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NUCLEAR ENERGY AGENCY
RADIOACTIVE WASTE MANAGEMENT COMMITTEE

Working Party on Decommissioning and Dismantling (WPDD)

**INTERNATIONAL SEMINAR ON STRATEGY SELECTION FOR THE DECOMMISSIONING OF
NUCLEAR FACILITIES**

Summary and overview of lessons learnt

**Tarragona, Spain
2 - 4, September 2003**

This international seminar was held in connection with the entering of the Vandellòs-I nuclear power plant into the safestore period. The seminar focused on strategy selection for the decommissioning of nuclear facilities. All the major types of facilities encountered in the nuclear fuel cycle were represented. Over 100 high-level specialists from all over the world attended, including representatives of the Regulatory Commission of Spain and decommissioning projects managers from Spain, UK, USA, Japan, Italy, Slovak Republic, France, etc. Several mayors from both Europe and North America also attended. The seminar encouraged open discussions to share lessons learnt.

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OVERVIEW OF LESSONS LEARNT

A. Duncan, Rapporteur
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OECD/NEA Member countries include those involved in the earliest developments of nuclear technology in the 1940s and 1950s. These countries have a wide range of plant and equipment that has now served its purpose and needs to be decommissioned and dismantled. A new range of challenges opens up as the more modern nuclear power programmes mature and large commercial nuclear power plants approach the end of their useful life by reason of age, economics or change of policy on the use of nuclear power. The current situation is that much has already been done to deal with the decommissioning and dismantling (D&D) but much remains to be done. The work on earlier facilities has provided a substantial body of knowledge and experience over a wide range of complex technical issues but the requirement now is to apply the available techniques to D&D of the larger commercial facilities. In addition to technical issues, plans and procedures will need to address other major issues associated with impacts on society and the environment, regulatory arrangements and with long-term funding.

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The following points provide an insight into these discussions.

- Although there appears to be a trend towards early dismantling, there seemed to be general agreement that technical solutions support a wide variety of safe decommissioning approaches. Thus, in terms of decommissioning strategy, it appears that no one size fits all.
- A flexible regulatory approach is needed in order to recognize the changing operational risks and physical conditions of facilities with time, and to optimise their dismantling.
- The NEA has been released a comprehensive study on decommissioning strategies and costs that indicates worldwide progress¹. According to this report, over 50% of countries with nuclear facilities have a framework of decommissioning requirements and 60% have defined radioactive waste clearance levels. Up to about 70% of the costs of D&D are attributable to dismantling and waste management.

1 . See: Decommissioning Nuclear Power Plants - Policies, Strategies, and Costs, OECD\NEA, Paris (2003).

- The provisions for safety of the D&D process are closely linked to the availability of the necessary funds as and when required.
- A number of common factors were defined for successful implementation of decommissioning strategies: i.e., safety, technical feasibility of decommissioning options, risk-informed progression of D&D activities as project proceeds, maintenance of competency and corporate memory throughout project, waste management and disposal capability, financing that suits the scope of the project, a well-defined risk-informed and performance-based regulatory process, and establishment of effective communication with local and regional governments and key stakeholders, particularly personnel, at the earliest opportunity before decommissioning.
- LWRs are relatively easier to dismantle than GCRs, because of the large amounts of contaminated materials, such as graphite, associated with the latter.
- The techniques for dismantling fuel cycle facilities are essentially similar to those for dismantling nuclear power plants except that a safestore period would not be helpful in reducing the radioactivity of those facilities contaminated with long-lived radionuclides.
- It is important that stakeholders feel that their considerations and concerns are addressed throughout the project.
- Several programmatic and policy issues were raised including:
 - Should the costs/ benefits of adopting internationally consistent radioactive waste clearance levels, for use in decommissioning projects, be more heavily emphasized in the context of international business and competition?
 - To what degree should institutional controls be relied on in safety cases for decommissioning options involving an element of long-term stewardship?
 - Does the international trend toward independent national organizations having responsibility for waste management and disposal set a useful precedent?
 - Is early dismantling and successful demonstration of technology a significant factor in establishing public confidence for building new plants? (This is key in the French and Japanese strategy.)

Regarding views on where bilateral and multilateral cooperation might enhance progress in defining and implementing decommissioning strategies, the following points were agreed.

- On the issue of radioactive waste clearance, an adequate scientific basis is available for defining clearance levels, but a high level discussion of is needed to look for solutions that can satisfy both international and national interests.
- There was general agreement, supported by the regulators present, that a simpler decommissioning regulatory framework would be beneficial.
- Although it was agreed that exchange of information on funding requirements and systems might be useful, differences in decommissioning work breakdown structures make it difficult to get good cost data.

- An international database on decommissioning experience would be useful. Several databases now exist and it may be useful to look at combining them.
- Societal factors are key to successful decommissioning projects and establishing pillars of trust is important at the earliest opportunity before decommissioning.

In addition to the above points, the seminar attendees were asked to identify the issues that were of significance to them and where they believed advice and further work by the international community might enable progress. They identified the issues of:

Stakeholder involvement:

Early discussion of plans with stakeholders.

Continued dialogue with local communities.

Strategy selection:

Waste management provisions.

Costs and funding arrangements.

Waste Management and clearance:

Availability of waste disposal routes.

Standards of clearance and effects of differences on decommissioning costs and international business.

Funding and costs:

Relationship between funding and safety.

Hazards to the long-term security of funds.

Social demands:

Implementing 'Pillars of Trust'. (Safety, participation and economic development.)

Concluding remarks.

There may be an expectation amongst politicians and the public that there is a "right answer" to the choice of strategy selection for a particular type of facility, or even all facilities. This seminar and, indeed, wider experience shows that this is not the case.

- Local factors and national political positions have a significant input and often result in widely differing strategy approaches to broadly similar decommissioning projects. All

facility owners represented could demonstrate a rational process for strategy selection and compelling arguments for the choices made.

The NEA, and in particular its Working Party on Decommissioning and Dismantling, which was one of the joint organisers of this event, will use these outcomes to inform its future work programme.

SUMMARY OF INDIVIDUAL SESSIONS.

THE SPANISH DECOMMISSIONING SCENE.

Moderator: José-Luís Revilla, CSN, Spain.

The objective of this session was to present information about the Spanish decommissioning scene from the perspective of the different stakeholder groups (i.e. implementers, regulators and local communities). Spain has a relatively important position in the field of the decommissioning of nuclear facilities. The Spanish nuclear industry may be relatively small but it is well diversified and includes the whole nuclear fuel cycle except for spent fuel reprocessing. Spanish decommissioning experience to date covers a wide spectrum of facilities, from uranium mines, uranium concentrate facilities, research reactors and installations, to a nuclear power plant that is currently being decommissioned.

