

## Contents

Editorial	1
Arius Internal News	1
Conference Reports	3
International News	4
Topical Article	
• Radioactive Waste Management in Italy	6
Recent Publications	9
Upcoming Conferences	10

## Editorial

September marks the completion of the first six months of Arius activities. Our opening half-year has been busy! This, our second Newsletter, brings you news of new members, Arius presentations at a number of high profile international meetings and the launch of our upgraded member services. Apart from several significant developments internationally (reported on from page 4), Arius itself has been a source of interest in the Australian and USA news media – all this reported on below. Our Topical Article for this issue, on the history and status of the Italian radioactive waste management programme, welcomes ENEA, our new organisational member. We hope that you will continue to find the Newsletter stimulating, and, as always, we welcome feedback on content and presentation.

*Neil Chapman  
Baden*

## Arius Internal News

**ENEA, Italy, joins as sixth organisational member:** July saw completion of discussions with ENEA (Ente per le Nuove Tecnologie, l'Energia e l'Ambiente – the Italian national Organisation for New Technologies, Energy and the Environment), which joined Arius as an organisational member in August. ENEA has several decades of R&D experience in radioactive waste management. Its 'Siting Task Force' manages the Italian waste inventory database and the current programme into storage and disposal of radioactive wastes. The Topical Article in this issue, by Piero Risoluti (who is the ENEA representative for Arius), describes the history and status of the Italian waste management programme, as well as the current changes going through government, designed to move the programme forward.

ENEA can be visited at: <http://www.enea.it>

**Arius database launched:** The Arius website was updated this month and the database service for members is now available via the Arius homepage.

Back issues of the Newsletter (not current issues) are now freely available on the Arius site – a development that we hope will promote and inform wider discussions on international solutions.

The database contains bibliographic references to reports, papers, articles and news items related to the broad field of international storage and disposal of radioactive wastes, with emphasis on multinational solutions for managing spent fuel and fissile materials. Establishment of the database was enabled by a joint project with the library and information services section of Nagra, Switzerland. Under the terms of the agreement, both organisations share resources and have access to the material. The database is continually updated.

Members accessing the database can search by topic, by bibliographic information or by text strings, providing a sure way to identify all relevant material. Most of the non-copyrighted references on the database are available as full text, downloadable pdf files.

This service is available only to Arius members. User names and passwords have been issued recently. If you have not yet received yours, please contact Sylvia Mieth ([sylvia.mieth@arius-world.org](mailto:sylvia.mieth@arius-world.org)).

**Assembly of Members:** The first gathering of members of our association since our inauguration will take place on November 19<sup>th</sup> at the Arius offices in Switzerland. Apart from representatives of all our organisational members, we are pleased to see that several individual members have also registered for the meeting.

Key items on the agenda will be the strategy for 2003 and the approach to developing our proposed 'European Pilot Study for Regional Repositories (EPSRR)' project for the European Union 6<sup>th</sup> Framework programme, for which calls for tenders are expected in the next six months.

**Excitement in Australia:** Arius found itself involved in the centre of a small frisson of media excitement in Australia during early September. The *Australian* newspaper belatedly produced a short item on the termination of Pangea activities in Australia and on the setting up of Arius, based on information on the Arius website. This prompted a telephone interview with Charles McCombie by ABC (Australian Broadcasting Corporation), information from which was broadcast on the ABC radio news on 5<sup>th</sup> September. Both media pieces caused a large amount of public interest and, as you will see below, a disproportionate reaction from the Australian government.

The ABC news item began by saying:

An international nuclear industry association has described Australia as the ideal dumping ground for the world's nuclear waste. Arius, based in Switzerland, calls itself a non-profit organisation seeking solutions for toxic waste storage.

It went on to say that the:

.....group wants a single international waste dump and Australia is the most obvious choice. "Scientists around the world, including scientists in Australia, recognise that the stable continent, the old rocks in Australia, are more stable than anywhere else in the world, which, if you had a worldwide choice, are certainly the kind of areas you would tend to go".

This statement was coupled with an assertion that Arius was concentrating its efforts on Australia. This misleading reporting led to a number of contacts by members of the Australian public, to which Arius was able to respond with correct information.

On the same day, the Australian government felt compelled to make an unwarranted and unnecessary response to the media excitement, issuing a formal statement under the header "Australia will not accept the world's nuclear waste".

The press release included statements such as:

*Federal Science Minister Peter McGauran has today re-stated that the Government will not accept the nuclear waste of other countries to be stored or disposed of in Australia.*

.....  
*Countries deriving benefits from nuclear technology should make their own arrangements to safely dispose of their nuclear waste.*

.....  
*The Federal Government is advancing two projects for the safe disposal and storage of Australian radioactive waste which is generated from the beneficial use of radioactive materials in medicine, industry and research, in Australia.*

The same Minister has returned very recently from Argentina, where he is understood to have discussed the return (to the constructors) of the fuel waste from Australia's new research reactor, under construction at Lucas Heights, near Sydney. Readers may be forgiven for questioning the consistency of the principles that underlie Australian government policy on radioactive wastes.

