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COLLABORATIVE WORKING TO DEVELOP INDUSTRY GUIDANCE – SITE DECOMMISSIONING: SUSTAINABLE PRACTICES IN THE USE OF RESOURCES (SD:SPUR)

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ABSTRACT

As awareness of the impacts of industrialisation on the environment and populations increases, responsibly managing our impact on the environment is becoming an ever-increasing part of business decision making. Gone are the days of basing decisions solely on business cases, or science and engineering principles evaluated in isolation from other factors.

The nuclear industry comes from a proud past based on growth and developments in engineering, science and technology. The drive to produce energy dominated this period of its history. Now that it is shifting towards decommissioning, the drivers shift in relative importance. Although safety and cost-effectiveness will still be important; however, as decommissioning is the final action, decisions will now involve determining what is right for society and the environment for many future generations to come.

Society is changing. Members of the public are becoming increasingly more knowledgeable and are less likely to blindly put their faith in experts. In the past, the public were largely content to leave this type of decision making up to experts who could perform evaluations using a sound scientific model involving isolating the issue of interest. However, there is a growing view that issues surrounding the relationship between industrialised society and the environment are so complex that it may not be possible to completely isolate individual interactions, and this effect could call into question the validity of conventional models used for such decision making.

How then, can the industry determine what is the right approach to take regarding nuclear decommissioning, and once this has been determined, achieve acceptance of the public? A potentially powerful approach is to develop collaborative working relationships with stakeholder groups. Whilst it is clear that nuclear decommissioning has to be achieved, it is not clear which approaches result in the overall best solution for society, the environment and future generations, i.e. the most sustainable option. This paper describes how dialogue and collaborative working has been used to very positive effect to develop guidance for decommissioning managers at nuclear sites to consider sustainable approaches for the management of the large volumes of construction materials wastes arising from decommissioning. Specifically, this paper describes various themes that emerged during the dialogue and how these relate to developing practical approaches to sustainability during nuclear decommissioning.

INTRODUCTION TO SD:SPUR

SD:SPUR is a stakeholder dialogue, managed by CIRIA for the nuclear industry, regulators and stakeholders. SD:SPUR was created by the DTI Safety Issues Task Force (SITF) following the success of the SAFEGROUNDS [1] consultation for managing contaminated land. A scoping study [2] was carried out to identify:

1. a preliminary inventory of construction materials from the demolition of a typical nuclear decommissioning project (e.g. Dounreay);
2. sustainable indicators from the construction industry; and
3. the principal views of various stakeholders via a preliminary stakeholder dialogue.

Sustainable practices are being adopted by the construction industry and the intent of this project is to share this good experience and through stakeholder dialogue enable similar sustainable practices to be adopted by the nuclear decommissioning sector.

The vast majority of wastes from nuclear decommissioning will be building materials, most of which will be either uncontaminated or very lightly contaminated with radioactive isotopes. Much of these materials will be fit for reuse and a significant proportion may comprise relatively high value materials if deconstruction is managed appropriately. As waste, disposal of these materials represents a large burden to the taxpayer. If much of this material can be beneficially reused, then costly disposal is avoided in addition to avoiding

further mining of aggregates. This principle is being exploited in the construction industry and the WRAP protocol [3] has been developed to assist definition of when demolition debris ceases to be a waste. A similar approach is desired for nuclear decommissioning demolition wastes, but it is recognised that being associated with a nuclear licensed site poses specific challenges regarding public acceptability.

A project team and project steering group (PSG) were established with representatives from the nuclear industry, the nuclear and environmental regulators, the construction industry, a sustainability expert in academia, non-governmental organisation and focus groups. The output of the exercise is a guidance report outlining how sustainability can be considered when decommissioning nuclear sites, with Dounreay as a case study. Enviros were selected as the consultant to prepare the report, and at the time of writing this paper, the report was in the final stage of public consultation. Consultation occurred on many levels. Narrow and deep consultation occurred at the project steering group with the broad representation of knowledgeable stakeholders. Each member of the PSG provided a list of constituents who were all solicited to comment on the draft report at various stages of development to provide a more wide and shallow view. In addition, a stakeholder workshop was held early in the exercise to get a feel for what sustainability indicators should be incorporated.

OUTPUT OF PROJECT

The output of the project is a guidance report, which describes a process for dialogue while decisions regarding any particular nuclear decommissioning project are to be made. The adopted process is an extension of the well established Best Practicable Environmental Option (BPEO) process [4]. Relevant sustainability attributes are to be included as attributes in the BPEO process and evaluated and weighted along with other environmental and socio-economic attributes commonly associated with BPEO studies. Dounreay as a test case shows how these issues may be explored, trust with relevant stakeholders engendered and knowledge from various inputs captured.

