work did not include any topic to which EPSRR could be related, thus putting it outside the scope of the current FP6 programme. Arius has been in touch with Commission staff in Brussels to see whether other routes could be found to supporting what is clearly an important European strategic study, especially when seen in the light of the considerable interest the EoI generated from potential participants in such a project and, more importantly, in connection with the draft EU directive on radioactive waste management which advances the prospect of shared solutions. We hope to have further news to report on these approaches soon.

Arius guest lecture at Czech-Slovak Seminar on *Radioactive Waste Management Issues*, Straznice, October 7/8 2002: Following their political separation, Czech and Slovak waste management experts decided to organise an annual seminar to help maintain technical contacts. At the 2002 seminar, participants from Hungary and Poland also took part and the organizers aim to expand further, including

Slovenia and Armenia in a group of central European countries. As its detailed focus, the 2002 seminar in Straznice had the topics of monitoring, clay engineered barriers and public participation. To open the seminar, two guest lectures were invited: one on international repository concepts, by Arius, and another on the new German siting concepts by a member of the AkEnd working group (see also separate news item on AkEnd on this page).

The invitation from the Czech waste management agency, RAWRA, to present the concept of multinational disposal solutions was an excellent opportunity for Central European countries to learn about Arius and for Arius to establish useful connections. From Hungary, three representatives of PURAM, which is already an Arius member, were present.

Useful discussions were held with a representative from the Atom Energy Agency (NAEA) in Poland. The agency is responsible for disposal of wastes - including fuel from research reactors that Russia refuses to accept. There was great interest in Arius; documentation has since been sent and mechanisms for cooperation are being looked at. Further useful contacts were with the RAWRA personnel from the Czech Republic. The 2002 Czech paper on waste strategy outlines a national programme but also acknowledges that multinational solutions could be an option. Presently, however, RAWRA is concentrating on getting the national option to move forward again. Talks were also held with participants from Slovakia. Arius has already had contact with staff from DECOM, the company contracted to study disposal in Slovakia. A direct link to Slovak Electric, which alone has the responsibility to organise waste management, would be useful, but this utility is currently engaged in talks on privatisation and this makes it difficult to pursue other initiatives.

At the 2003 Czech-Slovak seminar, it is expected that Slovenia will also attend and the "Central European" group of participant countries would also like to extend cooperation to Armenia. For these countries and for Arius, maintaining good connections will be valuable, since we share the common goal of ensuring that safe and affordable disposal options are available for all countries.

International News

German advisory group, AkEnd, argues for national disposal solution: In its first Forum newsletter, the German Government advisory group documents arguments raised by one of its members, Michael Sailer, in favour of a national repository. Mr. Sailer, who is also chairman of the German Reactor Safety Commission, concludes that there is no alternative to deep geological disposal, and that this must take place in Germany. His four arguments against export of German wastes are:

1. Strong opposition would be expected in a foreign host country.
2. It would be difficult to guarantee German safety standards in other countries.
3. There are no repositories in existence and implementation would be a long process that Germany could not influence.
4. During this long period, there is a risk of misuse of materials for military purposes following political changes.

From the perspective of Arius, only the first point is a clear difficulty standing in the way of multinational solutions. Arguments two and three are invalid for Arius concepts, which lay down that no reduction in safety standards can be tolerated for a multinational repository and which assume that a common repository could be developed as a cooperative venture with all of the participants sharing responsibility and able to influence the project development. The concern about security of fissile materials is actually an argument in favour of multinational solutions. Shared facilities with a high degree of international oversight, financed jointly by several users, are more likely to provide enhanced global security than multiple, distributed storage facilities.

Gorleben as a repository for Europe's HLW?: During the current campaign for the February 2nd elections in Germany's Lower Saxony, a CDU party spokesman, Lutz Stratmann, told a Hannover press conference that the stalled Gorleben repository project should be reinstated and that the site ought to be considered as the European Union repository for HLW. Subsequently, *Die Welt* reported that Mr Stratmann had withdrawn the comments three days later.