To set matters straight, Arius wrote to the *Australian*, as follows (the letter is yet to be published):

Dear Sir

Recently, you published a short item on Australian radioactive waste that mentioned our new organisation, Arius. The article has led to a minor flood of media reports, numerous letters to ourselves and, ultimately, to a press release from the office of Federal Science Minister Peter McGauran. Given this

level of interest, we would appreciate the opportunity to get some of the important facts straight.

Arius (Association for Regional and International Underground Storage) is an entirely non-commercial association. It was founded in February of this year, with the mission of promoting cooperation between countries that will eventually need to implement shared geological disposal facilities for radioactive wastes. Arius was born after the commercial company, Pangea Resources (with which your readers will be familiar from its work in Australia), ceased operations. It had become clear that a purely commercial approach was not what either potential users of shared disposal facilities, or potential host countries wanted. This is partly because the development time involved is likely to be long. We are proud to have been involved in managing Pangea, and to now be managing Arius, because we firmly believe that shared disposal facilities are essential for international safety and security. Details of the Arius association members from 6 different countries are available on our web site [www.arius-world.org](http://www.arius-world.org).

Our main focus at present is on helping countries with only small amounts of wastes that need to be disposed of in a deep geological repository. We have no projects in Australia. The discussions on Australia with your reporters arose for two reasons. One is that we confirmed, on being asked by your reporter, that Australia is indeed one of the most geologically suited countries in the world for a hosting a safe repository. Secondly, we wished to point out that Australia does itself possess limited quantities of long lived radioactive wastes and will one day have to look for a safe disposal route for these. Storage is not a permanent solution.

The present exaggerated emphasis of the government on initiating a nationwide search for a suitable storage site for long-lived wastes distracts attention from finding a permanent solution and is also unnecessary. Storage of Australia's long-lived waste requires only a robust and relatively unsophisticated building that can be constructed almost anywhere. With proper maintenance and security measures, safety can be ensured for a long time. Eventually, however, these wastes will need to be permanently disposed of.

Deep geological disposal represents the only scientifically recognised solution to this problem. Australia has three options. It can implement its own, very expensive, geological repository, share the costs of such a facility with other users, or export its wastes for disposal elsewhere. An open debate on the options will be needed at some point: the present discussions on an interim store address only part of the problem.

Arius could contribute constructively to the debate that will take place. Its members face the same challenges as Australia. Uninformed reactions to constructive proposals for cooperation, before any consideration of the facts, and statements that avoid the issue of what is eventually to happen to Australia's long-lived wastes, serve no useful purpose.

Charles McCombie                      Neil Chapman

**European Union 6<sup>th</sup> Framework Programme:** The Arius expression of interest (EOI) for the EPSRR (European Pilot Study for Regional Repositories) proposal was published on the EU Cordis website on 24<sup>th</sup> September, along with 29 other EOIs in the field of Management of Radioactive Waste. A further 27 EOIs were published in the field of Research on Geological Disposal.

The only other EOI to cover shared repository options comes from the Lithuanian Energy Institute: *Comparative investigation of the geological disposal technologies oriented to simulate the development of regional disposal facilities (RDF)*. As intended by the publication of these EOIs, Arius has contacted the LEI to discuss possible forms of collaboration over eventual proposal submission to the EU programme (probably early next year).

All the EOIs can be viewed at the Cordis site: [http://eoi.cordis.lu/search\\_form.cfm](http://eoi.cordis.lu/search_form.cfm)

## Conference Reports

### LONDON

In September, Charles McCombie presented an Arius paper at the **World Nuclear Association (WNA) Symposium** in London. This has become established as the main nuclear industry meeting in Europe. John Ritch, Director General, has successfully expanded the organisation from 62 members in 16 countries last year to 100 members in 30 countries this year. The tone of the meeting was very up-beat, with the audience looking forward to a “nuclear renaissance”

(although this was tempered by the bad news during the meeting on the problems of TEPCO in Japan and of British Energy in the UK).

The Arius presentation (*Regional and International Repositories: Not If, But How and When*. Charles McCombie and Neil Chapman) prompted Jeff Beattie of *Energy Daily* to interview Charles McCombie and subsequently to write a long article on Arius (“*Group Eyeing International Nuclear Waste Repository*”, vol 30, No. 171, September 5<sup>th</sup> 2002). Beattie’s article notes:

*A group of government agencies and companies from Europe and Japan is mulling plans for an international underground nuclear waste repository, with countries in East Asia and eastern Europe seen as potential host sites.....the newly-formed Association for Regional and International Underground Storage (ARIUS) is a long way from picking potential sites and is now only promoting the shared repository concept generally and building membership. ....ARIUS’ five members—from Belgium, Bulgaria, Hungary, Switzerland and Japan — are joining forces to craft a shared solution to the nuclear waste problem, seen as a key obstacle worldwide to the long-term viability of nuclear power.*

Beyond the meeting, the immediate possibility of Arius becoming involved with WNA, and vice-versa, will be followed up. This has already been discussed in principle during the formative months of Arius, in late 2001.