Commissioner Paloma Sendín, of the Spanish Nuclear Safety Council, (CSN) explained that CSN is the regulatory body responsible for the safety of all activities concerned with ionising radiation and the nuclear industry, including decommissioning. Commissioner Sendín's presentation covered the CSN experience of regulating the decommissioning of some Spanish nuclear facilities and analysed lessons learned specifically from implementation of the Vandellós 1 Nuclear Power Plant Decommissioning Plan.

Decommissioning of a nuclear facility raises new regulatory issues that differ in some respects from those prevailing during its operation and that have become a real challenge for the competent regulatory authorities dealing with it. Regulatory bodies need, somehow, to modify their existing methods, and responding to this challenge implies a change in regulatory thinking and a new approach to regulating decommissioning. The principle of proportionality, in regard to the balance between risk and the safety requirements, should inform the level of control established during the decommissioning process. Commissioner Sendín concluded that Spanish decommissioning regulatory strategy would benefit from the current review of safety regulation intended to define a more systematic and predictable decommissioning process.

Javier Arana, Deputy Director General for Nuclear Energy of the Spanish Ministry of Economy, presented the reference regulatory framework for decommissioning nuclear installations in Spain and described the main participants in the decommissioning procedure. Mr. Arana also gave the Spanish policy-makers' viewpoint on the decommissioning of nuclear facilities. The policy is established in the General Radioactive Waste Plan, an official document, updated periodically and approved by the Government. The Ministry of Economy plays a fundamental role in the selection of decommissioning strategy in Spain. As the main body responsible for the Spanish nuclear programme, the Ministry of Economy has to approve any nuclear facility decommissioning plan being proposed. The Ministry of Economy is also responsible for granting the decommissioning authorisation for start of decommissioning activities and the decommissioning completion statement when the process has finished.

José M. Grávalos, Director for Operations in ENRESA, the Spanish radioactive waste management agency, explained that as the licensee for decommissioning of all commercial nuclear power plants ENRESA is the main body for nuclear decommissioning in Spain. When the operating permit for a Spanish nuclear power expires, the responsibility for its decommissioning is transferred from the operating licensee to ENRESA. The latter then becomes the licence holder of the facility during the performance of dismantling activities and up to the moment of award of the decommissioning completion statement, at which point the site is returned to its owner, the former licensee. Mr. Grávalos focussed his presentation on the experience acquired by ENRESA in getting to stage 2 of the Vandellós 1 nuclear power plant decommissioning program, currently the most important Spanish decommissioning project.

Cesar Dopazo, General Director of CIEMAT, the Spanish national research and technological development centre for energy and environmental issues, described the work of the CIEMAT centre, which is located on the site of the former JEN Spanish Nuclear Energy Board, the originator of the Spanish nuclear energy program. Mr. Dopazo focused first on research and development on radioactive waste management activities and decommissioning projects being developed in CIEMAT. He then described PIMIC, a current project for rehabilitation and decommissioning of redundant facilities at its centre. This is a consequence of the history of the site, and the project includes rehabilitation of some buildings, equipment and areas possibly affected by past activities involving radioactive materials.

The last presentation concentrated on social aspects. The speaker was **Mariano Vila d'Abadal**, a representative of AMAC, a group of the Spanish municipalities with nuclear facilities located in them. He described the three basic "pillars of trust" for effective involvement of the local and municipal communities in decommissioning strategy, i.e. safety, information and participation, and economic development as a guarantee for the future development of the community. He explained the role and competence of the Local Committees of Information in Spain and concluded that decommissioning, as well as development of nuclear waste policies, needs a public framework and local involvement in order to achieve stable decisions and effective management.

PART I: INTERNATIONAL STOCKTAKING.

Moderator: Ernst Warnecke, Bfs, Germany.

The selection of a decommissioning strategy, e.g. direct dismantling or deferred dismantling after a period of safe enclosure, is an important decision to be taken by the operator of a facility. Four international organisations presented information that could be relevant for the selection of a decommissioning strategy.

Ingemar Lund described a publication issued by the OECD/NEA on decommissioning policies, strategies and costs. The objective of the study was to find important cost drivers for the decommissioning of nuclear power plants. Average decommissioning costs for the various types of water-cooled reactors were found to be in the order of magnitude of 360 (+/-50) million USD/kWe. The decommissioning costs of gas-cooled reactors were much higher (>2500 USD/kWe), due to the much higher volumes of materials that need to be managed. Labour costs represent typically a significant (20% - 40%) share of the total decommissioning costs. The two cost elements representing a major share of the total costs are the dismantling activities and the management of radioactive waste, including waste disposal (about 30% each). On the basis of the data collected during the study it was difficult to determine clear dependencies between strategies and costs because of the rather high cost variations. Additional work is needed to clarify this point.

Gordon Linsley reported on an international decommissioning conference held by the IAEA in Berlin in September 2002. The discussion of decommissioning strategy (immediate dismantling, safe enclosure and entombment) was one part of this conference. Entombment was seen as a strategy that may be an option for countries with only one nuclear facility such as a research reactor and not having the resources for developing the infrastructure needed for dismantling and waste disposal. The trend towards immediate dismantling as a preferred decommissioning strategy was a clear message from this conference. The main reasons for favouring direct dismantling are the improved security of funds, the decreased impacts on the local community and the ability to take advantage of the know how and experience of the operational staff.

The EU has issued two DRAFT directives, one on nuclear safety and another on radioactive waste management. **Jose Hoyos Pérez** explained that these drafts do not explicitly favour one or the other of the above mentioned strategies. They provide, however, a legal framework that may influence the actual strategy selection. Two of the highly debated issues of the draft directives are (a) the requirement that funds be set aside in a manner that should be independent of the operator and (b) the timetable for the construction of waste repositories.

The union of the Electricity Industry, EURELECTRIC, represents the common interests of the European electricity industry and **Manuel Ibáñez** noted that it has issued a position paper on the above-mentioned DRAFT EU directives. Otherwise, EURELECTRIC provides more practical information resulting from actual experience of decommissioning of nuclear facilities, for example on cost estimates and waste issues in the decommissioning of nuclear facilities. Until now EURELECTRIC has not given a recommendation favouring either of the two decommissioning strategies.

PART II: STRATEGY SELECTION.

SESSION I: GAS/GRAPHITE REACTORS.

Moderator: Vincent Massaut, CEN/SCK, Belgium.

This session was the first to provide a comparison of the different strategies selected for decommissioning of the same type of reactor in different countries. In this case the reactors were the gas-cooled, graphite-moderated reactors (GCRs) in Spain, UK and Japan.

Alejandro Rodriguez explained that, for the Vandellós 1 NPP in Spain, it appeared that 30 years deferral of reactor dismantling, for radioactive decay, was an optimum time for dose reduction. Moreover, there is no current disposal route for the reactor graphite. These two aspects have caused ENRESA to select a deferred dismantling strategy, with a deferral duration of about 30 years, which can be adapted if necessary. This does not imply that the same strategy will be applied for the other, LWR nuclear power plants in Spain.

