A NUCLEAR RENAISSANCE WITHOUT DISPOSAL?

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Nuclear power is undoubtedly experiencing more rapid growth than it has for decades. This "nuclear renaissance" is heartening many experts who joined the industry back in its first heyday, expecting then to see a continuous rapid development of a powerful new technology. It didn't happen as was expected back then. Instead, nuclear energy production stagnated, in particular in the western world. Three prime problems were responsible for this: public concerns about reactor safety, business doubts about economics and no clear demonstration of a waste disposal route. What is the situation today? This paper asserts that the former two issues have been resolved to the satisfaction of the majority of stakeholders – but that waste disposal could again be a stumbling block to the expansion of nuclear power programmes around the world. It looks at how expanding and new nuclear nations can react to ensure that credible disposal solutions can be made available – either in a national or a multinational framework. It also addresses the key challenge – repository siting - in these two scenarios.

I. INTRODUCTION

Nuclear power is undoubtedly experiencing more rapid growth than it has for decades. This "nuclear renaissance" is heartening many experts who joined the industry back in its first heyday, expecting then to see a continuous rapid development of a powerful new technology. It didn't happen as was expected back then. Instead, nuclear energy production stagnated, in particular in the western world. Three prime problems were responsible for this: public concerns about reactor safety, business doubts about economics and no clear demonstration of a waste disposal route. What is the situation today? This paper asserts that the former two issues have been resolved to the satisfaction of the majority of stakeholders – but that waste disposal could again be a stumbling block to the expansion of nuclear power programmes around the world.

Nuclear reactors have proven to be a safe and reliable source of base load electricity. The few major accidents that have occurred resulted in large financial losses, but relatively few fatalities. The economics of nuclear electricity now look very favourable compared to the alternatives. A major reason for this is the vastly improved efficiency of plant operation and the increased availability. Another key reason is that – finally – fossil fuel competitors are being forced to meet costs required to check atmospheric pollution and CO_2 emissions. However, in the eyes of much of the public "the waste problem" is still unsolved. Specifically, the final disposal of radioactive wastes remains a controversial public and political issue.

Of course, there has been tremendous progress made towards safe geological disposal of HLW or spent fuel. The necessary technologies have been developed. In some countries, e.g. Finland, Sweden, and the USA, preferred repository sites are selected. Nowhere, however, is disposal in progress – and this will remain the case for 10 years or more, as illustrated in Table 1 below.

TABLE I. Planned Operational Dates for Geological Repositories

Country: Date	Country: Date
Austria: no plans	Belgium: after 2025
Bulgaria: no plans	China: after 2040
Czech Republic: 2065	Finland: 2020
France 2025	Germany: 2030
Hungary: 2047	Italy: open
Japan: 2035	Lithuania: no date
Netherlands: after 2100	Romania 2049
Slovakia: 2037	Slovenia: 2066
Spain: 2035	South Korea: open
Sweden: 2017	Switzerland: 2040
United Kingdom: open	USA: 2018?

The situation is somewhat better now than in the early rise of nuclear. Geological disposal is widely accepted as the correct way forward and the technical community has reached consensus on the feasibility of constructing, operating and closing safe and secure repositories. But public and political scepticism remains strong.

Is it responsible, or indeed feasible, to accelerate the expansion of nuclear energy without sufficient acceptance of disposal? Are we heading into the same problem that hindered nuclear the first time round, giving rise the criticism that constructing a nuclear power plant without a repository was like "building a house without a toilet"? How will this new nuclear renaissance affect the effort being put into repository development?

The negative scenario is that the urgent need for more energy will far outweigh the postponable task of repository implementation, which will then be neglected. Already some signs of this are visible. The USA argued not so long ago that operation of the Yucca Mountain repository was a pre-requisite for new nuclear plants in the country; today license applications are being submitted despite the very uncertain future of the repository project. Other developed countries with existing nuclear plants, such as the UK, China, Taiwan, Russia and Canada, are contemplating new nuclear build although no repository is in sight. The hunger for electrical energy in numerous less developed countries that are now considering nuclear power (e.g. Indonesia, Vietnam, Algeria, Thailand, Turkey, and Nigeria) is attracting potential nuclear vendors who offer to provide reactors and fuel services - but no disposal route.