An illustration, from the Arius paper at the London WNA meeting, showing the main European countries that will eventually require access to geological disposal facilities, superimposed on a map of the USA, at the same scale.

The illustration was used to make the point that the USA will have only a few repositories, effectively ‘shared’ by its states, while the similar land area of Europe would have many, if shared facilities are not developed.

## MOSCOW

Arius was invited to present a paper on behalf of the Swiss national spent fuel management programme at Minatom's '**Irradiated Nuclear Fuel Management 2002 – Russian New Initiatives**' conference in Moscow this September. Owing to the direct relevance of the whole meeting to international solutions, an extended report is provided below.

The main purpose of the 3-day conference was to present the Russian initiative for offering services for spent fuel management to foreign customers, although the presentations on this topic from Minatom, or its wholly owned company, Tenex, were embedded in a full-scale technical conference. Over 50 papers were presented to an audience of around 230, from all around the world. The topics covered technical, economic, political and public acceptance issues. Tenex provided ecologists and members of green movements with the opportunity to address the conference. Charles McCombie presented an invited overview of the Swiss spent fuel management programme (written jointly with Tony Williams of EGL, Switzerland).

Minister A. Rumjantsev, from Minatom, pointed out the increase in security concerns after 11<sup>th</sup> September and stressed that a variety of fuel cycle approaches was necessary. Russ Dyer, the senior USA representative present, acknowledged that shared repositories are necessary for some countries and that "collaboration was supported by the USA", provided certain requirements were met. He stated that the USA is interested in Duma legislation allowing storage of spent fuel but that "certain issues impede" the granting of US consent rights for the roughly 33'000 tons of spent fuel in Europe with US rights.

K. Fukeda of the IAEA pointed out that there was a growing shortage of storage for spent fuel and that "international or regional concepts cannot be ignored". In particular, he advocated that research reactor fuels should be returned to the USA and to Russia, in both cases with no return of wastes to the users.

M. Solonin of Minatom stated that not all countries possess suitable geological formations for disposal. He noted that Minatom is "ready for any form of international collaboration in the field of SNF management" - without explicitly mentioning disposal. V. Grachev, from the State Duma pointed out that the new law forbids import of waste - but that spent fuel is not classified as waste in Russia since it should be reprocessed. SNF is classed a "nuclear material" and this can be imported if proper international agreements are concluded. He claimed that bringing back spent fuel of Russian (or USSR) origin presented no problems, but that foreign-flagged fuel did. These outstanding problems concerned transparency in the use of funds and regulating the right of Russia to return wastes.

Bill Timbers, CEO of USEC, described the Russian interest in offering an international service for the management of SNF as "bold and timely" - but with many challenges still to be met to transform the vision

into reality. A. Bykov of the Nuclear Disarmament Forum (Zug, Switzerland) cited security issues and terrorist threats to support the argument that Russia should offer services for fuel leasing and for international storage. He raised the 'Iran issue' directly, concluding that the best arrangement would be "an international consortium with participating Western countries specialised in dry storage and spent nuclear fuel shipments".

V. A. Smirnov, General Director of Tenex, also promoted the fuel leasing concept. The Russian Government has appointed Tenex as its agent for foreign fuel services. These are currently storage and reprocessing, but he believed these will lead to leasing arrangements.

Jim Malon, Vice President of Exelon, pointed out that the US utilities were still cynical about the Yucca Mountain schedule and welcomed new initiatives that bundled front and back end interests. He cautioned, however, that since the US utilities are paying into the Nuclear Waste Fund, new initiatives involved extra costs, which are very unwelcome at this time.

The Non-Proliferation Trust adopted a high profile, with talks by President Bob Newman, chief advisor Tom Cochran, V. Ivanov (ex-Deputy Minister, now at RIAR) and V.P. Krondzan. Newman claimed that contracts were signed in October 2001 and that "detailed development is in progress, with NPT now in the final throes of finalising project financing". Cochran claimed that there is no confidence that Minatom would implement a disposal facility or would manage the funds honestly - so that both these activities must be under direct US (NPT) control. He asserted that NPT is the only realistic proposal for funding, that the US Congress will agree only to the NPT proposal and that Minatom cannot go forward alone. He also wishes to insert a clause barring Russia from reprocessing for 30y years, "provided that the USA also does no reprocessing." V. Keondzan (Chairman of a Board of "Non-Proliferation and Ecologic Improvement", set up by the Russian Government to support various projects, but primarily NPT) noted that his Board is a party to the NPT agreement, which he stated "still needs government approval". He claimed that after originally objecting to the financial model (which gives NPT 3.75 billion USD for running the project and has NPT controlling the 11.25 billion USD to be disbursed), his group now approves of this.

Despite the upbeat presentations, the wider opinion outside the meeting is that there is less substance to the NPT proposal, and that the US government remains reluctant to support any single initiative. Nevertheless, NPT has a range of influential public supporters in both the USA and Russia.

