Public participation in EIA of nuclear power plant decommissioning projects: a case study analysis

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Received 3 October 2003; received in revised form 4 February 2004; accepted 4 February 2004
Available online 6 May 2004

Abstract

Over the coming years a large number of nuclear power plants (NPP) will be decommissioned as they reach the end of their operational life and the decommissioning proposals will be subjected to Environmental Impact Assessment (EIA). At present, experience of decommissioning is extremely limited and three detailed reviews were conducted of the public participation experiences associated with this activity in three European Union countries (Germany, Spain and the United Kingdom) to try to identify elements of good practice which could be carried forward to future decommissioning projects.

For each of the case studies, information was gathered using a combination of review of the Environmental Statement, site visits and interviews with key personnel identified by the study team. The information collected pointed to five ‘success factors’, which could be used to summarise the main aspects of good practice to carry forward. These can be categorised as: authority acceptance of the value of participation; integration of all participation activities under the umbrella of EIA; carrying out participation activities before final strategies are adopted; keeping the decision-making process transparent; and providing sufficient information to the public to facilitate participation.
A further review of public participation experiences in the literature covering 13 contentious projects provides support for these success factors. © 2004 Elsevier Inc. All rights reserved.

**Keywords:** Decommissioning; Nuclear power plants; Environmental Impact Assessment; Public participation; Contentious projects; Case studies

### 1. Introduction

At the present time a large number (over 100) of nuclear power plants (NPP) are at various stages of the decommissioning process in the European Union, and the current forecast is that another 160 nuclear facilities will be taken out of service in the next 15 years, with a further 50 sites needing to be decommissioned once the European Union expands to include the Baltic and Central European countries (Vankerckhoven, 1998).

Decommissioning of nuclear power plants is made up of the activities of dismantling, decontamination and restoration (Cassiopee, 2001b) with three separate levels, or stages, of decommissioning being recognised under the categories described by the International Atomic Energy Agency (1983):

1. **No Action**, implying maintenance of the shutdown situation.
2. **Long term or 'safe' storage**, which entails modifying the installation in order to establish a structure that will safely contain the radioactive material for a prolonged period. This allows radioactive decay to reduce the quantity of radionuclides in the former nuclear power plant with a view to the eventual dismantling and unconditional release of the site. This period may be from 10 up to 100 years or more, depending upon the detailed decommissioning strategy adopted and the availability of radioactive waste storage or disposal facilities.
3. **Immediate dismantling**, consisting of the dismantling of the facility in the short term, leaving the site free for unconditional use after a short waiting period (3 to 10 years) during which it is subject to surveillance.

Decommissioning nuclear power plants and most research reactors requires an Environmental Impact Assessment (EIA) to be undertaken, following paragraph 2 of Annex I of the Environmental Assessment Directive (Council of the European Communities, 1985) as amended by Directive 97/11/EC (Council of the European Union, 1997), except in exceptional cases covered in Article 2(3). This Directive, as amended, already incorporates the requirements of the Espoo Convention covering Environmental Impact Assessment in
a Transboundary Context\textsuperscript{1} (United Nations Economic Commission for Europe, 1991) and has been further amended by Directive 2003/35/EC (European Parliament and the Council of the European Union, 2003) to incorporate the obligations of the Århus Convention on access to information, public participation in decision-making and access to justice in environmental matters (United Nations Economic Commission for Europe, 1998) requiring greater public involvement at the earlier stages of the EIA process. It is of note that the 1985 Directive did not refer to decommissioning nuclear power plants and it was only the 1997 amendments, which had to be implemented by July 14th 1999, which added the requirement to carry out EIA of such projects.

This paper focuses on the public participation process associated with decommissioning nuclear power plants. To date only a few Member States have experience of undertaking a full EIA of a nuclear power plant decommissioning project. In the United Kingdom, the company ‘BNFL Magnox’ has published an EIA of proposals for the decommissioning of the two reactors at Trawsfynydd. In Spain, an EIA has been submitted for the decommissioning of the Vandellós 1 reactor and the project has been approved and operations have commenced. In the Netherlands, there have been two NPP decommissioning EIAs, one for the small Dodewaard reactor and one for the still operational Borssele reactor (currently scheduled for decommissioning in 2004, but may have its license extended). The first of these has been published and the review procedure is under way. The future of the Borssele site is being debated at present although it is understood that a revised EIA is in preparation. France is in the process of decommissioning 21 nuclear power plants and 9 other nuclear installations; EIAs have been carried out for five of the NPP decommissioning projects. Of the other Member States, in Austria an EIA for the decommissioning of the Seibersdorf research reactor (10 MW), which was shut down in 1999, was published on September 2nd 2002. In Germany, environmental appraisals have been made in relation to operations conducted for decommissioning of the Greifswald NPP.

Thus, there is limited experience of applying EIA to the decommissioning of nuclear power reactors in the EU and, therefore, limited experience of how best to involve the public in these activities. This paper details a study which examined in detail the approaches taken at three major NPPs currently undergoing decommissioning: Trawsfynydd (UK), Greifswald (Germany) and Vandellós 1 (Spain). In all cases, the power plant terminated operation before the requirements of the 1997 EIA Directive were transposed into national legislation, and therefore the approaches for future decommissioning projects in these countries are likely to be different in various respects from the historical approaches recorded here.