The solution to the problem is not to insist that repositories are actually available before new nuclear plants. This is in any case not feasible in practice given the long repository development times. It is also not necessary, since a HLW or spent fuel inventory for disposal will not arise from any new nuclear plant for decades because of the long cooling times and the slow accumulation. The crucial task is to ensure that all countries that use nuclear energy now, or wish to do so in the future, have a credible waste disposal strategy that will lead to safe disposal when this becomes necessary and that is accepted by a sufficiently large fraction of the population. This task was not successfully accomplished in the early days of nuclear power, and the result was that opponents had a powerful argument to brake or halt nuclear developments. There is a real danger of the same thing happening again in the near future. The apt saying often attributed to Benjamin Franklin is that "the definition of insanity is doing the same thing over and over and expecting different results". By again underestimating the importance of the backend in nuclear power development plans, we may well be proving ourselves insane!

What does a credible waste disposal strategy require? The components are the availability of the necessary technologies, personnel and funding – and, importantly, a siting strategy that that can deliver at the required time an acceptable location for a repository. Large nuclear programmes with no such strategy must work on all three components. Countries like the UK and Canada, having recently re-established a consensus on geological disposal as such, are initiating appropriate siting programmes for geological repositories. In some other nuclear countries planning or contemplating new build, little attention appears to be devoted to the repository programme. Amongst the countries seeking to introduce nuclear, almost none seems to address the waste disposal programme at the outset.

This is regrettable, since the personnel and financial resources required in the early stage of a nuclear programme are modest. A prudent approach for new nuclear countries would be to recognise the technological and financial implications and to start out on the siting task in a "dual track" manner. By this is meant an approach which includes:

- a national survey of geologically, environmentally and socially acceptable disposal concepts and siting options and also
- linking up with potential partner countries to investigate multinational approaches that could provide safe and economic disposal options.

The latter option might be achieved by partnering with other small or new nuclear countries or else by negotiating export of spent fuel or HLW (and other long-lived wastes) to a third country.

II. THE NUCLEAR RENAISSANCE IS REAL

There are currently 439 nuclear power plants (NPP) in operation in 30 countries[1]. These reactors supply about 15.2% of the global electrical energy consumed today. In the western world, nuclear programmes have been stagnant or decreasing for two decades, although construction of new plants continued in some parts of the world such as East Asia. A resurgence of nuclear power has been predicted at various times in the past, but the current increase in activity and interest appears, more than anytime as yet, to herald a real "renaissance". The drivers are energy security, fossil energy costs, and concerns about carbon dioxide contributions to climate change.
Countries with operating nuclear plants are seeking to replace old reactors as well as expand capacity, countries that have shut down plants or have planned to do so are re-thinking, and many countries are considering or firmly planning to make nuclear energy part of their national

[1] Based largely on March 2003 data from www.world-nuclear.org

power supply. All parts of the world are involved in this development

II.A. Expansion of established nuclear programmes

Most of the recent expansion has been centred in the Eastern half of the world. The Chinese government plans to increase nuclear generating capacity to 40 GWe by 2020. China has completed construction and commenced operation of eight nuclear power plants within the last five years, and there are currently six more units that are under construction and a further 10-16 that are planned. India's target is to construct 20 to 30 new reactors by 2020 as part of its national energy policy and 6 are currently under construction. Pakistan is expanding its nuclear fleet with Chinese designed reactors, and its 2005 Energy Security Plan includes construction of an additional 8 GWe of nuclear capacity by 2030. Russia plans to build seventeen 1200 MWe domestically designed light water reactors to come on line 2013-17. Japan has two reactors under construction and plans or placed orders for 11 new nuclear power plants; it is also involved in intense research on future reactor designs. The Republic of Korea already has 20 operating power reactors supplying about 40% of electricity demand, one nuclear plant is under construction and seven more planned.