The conference was an important milestone towards realisation of multinational repositories. Minatom were explicit about their proposals and important reactions - in particular from the USA - were given. The biggest obstacles to early import of spent fuel by Russia seem to be:

- Import of waste is still prohibited, so that a full service (acceptance of spent fuel with no waste return) is still not on offer.
- Although the USA expressed open support for the multinational concept, there are still issues concerning Iran and reprocessing that would prevent the USA giving consent at present.
- There is still a degree of distrust in the credibility of the Russian partners that could lead to public opposition to their proposals in potential customer countries.
- Minatom exaggerates the urgency with which potential customers need to make use of a spent fuel service. Interim storage provides most countries with long times for reaching final solutions.

**Arius as facilitator:** Discussions outside the conference reinforced the potential for a constructive role for Arius in the global search for multinational disposal solutions. Arius could be a valuable intermediary between countries considering hosting a repository and countries requiring a disposal service. The former category includes Russia as the most immediate candidate, but others may well come forward as the concept gains in acceptability. For potential hosts, the existence of a public group of partner countries interested in pursuing the concept will help to increase public acceptability by making it clear that a real need for the service exists. In addition, a co-ordinated group of countries could insist more easily on various conditions being met by the potential host (first class technology, accessibility to facilities, transparent financing, etc.).

For potential users, it may be more effective to channel interactions with potential hosts through Arius, acting as an intermediary. This avoids a strong degree of commitment to any specific project at an early stage. Of course, if and when all of the conditions needed to allow real negotiations on potential terms and conditions can be put in place, then potential users could co-ordinate their actions by other means, or progress individually.

## International News

**Proposed European Union Directive on radioactive waste disposal:** European Commission staff and EU Energy Commissioner Loyola de Palacio are proposing a Directive within the framework of the Euratom Treaty that would impose timetables on member states for the development of disposal facilities for their radioactive wastes. The Directive is one of a set of three being put forward for consideration by the European Commission. The other two concern setting up common EU safety standards and the setting up and management of funds for decommissioning, waste management and other nuclear liabilities.

The background to these Directives is a desire to convince the European public that nuclear safety is

high priority and that credible solutions for waste management really exist, and also to accelerate national disposal programmes, especially those that are in the doldrums.

For the radioactive waste disposal Directive, member states would be required to establish and publicise plans for managing their radioactive wastes, and to find and authorise disposal sites within a short timeframe. 2008 is cited as a possible deadline for selecting sites for HLW repositories, and 2018 for them to become operational. Given the considerable social problems encountered in repository siting in many countries, it is difficult to see how all member states would be able to meet the waste Directive timetable. This clearly raises the question of whether every member state can most efficiently try to address the Directive by going it alone, or whether sharing would be more effective. As discussed in our last Newsletter, sectors of the European Commission are known to be keen to see these possibilities develop and Commissioner Loyola de Palacio acknowledged that shared disposal facilities may need to be considered.

The timetable for moving the Directives forward is now short. Consultation is expected to be completed early next month. The existence of the Directive would certainly act as a spur to governments that have effectively put the waste issue on the back-burner.

**Wellenberg vote raises questions about disposal in Switzerland:** On 22 September, the Canton of Nidwalden voted against granting permission to GNW (the company set up to manage a LLW repository) for an exploratory drift at Wellenberg. The majority against was 57.5%. The Wellenberg site was selected in the late 1980s as the location for the national LLW repository, and progress was stymied by an earlier referendum in 1995. While the technical suitability of the site is not in question, the referendum result has left the Swiss waste management programme in some disarray. The outcome of the vote will affect the schedule of the L-ILW disposal programme, although there is plenty of interim storage capacity at the recently commissioned Zwiilag facility at Würenlingen.

The timing of the vote will affect the new Nuclear Law, currently under debate in the Swiss Parliament, and Nagra has issued a statement noting that this debate will need to consider the decision-making authority (federal versus cantonal government) for such national issues. Nagra also state that their programme for HLW and LL-ILW will not be affected by the vote. The main results from the HLW/SF/LL-ILW disposal feasibility (Entsorgungsnachweis) project will be submitted to the authorities this winter.

The reaction of the nuclear industry is likely to be tinted by the scheduled 2004 vote on whether to phase out nuclear power. Clearly, the existence of a credible disposal programme will be central to considerations on whether to continue with nuclear power. The Wellenberg result may also affect views on Switzerland's continued commitment to seeking international disposal solutions, which is still slated to be in the new Nuclear Law, but which is by no means a certainty.

**Swiss parliament debates new nuclear law:** When the Swiss parliament resumed the debate on the new Nuclear Law following the Wellenberg referendum result, an important change from decisions taken during the earlier debate in the summer session was that cantons should, after all, have the right to veto nuclear installations. Other key decisions taken by parliament were that new nuclear power plant licenses must be approved by parliament, with the possibility of a referendum contesting the decision; that the existing power plants will have no fixed restriction on their lifetimes and that reprocessing should remain an option that power plant owners may choose if they wish. In the context of the work of Arius, important guidelines for export or import of radioactive wastes were set. Both are allowed in exceptional circumstances, with a permit for export being coupled to strict conditions concerning the safety levels in any foreign country accepting Swiss wastes.