\textsuperscript{1} The amended Directive (97/11/EC) only addresses the Espoo Convention with respect to consultation over transboundary impacts between member states of the European Union’s borders; in order to fully address the Espoo Convention, it would need to allow for consultation with non-member states bordering EU countries as well.
Although any decision-making process finds benefits from having transparent and interactive communication processes with the public, the effectiveness of the most adequate mechanisms is demonstrated in controversial projects. Due to their nature, decommissioning projects for existing nuclear reactors tend not to be as controversial as projects for new development. As there is general acceptance of the need to decommission nuclear reactors at the end of their operating lives, the concerns that emerge relate mainly to associated impacts such as employment in the local community, visual impacts, waste disposal and the decommissioning strategy.

2. Methodology

The research aims to examine how public participation was undertaken, and to evaluate this practice. A case study approach is useful for dealing with these forms of research question (Yin, 1994) and there are numerous examples of the successful application of case study approaches to describe (Ng and Sheate, 1997) or explain the use of public involvement in EIA (Kakonge, 1996; Palerm, 1999a,b; Sinclair and Diduck, 2000), or to evaluate theories (Webler et al., 1995).

For each of the case studies, information was gathered using a combination of documentation review (including Environmental Impact Statements), site visits and interviews with key personnel.

Whilst there is a wealth of literature on EIS review (for example, Bond, 1997; Department of the Environment Planning Research Programme, 1996; Glasson et al., 1996; McMahon, 1996; Scholten, 1997), it was not the aim of the research to investigate the quality of this document. Instead, the EIS was reviewed to gain insights into the consultation process carried out.

A framework for public participation in EIA is presented, drawing from political science theory as well as reported best-practice. This framework was used in assessing public participation in the case studies and also helped validate the findings (as well as through a more detailed review of specific controversial case studies).

It is clearly a concern that conclusions drawn from these cases, some preceding formal EIA legislation at all, might be used to formulate general recommendations for decommissioning nuclear power plants. This was recognised and a strategy adopted of verifying any findings using literature reviewing public participation undertaken as part of decision-making processes involving controversial projects.

The approach taken relies very heavily on the abilities of the researchers to extract relevant information from the various data sources, and the possibility remains where public attitudes are being considered, that some perceptions may be misleading. Thus the opportunity was taken to check the accuracy of key facts with authorities at each site.
The description of the public participation experience associated with the decommissioning of Trawsfynydd (UK), Greifswald (Germany) and Vandellós 1 (Spain), will follow a common format. First, the background to the operation of the nuclear power plant will be provided along with an explanation of the need for decommissioning. Then the public participation in the development of decommissioning proposals will be detailed, as this is clearly a stage at which options can be influenced. It should be noted that such participation occurs outside the EIA process, and the implications of this will be considered later in this paper. Then the EIA context will be set indicating the role which it played in the decision-making process, and this will be followed by an explanation of the role public participation played in that EIA process. Finally, the lessons learned on public participation in each case will be discussed.

3. Framework for public participation in EIA

Public participation has become an obligated term in policy discourse, not without reason. The scientific/technological paradigm (‘experts’ know best) that worked well in representative systems has been losing credibility and is becoming demystified, often attributed to the rise of global and intangible risks that characterise the risk society (Beck, 1992). This lost ground has been gained by discursive democratic practices, where public participation becomes the essential element to legitimate decisions (see, for example, Hajer and Wagenaar, 2003; Renn et al., 1995). But this move towards more discursive forms of decision-making started to build on a recognition of public participation as an instrument necessary in democratic systems which facilitates the development of individual capabilities and a sense of social responsibility (for example, Bachrach, 1967; Pateman, 1970).

Public participation is often acknowledged for its pragmatic advantages (e.g. avoidance of conflicts and delays of controversial projects, social learning), but it should primarily be defended on normative grounds. Democracy—without adjectives—places trust on the public to decide its own interest; when trust is transferred strictly to elected (or selected) representatives and results are not obtained then alternative means to ensure legitimacy and reach ‘better’ decisions must be devised. This is exactly what is taking place in the move to discursive practices. The A˚rhus Convention is a milestone achieved by recognising public participation as a right on its own.

Theoretical models for public participation have been proposed, some of which are grounded in discursive practices (for example, Palerm, 2000; Renn et al., 1995). The effectiveness of the principles of public participation that may be derived from such theoretical models have been generally confirmed by practical case studies. It is beyond the scope of this paper to undertake a review of case studies that support each of the principles of best-practice described below,
although readers familiar with public participation processes and literature will relate to them. Thus only a short reference will be made to specific cases that support the principles (note that the cited case studies support the principles on a pragmatic basis; the normative basis need no pragmatic support and may only be challenged on political science and philosophical grounds).

- Public participation must take place **early** in the decision-making process, when alternatives are still open, and ideally from the screening and scoping stages; e.g. in the analysis of EIA processes in Hungary (Palerm, 1999a) it was found that the case study that allowed for earlier involvement proved less controversial and more constructive in the view of stakeholders, as opposed to the cases where the public could only participate after the EIA had been submitted.

- Public participation must be **inclusive**, integrating a wide range of stakeholders and taking particular account of minorities. Ward (2001) explores stakeholder involvement in transport planning and confirms that stakeholder inclusion does not make planning expensive or inconclusive and, on the other hand increases problem definition and innovation diversity.

- Public participation must be a **two-way communication** affair, where there is a dialogue between the developer and the public oriented to reach (if possible) consensus and where mutual learning takes place. Videira et al. (2003) used successfully a participatory modelling framework for public participation for the definition of the Ria Formosa management plan, based on extensive dialogue.

- In order for public participation to be effective, it must be accompanied by real opportunities of **access of information** as well as **provision of key information**. The EIA for the construction of a hazardous waste incinerator by Solvay in Spain (Palerm, 1999b) took place under a series of non-transparent practices (e.g. the whole EIS classified as confidential, reduced public consultation period, public consultation during holiday period); this approach intensified conflict with NGOs and led to a de-legitimisation of the process and of competent authorities.