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

Nuclear power counties in the western hemisphere are also seeking to expand their programmes. In the USA, notices of application for joint construction and operating licences have been submitted for more that 20 new units, and it is clear that there will be substantial new nuclear capacity by 2020. In Canada, the Ontario government has decided to refurbish and restart four reactors adding 25 years to operating lifetime as a step in its plan to expand its nuclear fleet. Two more reactors will be needed for Ontario under mid 2006 policy. Alberta is now considering using nuclear power to extract oil from its northern deposits of oil sands. Argentina and Brazil both have commercial nuclear reactors generating electricity, and additional reactors are planned or under construction. Chile has a research reactor in operation and has the infrastructure and intention to build commercial reactors.

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

II.B. New nuclear programmes

In fact, South Africa may be joined as a nuclear power nation by other African countries that are currently showing interest in introducing new, clean base load energy. Nigeria has sought the support of the International Atomic Energy Agency to develop plans for two 1000 MWe reactors, and Egypt has revived its plans for a combined nuclear power and desalination plant. Morocco and Algeria are further African countries considering nuclear energy. Entry into nuclear energy production is being considered also by several other nations in the world. In Europe, these include Poland, Estonia and Latvia, who are looking into a joint project with established nuclear power producer Lithuania. Jordan and Turkey are seriously considering or planning for the introduction of nuclear power programmes. In the East, Vietnam has plans to build up to eight nuclear reactors by 2025. Indonesia plans to build two 1000 megawatt reactors in central Java. Thailand has announced plans to build two large nuclear plants, with construction to begin in 2015. Bangladesh signed an agreement with China in 2005 regarding nuclear cooperation and plans for nuclear power. In Malaysia, a comprehensive energy policy study - including consideration of nuclear power - is to be completed by 2010.

III. IMPLICATIONS FOR NATIONAL DISPOSAL PROGRAMMES

The growth in existing nuclear programmes and the spread of nuclear technology to new countries will have a serious effect on the back-end of the fuel cycle because of the increased concerns about proliferation and about waste management. The effort expended on planning and implementing waste management strategies – especially for waste disposal – may increase or decrease over the coming years. An increase in intensity and in the resources devoted to waste management will result if the proof of a viable disposal option is a prerequisite for new build of power stations. Given the variety of new NPP designs that are being pushed on the market, more attention might be focussed on waste issues if these directly influence choice of reactor vendor.

On the other hand, it is also conceivable that the “rush to nuclear” will reduce interest in waste issues. These may be judged less urgent when compared with the

higher priority goals of increasing dependable energy supplies or of reducing CO2 emissions. A recent fuel cycle issue that can also affect the amount of effort devoted specifically to disposal of spent fuel is the revival of interest in recycling. If nuclear power is to be sustainable or at least usable for hundreds of years rather than as a transition energy source, then it becomes imperative to recover the useful materials in the spent fuel. This may increase the attraction of long-term storage rather than moving to disposal of spent fuel (or else may favour repository concepts that ease retrieval). Finally, at a more mundane level, the recognised shortage of nuclear specialists in general may mean that there are too few who wish to work in the waste area, rather than in the more exciting tasks of building and operating power plants.

It will be a serious risk, however, if the expected future rapid increase in nuclear power is attempted without proper regards for the waste issues – as was the case during the initial build up of nuclear in the 1960s and 1970s. Attempts to initiate new NPP programmes without a back-end strategy will open nuclear to criticism and will intensify disposal-based opposition by environmental groups. The so-called "waste problem" must be recognised by society as being solved or at least solvable. The biggest challenge facing a geological disposal programme is repository siting.

III. A. Siting a national geological repository for HLW/SNF/Long-lived wastes

Successful national repository siting is dependent on achieving, at the outset, a sufficiently broad consensus amongst stakeholders on the following premises:

- A safe solution for the long-term management of long-lived radioactive wastes is required by all parties. The parties referred to in the national case are communities, regions, or political jurisdictions
- Geological disposal in a deep repository is the only available approach today that can guarantee the required level of safety – provided the repository is properly implemented at a well chosen site.
- Numerous, small repositories in a country are for reasons of cost, safety and security either infeasible or, at a minimum, clearly less effective than fewer or even a single shared facility. At present, even the largest national disposal programmes are seeking only a single site for implementation of a geological repository.
- A repository host community is providing a localised service to a wide range of users. Hosting such a shared facility can result not only in real or perceived drawbacks for the host party but also in specific benefits, such as financial gains, broader economic developments or increased political leverage.
- If these benefits are judged to outweigh potential drawbacks, willing hosts may well come forward. In any case, a repository will not be imposed on any party against its will.