**Denmark returns fuel to USA:** Decommissioning of the three shut-down research reactors at Denmark's National Research Laboratory at Risø will generate a range of waste types. A storage site is to be sought for the LLW, ILW and small amount of HLW arisings. The fuel from the reactors was returned to its source country, the USA, providing a further example of the feasibility of spent fuel transfer between collaborating states. The possibility of looking for other recipients was not considered. Long term plans (e.g. for eventual disposal of the stored wastes) are not known.

**Joint group from Duma and European Parliament to evaluate issues of SF import to Russia:** A working group of Duma members and members of the European Parliament has been established to look into any contacts that might take place between the European nuclear sector and Russia's Minatom with respect to the possibility of Russia importing spent fuel.

According to the Bellona Environmental Foundation, the working group will exchange information on any proposals of national organisations to move spent fuel to Russia, with the aim of preventing any project that might be environmentally unsafe, violate legislation (e.g. EU requirements for authorisation of exports of nuclear materials) or threaten non-proliferation aims. The group is to commission a report reviewing the current status of proposals for SF import to Russia and will also promote continued EU aid to Russia in coping with its historical radioactive waste legacy.

**UK to set up new organisation to look into waste management options:** After decades of repeated setbacks in implementing disposal solutions for long-lived wastes, the UK Government ran a public consultation exercise over the course of the last year to find out how to develop a new programme. In July, the ministry responsible (DEFRA) issued a statement about how they plan to proceed.

They propose a rigorous assessment of long term waste management options and active public involvement in the process. A new, independent body will be appointed to oversee the review process and

will make recommendations on the most appropriate option, or combination of options. The new body will be in place by the end of this year. Consideration of options (which will not address the issue of potential radioactive waste storage or disposal sites) will end when the government publishes a decision, around 2006, followed by a public debate on how the decision should be implemented, including any site selection criteria. The implementation process, including any necessary legislation will begin in around 2007.

Pilot work commissioned by DEFRA is looking at all management options, including international disposal solutions, and beginning to identify any necessary R&D that would be needed to compare them properly when the new independent body is formed.

In parallel with its proposals for moving the waste management issue forward, in July the UK government also announced its strategy for managing the clean up of Britain's legacy from nuclear power development. The strategy aims to set up a Liabilities Management Authority (LMA) to manage the task of cleaning up the BNFL, UKAEA and Magnox NPP 'legacy sites'. The programme is expected to cost in the order of 40 billion GBP over a period of about 150 years, with a significant proportion of the expenditure occurring in the next thirty years. To develop the LMA programme, a small, interim Liabilities Management Unit has been established by the government.

## TOPICAL ARTICLE

### Radioactive Waste Management in Italy: Past and Present

*Piero Risoluti, ENEA*

Nuclear energy has been abandoned in Italy, the programme being terminated after a referendum in 1987. Nevertheless, Italy played a prominent role for more than thirty years in both applied nuclear research and in the production of nuclear electricity, beginning in the late 1950s. Italy was one of the pioneering countries during the period when the commercial and industrial use of nuclear energy was first implemented. The Latina and Garigliano nuclear power stations were among the first in Europe, and the CNEN's (National Committee for Nuclear Energy) plants and laboratories were also among the most advanced during the 1960s.

Consequently, even though Italy presently does not have a nuclear power programme, it does have a significant history in the nuclear world. Having this past means having radioactive wastes: those generated by past activities and those that will be produced by the dismantling of shut-down nuclear power stations, research laboratories and pilot plants, included two reprocessing facilities. This material must be disposed of safely, not only in order to conclusively 'de-nuclearise' the research centres, which are today fully converted to other activities, but also to provide a higher level of environmental safety.

## PRESENT SITUATION OF ITALIAN NUCLEAR INSTALLATIONS

Four nuclear power stations were in operation in Italy:

**Latina:** A 210 Mw(e) Graphite Gas Reactor, operated from 1963 to 1986. All the Magnox spent fuel has been reprocessed in UK. All the moveable radioactive wastes have been conditioned. A detailed plan for dismantling has been presented to the licensing authority.

**Trino:** A 270 Mw(e) PWR reactor, operated from 1965 to 1987. The spent fuel is stored in pools (at the site and elsewhere) waiting for transfer in dual purpose casks. Most of the radioactive waste has been conditioned.

**Garigliano:** A 160 Mw(e) BWR reactor, operated from 1964 to 1978. All the spent fuel has been removed and will be reprocessed at Sellafield in the UK. The radioactive waste has been conditioned. A detailed plan for dismantling is under licensing procedure.

**Caorso:** An 860 Mw(e) BWR reactor, operated from 1978 to 1986. The spent fuel is stored in the reactor pool, waiting for transfer in dual purpose casks. Radioactive waste conditioning is under way.

A fifth power station was under construction when nuclear energy was phased out in Italy: **Montalto**, 2000 Mw(e) in two BWR units, about 90% completed in 1987.

Three nuclear research centres were formerly operated by CNEN, the National Commission of Nuclear Energy, which became ENEA in 1983 (ENEA is today the national Agency for New Technologies, Energy and the Environment).