China's potential HLW repository site: China is about to sink a third deep borehole at its very remote HLW disposal site in Beishan. The programme foresees implementation of an underground laboratory as a preliminary step to initiating disposal in 2040. Wang Ju, one of the directors of the Chinese project, has been quoted as agreeing that the planned repository would also be technically suitable for accepting foreign HLW, although he pointed out that this would be a political rather than a technical decision.

Yugoslavian research reactor fuel repatriated to Russia: At the end of August 2002, Russia accepted the return of 817 kg of highly enriched research reactor fuel from the Nuclear Research Institute Vincha near Belgrade, Yugoslavia. The nuclear research reactor at Vincha was shut down in 1984 and the United States sponsored its decommissioning. The fuel originated from Russia and, to avoid fissile materials being retained in the Institute, was returned in the framework of agreements between Russia, the former Yugoslavia, the USA, and the IAEA. There is increasing concern world-wide about the proliferation hazards of such fissile materials. Accordingly, the costs of the transfer were met by the Nuclear Threat Initiative (NTI), a US Foundation set up to reduce proliferation threats. The exercise provides a clear example of the importance of disposal routes being made available to small countries.

Kazakhstan proposals to import LLW progress: In our first Newsletter we reported on the proposal by Kazakhstan that disused uranium mines be used as a site for an international LLW waste repository. The parliament is to be asked to reverse existing national law that prohibits the import of such wastes. KazAtomProm, the company promoting the scheme, says that the proceeds would help to cover the one billion USD (or more) cost of managing the country's own LLW. An indicative disposal charge figure for foreign wastes of 5000 USD per 200 litre drum of waste is being considered. Questions have been raised as to whether Kazakhstan's neighbours would allow wastes to be transported across their territory.

Russian and US National Academies to discuss international storage and disposal: A current initiative of the National Academies of Science in these two countries, financed by a private foundation, involves organising a workshop in Moscow on international storage and disposal. The open workshop from May 14-17 2003 will also involve participants from other countries. All aspects of the concept will be addressed, including legal and financial issues, transportation, reprocessing and transmutation, siting and disposal.

International solutions feature in major IAEA review meeting: December 2002 saw a major one-week conference at the IAEA in Vienna on 'Issues and Trends in Radioactive Waste Management'. In his plenary lecture, John Ritch of the WNA pointed out the great value of international repositories, especially for small countries, and expressed the intention of the WNA to work closely with Arius. He also emphasised the clear recognition by WNA and Arius that multinational initiatives must not impede progress in national programmes. Arius was represented on the geological disposal panel session on day two and the resulting discussion showed a marked agreement that international solutions were not only going to be necessary for some countries, but also inevitable. This is a considerable step forward from the previous IAEA conference on this topic in 2000, when the topic was given little support in official quarters. Later in the week, a Greenpeace panellist took a strong stand against international repositories, saying that they are 'dumping by another name', developing an argument that host countries would have low safety standards, otherwise there would be no benefit for other countries to 'go to countries with higher standards than their own'. This provoked a response from Arius that any international repository would only be accepted if it was managed to the highest possible standards, a view that was noted in the concluding session of the meeting. Nevertheless, this exchange reinforces the need for clear statements on the ethics of disposal, as discussed in the Topical Article below.

TOPICAL ARTICLE

Ethical issues are often raised when waste export for disposal in another country is discussed. This article is intended to kick-off the discussion and state some of the main arguments. It is an issue that we expect to return to in more depth in the future, with a page on our web site being devoted to it in 2003. Clearly, an international repository must be, and could be, implemented in accord with the same principles as a national facility. Therefore the article treats both issues. The aspect of disposal of unwanted materials from disarmament raises a new and powerful ethical argument for international repositories. A responsible, secure host nation which accepted the responsibility of the guardianship of fissile materials, which might otherwise cause mass destruction anywhere in the world, would occupy high moral ground.