Paul Woollam described the UK Government policy on nuclear plant decommissioning, as laid down in 1995. Key points are:

- D&D should progressively reduce the hazards of the installation.
- Decommissioning should be undertaken as soon as reasonably practicable, taking into account all relevant factors.

For the UK Magnox reactors, this has led to selection of a strategy based on deferral of reactor dismantling for a period close to 100 years. The main considerations were:

- Radioactivity decay, resulting in increased safety for workers and the public, and reduction of the quantity of ILW for disposal. Also, the current national LLW disposal facility at Drigg, would probably not accommodate the large amount of LLW if it was produced sooner and this would have to be stored on-site.
- The requirement for passive safety. Plant contaminated with Co-60 (e.g. reactor structure and boilers) can easily be made passively safe for an extended period whereas the plant contaminated with Cs-137 (e.g. effluent treatment plant) is more difficult to maintain and would be dismantled early.

Tadamichi Satoh explained that the strategy selected for decommissioning of the Tokai-1 NPP in Japan involves prompt reactor dismantling, after a period of 5-10 years for defuelling and conventional building demolition. This strategy is based on the following main considerations:

- Potential reuse of the land.
- The Ministry (METI) recommends the prompt decommissioning strategy. (In fact called "deferred", with a deferral period of 5-10 years for defuelling, decommissioning preparation and conventional plant dismantling.)

- It would be unacceptable to local communities for a closed NPP to remain in place for a long time.
- Use of the knowledge of the operating plant workforce.

Thus, with these 3 projects in different countries it is seen that 3 different strategies (prompt reactor dismantling, short deferral for a period of 30 years, and long deferral for a period of about 100 years) have been selected on the bases of local constraints, national aspects, and waste management strategies.

The following main points were noted in the subsequent discussion:

- Comparing the 3 strategies in these 3 countries, the UK concludes that the cost of the deferred reactor dismantling strategy is lower than that of the prompt dismantling strategy, and that the difference is even larger when using discounted costs at 2% real interest rate. The other countries conclude that the prompt dismantling strategy with mid- or long-term storage of the waste appears cheaper. It was also noted that, if the decommissioning decisions or actions are deferred, it is not certain that future generations will actually want to spend money on decommissioning.
- The question about the role of regulators in decommissioning strategy selection was also raised. The answer is not simple and varies from country to country. In the UK, for instance, operators draw up strategies acceptable to the regulators, having discussed with them in advance, including justification of the timetables proposed. This is done on a case-by-case basis. In Japan, the Government has set up a "standard process" for the decommissioning of NPPs. In Spain, the responsibility finally rests with the Government Authority. It was noted, however, that in general the regulators must deal with various aspects and must have a broad understanding of the whole process.
- As regards the question "Are funding and cost also drivers in the strategy selection?" the answers differ depending on national or local specificities. In Japan, for instance, there is no significant cost difference between prompt and deferred dismantling, and other aspects (as mentioned above) are more important. In Spain, the funding is "global" and comes from a levy on electricity sales. It is not regarded as a significant driver of strategy. In the UK costs are calculated on a discounted basis and, whilst the operator and regulators have to ensure that all the options are adequately safe, the Government (in regard to its own nuclear liabilities) has to choose if it wants to spend the money on decommissioning now as opposed to using it for other purposes. The question of the continued existence of operators was also raised in regard to funding and it was noted that, in the final analysis, the State has to underwrite funding for decommissioning after deferral if no other arrangement has been made of if there are insufficient funds available.

In conclusion, it is seen that selection of a decommissioning strategy depends on many factors that are often specific to the country, to local policy, to Government guidelines or policies, etc. There is no "universal" good strategy and selection has to take account of various parameters, ensuring that decommissioning operations are undertaken safely.

SESSION II: LIGHT WATER REACTORS.

Moderator: Luigi Noviello, SOGIN, Italy.

Klaus Schiffer described the strategy for decommissioning the Stade NPP in northern Germany. It is a privately owned PWR that is being shut down by end 2003 because of government commitment to phasing out nuclear power and economic pressures arising from developments in the energy market. A strategy of immediate dismantling was chosen because there is little difference between that and deferred dismantling in terms of final waste volume or dose commitment, and it allows use of existing staff. The plant has a good safety record and no new safety issues arise. The plan is to return the site to green or brown field status by 2013 by way of four phases of dismantling within the controlled area, with a final fifth phase involving conventional demolition of remaining buildings. In absence of a disposal facility for low and medium level radioactive waste an interim storage facility will be built on the site and will remain there until the packaged waste can be removed to a final repository.

These activities need a nuclear licence and environmental impact assessment both of which involve the public. The company has good contacts with the local community and local government and claims to involve them more than would be done on shutdown of a chemical plant for example. It plans to use its own staff as far as possible and then to transfer them from one plant to another as the overall NPP decommissioning programme proceeds, thereby retaining and building continuously upon the accumulated experience.

Ján Timulák reported on preparations for decommissioning the Jaslovské Bohunice V1 NPP in the Slovak Republic. This work had started in 1991 but a change in the law in 1999 necessitated a review. There had been significant changes in the intervening years involving technical refurbishment on the site, strategy for radioactive waste management, costs and the general state of knowledge about D&D of NPPs. A stepwise approach to planning started with characterisation of initial site condition and analysed three options by way of various technical, financial, safety and environmental characteristics. One option involved immediate dismantling (Option 1) and two involved deferral of dismantling for 30 years, one with safe enclosure of the reactor (Option 2) and the other with safe enclosure of the whole nuclear island (Option 3).

Dr. Timulák also described the main results of the analyses and explained that comparison of the three options was carried out by a form of multi-criteria analysis with weighting of the various criteria assigned by experts. The analyses showed that, if emphasis is placed on costs, Option 1 would be selected and, if placed on collective dose and radioactive waste generation, Option 3 would be selected. In the event, and on the basis also of other subjective criteria, Option 3 has been preferred, but he emphasised the influence of the values and weights attached to the subjective criteria by the experts. It was not clear whether these other subjective criteria included social aspects or not. Final selection awaits the submission of an environmental impact assessment and its review by the Ministry of Environment and other authorities.

Hakan Sterner described strategy selection for decommissioning at the Greifswald site in Germany, where there are 8 reactors of the Russian WWER 440 type, three of which are only partly constructed. Shutdown had not been expected so there had been no preparatory planning for decommissioning. The operating licence was renewed in the form of a decommissioning licence, along with introduction of new planning and management methods. From the start there has been emphasis on effective project planning and on consideration of the issues of post-operation strategy, waste management

and material flows, personnel, licensing and site reuse. These considerations also recognised that early dismantling of these reactors involves the least cost, least dose commitment and produces the least waste.

Consequently, it was decided to opt for immediate dismantling, with construction of an interim store for all spent fuel and waste in the absence of disposal facilities. It was also decided to perform as much as possible of the work with existing personnel, and to reuse the site for industrial use or energy production in order to secure long-term employment for the community. Dr. Sterner concluded that the dismantling of these facilities is not a technical problem but is a challenge to project management and logistics, and requires the constructive cooperation of all stakeholders, including operator, authorities, authorised experts, and the public.