**Casaccia Centre:** Located 20 Km northwest of Rome, Casaccia is currently the largest research centre in Italy. The unique nuclear facility in operation for radioisotopes production is a *Triga* reactor. Facilities under decommissioning are:

- *Plutonium Plant.* This facility was used from 1968 for development of mixed oxide fuel fabrication processes. The fuel for the Italian fast reactor programme (carried out for several years up to the referendum of 1987) was developed in this facility
- *Hot Cell complex.* Two groups of hot cells were built in 1962 and 1978. Post-irradiation examinations were carried out since 1965.
- *Radiochemistry Laboratory.* Chemical processes for spent fuel reprocessing and waste conditioning were under development from 1965. The chemical process for MTR fuel reprocessing, based on solvent extraction by amines, was developed in this laboratory.

Nucleco, the LLW operator, is also located at the Casaccia Centre (in a separate area). Nucleco is a

joint company of ENEA and ENI, the large national oil company of Italy. In Casaccia, Nucleco operates the largest national facility for solid waste treatment and conditioning, equipped with a supercompaction unit. Most of the radioactive wastes produced by hospitals and small producers are also collected at Nucleco, on behalf of ENEA.

**Saluggia Centre:** Located in northern Italy, 50 km from Torino. Between 1970 and 1987, the Eurex pilot reprocessing plant was operated at the Saluggia Centre, with MTR and Candu spent fuels being processed. The largest inventory of radioactive waste in Italy (in terms of radioactivity) is stored at Eurex, including some 150 cubic meters of fission product liquid wastes. The conditioning of the Eurex liquid wastes is the most important ENEA waste management activity. A vitrification facility is under licensing procedure and is expected to begin operation in 2007.

**Trisaia Centre:** Located in southern Italy, 60 km from Taranto. At Trisaia a reprocessing pilot plant – the *Itrec* plant – was in hot operation from 1978 to 1980 for uranium-thorium spent fuel reprocessing. Refurbishing was under way when the nuclear programme was cancelled. Itrec was designed for remote operation and maintenance. Almost all the LLW and HLW has been conditioned by cementation.

A commercial fuel fabrication plant (FN, **Fabbricazioni Nucleari**) was also operated in Italy from 1973 to 1995, producing BWR and PWR fuel for Italian and foreign reactors. The FN plant, located in Piemonte, some 80 km west of Torino, is presently owned by ENEA. Other smaller research centres have been operated in Italy: **CISAM** in Pisa, **CESNEF** in Milan. In addition, two *Triga* reactors are still operated at the Universities of Pavia and Palermo. The Joint European Research Centre at **Ispra**, the largest Euratom Research Centre, located 50 km north west of Milan, is also a radioactive waste producer.

## MAIN INSTITUTIONAL FRAMEWORK

The main waste management operators in Italy are:

- **ENEA**, The national Agency for New Technologies, Energy and the Environment
- **SOGIN** (Società Gestione Impianti Nucleari). SOGIN, a previous daughter company of ENEL (the national electricity producer), was established as an independent body, fully owned by the Ministry of Economy, in 1999. Its mission is to carry out the decommissioning of the four shut-down nuclear power plants.
- **ANPA** (Agenzia Nazionale Protezione Ambiente), is the agency responsible, among other tasks, for nuclear safety and licensing.

Activities are now carried out under the institutional and financial framework established in 2000 by a Decree of the Minister of Industry. This Decree established plans and procedures for funding the

whole back-end activity at the phased-out national nuclear facilities, including waste conditioning, dismantling and disposal. The costs incurred will be covered by levying a fee on electricity sales. The fee will be fixed annually by the Authority for Energy, an independent public body, upon presentation of a detailed business plan. The first such plan was presented in September 2000.

The above decree also provided directions for merging the ENEA nuclear facilities that are to be decommissioned, with SOGIN, by the end of 2003.

### RADIOACTIVE WASTE INVENTORY AND DISPOSAL PROGRAMME

Radioactive wastes are currently stored at the sites where they were produced. Conditioning is under way, and is expected to be completed by 2010. All conditioned waste will have to be stored at the same sites until they can be sent a final disposal facility. The national inventory of conditioned waste by volume is shown in the figure below. The inventory also includes the wastes from Ispra, which are presently planned to be disposed of in the Italian LLW repository, since they have been produced within the Italian national territory.

In Italy, high activity waste is classified as Category III wastes, which includes spent fuel, vitrified wastes, TRU waste and other long lived wastes not suitable for near surface disposal. The rather limited amount of HLW does not justify the provision of a geological disposal site in Italy. At present, the plan is to store these wastes in a centralised long term storage facility for 50 – 100 years. Italy, as with other countries which share the same problem, is interested in international co-operation in the field of geological disposal and

also in initiatives directed at verifying the feasibility of implementing an international repository.

A programme for LLW disposal has been under way since 1997, when a Task Force was established within ENEA, whose mission is to undertake activities directed at the identification of disposal and storage options for LLW and HLW, and at site selection.