- Effective public participation should **empower** stakeholders, i.e. give them a real opportunity to influence the decision-making process. The planning process for the expansion of the port of Rotterdam proved very successful mainly due to the creation of a participation forum where stakeholders had a say throughout the decision-making process, including basic decisions, and which empowered them in the process (COWI ECA and Scott Wilson, 2004; Deelstra et al., 2003).

- Public participation should take into account the **values** of stakeholders and not be limited to the discussion of factual evidence (see Stolp et al., 2002). A Citizen Value Assessment (CVA) was carried out as part of the EIA for the design of highway options in The Netherlands (Stolp et al., 2002), which proved to enhance the process and the quality of the final decision.
• EIA processes must be transparent (see Morrison-Saunders and Bailey, 2000) and decisions accountable. Where decisions are not justified, trust is lost and decisions lose legitimacy, as has been shown in the planning and EIA process that led to the construction of the Arcediano dam in Mexico (Palerm, 2004) and which exacerbated conflict in the construction of the Madrid–Valencia motorway (Palerm, 1999b).

It is only fair to mention that effective participation will not necessarily be achieved through the direct implementation of the above elements; political, social and economic contexts specific to each country or case will have an effect on the effectiveness of participatory practices (for example, Petts, 2003); Palerm (2000) has classified these elements under the heading of ‘attitudes’ and ‘capacities’ of the different actors. It is impossible to come up with a single participatory and global model; this will have to be devised for each specific context, but the general principles outlined above are nevertheless the starting point for effective participation.

Elements that will influence the effectiveness of public participation processes include:

• The maturity of civil society and political culture. For example, in so-called Countries in Transition (CITs) as well as other emerging or consolidating democracies, the public tends to have a low degree of trust in the system and in decision-makers, added to long years of state paternalism and repression (for example, Palerm and Aceves, submitted for publication; Przeworski, 1995).

• Attitudes of developers and competent authorities towards public participation. If developers and authorities are not convinced of the benefits of public participation, opportunities for participation tend to be minimised and thus their benefits diminished. For example, Monnikhof and Edelenbos (2001) found that participatory processes become less effective when actors setting up the process had clear expectations and thus had no real interest in the contributions of participants.

• Resources to participate. Stakeholders may wish to engage in participatory processes but lack the human or economic resources to undertake comprehensive reviews of the documentation and defend their positions; Canada offers an example where stakeholders may be funded by the government to engage in public participation.

4. Case Study 1: Trawsfynydd (UK)

The key personnel interviewed at this site were the Head of Communications and Public Affairs at BNFL Magnox, a representative of the local authority, and the summary review was sent to the NPP manager for comment.
4.1. Background

Trawsfynydd Nuclear Power Plant is in North Wales, UK, within the Snowdonia National Park. It was built between 1959 and 1964, and first supplied electricity in 1965 from two Magnox-type reactors. The plant continued to produce electricity until February 1991 when it was shut down for maintenance. Because of the cost of safety improvements required by the regulatory authorities for continued operation, it was considered to be uneconomic to restart the reactors and the plant was formally closed in July 1993. In accordance with the operating license for the plant, agreement was obtained from the regulators for the removal of the spent fuel (defuelling was considered by both the operator and the regulator to be a part of the reactor operations). Beginning in November 1993 the fuel rods were removed from the reactor cores and transported to BNFL Sellafield. Defuelling was completed in August 1995.

A decommissioning plan was prepared and submitted to regulators and, since defuelling, additional work has been undertaken in accordance with that plan with some dismantling of non-radioactive plant and materials.

4.2. Role of public participation in the development of decommissioning proposals

Three broad approaches to the decommissioning of Trawsfynydd NPP were considered:

(1) Early site clearance, which would take about 20 years to complete using current technology.
(2) Deferred site clearance, where buildings containing radioactive plant are retained on-site in a ‘safestore’ until the optimum time for decommissioning is reached, currently considered to be about 100 to 135 years after plant shutdown.
(3) Mounding, which consists of removing non-radioactive buildings, possibly reducing the height of the reactor buildings and then filling in all voids within buildings and burying the plant under a mound.

The second of these alternatives, deferred site clearance, was considered by the operators to provide the best option, particularly in balancing worker dose and resource requirements. A proposed strategy was developed on this basis.

Before the decommissioning strategy was selected, the site operator decided to consult with the staff and the local community in order to ascertain their concerns. Consultations with the general public took place in April and May 1994, although consultations with the staff were undertaken some time before that and included the circulation of an information pack and personal counselling to determine their preferences regarding their employment options (i.e. volunteer-
ing for severance, redeployment or continue employment at Trawsfynydd). The stakeholders were defined according to three groups:

(1) Trawsfynydd plant employees and trade union representatives,
(2) People living within an approximate 25–30 km radius of the plant,
(3) Local authorities including the then competent authority (Gwynedd County Council), the district council and the two bordering district councils.

In defining the public consultation strategy, care was taken to ensure that most of the input was from the local population. Details were given on the range of decommissioning methods and not only the safestore option. Information was provided for each option in terms of safety, the environment, employment and costs.

Consultations occurred at three levels:

- In the UK, each licensed nuclear site has a local liaison committee, run by the licensee and including representatives from local authorities, trade unions, interested local groups and members of the public. Consultation occurred with the Trawsfynydd Local Community Liaison Council and separately with local authorities, including the provision of information.
- A touring exhibition visited 13 local venues, supported by technical staff and by staff from the site visitor centre.
- Questionnaires were available at the site visitor centre and at the touring exhibition. The returns were independently analysed.