Assuming that all of these premises are accepted by the involved parties, consensual siting is feasible.

However, a transparent process leading to identification of technically or socially acceptable sites is still required. Much progress towards identifying a generically suitable process has been made by national waste management programmes in recent years, although the way it is being implemented today differs in detail from country to country. The generic characteristics of a suitable siting process are broadly agreed to be as follows:

- It is adaptively staged and acknowledged to be a multi-year process that will evolve as the implementers take account of feedback from all stakeholders.
- The siting process is based on objective, transparent, pre-defined and well-documented criteria.
- The objective is to identify sites that are demonstrably safe and the process is not based on claims that a "safest" site can be identified.
- The process includes true dialogue between all stakeholders, especially potential hosts, with the objective of ensuring that it is regarded as fair and equitable by all.
- The aim is to identify informed and willing repository hosts that will subsequently be full partners in the repository implementation process and therefore have a direct influence on the project development.

Increasingly, national programmes are accepting that potential siting communities must be directly involved in the siting process and finally must be willing hosts. Japan is looking for voluntary sites. The Swedish implementer, SKB agreed to accept any local veto despite legislation that would allow the government to overrule this. Both the UK and Canada have recently chosen strategies based on consensual siting. Successes are also being registered in national disposal programmes that seek local community assent. In both Finland and Sweden, competition has even arisen between potential sites.

IV IMPLICATIONS FOR MULTINATIONAL DISPOSAL INITIATIVES

The growth in interest in nuclear power in countries that have as yet only small nuclear energy programmes or that have no nuclear plants will also affect the prospects for multinational disposal or disposal proposals. The potential impacts can be considered under three headings, each related to a recognised benefit of

shared nuclear facilities: a) economics, b) safety and security and c) political/public support.

The high cost of repositories means that new or small NPP programmes will not be able to afford a national repository and must be interested in prospects for cost sharing. It may even be that there are so many small nuclear countries looking for a disposal route that there is a market for competing multinational repositories. On the other hand some currently small programmes may grow large enough to make national disposal a feasible strategy – particularly if repository implementation is in the far future. The economics of the back-end may also be directly connected with front-end costs if competition to supply reactor fuel or uranium leads to offers of leasing either of those as a sales argument. A final point related to economics is that increased use of nuclear energy may result in spent fuel inventories that grow quickly enough to make new interim storage facilities necessary so that the financial benefits of pooling facilities may be re-examined.

International concerns about safety and security have already led to pressure to concentrate nuclear materials at fewer, well controlled locations. The list of potential new nuclear countries given at the beginning of this article makes it obvious that pressures of this sort may well increase. This can lead to more support for facilities shared by smaller countries or else to growth in importance of the "add-on scenarios", as defined by the IAEA, i.e. scenarios in which large nuclear programmes accept wastes for disposal from smaller ones. Proposals of this sort have been made in the US Global Nuclear Energy Partnership (GNEP) and the Russian Global Nuclear Power Infrastructure (GNPI) project. In any case, the spread of nuclear power will certainly result in increased international control of multinational initiatives. It may even increase the possibility of "supranational scenarios" in which a direct, operational role in waste storage and disposal is taken by the IAEA or the EC.

In the area of nuclear security, there is again a danger that governments and the industry will neglect the back-end relative to more critical risk area such as NPP operation, uranium enrichment and fuel reprocessing. In the back-end itself, there is also a danger that proliferation concerns will lead to neglect of HLW and ILW issues relative to spent fuel, although disposal plans for all long-lived wastes should be moved ahead simultaneously.

For multinational storage or disposal initiatives, as for national programmes, the biggest challenge today is winning sufficient political and public support for siting facilities. In the multinational case, the political aspects loom large, but there are significant developments.