Ethical Issues in National and International Disposal of Radioactive Wastes

Charles McCombie & Neil Chapman

The radioactive waste management community has frequently considered the ethical issues underlying concepts for safe handling and disposal of long-lived wastes. Many regulatory regimes governing disposal acknowledge and base their requirements on these principles. In the early years of radioactive waste disposal studies, the problem was primarily regarded as a technical and economic challenge without much explicit recognition of political, social and ethical aspects. Nevertheless, the key importance of ensuring the safety of people and the environment was recognised, and the 1955 guidelines of the US National Academy Committee on geological disposal had already established the principle that long-term safety should take precedence over cost.

In the eighties, explicit attention was paid to ethical issues during development of objectives and principles for radioactive waste management by the NEA and the IAEA. A 1984 NEA report concentrated on how to apply operational radiation protection principles to practices which might give doses only in the far future, establishing *"....a desire for equity, in that future generations should be given the same degree of protection that is given to the present generation."*

The 1989 IAEA Principles were much broader, reflecting various ethical aspects of waste disposal and led to the 1995 *Principles of Radioactive Waste Management*, which include:

Principle 3: ***Protection beyond national borders***
Radioactive waste shall be managed in such a way as to assure that possible effects on human health and the environment beyond national borders will also be taken into account.

Principle 4: ***Protection of future generations***
Radioactive waste shall be managed in a way that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today.

Principle 5: ***Burdens on future generations***
Radioactive waste shall be managed in a way that will not impose burdens on future generations.

The Safety Principles of the IAEA have formed a basis for the major IAEA *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*, which came into force in June 2001. The above three principles all have relevance for international repositories. Principle 3 was originally intended for application to possible effects of a national repository on its neighbours. It would, however, also oblige a nation sending waste for disposal elsewhere to assume its proper share of the responsibility for the future safety. Principles 4 and 5 are relevant for international disposal for the simple reason that they also refer to far future generations, living at times when no-one can predict if and how national boundaries may have moved. A look at the map of any region of the world illustrates vividly how borders change on the timescales of decades or centuries, without even considering the many millennia being discussed in waste disposal.

The Joint Convention explicitly addresses the issue of transfers of wastes between countries when it states:

" (xi) Convinced that radioactive waste should, as far as is compatible with the safety of the management of such material, be disposed of in the State in which it was generated, whilst recognizing that, in certain circumstances, safe and efficient management of spent fuel and radioactive waste might be fostered through agreements among Contracting Parties to use facilities in one of them for the benefit of the other Parties, particularly where waste originates from joint projects; .....".

The second half of the statement makes it obvious that transfer of wastes can be a justifiable approach. It can, indeed, be asked why the main recommendation, that national disposal is to be aimed at, needs to be so explicitly stated. In practice, the wording reflects the tensions that existed during drafting between larger member states seeking national solutions and smaller member states. The fact is that risks or hazards are routinely transferred between sovereign states, on the assumption that the benefits and drawbacks are weighed against one another. Countries that mine raw materials (including uranium) for export implicitly accept the risks from what is often the most hazardous part of the life cycle of commodities. Hazardous materials and chemicals are normally traded with no requirement to return residues. Toxic wastes are transferred to countries with safe disposal options (e.g. to German salt mines).

The argument has been made (e.g. by the UK government) that there is a principle of 'self-sufficiency' which dictates that nations should dispose of their own radioactive wastes. The first flaw in such a principle is that it is arbitrarily narrow. If a nation wishes to be self-sufficient and also use nuclear power, one might expect it to engage in all aspects of the fuel cycle on its own territory. Very few countries have the possibility of being involved in mining, milling, enrichment, fuel fabrication, nuclear power generation and waste disposal. Accordingly, self sufficiency is a myth in this area