The feedback to the consultation came as direct responses from staff, as formal feedback from the three local councils, and from the independent analysis of the questionnaires.

Of 1286 questionnaires given out, 266 (21%) were returned. The analysis of these showed that local employment was a major concern (78% of respondents) as would be expected in an area where about 85% of the working population within a 30-km radius of Trawsfynydd were employed at the power plant. Other major concerns were the visual impact of the site in the long term (76% of respondents) and the radiation doses to be received by workers during dismantling (70%).

As a direct result of the consultations it was decided to change the proposed strategy from ‘Deferred Safestore’ to ‘Early Reduced Height Safestore’. This new approach would require more work on site in the years immediately following the end of defuelling, thereby increasing employment opportunities. In addition, the “reduced height” element (relating to lowering the height of the reactor buildings) would help to reduce the visual impact in the long term.

Feedback on the results of the consultation exercise was given to all affected parties through face-to-face meetings with workers, meetings with local councils,
letters to questionnaire respondents and an exhibition in the visitor centre. All feedback included information on the revised strategy.

The revised decommissioning strategy therefore involved the following:

- Nuclear fuel is removed from the reactors and is sent to Sellafield for reprocessing. (In the UK, defuelling is regulated as part of normal reactor operations.) This phase of the work is complete.
- A period of work involving the following:
  - removal of some plant and buildings (e.g. the turbine hall),
  - reduction in height of the reactor buildings from 55 m to about 35 m,
  - refurbishment and recladding of the buildings that are going to be retained,
  - construction of a safestore that is in sympathy with the surrounding landscape,
  - retrieval of the operational intermediate level wastes that had been accumulating in storage since the plant became operational, followed by waste conditioning and packaging, and then further storage on site,
  - removal of asbestos, oils, gases and chemicals.
- The site would then be managed and maintained for a period which could extend to up about 135 years, during which time the facility would be maintained in a safe and secure condition.
- After this period, all the remaining plant and buildings would be removed and the site could be released for alternative use.

4.3. The role of EIA in the decommissioning process

On April 1st 1996, local government in Wales was reorganised and the Snowdonia National Parks Authority (SNPA) came into existence and is now the authority with responsibility in planning matters for Snowdonia National Park in which Trawsfynydd is situated. The SNPA identified the need for a planning application, accompanied by an EIA, in relation to proposals for alterations to the cooling ponds complex and other buildings. This pre-dated Directive 97/11/EC, but the site operator considered that they should comply.

The EIS was submitted to the SNPA in 1998, but the planning application which it accompanied was ‘called in’ by the Welsh Office moving the decision from a local level to a national level. Further delay was then introduced by the devolution process in the UK which involved the Welsh Assembly taking over powers in Wales in 1999.

At the time of submission of the Environmental Impact Statement (EIS) for Trawsfynydd NPP decommissioning there was no connection between the need for planning permission and the ongoing regulation in terms of radiological and nuclear safety. At that time, the site operator was required to prepare a decommissioning plan submitted to the Health and Safety Executive under the terms of the site license. Planning consent was only required for certain aspects of the proposed work, such as the construction or
significant alteration of buildings. The EIA for Trawsfynydd was therefore undertaken as part of a process leading to planning consent rather than for the decommissioning plan.

Since late 1999, the decommissioning of a nuclear power plant cannot proceed until the Health and Safety Executive (HSE) has granted consent. An EIA and an EIS will be required. The EIS must be made available to the general public, and the HSE will also consult with a number of statutory consultees (e.g. the environment agencies that have responsibility for radioactive discharges; local government; and other statutory bodies). In arriving at a decision, the HSE must take into account both the EIS and the responses received from statutory consultation bodies and the public. Separate land use planning permission will be required for works such as external alterations to buildings, but it should not be necessary to undertake a separate EIA.

4.4. The role of public participation in the EIA process

The EIS was sent together with the application for development consent to the Local Planning Authority (i.e. the Snowdonia National Park Authority, SNPA). A copy of the EIS and its non-technical summary were provided in both English and Welsh for any member of the public who requested it.

The EIA procedure in the UK provides for a period of public consultation when members of the public can send their comments on the planning application to the competent authority. The planning application was notified in the local press and sent to statutory consultees and the neighbouring local authorities. Thus the public participation during the EIS review phase helped to disseminate the proposal to the wider public, including the statutory consultees. Since a public consultation exercise had already been carried out, that stage was not repeated for the EIA.

In addition to the consultations made by the SNPA, the site operator consulted with a range of organisations (e.g. other local authorities and NGOs) to get their opinions on the planning application. Several groups showed interest in the process, mainly environmental NGOs, e.g. the Welsh Anti Nuclear Alliance, the North Wales Wildlife Trust, the Council for the Protection of Rural Wales, the Snowdonia Society, Friends of the Earth Cymru and the Council for National Parks. Ongoing liaison between the site operator and the SNPA was undertaken by the plant management using existing channels, rather than separately by the EIA team leader. This liaison continued through the EIA process, and served to inform the SNPA of progress and to ensure that the site operator was aware of the chief areas of concern for the SNPA. In general, the EIA process was seen to be a credible exercise by the SNPA.

The comments presented by the statutory and non-statutory consultees were very varied in nature. The most consistent concerns were over possible radioactive leaks, the fairness to future generations of an option that has implications for 135 years, and the insufficient analysis of alternatives. All
letters received were acknowledged and their comments transferred to the Welsh Office, which by then had become the Competent Authority.

4.5. Lessons learned on public participation from the Trawsfynydd EIA process

The public participation mainly took place during the development of decommissioning proposals and was separate to the EIA process. The success of this process is indicated by the fact that the site operators were receptive to views and decommissioning options were altered. Once the EIA process was triggered, there was little to be gained by repeating the process as agreement had already been reached, the minimum public participation necessary under the EIA procedure was therefore undertaken, but could not be considered to be adversely affecting the decision.