In summary, the presentations in this session seemed to show that there are no significant safety or technical problems in decommissioning and dismantling light water reactors and, rather, that strategic planning for D&D is a matter of effective analysis, understanding of the implications of major materials flows and non-availability of disposal facilities, clear objectives and decision making procedures, professional project management and meaningful stakeholder involvement. In particular, it was noted that initial plant characterisation is crucial, that interim waste storage will be required for the dismantling process in any case, and that waste and site release limits also have a major influence on planning. It was also noted that, although regulatory involvement is important, the final decision on decommissioning strategy development is a matter for the operator.

SESSION III: NATIONAL STRATEGIES.

Moderator: Stan Gordelier, UKAEA, United Kingdom.

This session covered a number of aspects in strategy selection. In the first paper, **Marnix Braeckeveldt** described the effort in Belgium to produce a national inventory of all those facilities that will require decommissioning. In decommissioning there are four fundamental questions:

- What have you got?
- What will you do with it?
- When will you do it?
- What will it cost?

The work in Belgium addresses the first and last of these questions in an endeavour to ensure that all issues have been identified and provisions made for the associated costs. As far as is generally known, this is the only national inventory on such an exhaustive scale. The intention is that the inventory will be updated on a five yearly basis.

Important issues revealed by this work are:

- While the financial responsibility for decommissioning is normally clear, this was by no means always the case. Who is responsible for what must be clarified.
- The nature of the responsible organisation affects the accounting requirements for future decommissioning liabilities. Even when there was a clear accounting requirement the exact extent of the liability was not always clear.
- The manner in which provisions were built up and invested did not always provide certainty in the future availability of funds. Non-segregated funds, where the provisions are reinvested in the company, are a particular example of where bankruptcy of the organisation might leave the taxpayer as the founder of the last resort.

A future area of work for the WPDD might therefore be a consideration of provisions, exploring the practices across international organisations and their merits for providing a degree of certainty without being unduly penalising to the organisations concerned.

In the second paper, **Luigi Noviello** described the progress on decommissioning in Italy, and the creation in 1999 of SOGIN, a new Italian organisation dedicated to this work. The nuclear power industry in Italy was closed down in 1987 by a government decision, making this rather a special case. SOGIN has been made responsible for decommissioning of the NPP's, the R&D facilities and the commercial fuel fabrication plants. It is also responsible for establishing the national centralised repository.

It was interesting to note a possible pattern emerging internationally here. In Sweden the SKB organisation holds responsibilities for examining the adequacy of technical proposals and of funding for power plant decommissioning (but no responsibility for implementation), direct responsibility for

managing the decommissioning of some R&D facilities, for the management of the Forsmark repository and for the development of an HLW repository. In Spain, ENRESA has similar responsibilities, including managing NPP decommissioning. In Italy, the creation of SOGIN is another parallel. In the UK, the government is moving towards the creation of the Nuclear Decommissioning Authority, which does not presently cover repositories, but is otherwise broadly similar. Is this purpose designed decommissioning body going to be a continuing international trend?

Luigi Novello's presentation also identified the drivers for the change of Italian strategy for NPP decommissioning from Safestore to prompt dismantling. Key features were the national abandonment of nuclear power, leading to concerns about long-term skill retention. Also, the Italian industrial context by which the workforce remained on the site; if the workforce is there it may as well be used for something useful. These are important and specifically Italian factors in strategy selection. Other key features were:

- Again, the focus on financial provisions and funding mechanisms. The premature closure of the industry by political decision resulted in inadequate provisions and decommissioning is paid for by a levy on the price of electricity.
- The clear impact of political decisions and sometimes no political decisions on decommissioning programmes and the ability to make progress. A lack of clarity in which Ministry is responsible for what has clearly hampered progress in Italy.
- Finally, and very importantly, the need for somewhere to send the wastes. The SOGIN programme is predicated on the availability of a repository in the shorter term. If this does not materialise then the programme will have to change.

Dominick Orlando presented the US position from the particular perspective of the NRC. It was interesting to hear of the progress and difficulties in establishing consensus and workable rules for final site clearance and delicensing. A point noted in discussion was the marked difference between the delicensing criteria in the US and those in Germany, with the US allowing doses up to 25 higher (but with the need to demonstrate ALARP). Does this matter in an international context? Clearly sites, unlike free release materials, cannot cross borders. International agreement on materials clearance criteria must therefore be of a much higher priority. Clearance criteria would matter, however, for free trade in electrical power (for example across the EU) where differences in requirements can impact on price via decommissioning costs, although the impact would be small.

Dr. Orlando also showed a clear example of the observation that "one size does not fit all in decommissioning". In the US, with the same regulatory framework and similar plant types, eight NPP's have selected a safe store (SAFSTOR) strategy and eleven have selected prompt decommissioning (DECON). Why? Those choosing prompt decommissioning cited concerns about the potential for losing access to waste disposal facilities in the future, and the possibilities of future cost escalation (i.e. do it now, where you have some certainty about the cost). Some of those choosing SAFSTOR cited co-location with operating units or staged decommissioning of all the utilities NPP's as delivering economies of scale for the future. Senior executive perception of business risk or business advantage is a clear factor in the selection.

In the last paper **Jean-Jacques Grenouillet** explained the decommissioning strategy of the French utility, EdF, and in particular the recent change from Safestore to relatively prompt decommissioning. What were the drivers for this change? Again, specific national factors have a key role. Firstly, France has a major investment in NPP's and believes that it must continue this into the future. EdF believes that a major factor in public acceptance for new plants will be a demonstration that the older plants can be safely and effectively decommissioned. In the same vein, sites for new NPP's are

increasingly difficult to obtain. Decommissioning existing facilities will free sites for new construction (see also the same driver in the strategy selection process in Japan). Finally, a company specific factor, EdF pays for decommissioning from revenue, not from a segregated fund. The cost of decommissioning first generation units will have been already met when the time comes for renewal of the more modern operation PWRs. Cash flow is thus a clear driver for EdF's choice.

M. Grenouillet also illuminated the waste repository issue raised in other presentations. EdF's strategy choice is predicated on the availability of:

- A very low level waste disposal facility (2003).
- A new disposal facility for graphite (2010).
- A centralised interim store for long-lived intermediate level wastes (2007-2008).

If these do not materialise, the strategy will have to change.

A final, key feature of this paper was an observation on the French regulatory framework, reflecting some of the issues in the Italian position. Regulations for decommissioning are often 'rolled over' from the operating phase and are not really fit for purpose. In France, until recently, three separate authorisations were required and this has now been rationalised to one, leaving the operator more control to manage necessary changes to his approach.

What can be concluded overall from this session? As regards decommissioning strategy, one size does not fit all. There are different perceptions of financial and business risk that have a clear impact on strategy choice. There are different drivers associated with key factors for different organisations, public relations and cash flow being obvious examples. There are different plant portfolios allowing economics of scale and experience for a staged programme. The availability of waste disposal routes to repositories or national stores will have a clear impact.