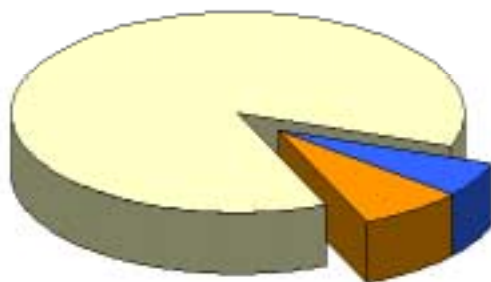
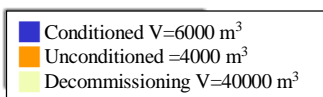
On the institutional side, in January 2000 the Ministry of Industry established a special Working Group comprising representatives of central government and of the regions of Italy, charged with identifying and proposing a procedure and methodology for site selection that would have the necessary level of consensus. This Working Group presented initial conclusions to the government in September 2001. A decision by the new government on how to proceed is now expected in 2003.

### THE LLW REPOSITORY PROJECT AND THE NATIONAL STORAGE FACILITY

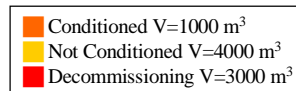
Since 1997, ENEA has carried out work directed at the design of a national LLW repository and at selecting and qualifying a site for the repository. The main achievements have been:

- A first revision of the national inventory of the radioactive materials that need to be disposed of or stored in a centralised interim storage facility. The inventory also includes the wastes expected to be produced in the plant dismantling activities.
- A preliminary design of a LLW repository based on a near-surface vault concept. The disposal technique has been identified and the engineered

## WASTE INVENTORY By VOLUME



LLW  
(50'000m<sup>3</sup>)



HLW  
(8'000 m<sup>3</sup>)

barrier system is being characterised. The development of suitable cementitious material in collaboration with Italian Universities is supporting the design activity. The repository is designed for a total national inventory of around 50,000 cubic meters of conditioned waste. By using advanced dismantling and conditioning techniques for large equipment from the power stations, reduction of the requisite capacity might be possible. The chosen disposal option is under evaluation by ANPA (the National Agency for Environment Protection, the licensing body of Italy).

- In 2000 ANPA issued a criterion of *reversibility* for the LLW Repository. The design developed by ENEA allows for disposal to be carried out using a *disposal module*, which allows for reversibility.
- As mentioned above, it is planned that the long term storage facility for Category III wastes will be located at the same site as the LLW repository. The conceptual design of a long term storage system has also been completed, in order to identify interface problems with the LLW repository and to allow development of the general layout of the site. The conditioning facility for radioactive wastes that will arise in future years from small producers is also located at the disposal site
- A Performance Assessment methodology for the LLW Repository has been developed, based on the AMBER code, first developed by QuantiSci in the UK and further upgraded by the ENEA Task Force. The upgraded AMBER code is being used for evaluation of the confinement performance of the concrete structures of the repository and for evaluation of site suitability. Deterministic and probabilistic calculation codes are being developed by ENEA and are currently being applied for source term determination and for transport of radionuclides through concrete structures and soil layers.
- An extensive geographical screening of Italy to identify suitable areas for the location of the LLW repository was completed in 2000. The investigation began in 1998 and was based on GIS methodology, which was used to build a National Map of Suitable Areas. Further investigation, using an upgraded GIS methodology and a model for area ranking, allowed nation-wide selection of a number of areas with appropriate geographical, geological, demographic and environmental characteristics. These areas are distributed throughout all the regions of Italy for which exclusion criteria do not apply. During 2001, a further evaluation of the selected areas was carried out, whilst a decision by the government is awaited, to establish the procedure for selection of the eventual site.

## FUTURE INSTITUTIONAL FRAMEWORK FOR RADIOACTIVE WASTE DISPOSAL

Decisions on the institutional framework for the disposal of radioactive waste are expected to be taken shortly in Italy. Provisions are made in the finance bill under discussions at the national parliament for fiscal year 2003, concerning some key points which should allow the programme to speed up. The bill directs the government, among other things, to:

- indicate the organisation that will be responsible for final site investigation;
- indicate the procedure for site selection and approval;
- promote actions for providing information to the public;
- indicate the allocation of responsibilities for the medium and long term;
- establish the financial framework for the construction and operation of the site.

The financial bill has to be approved by the end of this year. By that time it will be more apparent if, and to what extent, the Italian radioactive waste disposal programme can progress in the coming years.

## Recent Publications

In this issue, we look at three new books concerning the potential threat posed by terrorism using nuclear materials, and a fourth book that provides a valuable compendium of national activities in geological disposal.

### THE THREAT FROM MISUSE OF NUCLEAR MATERIALS

With the collapse of the former Soviet Union, concerns grew that the resulting disarray could lead to inadequate safeguards on fissile materials. These concerns were magnified by the fact that the huge weapons dismantling programmes foreseen by Russia and the USA would be releasing much more high enriched uranium and plutonium. Following the tragic terrorist attacks of 11<sup>th</sup> September 2001, the threat was recognised to be wider, also extending to radiological dispersion devices ('dirty bombs') that could be used by terrorist groups gaining access to suitable materials. Three recent publications have addressed various aspects of these threats. The overall message is clear: radioactive materials, and especially fissile isotopes, must be carefully managed across the globe if nations are to be protected from their misuse.