An important feature of the public consultation exercise was the feedback given which kept the interested parties appraised of developments. It is possible that this prevented any further reaction at the EIA publication stage, which might have resulted if the public had been unaware of how their views had been taken into account.

The weakest part of the EIA process was identified as the lack of a formal scoping exercise, stemming from SNPA’s indication that all possible impacts should be considered. As such, an objective of the public consultation was not to identify the scope of the project and this could have led to a more costly study than was necessary.

5. Case Study 2: Greifswald (Germany)

The key personnel interviewed at this site were the Project Manager Decommissioning (Energiewerke Nord), Deputy Manager Decommissioning (Energiewerke Nord), Head of Public Relations Department (Energiewerke Nord). Information was checked with Environmental Issues Professional of Energiewerke Nord.

5.1. Background

On the site of the Greifswald Nuclear Power Plant in the former DDR, there are eight Pressurised Water Reactors of the Russian VVER-440 family, the first of which was commissioned in 1979. Five reactors had been operational, one was nearing full commissioning and the final two were not fully constructed when the decision was made to take the power plant out of service in 1990.

A decision was taken to dismantle the plant for a number of reasons based on the findings of assessment work; one was to address the main local concern of continuing employment, but others included the desire to reduce the risk
potential, the fact that the personnel with experience of repairing and maintaining all components to be decommissioned were available and this action would prevent the need for future maintenance and repair over very long time periods. Because of concerns over the continuing availability of waste disposal routes in Germany, and to avoid complications of loss of ability to return spent fuel to Russia, a decision was taken to build a new on-site facility—called Interim Store North (ISN)—to store both spent fuel and waste.

Although the former DDR site license was valid until 1995 by German Law, the requirement to secure a new license provided an opportunity to obtain a license that covered as much of the decommissioning activities as seemed reasonable at the time. This covered possession of plant, post-operational activities, and large-scale dismantling works. Some consideration was given to a ‘safestore’ enclosure but the ultimate decision was for immediate dismantling.

The Greifswald decommissioning project can be considered in three main phases:

1. The post-operational phase comprising operation of all systems relevant to the safe storage of fuel elements, the removal of fuel elements, dismantling of inactive systems and decontamination.
2. The dismantling phase comprising:
   - the dismantling of the contaminated and suspect (potentially contaminated) systems; and
   - the remote dismantling and conditioning of recovered material.
3. The site restoration phase consisting of the dismantling of remaining systems, building decontamination and demolition, and site restoration and adaptation for alternative use.

Central to the strategy was the construction of the Interim Store North as this enabled dismantling work to proceed in the secure knowledge that the components removed could be further handled, decontaminated and stored on site. All spent fuel elements were transported to the interim wet storage. The next step is transport back to the cooling pond of the reactor unit and reloading in CASTOR casks (these are containers approved for the storage and transport of radioactive materials in Germany). After sealing and drying the CASTOR casks are transported to a hall within the Interim Storage North. In reality, all phases run in parallel.

In Germany, responsibility for licensing various components of decommissioning differs depending on the specific task and whether the spent nuclear fuel is being handled as opposed to radioactive waste. The interim storage of radioactive waste (except spent nuclear fuel) is the responsibility of the federal state where the interim storage facility is located. The interim storage of spent nuclear fuel, however, is the responsibility of the Federal Office for Radiation Protection (BfS), independently of the facility location. Disposal of any kind of
radioactive waste, including spent nuclear fuel is also the responsibility of the Federal Office for Radiation Protection (BfS) on behalf of the State.

Three separate licenses were required to cover the processes of decommissioning and dismantling. One was a basic license for decommissioning the nuclear power plant and for the dismantling of plant parts. This license was obtained in 1995 from the Ministry of the Environment of the Federal State of Mecklenburg–Vorpommern (where Greifswald is located) and limited values for nuclide emissions into air and water, specified procedures for the treatment of suspect material and also specified conditions for the dismantling process. The same Ministry granted the license for using the ISN for radioactive waste, whilst the Federal Office for Radiation Protection (BfS) on behalf of the State granted the license for using the ISN for spent fuel.

Planning of dismantling activities was carried out mainly on a technical basis. Work started on Unit 5 by the removal of contaminated items, to avoid activity spread, followed by the removal of high radiation sources to reduce operator dose. Unit 5 is now being used to demonstrate and develop dismantling and removal techniques. During dismantling, major components are removed from the primary circuit and transported to the ISN where they are handled without prejudice to ongoing dismantling operations on the plant. In this way continuation of employment is better managed.

5.2. Role of public participation in the development of decommissioning proposals

Local concern over employment was clearly a significant driver in formulating the decommissioning strategy, particularly in the aftermath of reunification which led to job losses in the former DDR, as has been the desire to attract alternative technology to the site. Some success has been achieved in the latter case and the medium-term vision is now of a largely delicensed brown field site with nuclear activities ceasing in 2008/2009 and with two gas turbine installations operating and nuclear activities restricted to the ISN.

The application to proceed with a particular dismantling project was made to the environmental authorities in Greifswald representing the Federal State of Mecklenburg–Vorpommern. The authorities established a ‘Nuclear Engineering Group’, composed of 13 members, several of which represent environmental NGOs and other social groups with the remainder being local elected officials, to advise on all aspects of work at the power plant site. This Group was to advise the authorities if the environmental impacts addressed in the documentation were considered unacceptable. The Plant Director attended meetings of the Group, which was primarily seen as supporting the Federal State authorities rather than the power plant.