Against this background, it is suggested that a "Successful Decommissioning Shopping List" should contain the following items:

- Secure, available funding when needed.
- Clearance levels for materials, preferably agreed at international level.
- Delicensing levels for sites, not necessarily agreed at international level.
- A licensing regime that is fit for purpose for decommissioning. It should be effective but not overly intrusive (recognising the much reduced hazard by comparison with the operating phase). It must be clear who is responsible for what and the regime must operate to a responsive timescale.

SESSION IV: OTHER FUEL CYCLE FACILITIES.

Moderator: Dominick Orlando, USNRC, USA.

This session focused mainly on the decommissioning of fuel cycle facilities other than commercial nuclear power plants.

Guy Decobert described the strategic approach to decommissioning of the UP 1 spent fuel reprocessing plant located on the COGEMA site at Marcoule in France. This plant reprocessed spent fuel first from plutonium-producing reactors and, latterly, from commercial GCRs. **Jean-Jacques Grenouillet** explained the EDF approach to dealing with an early, small Heavy Water Reactor (HWR) at Brennilis in France. **Helmut Rupa** and **Stefan Rosenberger** described the experience of decommissioning six fuel cycle facilities operated by Siemens AG and NUKEM at Hanau and Karlstein in Germany. These comprised five fuel fabrication facilities and a hot-cell complex. **Tim Milner** presented information about decontamination and decommissioning of the West Valley Demonstration Project (WVDP) in New York, USA, which was established to demonstrate solidification of high-level waste. And **Kevin Hayes** described the Westinghouse response to discovery of drinking water contamination in the vicinity of a uranium processing plant at Hematite, Missouri, USA.

The selection of the decommissioning strategy for these types of facilities was predicated on many of the same issues that were seen at power reactor sites. For example, the strategy for the WVDP was dictated by the USNRC in a Policy Statement pursuant to the West Valley Demonstration Project Act (i.e. the Federal authority chose the decommissioning strategy), which may allow remediation with restrictions on future site use. At this Westinghouse facility the licensee chose to remediate the site to a level that allows unrestricted use after license termination, but the timing of the decommissioning is based on the NRC's regulations. The UP 1 site, and the Brennilis and Hanau sites, are pursuing immediate decommissioning in compliance with government requirements, although these may allow for a period of dormancy during the decommissioning phase of the plant.

There were numerous similarities and differences between the issues faced by these types of fuel cycle facilities when undergoing decommissioning and those faced by power reactors, as summarized below:

Similarities:

1. It is necessary to maintain a core competency about the site when it moves from the operational to the decommissioning phase. This will ensure that the site retains the "best" workers with the necessary skills, as well as the institutional memory needed to efficiently and safely decommission the site.
2. Efficiencies in decommissioning project management, technology and approaches must be identified early on in the project. As new efficiencies are identified, they must be employed every place else at the site where they are appropriate. Continual improvement in decommissioning efficiency should be sought and communicated throughout the organization.

3. The safety culture that was in place during the operational phase of the plant must be maintained and in some cases enhanced during decommissioning to ensure that the project is carried out safely.
4. Staffing and personnel concerns regarding loss of jobs/careers must be addressed at the front end of the project to ensure that worker moral is maintained.
5. Mid-course changes in decommissioning strategies and approaches result in significant delays. To the maximum extent possible the decommissioning “end state” or goal should be established and adhered to throughout the project.
6. Multi-disciplinary teams are necessary to effectively and efficiently carry out the decommissioning project.
7. Cooperation and coordination between implementers, regulators and stakeholders are critical.

Differences

1. Non-power facilities tend to have a more diverse “activities” than power reactors such as on-site disposal of waste, waste incineration etc. This tends to result in a more complex decommissioning project with a greater number of policy issues that must be addressed.
2. Legacy waste is a greater concern at non-power facilities as many different activities have occurred during the operational phase of the site.
3. Non-power sites tend to have more regulatory authorities than a power reactor due to the diverse types of activities undertaken during the operational phase of the site.
4. There are fewer decommissioning options for non-power sites, as they typically do not have a SAFSTOR option.
5. It is typical to find that the site groundwater has been impacted by past operations at a non-power site.
6. Non-power reactor site may contain long unused areas with unknown contaminants. In some cases unknown areas of use are discovered during the decommissioning project.
7. The uniqueness of the non-power site along with the non-homogenous nature of site contamination typically results in implementers trying new or innovative decommissioning technologies or approaches.
8. Waste streams may be unique or “one-of-a-kind” requiring significant resources to address.
9. Fissile material issues are more prevalent at non-power sites.
10. The variability in building materials present unique measurement and decontamination challenges.

Regardless of the similarities or differences in the issues faced by power and non-power sites the most common truism for all decommissioning projects is that one needs to anticipate the unexpected problems, and their occurrence at the worst possible time.

SESSION V: SOCIAL ASPECTS.

Moderator: Mariano Vila d'Abadal, AMAC, Spain.

Paul Woollam outlined the Town and Country Planning Act of 1990, which addresses land use planning in the UK and provides for involvement of the public. He described experience of its application by way of a Public Inquiry into the BNFL Magnox Electric proposal for decommissioning of its Trawsfynydd nuclear power plant. He stressed, particularly, that documentary evidence for such an Inquiry needs to be written in a way that the public can understand, whilst not compromising commercial or security aspects or containing material that could be misleading if taken out of context. He also noted the legal requirement to assess alternative options but observed that, without a waste disposal route, the options for dismantling a nuclear power station and dealing with the waste are limited.

Lessons were learnt during the Trawsfynydd Public Inquiry about relationships with stakeholders, including members of the local community, NGOs and the media. One significant factor was the location of the nuclear facility in a National Park, and another was the concern of some groups that the Company had not made available all of its extensive decision-making documentation, which was because of the prospect of commercial exploitation of the decision-making methodology. The main conclusion, however, was that D&D proposals were not opposed by the regulatory bodies or the elected representatives of the local communities, including the local Planning Authority, in spite of the sensitive location of the plant. The basic concerns came from national anti-nuclear groups and focussed on matters outside the remit of land use planning law.

Mayor Josep Castellnou gave a chronological review of the life of the Vandellós-I NPP, from plant construction to the transfer of ownership to ENRESA. He also described the duties and membership of the Commission of Municipal Monitoring, which was created to follow up and control the work done at the plant, and he explained how public relations arrangements were made to provide information to people, magazines, radio, TV, and to meetings with press.

The subsequent discussion addressed social and economic impacts in the local area, and focused on the social projects and activities that were carried out, including the construction of an industrial park to promote local economic development.