**Securing Nuclear Weapons and Materials: Seven Steps for Immediate Action.** Matthew Bunn, John P. Holdren & Anthony Wier. *Project on Managing the Atom (MTA), Belfer Center for Science & International Affairs, Harvard University JFK School of Government, USA. May 2002.*

This Harvard report reviews the dimensions of the danger of nuclear attack by terrorists and the efforts underway to combat it. The authors recommend seven steps that should be taken to keep nuclear weapons and their essential ingredients out of terrorist hands. The seventh step supports the proposal by the Russian Ministry of Atomic Energy to ship foreign spent nuclear fuel to Russia. The report warns that, even after September 11<sup>th</sup> 2001, the size and speed of the U.S. and global response to the threat of nuclear terrorism are not remotely commensurate with the threat. The steps are:

1. Build a global coalition to ensure the security of Weapons of Mass Destruction (WMD).
2. Nominate single leaders for US and Russian efforts.
3. Secure stockpiles of fissile materials as fast as possible. According to the report the main security risks may be addressed within four years.
4. Ensure that all vulnerable stockpiles of plutonium or HEU are either eliminated or provided with high levels of security.
5. Make a politically binding commitment to meet a stringent, agreed standard for security and accounting for all nuclear material and facilities.
6. Accelerate blend-down of highly enriched uranium.
7. Develop new revenue streams that can supplement government expenditures

The report is available in its full length at: <http://www.nti.org>

**Making the Nation Safer: the role of science and technology in countering terrorism.** *National Research Council of the US National Academies, National Academy Press, Washington DC, 2002.*

Following the September 11<sup>th</sup> 2001 attacks, the National Academies initiated and funded a major effort involving a 24 member main committee and 8 sub-panels on the above subject. The first threats addressed are nuclear and radiological, but sub-panels also looked at other areas including health systems, toxic and explosive materials, information technology, energy systems and transportation. In the nuclear area, plant-by-plant analyses of power stations is recommended. For radiological dispersion devices, it is recognised that, although they would be unlikely to cause large numbers of casualties, the potential for inflicting economic loss and causing terror and panic is significant. Safe management and control of radioactive materials is a must. The report concentrates on the US situation, but acknowledges that the key messages are relevant to all nations of the world.

**Russian Weapons Plutonium and the Western Option.** *Nuclear Disarmament Forum (NDF), Zug, Switzerland, 2002.*

This interesting report, with a foreword from Frank N. von Hippel of Princeton University was produced under the management of Bengt Tveiten of NDF. It addresses the challenge of irreversible disposition of the plutonium from dismantled warheads in Russia (and implicitly in the USA). Building on work done earlier by Russian/US and French/German/Russian expert groups, the authors examine ways of securing the necessary financing for the work, by commercialising certain aspects. The proposed "Western Option" suggests:

- using only Western European power plants to burn the MOX fuel created from weapons plutonium (thereby saving expensive Russian reactor upgrades);
- using MOX fuel leasing as a vehicle for obtaining revenue that would finance weapons grade plutonium conversion and MOX fuel fabrication.

The report is obtainable from the NDF at Baarerstrasse 8, CH 6301 Zug, Switzerland

## NATIONAL PROGRAMMES IN GEOLOGICAL DISPOSAL

**Geological Challenges in Radioactive Waste Isolation: 3<sup>rd</sup> Worldwide Review.** P. A. Witherspoon and G. S. Bodvarsson (eds). *Lawrence Berkeley National Laboratory, Report No: LBNL-49767*

This is the third in a series of books that reports, every five years, on the status of key national disposal programmes world wide. The first two volumes were published in 1991 and 1996. The volume is reasonably up to date (being based on a workshop held in April 2001) and covers 32 countries, including all those that have organisational members of Arius. The final group of papers, covers international repositories (McCombie, Chapman, Kurzeme and Stoll), deep repositories as an aid to non-proliferation (Pentz and Stoll) and international co-operation (Burkart). This is a useful reference volume for anyone needing to obtain basic information about national programmes or international concepts and to compare the state of development of geological disposal around the world.

## Upcoming Conferences

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

### October

7 – 9 International Congress of the European Nuclear Society and World Nuclear Expo. Lille, France. [www.euronuclear.org](http://www.euronuclear.org)

7 – 8 5th Czech-Slovak seminar on radioactive waste management issues, Prague, Czech Republic  
**(Arius invited presentation)**

#### November

5 – 7 Symposium on Radioactive Materials Transport. Edinburgh, Scotland. [www.inuce.org.uk/](http://www.inuce.org.uk/)

#### December

4 – 5 7<sup>th</sup> Nuclear Congress. London, UK.  
[www.bnes.com/](http://www.bnes.com/)

9 – 13 International Conference on Issues and Trends in Radioactive Waste Management. Vienna, Austria.  
[www.iaea.org/worldatom/](http://www.iaea.org/worldatom/)  
**(Arius invited participation in panel)**

#### February 2003

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

#### March 2003

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