Public consultation was carried out at the stages where licenses were obtained in line with the legal requirements; this involved a public hearing. The company managing the decommissioning process, Energiewerke Nord, maintained con-
tacts and correspondence with opposition NGOs throughout the process for
obtaining licenses, a Visitor Centre was established on the site and visits to the
nuclear facilities and to Interim Store North are possible.

Opposition to the decommissioning activities came mainly from Greifswald
through a public campaign “Nuclear Energy for Promotion of Renewable
Energies”. The campaign is against industrial reuse of the site and is supported
by NGOs for nature protection. It should be noted that the local town is not
Greifswald but Lubmin, from which no major opposition was shown.

5.3. The role of EIA in the decommissioning process

When the decommissioning project started, there was no requirement for a
formal EIA. At the time of re-licensing in 1995, although the need for some
form of EIA was not mandatory, it was recognised, and a procedure for
assessment and approval of specific tasks or activities was agreed with the
local authorities for the part licenses covering decommissioning and disman-
tling under the umbrella of the basic license obtained. The process developed
facilitated the consent process and, provided that the potential for significant
environmental impact is reported to be small, the process allows dismantling
work to progress unhindered.

Thus, formal EIA has not featured prominently in decommissioning planning
at Greifswald, although there was recognition of the need to take into account the
EC Directive 85/337/EEC together with national laws and regulations on EIA.
Discussion with the local authorities of Mecklenburg–Vorpommern led to an
agreement that the EIA process could be carried out at three levels on a voluntary
basis. The first level is an Evaluation of Environmental Impact (EEI). When the
result of this evaluation is that there will be no significant impacts, then EIA is
not necessary and the assessment is regarded as an amendment to the application
and is automatically accepted and work can proceed. When the potential for
significant impacts do exist, then two further levels of EIA are performed. In
practice, it has not yet been necessary to progress beyond the agreed first stage of
the process. In this context, the term ‘project’ is applied to a relatively small,
clearly identified package of dismantling or decommissioning activity to which
the EIA procedure can be applied as appropriate.

Since 1997, an annual report has been published describing the activities
undertaken and their environmental impacts, and presenting information on the
emissions of nuclides and other pollutants to air and water.

5.4. The role of public participation in the EIA process

Public participation was not associated directly with the EIA process which
was carried out informally. Such a decision-making process would not be
possible now under the amended EIA Directive, which would oblige public
access to the EIS as well as an opportunity for public consultation.
No formal public participation took place in the sense of providing an opportunity to the general public to express their views and/or have a say in the decision-making process with regards to the potential environmental impacts of the decommissioning activities.

5.5. Lessons learned on public participation from the Greifswald EIA process

The opportunities for public participation at the EIA stage were limited to the views expressed through the Nuclear Engineering Group to the local authority, although broader participation was undertaken as part of the procedure for obtaining licenses.

Ongoing dialogue with opposition groups was seen to be a productive part of participation and the use of a variety of techniques for facilitating participation, such as Visitor Centre, web pages, environmental reports, have been seen as successful in maintaining dialogue with the public, albeit at a stage too late to affect planning and decision-making.

6. Case Study 3: Vandellós 1 (Spain)

The key personnel member interviewed at this site was the Mayor of Vandellós (where the NPP is situated) who is also President of AMAC and COMUN. AMAC is a National Association of Municipalities affected by NPPs; COMUN, on the other hand, is a similar association but with representation only of those municipalities where power plants are situated. AMAC and COMUN are members of a European network of similar associations, GMF. Also interviewed were employees of ENRESA, the Spanish national radioactive waste company.

6.1. Background

Vandellós 1 is a 497 MW gas graphite type nuclear power plant located in the Province of Tarragona (Catalonia). Its construction by the joint French/Spanish company HIFRENSA began in 1967 and it started operating in 1972. The plant suffered a turbine fire in 1989 and in 1990 the Energy Directorate General decided to suspend the operating permit and set the conditions for its subsequent decommissioning.

The Spanish national radioactive waste company ENRESA was made responsible for dismantling the plant and has drawn up the decommissioning and dismantling plan which was submitted to the Ministry of Industry and the Nuclear Safety Council. An EIA was completed as part of this preparatory work.

ENRESA is responsible for the dismantling and waste treatment, with active waste being consigned to the LLW/ILW repository operated by ENRESA at El Cabril in Cordoba. Regulatory matters are addressed by the Nuclear Regulatory
Council and research into decommissioning processes is sponsored by CIEMAT (Research Centre for Energy, Environment and Technology—a public body for research and technological development supported by the Ministry of Science and Technology). ENRESA assumed ownership of the site and plant for a 5-year period to take on the decommissioning Stages 1 and 2 and will return the site to HIFRENSA thereafter.

Stage 1 activities include the preparation of infrastructure for removal or reuse as appropriate and some decontamination. Radioactive wastes will be appropriately treated, packaged and consigned off site, and the remaining reactor vessel sealed.

Stage 2 activities lead to restricted site release and involve the dismantling, removal or decontamination of all equipment and buildings for which this is possible. It also involves the draining of remaining fluids.

By 1998, following post-operational cleanout (which included the removal of spent fuel and the treatment of operational wastes, such as, the graphite components from fuel elements), the plant was ready for Stage 1 decommissioning. The plan is for stage 2 to follow in sequence but for work then to be suspended for a period of 25 to 30 years before final site clearance.

During the following care and maintenance period the reactor vessel will be maintained in a hermetically sealed state, with occasional monitoring, and much of the site, about 80% in total area, will be returned to alternative uses. Equipment and infrastructure such as the switch-gear compound and cooling water supplies will be maintained in case a further power plant should be built on the site.