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

IV. A.1 Siting in the multinational case

Initiatives aimed at developing regional, multinational waste disposal facilities have been criticised as not being credible until such time as a country agrees to host one. Are such initiatives really 'castles in the air' – unrealistic fantasies with no identified location and hence with no hope of being implemented?

An obvious counter to such criticism is that, if lack of an agreed site implies that a radioactive waste disposal programme will fail, then there are remarkably few successes in the national disposal programmes around the world today. Only in Finland has a preferred site for deep disposal been agreed at all necessary regulatory and legal levels. A few other countries are quite close to this stage (e.g. Sweden, the USA and France), but they have not yet cleared the final hurdles. Furthermore, all these programmes, including the Finnish success, have spent decades in the siting process.

On this basis, it seems premature to write off budding programmes to develop multinational repositories as unrealistic because they have not identified a host country in the first years. In practice, multinational strategies can be modelled directly on successful national siting approaches in that they have to go through exactly the same technical and stakeholder involvements steps, may take many years to achieve siting successfully and, in fact, should actually avoid premature selection of potential sites. The elements of national approaches that

can guide multinational strategies were summarised above.

What are the differences between this idealised national repository siting process and a multinational process? Almost none, is the answer. When the parties interested in jointly using a shared repository are sovereign nations rather than sub-national entities, the hurdles to be surmounted are basically the same – although some of them are undoubtedly set higher. Furthermore, some siting options at the national level, such as imposing a facility on a community if no volunteers came forward, are not feasible in a multinational process. This 'last resort' option has arguably played a role in some national repository programmes. The US Congress overrode the State of Nevada veto on the selection of Yucca Mountain. The Swiss government, after a Cantonal referendum led to the loss of a potential site at Wellenberg, changed the law so as to remove cantonal veto rights. In Germany, the AkEnd government advisory group was divided on whether a government ruling could unilaterally fix a site in the event that no willing communities came forward.

As pointed out above, however, national programmes are increasingly accepting that potential siting communities must be willing hosts. In such an environment, willing national hosts in a multinational initiative appear no less likely than local hosts for a national facility. A further hopeful indication that optimisation of waste management can occur above the national level is provided by current hazardous waste disposal projects. In Europe, several nations export and import hazardous chemical wastes without raising public concern, in order to make use of the best available facilities.

A staged approach for a multinational facility needs to tackle some difficult and high-profile matters up front. It need not solve them all at the outset, but it must have a transparent, agreed route to doing so. Specifically, the approach should be clear about the extent of commitment being made by partner countries on joining a shared solution enterprise and at all subsequent siting stages. In this respect we can consider the following points:

- The ideal approach is that potential host sites result from voluntary expressions of interest at the local community level. However, the national government of the potential host country would obviously, at a minimum, have to agree not to block or forbid such local community volunteering.
- The mechanisms and implications of being in or out of the pool of potential host countries need to be established by the partners at the start of the project. One approach to starting the siting work would be to establish agreed exclusion criteria for clearly unsuitable land and then to invite volunteers in the non-excluded land areas of partner countries.
- Partners could enter the project at different stages. Only when the largest programmes likely to be in the eventual project are known with more confidence can a sensible estimate be made of the costs of repository implementation and of the scale of benefits and impacts to the host country and community.
- Partner countries that already have developed national siting programmes will be readily able to pool their knowledge, but they will also have to decide how to deal with sites and communities that are already being considered as possible national repository locations.

IV. A.2. Potential global siting regions for multinational repositories

Where might regional or multinational repositories first be implemented? Currently, the most intensive work on this concept is being done within the SAPIERR project, which concentrates on the feasibility of establishing one or more regional repositories serving several European countries. This project, now completing its 2nd phase, is funded by the European Commission, reflecting the support for such an approach as expressed in the European Parliament. The goals of SAPIERR are:

- to develop an organisational framework and a project plan to facilitate debate on the establishment of a modestly sized, self-sufficient, European Development Organisation (EDO) that can work in parallel with national waste agencies;
- to perform further studies on key issues related to economics, design, public and political attitudes and the safety and security of shared storage and disposal facilities;
- to achieve and document the consensus of interested parties from a number of nations on a preferred way forward.