Another important international document is the *Collective Opinion on the Environmental and Ethical Basis of Geological Disposal* produced by the NEA, IAEA and EEC in 1995. This records the consensus view that the concept of geological waste disposal rests on a firm ethical basis and develops a set of guiding ethical principles that are broadly similar to those stated by the IAEA, although two issues are more strongly emphasised. The first is that *"....a waste management strategy should not be based on a presumption of a stable societal structure for the indefinite future, nor of technological advance"***.** This leads to rejection of indefinite storage strategies, requiring continuing of resources, in favour of geological disposal concepts offering permanent protection. The second is the wish to *".....not unduly restrict the freedom of choice of future generations"*. An incremental process, involving development of deep repositories in a stepwise fashion over decades, meets this requirement - even when disposal facilities have no deliberate provisions for waste retrieval following repository closure.

There have also been numerous meetings and position papers on ethical issues at a national level. In 1987, KASAM (Sweden) was the first organisation to place strong emphasis on the overriding importance of keeping future options open - a topic to which we return below. In Canada, a workshop was held to give ethical input to the national strategy for disposal of spent fuel. In Switzerland, as a preliminary to revision of the government regulations governing long-term disposal of radioactive wastes, a seminar was held at which ethical issues were presented by experts from outside the nuclear community. The USA has an extensive literature on the general question of achieving equity between successive generations, which has been taken up by those concerned with radioactive waste management.

The fundamental ethics underlying all the principles discussed above are **fairness or equity** for current and future generations; these two concepts are labelled respectively **intragenerational** and **intergenerational** equity.

Intragenerational Equity Aspects

Intragenerational equity means that it is important for current generations to ensure that our finite resources are spent sensibly on solving environmental problems, taking into account the relative scale of the potential impacts and the distribution of risks and benefits. Decisions on how to achieve these aims should be made in a fair and open manner, involving all sections of society. In the following, we address a series of intragenerational equity issues.

Regulating health risks to current populations: Ethical considerations would argue that intragenerational equity requires regulatory criteria for radioactive wastes to be set relative to other activities which are potentially hazardous to the public. In practice, only few countries have a uniform regulatory framework which could encourage this (e.g. USA, with the Environmental Protection Agency, and UK with its Environment Agency). Even in these organisations, there is no real pressure to use uniform risk criteria.

The widely recognised 'nuclear dread' factor associated with radioactivity tends to lead to especially strict formulation and enforcement of regulations in the nuclear area, including waste management.

Spatial distribution of burdens and benefits: The IAEA Principle 3, on protection beyond national borders, and the IAEA guidance on international transfers in its Spent Fuel and Waste Convention were discussed above. The ethical rules proposed do not, it is re-emphasised, exclude transfer of wastes between sovereign States. In practice, this has happened often in the past. For example, the reprocessing nations, France and the UK, originally accepted that they would dispose of the resulting wastes along with their own national waste inventories. The IAEA is currently studying the conditions which should be fulfilled for multinational waste repositories and the EU has debated equivalence principles for waste substitution.

However, there are prominent examples of limiting or banning transfer of wastes. Countries like France, Sweden, Finland, and Russia have banned waste imports. France and the UK now insist on returning wastes from reprocessing to customer countries. There have also been public assertions that transfer of radioactive wastes is somehow morally unjustified (e.g. by a national programme representative at the 1999 DOE Conference in Denver or by Greenpeace at the recent IAEA Conference in Vienna). In practice there are no ethical reasons for treating radioactive wastes differently from other commodities, including chemotoxic wastes. There are, of course, strong ethical reasons for not exporting hazardous wastes to any country which does not have the appropriate technological and societal structures to ensure that these wastes are properly handled. The arguments against waste transfers in the case of willing and capable host nations being prepared to accept waste imports are often less a matter of ethical principle and more of political expediency.