THEMES THAT EMERGED DURING THE PROJECT

One very interesting aspect to this project was the various themes that emerged within the project steering group, the workshop and broader consultations. The following is a summary of some of the principal themes encountered.

Benefits of co-work

The benefits of co-work may seem intuitively obvious; however, actually achieving cohesion and realising such benefits can be quite difficult. In many circumstances, at the beginning of such projects, it may actually seem that co-work is an impossible dream. A principal aim of many remediation projects is a way forward that is acceptable to the public. The only way to achieve this is to consult with the public. To be effective, this consultation must also have credibility. It is here that the benefits of co-work can be greatest.

There are almost as many views as there are members of the public. Since it is often impractical or impossible to consult every member of the public, it is common practice to try and identify and involve individuals or organisations across a wide spectrum to try and capture as much as possible the views of the public at large. The theory is that if there is broad support for a particular way forward amongst all of these various participants, then it is probably acceptable to the public. A proposal with such wide support put to broader public consultation is likely to be viewed with much more credibility.

Co-work is a positive sum game, for all involved. There is a cliché that “an army cannot march when it is fighting”. In the case of nuclear decommissioning, a common desire is to achieve the clean up of the nuclear legacy in a safe and environmentally responsible manner. Consultation on decommissioning puts groups that may be traditionally viewed as adversaries working together for the same goal. A mutually agreeable outcome will achieve success much more quickly. Working together as opposed to fighting is best for everyone involved when the goal is common The PSG worked very well together and this is a good example of the benefits of co-working.

Sustainability and political pressures

Inflexible waste legislation

When it comes to practical implementation of sustainability in a real waste management project, a degree of frustration has been encountered in certain areas. One of these areas is the flexibility of current UK waste management legislation to proactively support sustainable reuse of demolition wastes.

Case law has largely established that items for which it is the intention of the owner to discard are waste in terms of waste legislation. Once items are bound by waste legislation, the management becomes complex, especially when it is the intention to recover and reuse the material. In many cases, it is quite simply easier to dispose. Several practical exemptions have been established [5]. However, these tend to be geared towards small volumes that do not warrant close regulation, and are generally unavailable, or impractical for large scale reuse projects that would arise from larger demolition campaigns such as nuclear site decommissioning. Although there is some small scope for using these exemptions, in practice, large scale reuse under the waste management licensing regime would require waste management licenses which can be rather costly, and arguably unjustly so when sustainable reuse is the intent. In the end, the bureaucracy associated with making use of these exemptions, or the requirement to pursue a waste management license often discourages demolition managers from pursuing sustainable reuse.

In the end, a message that has come out of all of this is that whilst we are gaining tremendous experience in understanding sustainability and what is possible, in many respects our

legislation has a lot of catching up to do regarding practical details. Although frustrating, we must live within the bounds of current legislation and continue to lobby politicians for improvements. Waste legislation is likely always going to be complex, and therefore, significant promise is being shown where demolition materials can cease to be waste by meeting a suitable specification as a building material. The WRAP protocols are already proving successful in this regard. The future at the moment appears to lie with getting these materials no longer classed as waste, because then the complex and rather inflexible waste legislation will no longer apply.

Regulator policies

Regulators have the responsibility of ensuring that legislation is followed. They accordingly have policies associated with interpretation and implementation of the legislation under their jurisdiction. One particular area of interest is the clearance of materials contaminated to levels below regulatory concern. These materials qualify for unrestricted release from nuclear sites.

In the spirit of waste minimisation, all wastes should be appropriately categorised and disposed of in accordance with the approved route for the hazards presented. In the past, it has been common for all wastes generated within radioactive work areas to be condemned without second thought as radioactive waste, and this was viewed at that time as appropriate conservative decision making. However, good practice waste minimisation takes into account appropriate use of resources and radioactive waste disposal capacity is now viewed as a limited national resource. Wastes that do not strictly require this level of control should be dealt with by other less stringent means. It is therefore the policy of the Scottish Environment Protection Agency (SEPA) that wastes that qualify for release as below regulatory concern (via appropriate RSA [6] exemption orders) are to be segregated from those that must be disposed of as radioactive waste, and the Dounreay solid radioactive waste authorisation has been so amended. This mandates segregation and clearance, and Dounreay must pursue this approach, or face potential regulatory enforcement action. Therefore Dounreay is not in a position to consult regarding clearance *per se*, but is in a position to consult on whether such wastes are disposed or made available for reuse following clearance. Some of the stakeholders involved had not been aware of this subtlety and mandate at the start of this project.

Different government interfaces

Nationally, the government owns the decommissioning liabilities for nuclear sites. Thus, sustainability is of interest to the national government on several fronts. Firstly, application of sustainable solutions can reduce the cost of decommissioning and lessen the burden on the treasury. Secondly, sustainability is in keeping with national environmental policy and helps preserve our environment and resources for future generations.