The ultimate objective of SAPIERR is to propose a practical implementation strategy and organisational structures that will enable a group of countries to create a formalised, structured organisation that could be established at some time after 2008 for working on shared EU radioactive waste storage and disposal activities. If the results published at the end of 2008 are endorsed by a sufficient number of European countries, then an ad-hoc multinational group could be set up to agree a framework for a formal implementing body for a regional repository.

The concept being developed by SAPIERR is, however, also applicable in other regions of the world where small nuclear programmes exist or new nuclear programmes are being proposed. For example, further bodies could be established in the following global regions

- Asia: Taiwan and Korea have had considerable problems in siting national disposal facilities, even for LLW. Both also have challenging geological environments and would be clear candidates for partnering, despite their substantial nuclear programmes. More obvious participants would be the countries in the region now considering initiating nuclear programmes.
- Arab States: The Gulf States have already established a cooperative effort to introduce nuclear power. Jordan has also expressed the wish to do so and has supported regional disposal concepts. Other Arab countries such as Algeria and Egypt are possible candidates.
- Central/ South America: Mexico needs a disposal solution as do Brazil, Argentina, and, depending on the course of decisions on future nuclear power programmes, Chile and Peru.
- Africa: South Africa has great nuclear ambitions and also large areas where safe geological repositories could be implemented. They may decide to follow a purely national strategy, rather than offering disposal services to their continental neighbours. In this case, other African countries, such as Ghana, that are contemplating introducing nuclear power will also need access to a repository

A very important point to note is that it is not only those countries that have, or will have, nuclear power plants that require access to a geological repository. Other nuclear technology applications also produce long-lived wastes that should be disposed of in this way. The quantities are modest, but the hazard potential is not. Regional repositories offering a safe disposal service would therefore also contribute to environmental health and safety in such non-nuclear power nations.

V. Alternatives to partnering

Are there realistic alternatives to regional repositories shared by partner countries, if global safety and security is the objective? The scenario in which every country, however small, implements its own state-of-the art geological repository is scarcely credible. Lack of resources and technical capabilities effectively rule this out. The partnering approach has been the focus of Arius work for some years and is best exemplified at present by the European Union SAPIERR project that is mentioned above and described in a separate paper. The currently most likely scenario for the export of spent fuel involves "take back" of leased fuel by a large supplier. This option is part of the current GNEP proposal of the USA and the GNPI proposal of Russia.

Unfortunately, neither of these take back offers is committing in its readiness to retain the HLW that would result from their reprocessing of the fuel – and therefore they would not relieve a new nuclear country of the need to establish a small but very expensive geological repository. Gaps will remain unless fuel leasing countries also accept the backlog of spent fuel that exists in some potential user countries, vitrified HLW resulting from reprocessing and also other long-lived wastes. The probability of such a wide service being offered may well be far lower than that of small nuclear waste producers getting together on their own terms, as partners to implement shared regional repositories.

Importantly, the strong focus of such proposals on front end issues like security of fuel supply ignores the facts that the free market if fuel has always ensured an adequate supply and that the key service that really should be offered is waste disposal. Analogous to the powerful, simple slogan that helped the re-election of President Clinton, the mantra here might be "It's the waste, stupid!"

II. CONCLUSIONS

A renaissance has been prophesised by the nuclear industry at various times over the past 20 or more years – with no visible consequences. However, the current surge of interest in expanding or initiating nuclear programmes appears more concrete than on any previous occasion. Avoiding energy shortages, reducing future energy costs and mitigating global climate change are all powerful arguments. The resurgence of nuclear can have positive or negative effects on the global efforts devoted to implementing safe and acceptable waste management strategies. It is imperative that the positive impulses dominate if the nuclear renaissance is to succeed. In its original period of expansion, the nuclear industry paid too little attention to waste disposal, working under the understandable assumption that ample time remained for developing solutions. This led to waste management becoming identified by the public as the Achilles heel of nuclear power.

From a technical point of view, the urgent tasks in rapidly expanding nuclear power are again not waste specific. They are related to (re)building engineering capacities, ensuring supplies of large components, accelerating licensing processes, educating personnel, etc. But the industry can not afford to ignore non-technical aspects and decide again that waste can wait.