Kevin Hayes reviewed the history of the Westinghouse uranium processing plant at Hematite, Missouri, (described in Session IV), as an example of how to deal with the social impact of a plant whose operation had resulted in contamination of soil and groundwater. The main requirement as regards social aspects was to communicate proactively and work with the local community and regulators. For this purpose, a community relations plan was developed using guidance from the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and model documents provided by the Missouri Department of Natural Resources (DNR), with Community interviews to ensure the plan recognised and addressed local concerns. Efforts to contain rumours involved building an effective mechanism for providing timely project updates to the community and being able to receive and understand community feedback

Key features of the resulting draft plan included nomination of a prime public contact, planned public meetings and community workshops, regular communication with local officials and regulatory agencies, and press releases about significant events. It also featured publication of fact sheets about matters of particular interest, periodic newsletters to the community, development of a mailing list shared with regulators, establishment of a local repository for providing access to official documents, and the

opportunity for site tours. The lessons learnt from the experience at Hematite confirm the need for proactive planning, particularly the development of a community relations plan, and the ability to take prompt actions and meet commitments in order to overcome public suspicion. They also confirm the need for awareness that direct financial cost is not the only cost when determining a course of action in this type of situation. The overall conclusion was that safety, environmental impact, and social responsibility must all be considered in order to make appropriate decisions.

Philip Moding emphasised that the affected local municipality and stakeholders have a major interest in participating in the decisions to shut down a nuclear installation, and in the social consequences of any large-scale investment. He said that too many decisions about large-scale investments in the nuclear sector have been taken from the top down, on the basis of "father knows best" or the DAD (decide, announce, defend) principle. Any decision concerning the expansion or phasing out of energy production has real, significant social effects and must be explained to the affected local communities. In regard to decommissioning, the implications need to be clearly understood before it takes place, and the process of dialogue must start early enough to give the local community a fair opportunity to influence decisions that affect them.

He also reviewed some recent EU initiatives and Directives designed to develop the dialogue between national government and local municipalities, and analysed the difficulties that still remain with these. He concluded with advice on the need to listen to all stakeholders in the affected areas, to develop early dialogue with the affected communities, and to try and understand local inhabitants who demand intelligibility.

Mayor Larry Kraemer described the role the Canadian Association of Nuclear Host Communities, (CANHC), of which he is Chairperson. He explained its mandate and goals and outlined the political background associated with each of its 6 host community members, together with the features of the nuclear facilities that they host. In the context of new Canadian Federal Government legislation on long-term Management of Nuclear Fuel Waste, he noted that it is impossible to discuss D&D of nuclear facilities without also discussing the options for nuclear waste disposal. This is because at least one of the options has major implications for the timing of D&D and, therefore, for the affected host communities.

He also described the experience of his own rural host community in dealing with the implications of hosting a permanent fuel waste repository as well as those of accepting operational and decommissioning wastes. Visits by community representatives to Europe and the US provided a valuable perspective that has contributed to the view that deep geological disposal appears to display the safety characteristics necessary to gain the support of the local community. In addition, the community has commissioned a study from a Business School in order to develop an effective plan that will address the long-term aspirations of the community as well as being acceptable to the nuclear site operator.

In conclusion, this session served to emphasise once more the importance of early involvement of stakeholders, and the local community in particular, in decommissioning plans and activities that are likely to affect them. The important role of local politicians and community leaders was identified, together with the need to co-operate with any local committees and support them with information in various forms that are readily understood by the public. It also brought attention to the importance of recognising and reconciling the long-term aspirations of the affected community with the operator's plans for the future of the site.

FINAL PLENARY DISCUSSION.

**Moderator: Margaret Federline, USNRC, USA,
Chair of NEA Radioactive Waste Management Committee.**

Introduction.

The subject of this seminar was "Strategy Selection for Decommissioning of Nuclear Facilities" and it was clear throughout that safety of D&D operations continues to be of importance in that selection, particularly in regard to the condition of the site and the risk it represents. In this context, it was specifically noted that a safety case for D&D needs to be kept under continuous review and needs to be flexible enough to accommodate appropriate modification as the work progresses and the nature of the risk changes. It was also noted that the hazard presented by a facility in decommissioning is normally significantly less than during the operating phase (for a reactor, for example, the fuel has been removed, there are no pressurised systems and no high operating temperatures). The changing plant configuration and the reduced hazard potential lead to the observation that the safety management arrangements also need appropriate adjustment from those employed during the operating phase. It was recalled that a Task Group of the WPDD is addressing safety issues on an on-going basis.

It was also clear from the detailed presentations that techniques for D&D are already available and that they have been successfully demonstrated in practice. Nevertheless, because the costs of dismantling nuclear facilities make up at least a third of the overall D&D costs, there seemed to be a strong case for continuing R&D in this area in order to improve the cost effectiveness of such techniques. It was noted, however, that the extent of such R&D is now somewhat limited and that further work is first required to identify the most effective areas for future R&D projects.

Also, throughout the seminar, it was emphasised that strategy selection must remain flexible since it is highly dependent on financing, societal input, technical feasibility, waste management options, and regulatory processes.

Against this well-established background, **Allan Duncan**, as rapporteur, chose to highlight other themes and issues from the seminar that appeared to be:

- Important for successful D&D.
- Worth further work in an international context.
- Controversial and worthy of further debate.

The five main themes selected were as follows:

- Stakeholder Involvement and Communication.
- Strategy Selection.
- Waste Management and Clearance.
- Funding and Costs.

- Satisfying Social Demands.

Various issues were identified under each one of these five themes and, in order to make best use of the time available for discussion, participants were invited to vote on the issues of most importance to them. Subsequent discussion was then focussed on the issues so identified.

Stakeholder Involvement and Communication.

As shown below, six specific issues were identified by the rapporteur as appearing to be of most importance or interest under this general theme. The voting by participants showed that issues 2 and 5 were of most interest followed closely by issues 3 and 6.

1. Early indication of intention, seeking views. (Not Decide-Announce- Defend.)
2. Early discussion of plans with stakeholders.
3. Identification of Key Stakeholders. (Operators, politicians (local and national), policy-makers, regulators, concerned public, neighbouring states, NGOs, employees.)
4. Engaging the Press and Broadcast Media.
5. Continued dialogue with local communities.
6. Communication by demonstration. (Show us you can do it!)

Discussion around items 2 and 5 confirmed the importance of early engagement with stakeholders, and with the affected local community in particular, even prior to the planning of decommissioning, and of the need to continue this engagement throughout implementation. It was recognised that this participation, involving two-way communication, is necessary in the development of D&D plans and in their successful implementation. This reflected the messages that emerged from the session on social aspects and that were flagged for discussion under the theme of "Satisfying Social Demands". It also re-confirmed that the policy of Decide-Announce-Defend has been a major element in creating stakeholder resistance to developments involving D&D and radioactive waste management at nuclear facilities. The heightened awareness of the importance of these issues led to a suggestion that a database of experience of stakeholder involvement might be helpful for those planning D&D for the first time, as well as for those wishing to share experiences, and that the NEA would be a suitable focal point for it².