The visual impact of the plant on the coastline is to be significantly reduced. The concrete shield around the reactor vessel is being sealed and the building surrounding it will eventually be removed. This will reduce both the height and diameter of the residual structure. The plant will then be left in this latent state until Stage 3 operations commence when the plant items can be demolished and removed with a significantly reduced radiation dose commitment.

This plan for immediate Stage 1 followed by Stage 2 and deferment of Stage 3 was submitted by ENRESA to the Ministry in 1994. Over the next few years, preparations continued and authorisation for dismantling to commence was given in January 1998.

6.2. Role of public participation in the development of decommissioning proposals

Employment was perceived to be the main local concern. Staff numbers have dropped from 350 when the plant was operational to about 100 currently and a planned 50 during the latency period. At the time of the case study there were also about 300 external contractors working on site.

There was public agreement on the need to dismantle Vandellós 1, reservations about the continuing operation of Vandellós 2, and a desire to have a (non-nuclear) power plant on the site as a replacement.
The Mayor of l’Hospitalet de l’Infant (the nearest local town) created a Commission which would interact with the developer during the whole decommissioning process. The Commission is formed by the five Mayors of the municipalities included in the so-called ‘nuclear area’ (i.e. those municipalities within a 10 km radius of the NPP), environmental authorities, representatives of NGOs, business associations, tourism interest associations, community groups, etc. The Commission presents technical reports to ENRESA and discusses these in periodic meetings (every 3 months) in order to resolve any controversies and concerns.

The creation of the Commission was mainly the initiative of the Mayor of L’Hospitalet in his role as President of AMAC and COMUN. AMAC is the national association of Municipalities affected by NPPs; COMUN, on the other hand, is a similar association but with representation only of those municipalities where power plants are situated. AMAC and COMUN are members of a European network of similar associations, GMF. This initiative has facilitated a smooth and transparent decommissioning process.

AMAC has played a major role in interacting with the national authorities and developers in meeting the needs and concerns of the affected municipalities. As an organisation they ensure not only that information is provided to the population regarding the NPPs and the dissemination of emergency plans, but are concerned also with the socio-economic issues around an NPP. As most of the NPPs in Spain are located in economically depressed areas with high unemployment, AMAC seeks to diversify the economic activity of the area (so that the local economy will not suffer through the closure of the NPP) and provide advice to affected workers on alternative schemes (e.g. early retirement, favourable severance schemes, employment in other NPPs).

6.3. The role of EIA in the decommissioning process

Although the power plant was formally closed in 1990, it took 8 years for decommissioning plans to be prepared, and then approved after the EIS was submitted to the Competent Authority in August 1996. Decommissioning proper started in 1998 although the spent fuel had all been removed by this time, the fuel elements leaving site mainly by 1994 with the final fuel shipment being in 1997. EIA considerations arose from EC Directive 85/337/EEC, which was deemed to apply to NPP decommissioning operations. The requirement to prepare an EIS can thus be regarded as ‘self imposed’ by ENRESA.

The EIS was submitted to the Ministry of the Environment, Industry Authorities and the Local Authority. Because the license application is made locally, the Local Authority has the final word on approval.

The decommissioning proposal was for the construction of a safestore followed by a period of monitoring and maintenance. Final dismantling, decommissioning and site clearance will follow some years later, allowing time for
radioactive decay to reduce the radionuclide inventory and the doses consequent upon decommissioning operations.

6.4. The role of public participation in the EIA process

The legislation establishes that the EIS must be made publicly available for 30 days (with prior notification given in the Official Gazette) and the public are given an opportunity to submit their comments to the Competent Authority. The official public participation procedure was followed, though no major comments were submitted in opposition. Consultations were also undertaken with other relevant sectoral authorities and the finished EIS was distributed to more than 100 local organisations for comment.

The developer (i.e. ENRESA) also undertook an extensive participation and consultation initiative with the local governments.

The need to publicise the proposed work to the local population was recognised early in the process. A touring mobile exhibition was used with good effect to communicate with all villages in the local area. A local newsletter was produced on a regular basis and there was extensive coverage of work on site on local radio and television.

As well as the official consultations undertaken by the Competent Authority, the developer has maintained an ongoing dialogue with representatives from the local governments.

6.5. Lessons learned on public participation from the Vandellós EIA process

The scope of the EIA is extensive and is considered to be an example of good practice. Indeed, this EIS was used as the basis for a model EIS in a recent study for the European Commission which derived an EIA procedure for decommissioning nuclear power plants (Cassiopee, 2001a,b,c). Recognising that it was based on agreement between all the concerned parties rather than a prescriptive list shows the value of recognising legitimate interests and contributions.

The process of conducting the EIA, presenting the results to the public and acting on the discussions, seems to have worked well in this case. Work is proceeding with the support of the local population and with little concern about environmental damage. However, it must be borne in mind that the decommissioning project was not inherently controversial, and the emphasis placed on local authorities as a voice representing local people may be misplaced in a more controversial project.

7. Key success factors drawn from case studies

The case studies have been very different and future decommissioning projects are likely to be different again. However, there are generic factors that can be
drawn from the investigations, which can be considered as successful example of public participation. It is worthwhile highlighting these factors here as they can be used as the basis on which to develop future public participation strategies.

(1) Acceptance on behalf of authorities and developers that public participation can be a positive experience rather than a hazardous chore creates the right environment for successful public participation.

(2) Integration of public participation activities within one coherent EIA strategy is beneficial; the case studies reveal a picture where public participation was often carried out both within and outside the EIA process, whilst there is no criticism of the different approaches used in these two different cases, there is the potential for: confusion in terms of the goals of the participation; duplication of effort (thereby wasting resources); creating conflicts where different groups are involved for the participation exercises inside and outside the EIA process.