At a national and an international level, the issue of distribution of burdens and benefits is a key issue in the siting of waste repositories. Today, it is a widely accepted practice that a host community should be compensated for its willingness to accept a common facility which is for the good of a wider population. Specific national negotiations on such issues have taken place in numerous countries, including Canada, Finland, France, Sweden, Switzerland, Taiwan and the USA. In developing the international repository concept, the issue of equitable distribution of the benefits between host and partner countries is of even greater importance. The benefits offered in both cases are regarded as fair compensation for offering a valuable environmental service and not as bribes or risk premiums.

Public Involvement: Intragenerational equity requires that the public be given open access to information, that their concerns are appropriately weighted and that they can participate in the relevant decision making processes. In virtually all countries today, information on waste management is freely available. This position has been reached despite the initial tendency to secrecy bred in nuclear weapons programmes and taken over into commercial power activities. Increasingly, there is also a trend towards engaging the public in the debate and, ultimately, in the decision processes. This is sometimes done informally, with public fora or public enquiries, sometimes, for example in the rule making of the USA, using a highly formalised mechanism for gathering public comments on key issues. The ultimate instrument of public participation is perhaps that of a referendum, in which everyone can record their opinion.

International repository programmes, if they are to earn public trust must be equally open. Thus, public information is one of the main missions of Arius. This is largely but not purely an issue in potential host countries; there will obviously be intensive debate in any potential host, but also in partner countries the public attitude towards exports of wastes must be taken into consideration. A caveat, often forgotten, is that the public cannot be expected to master all of the technical issues involved, so implementers and regulators have a direct responsibility to make clear the scientific issues on which there is a broad consensus.

Intergenerational Equity Aspects

Intergenerational equity involves ensuring fairness across generations and is directly related to the topical subject of *sustainability*. The basis tenets are that we do not pass on burdens unnecessarily and that we leave future generations with the same freedoms and choices that we have.

Risks to future generations: The IAEA Principles maintain that future generations should not be exposed to higher risks than current generations. This would lead to dose or risk criteria for future exposures being set equivalent to those for operating facilities. In practice, the argument is made (e.g. in Switzerland) that, since the current generation is the beneficiary of nuclear power, future doses should be less. This has resulted in lower dose limits being set for the future.

Burdens and benefits for future generations: The potential burdens on future generations do not only involve radiation risks. The most obvious other risk is financial and this is discussed separately below. In any ethical discussion on future impacts of waste disposal, one should also address the benefits which can result. Many of the benefits are associated with the overall practice of nuclear power – and hence subject to controversial discussions. However, serious debate on ethics must also acknowledge the potential benefits of technology advances and increased energy availability. For nuclear power, additional arguments are conservation of fossil reserves and reduction of greenhouse gases. As mentioned in the introduction, the aspect of disposal of unwanted materials from disarmament also raises an important ethical argument in favour of international repositories. A responsible, secure host nation which accepted the responsibility of the guardianship of fissile materials, which might otherwise cause mass destruction anywhere in the world, would occupy high moral ground. The huge importance of these points

for all future generations is often insufficiently stressed in debates on the ethics of nuclear power and radioactive waste disposal.

Financial risks to future generations: Implementing repositories will be expensive and postponing this task for long times means that these costs will fall on future generations. For this reason, serious waste management programmes set aside funds to cover these future liabilities. The pioneering example is Sweden, where a fund fully segregated from the utilities and from Government was established early. Many other countries now have funds, although these are sometimes open to appropriation by Governments for other uses, as in the USA, or are left within the utilities, as was the case in Switzerland until recently. Clearly, for international repositories the issues of funding, financing and risk sharing will be still more complex than in the national case. For this reason, generic studies in such topics are a high priority in the Arius programme.

Maximising freedom of choice: This aim can obviously cause conflict with the principle of minimising potential burdens. In the extreme case**, all** choices can be left open if current generations postpone all decisions on waste management – wastes should not be conditioned in case better methods become available, disposal should not be implemented in case alternatives like transmutation provide perfect solutions, repositories should not be sealed in case we wish to retrieve the wastes with ease, etc. This approach passes on all burdens and is certainly not ethical. In practice, there is a strong, and increasing, tendency to try to provide a compromise. Implementers are trying to develop repositories which provide future safety whilst also retaining options for change. Retrievability of wastes has become a major topic. In the ethical debate surrounding disposal, achieving the correct balance between maximising freedom to change direction and minimising future burdens is one of the most sensitive of all issues.