In the context of items 3 and 6, it was noted that it is particularly important to engage those politicians representing the local community, as discussed below in the context of social aspects. A "no surprises policy" was judged to be very important in this regard. Lessons learned have shown that developing a communication plan, getting involved with the community prior to decommissioning, being candid and rational and meeting commitments all contribute to trust and acceptance. As regards engaging the local population in a meaningful way, it was also noted that demonstration of techniques and activities,

2. A publication reviewing the experience of stakeholder involvement approaches - mostly in the area of waste management - has recently been released by the NEA and could be of both use and inspiration for similar work in the D&D area. See: "Public Information, Consultation and Involvement in Radioactive Waste Management - An International Overview of Approaches and Experiences", OECD\NEA, Paris (2003).

where practicable, is a particularly powerful means of communication. Similarly, it was reported that visitor centres and site-tours can play a valuable part in showing the realities of nuclear technology.

It was also noted that public attitudes changed, and hostility to proposed developments sometimes increased, with distance from the nuclear facility concerned. In this regard, it was also observed that the interests and motives of the various stakeholders needed to be understood. Cases were described where some NGOs, for example, claimed continuing inability to understand or accept even basic scientific information supplied to them. It was suspected that this was simply intended to obstruct progress on D&D as a means of discrediting nuclear power production. In such situations, it was suggested that referring them, publicly, to acknowledged independent experts (e.g. university academics) was the best way forward.

Particular reference was made to the importance of keeping employees fully informed and confident of their continuing value. This is necessary in order to avoid any loss of morale associated with the idea that D&D is somehow less important than operation, notwithstanding the fact that it may lead eventually to site closure. The retention of staff with detailed knowledge of the plant during its construction and operational phases was judged to be a key element in securing the continuing safety of D&D operations.

Factors in Strategy Selection.

This was the overall theme of the seminar, of course, and the following list identifies all the issues that seemed particularly relevant to strategy selection, other than the obvious issues of safety and practical techniques, as mentioned above.

1. Basic options. (Early or deferred dismantling; entombment?)
2. Flexibility (one size does not fit all).
3. Project planning / analysis of materials flow.
4. Regulatory / policy requirements. (Timing; release criteria.)
5. Socio-economic issues.
6. Waste management provision.
7. Costs and funding arrangements.
8. Staff availability and personnel issues.
9. Knowledge retention.
10. Site re-use.
11. Strategy selection process. (e.g. Multi-attribute analysis.)
12. Who are the "regulators" and the actual decision-makers?

Other relevant factors include life cycle stage (end of life, or shut prior to end of life), community support and who selects strategy.

The voting showed that "Waste management provision" and "Costs and funding arrangements", items 6 and 7, were of the highest importance to participants, subject of course to the proviso about safety issues. These, together with "Socio-economic issues", were judged important enough to be themes on their own and were discussed in more detail under the relevant theme heading. After items 6 and 7, items 1, 2, 3, 4 and 11 appeared to be of broadly similar importance.

As regards items 1 and 2, it was noted that the basic D&D strategic options are early and deferred dismantling. The position of entombment is somewhat ambiguous and it is not clear just what its status is in the context of overall D&D strategy. It appeared from remarks made during the seminar that the majority is in favour of early dismantling but it was emphasised throughout that flexibility of strategy selection is essential and that "one size does not fit all". In fact it was clear that some early dismantling strategies are based on current expectations about availability of waste disposal routes and that they may be modified if these expectations are not delivered. The related question in the final discussion was "How far is it sensible to dismantle the facility without a waste disposal route being available?" There did not seem to be a single or specific answer to this question, and debate appeared to confirm the observation that individual strategies will invariably have to have regard to a wide range of factors and will be judged on a case-by-case basis.

For example, it was noted that there seems to be a general preference for early dismantling of light water reactors, even if a radioactive waste disposal route is unavailable and waste has to be stored temporarily on the site. For GCRs however, the timing of dismantling seems to depend on a route for disposal of graphite, at least, being available. In some cases, of course, strategy is driven by national economic or policy factors, where plant shutdown and site-clearance are required before normal end-of-life or obsolescence. Similarly, analysis of the effects of delay for radioactive decay on costs, dose commitment and waste generation, for example, do not necessarily result in the same choice. Differences in facility owners' perception of the commercial risks of deferral (e.g. increasing costs of waste disposal, increasing regulatory requirements, etc.) also impact on strategy selection. These differences are also found in decisions about D&D of some fuel cycle facilities where there is no benefit from delay for decay.

It was noted that detailed project planning, item 3, is essential and that analysis of materials flow is a helpful tool in this regard. In this context, contrasts could be observed between the decommissioning of plants which had reached naturally the useful end of life and those which were experiencing premature shutdowns as a result of societal decisions. It was also recognised that regulatory or policy requirements, item 4, are key inputs to project planning and that, in this context, any requirements relating to timing of D&D operations, management of radioactive waste or criteria for release of the site from regulatory control will be critical. It was remarked that regulatory arrangements need to recognise the differences between the stable, on-going activities of the operational phase of a facility and the transition to a lower risk state as D&D progresses. It was suggested that different regulatory approaches might even be required and it was noted that new arrangements for regulating D&D of NPPs have already been introduced in France. Until recently 3 authorisations were needed to cover all elements of the decommissioning and dismantling process, but now only one decree is required, thus simplifying the whole regulatory process. The US is already using a risk-informed approach as utilities transition during decommissioning. It was also suggested that WPDD might contribute to review of regulatory frameworks for D&D with a view to sharing experience on these regulatory approaches.

On the important matter of site release criteria, it was noted that the US authorities set an upper limit of dose at 0.25mSv/year, coupled with a requirement for ALARA, as compared with the figure of 0.01mSv/year as applied in Germany, for example. In discussion, it was suggested that the US ALARA requirement ensured that actual doses from sites released from regulatory control on this basis were much lower than the upper limit. It was reported that the IAEA are working on preparation of a standard for uniformity in this area. It was also mentioned that the Western European Nuclear Regulators' Association

(WENRA) are discussing the concept of "reference levels" as opposed to "release criteria" in an attempt to provide an element of international uniformity. Representatives of nuclear operators appeared to be unaware of this important development and it was suggested that WPDD might usefully provide feedback to WENRA from an operator's perspective, either directly or by way of the RWMC, although developer-to-developer exchange may be better.

In concluding the discussion of this theme it was reiterated that differences between facilities and their surrounding circumstances militate against any form of strategic harmonisation (i.e. one size does not fit all). Politicians and the public might have an expectation that there should be a universal "right answer". It was suggested that, using the information provided in the seminar and other NEA studies as a basis, the NEA might consider further work in this area such as an exchange of experience in methods of strategy selection (e.g. use of multi-attribute analysis etc.) This might be extended by way of examples of reasons for apparently similar facilities choosing different approaches. With regard to the importance of decommissioning criteria, some participants indicated that decommissioning criteria are believed to be important to public confidence and establishing a consistent understanding of "clean enough". Others felt that a case-by-case treatment is more appropriate. Many felt that because of differences in work breakdown structures, cost impacts of different criteria are difficult to evaluate.