(3) Extensive participation used before final strategies are adopted can lead to publicly acceptable decommissioning strategies. This was particularly apparent for these decommissioning projects which tended to involve communities who already accepted the technology and the risks, and who stood to lose in socio-economic terms from plant closure.

(4) Transparency in the decision-making process fosters confidence in the public participation process. It is clear that where the public were well informed of the nature of the decision-making process and of where the participation fitted into that process, the potential for cynicism in terms of the objectives of the public participation was much reduced.

(5) Provision of sufficient information facilitates public participation (the converse situation being that lack of information frustrates the public and prevents sufficient understanding of issues to allow productive dialogue) and avoids mistrust.

These findings are completely consistent with the principles of best practice public participation developed from theory and practice that are explained above. In order to further test the findings a review was undertaken of case studies of controversial projects in order to identify good-practice in public participation and consultation to consider alongside the findings from the analysis of power plant case studies. The experience regarding public participation and consultation from the following case studies was reviewed:

- Hazardous waste incinerator in Garé, Hungary (Palerm, 1999a),
- Secondary reserve power plant in Litér, Hungary (Palerm, 1999a),
- Madrid–Valencia motorway, Spain (Palerm, 1999b),
- Solvay’s hazardous waste incinerator, Spain (Palerm, 1999b),
- Municipal waste disposal facility siting, Switzerland (Webler et al., 1995),
- Hampshire waste management strategy, UK (Petts, 1995, 1996),
• Heathrow airport terminal 5, UK (Ng and Sheate, 1997),
• Manchester airport second runway, UK (Ng and Sheate, 1997),
• Replacement airport at Chek Lap Kok, Hong Kong (Ng and Sheate, 1997),
• Siting of a hazardous waste site, USA (Lynn, 1987),
• Siting of a solid waste treatment plant, Japan (Harashina, 1995),
• NPP decommissioning cases, USA (Cameron, 1996),
• Siting of a nuclear waste treatment facility, Spain (Molina, 1996).

These case studies cover a range of sectors and not all refer to the EIA process. However, the lessons to be drawn from them all point to the same principles for public participation. The studies indicate that early participation is key to an effective public participation process. In the case of EIA, this generally means providing an opportunity for the public to comment on the scope of the EIA, with ongoing public participation throughout the entire EIA process. Early involvement allows the identification of the key concerns at a time when these can be adequately integrated into the preparation of the EIS.

Although the above case studies represent a diverse range of projects and need to be evaluated in the light of the specific local situation, a number of key common aspects can be identified. Two essential features of best practice are concerned with the early phases of assessment and the approach taken to public participation.

Considerable time and resources need to be invested in the start-up phase, in order that the EIA makes a positive contribution to the design of the project and the entire decision-making process. The approach taken during the scoping phase will be a key determinant of the overall success of the EIA. It is during this early assessment period that consultation procedures and on-going monitoring programmes are established. Ensuring that all the essential technical, administrative and project management aspects are included at the beginning of the project will greatly assist the EIA process. In contrast, an EIA that is undertaken without proper preparation is likely to omit certain issues and is unlikely to gain public confidence or support.

The case studies reviewed demonstrated that adequate mechanisms for public participation can help to reduce or avoid potential conflicts and ultimately result in better decisions. Examples with limited participatory opportunities ended-up in lengthy processes, exacerbated conflict and court actions.

8. Conclusions

The use of a case study approach has achieved its aim of describing and explaining the public participation process associated with three separate decommissioning activities. The evidence presented is some of the first to be gathered on approaches used for decommissioning nuclear power plants and provides useful insights. Clearly caution must be exercised in the application of general
principles from three cases, although the conclusions are substantiated by a broader study of controversial projects outside the sector.

In the three case studies considered (Trawsfynydd, Greifswald and Vandellós 1), the consultation process was focussed mainly at local groups and local individuals. This process occurred to a greater or lesser extent outside the EIA process. The study concluded that best practice would be to integrate these processes, as part of an ongoing exercise throughout the EIA, and also to involve interested parties outside the immediately affected region. This should streamline the process for authorities as they can focus public participation efforts within a single (EIA) framework, it should also help to avoid the possibility of confusing (and perhaps alienating as a result) the public through repeated public participation activities.

The study found that, for Trawsfynydd and Vandellós 1, there was broad acceptance of the decommissioning strategy amongst the local communities concerned, with socio-economic factors (especially local employment) being a key factor. For future decommissioning projects, it is possible that a wider range of factors will be important.

Based on all the case studies considered, the starting point for adequate public participation should be a recognition by both the developer and the authorities that public participation will lead to an improved decision-making process. It is important that the developer takes a pro-active approach and that decision-making processes are transparent, so the public feel that their legitimate concerns are being addressed.

The opportunities for participation should start early in the decision-making process, as is required by the Århus Convention. Provision of information is a key requirement at this stage, as the public needs to form an opinion on the issues at stake.

The case studies show that consensus can be facilitated by giving the public an opportunity to engage in ongoing two-way communication with all stakeholders, and by providing public access to information needed to adequately assess all of the issues relevant to the proposal. The case studies provide examples of participatory mechanisms that gave positive results when applied. These include Citizens’ Advisory Committees, ongoing bilateral meetings, involvement of independent experts and a continuous information process.

Thus the recommendation from this research is that the best practices identified should be considered when undertaking EIA for all future NPP decommissioning projects and, specifically, that public participation should take place from the very earliest stages and should be integrated into the EIA (thereby going beyond the Directive requirements).

References

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