Other Ethical Principles

Sustainability

The topical issue of sustainability is closely related to intergenerational equity. The most widely accepted definition of 'sustainable development' is that of the Brundtland Commission (World Commission on Environment and Development) in 1987: *"....development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*. Most of the relevant points for waste disposal have been touched on above in the discussions on burdens and benefits. Specific repository siting measures can be taken to enhance sustainability attributes, for example by locating repositories in areas where intensive human usage is unlikely and where no restrictions are put on the availability of natural resources.

There is a strong sustainability argument behind the drive to ensure that a geological disposal option is available to each country. Geological disposal is recognized as being the only sustainable solution to managing long-lived wastes, because it does not pass on problems to future generations who may have neither the resources nor the capability to handle them. This argument applies in any country and to any size of programme. However, it is perhaps an even more cogent argument for those countries, including several European countries with small nuclear power programmes, where pressure on resources is already evident.

Precautionary Principle

This principle calls upon society to take prudent preventative actions to deal with risks with potentially very serious consequences, even if there are doubts and scientific controversy surrounding the evidence. Whilst the concept is obviously laudable, its implementation without misuse of society's resources in a manner which conflicts with the principle of intragenerational equity calls for sound judgement. For radioactive waste disposal, it can be argued that any future impacts will be localised and not of a catastrophic nature so that the precautionary principle has limited relevance.

Polluter Pays Principle

The fact that polluters should not be subsidised is widely accepted and influences environmental legislation is almost all countries. Difficulties can arise in assessing the costs, in particular of pollution that is diluted and dispersed (e.g. CO_2 emissions). Nuclear power and geological disposal are more straightforward and, as described above, mechanisms to ensure that costs are covered are in place in most countries. Obviously, the funding arrangements as well as the sharing of potential future liabilities in a multinational project would be structured so as to fully comply with this principle.

Summary

The ethically related views expressed in this article, in particular those related to international repositories, can be summarised as follows:

- There are strong ethical reasons for not exporting hazardous wastes (of any kind, radioactive or otherwise) to any country that does not have the appropriate technological and societal structures to ensure that these wastes are properly handled.
- However, there are no valid ethical objections to bilateral waste transfer agreements in the case of willing and capable host nations that are prepared to accept waste imports.
- Deep geological repositories used by different nations will be necessary if we wish to protect the global environment.
- An ethical justification for self-sufficiency in disposal is a myth, since the rest of the nuclear fuel cycle is already thoroughly international.
- International repositories can be beneficial for world security since they can hinder misuse of fissile materials.
- Any country is entitled to decide that it will not import foreign wastes, but it should be acknowledged that the decision is based on

national attitudes and policies and not on any overriding ethical principle.

- If advanced countries overstate the case for national disposal, they are unfairly restricting the freedom of action of smaller or less advantaged nations for which shared disposal facilities can be an optimal solution for environmental and economic reasons.

Upcoming Conferences

This section of the newsletter highlights conferences in 2003 that are specifically relevant to Arius activities and objectives. Those at which Arius is attending or presenting papers are indicated.

February

23 – 27 Waste management 03: 29th Annual Waste Management Symposium, Tucson, USA.
http://www.wmsym.org/wm03/Index.html

April

30 March – April 3 10th International High-Level Radioactive Waste Management Conference (IHLRWM), Las Vegas, USA
http://www.ans.org/meetings/ihlrwm/
(Arius paper accepted)

September

21 – 25 ICEM'03 9th International Conference on Radioactive Waste Management and Environmental Remediation, Oxford, UK.
http://www.icemconf.com/
(Arius paper submitted)