Waste Management and Clearance.

This was an important theme throughout the seminar. Amongst the eight issues identified below for this theme, Items 3 and 5 were voted the most important issues by a large margin, followed by Item 1.

1. General Waste Management Plan.
2. Inventory of decommissioning liabilities.
3. Availability of waste disposal routes.
4. Conditioning of waste and avoidance of rework for disposal.
5. Standards for clearance, and effects of differences on costs and international business.
6. Handling of large quantities of VLLW.
7. Effects of variation of national WM arrangements on D&D strategy and cost comparisons.
8. Benefits of having single body (e.g. ENRESA) for both D&D and waste management? (Any parallels?)

It was generally acknowledged that the availability of a national General Waste Management Plan, item 1, is most helpful in development of D&D strategy, as is an inventory of decommissioning liabilities. But, so far as participants were concerned, the key issue is availability of disposal routes. This had been discussed to some extent in the context of strategy selection and the further remarks served only to confirm its importance in that context. Of particular interest were the cases of the early gas-cooled, graphite-moderated reactors now undergoing decommissioning in Spain, France, Japan, Italy and the United Kingdom. Different decisions have been made about the timing of final dismantling but they seem to depend heavily on assumptions about the availability of a graphite-waste disposal route, and they are likely to be modified if these assumptions prove to be incorrect.

Most of this part of the discussion centred on the issue of clearance levels for release of radioactive waste from regulatory control, Item 5. It was noted that this is different in principle from the issue of site release criteria. The latter is an essentially national issue. It has to have regard to such matters as local background radiation levels, which may be affected by presence of natural radioactive deposits such as monazite for example, and it is unlikely to raise any transboundary issues. National differences in clearance levels for radioactive waste, however, may raise various supra-national issues. They are likely to create difficulties with the transboundary movement of material that may have been cleared in one country but still requires regulatory control as radioactive waste in a neighbouring country. It may also have implications for the fairness of international business. Against this background, it was suggested that what is required is a set of clearance levels that operate in the same way as the internationally accepted standards for transport of radioactive materials.

It was also recognised that clearance levels have implications for the quantities of VLLW that arise in dismantling or site remediation, and thus for the costs of waste management. Consequently, they are likely to have implications also for basic D&D strategy, although experience with Vandellós I was reported as showing that the costs associated with demonstrating compliance with clearance levels may be greater than those of simply consigning the material to a VLLW disposal facility. It was noted also that there is still an on-going issue about the differences in clearance levels that apply to similar materials from nuclear and from non-nuclear sources.

Funding and Costs.

The issues under this theme that seemed to be important during the seminar were as follows:

1. Differences between commercial facilities and early R&D / Development facilities.
2. Relationship between funding and safety.
3. Hazards to the long-term security of funds.
4. Cost effects of using in-house staff, contractors or separate body for D&D. (e.g. training and management costs.)
5. Need for better breakdown of waste management costs?
6. Can harmonised funding arrangements ensure fair competition in the electricity supply market?
7. Interests of the local community. (e.g. in use of local labour and services.)

The voting showed that the greatest concern was about hazards to long-term security of funds created for D&D operations, Item 3, followed closely by the relationship between funding and safety, Item 2, and then Item 4, which dealt with the effects of staffing policy on costs.

The first concern was about ensuring that sufficient funds are available for D&D operations when they are actually required. The various interventions suggested a suspicion that segregated funds accumulated by way of a charge on electricity sales, for example, might be diverted for current requirements without sufficient guarantee of their availability when required for D&D. The majority opinion seemed to be that a truly independent fund managing body had advantages over plant operating companies, who may become bankrupt, or even Governments, whose priorities for funding may result in the funds being used for other purposes. Even in the case of an independent body, however, it was thought

that there were hazards to the long-term availability of funds. These hazards ranged from errors in the assumptions about inflation, or discount rates used for estimation of the funds required, to a simple loss in value of the assets held by the fund. These uncertainties led to the observation that, if sufficient funds are available, and other relevant conditions are satisfied, D&D should proceed as soon as possible. This seemed to be an important strategic consideration.

The relationship between funding availability and safety was also briefly explored. It seemed to be taken for granted that, if funds are needed for reason of ensuring safety - as it is foreseen in the Joint Convention on Safe Management of Spent Fuel and Radioactive Waste and in a proposed Directive on Nuclear Safety by the European Commission -, any uncertainty in the security of funds entails an impact on the safety margins.

Interest had been expressed in the effects of staffing policy on D&D costs. The main options were use of in-house staff, contractors, or a completely separate body. Setting aside the advantages of in-house staff having retained knowledge of the plant and systems, it seemed that savings might be made by avoiding the training and management costs associated with introducing new staff for D&D operations. The same benefit might be achieved, of course, by using the alternative of contractors who now specialise in D&D. However, the broad conclusion of this discussion was that it is still very difficult to compare information on D&D costs because the cost-basis is different from country to country and even from Company to Company, despite efforts of the NEA, IAEA and the EC to put such cost estimation on a more consistent and accurate basis.

Satisfying Social Demands.

The issues associated with social aspects were:

1. Implementing "Pillars of Trust", (safety, participation, economic development).
2. Providing channels for communication.
3. Creating representative local committees.
4. Does the EIA process satisfy the requirements of local communities?
5. Implementation of international conventions.

The voting clearly showed Item 1, implementing "Pillars of Trust", as being most important to participants in this context. In practice, it covers most of the social aspects.

The presentations had shown that assurance of safety is essential for communities in the locality of a nuclear facility. This applies to all phases of the plant's life, including D&D, and it requires adequate information about the safety of the facility and about plans for dealing with emergencies. Given that such facilities already exist, and that ongoing safety is assured, it seemed that these "nuclear municipalities" avoided debate about the relative merits of nuclear power and concentrated on dealing with the day-to-day issues arising from plant operation and with plans for its future.

In the specific context of D&D, participation in decisions was judged also to be essential and it was emphasised again that the decide-announce-defend policy is not conducive to progress. It was suggested that the best way forward is for site operators closely to involve local politicians or community leaders and to co-operate with any local committees set up to oversee the community interests. This means providing them with transparently valid information about plans and programmes, living up to

commitments, and being constantly available to answer questions and hear comments. It also means providing valid information on safety and environmental matters including waste management and giving full consideration to concerns about the effects on society such as loss of employment, the need for alternative economic activity, future use of the site and about compensatory benefits for the community.

As regards channels for communication of this information, it seemed that all techniques have a place, from conventional meetings, seminars, debates and provision of information packages for local discussions to television programmes and websites, supported with "chat-rooms" if appropriate. Timeliness was felt to be a key factor. Communities where facilities are shut down prior to the end of life have special communication needs as a result of termination of some employment.

The basic message from the representatives of local communities was that development of confidence and trust in the site operator are essential for effective progress of D&D.