However, there are many layers of government and the issues and relative importance of each may vary considerably. Interfaces at the local parish council level, county or town/city council, devolved assembly (where relevant) all exist, and issues of interest to each may vary and even in some cases be opposing. Neighbouring councils will be very interested where transport and use of materials for reuse directly involves them. As a general rule, higher levels of government will have views more directed to the industry as a whole, whereas more local levels of government will have a more personal relationship with the particular site and will in addition have views relative to the history of the site.

In addition, there may be strong regional differences. For example, communities very close to nuclear sites may be more comfortable with the practices on the sites as they receive benefits to the local economy by the way of jobs, local taxes and spending, etc. Communities a little further away may still see themselves as significantly affected by the site, but be less tolerant as they receive little or no economic benefit. Communities on key transport routes to and from the site may have other views. It is important to recognise that many communities are likely to be affected in some way by the decommissioning of a nuclear site and will have views on what constitutes sustainability. It is important that communities both near and far are consulted, and an open view of what constitutes impact is taken to avoid exclusion of any that see themselves as affected.

Overwhelming consensus that opportunity for reuse of radioactive waste is very limited

Included in the terms of reference for the project was consideration of reuse of low active materials contaminated at greater than 0.4 Bq/g and up to 4 Bq/g. This range is currently within the definition of low level waste and would otherwise require engineered disposal at an authorised repository such as Drigg. The logic for including this range of materials was that it was perceived by the SITF that:

- the hazard posed by such materials in a reuse situation would likely be sufficiently low that reuse in new build on a nuclear site in new structures required to support decommissioning would be feasible (note, consideration whether new nuclear generation would be a market was excluded as outside the scope of the project), and
- the anticipated volumes of demolition wastes in this range is so large that it poses a particular problem to the industry and is unlikely to be able to be accommodated at Drigg.

The overwhelming consensus of the project steering group was that reuse of this range of materials was largely not legally possible within the current legislative climate, was largely impractical and/or not the morally right thing to do. The very limited options that were not rejected all involved reuse of materials in aggregates in the grouting of radioactive waste containers to stabilise the waste form, or association with infill operations around waste containers at a radioactive waste repository. The reasons for largely rejecting this key component of the terms of reference for the project were numerous and include:

- The potential exposures and resulting health effects for this range would have to be evaluated on a case by

case basis specific to the end use and this would pose practical problems. It was anticipated that developing a generic assessment would be difficult.

- A formal radioactive waste disposal authorisation would be required to comply with current legislative requirements and it was anticipated that this would not likely be granted as it wouldn't represent good practice engineered disposal.
- If an authorisation were to be granted, use of the material would result in contamination of other materials used in construction, and by definition, would increase the amount of radioactive waste requiring disposal upon subsequent decommissioning of the new structure. Dilution could not be claimed to comply with clearance levels as that is contrary to the philosophy underpinning waste legislation (concentrate and contain as opposed to dilute and disperse).
- The experience of those involved in the PSG is that contamination rarely penetrates deeply into concrete and it is reasonable to expect that most of the contamination will be located near the surface. Removal of this layer is technically feasible and it is reasonable to expect that this can be removed, thereby segregating a much smaller volume of radioactive waste from the bulk of materials that will be releasable. Doing so would be reasonably practicable and would be in keeping with the concentrate and contain principle. It is anticipated that the predicted volumes that the industry is to face are overestimated, as they do not presume aggressive segregation and waste minimisation.
- The intentional release for reuse, even if controlled, of material that the government has defined as being within the range that engineered disposal as radioactive waste is warranted sends absolutely all the wrong messages to many stakeholders and could seriously undermine the credibility of the nuclear industry in other waste management areas.

Ability of industry to correctly segregate and sentence materials

Some stakeholders have expressed the view that credibility of nuclear operators to be able to confidently and demonstrably apply clearance criteria is an issue. The question is whether they can confidently draw the line between materials fit for reuse and those requiring disposal as radioactive waste. This is due to many factors, including lack of consistency amongst sites, mistakes made in this regard in the past and the appearance of a closed and secretive industry. Irrespective of anyone's personal views on this particular issue, it is absolutely clear that for the industry to succeed in this regard, firstly the clearances must be undertaken correctly, and secondly, they must be demonstrated to have been undertaken correctly. This is no small order, and recognising this, the industry has put a significant effort into developing comprehensive guidance leading towards standardised methods and reporting for correct sentencing and application of clearance operations. The end product is a code of practice for clearances and exemptions [7]. This document was issued as a consultation version over a year ago, and the first full version was issued this summer with a formal launch on the 4th of July.

The development of the code of practice has involved all of the major nuclear operators in the UK. The intent was to determine what practices are correct, defensible and demonstrate compliance with all relevant legislation. The intent was not to simply rubber stamp existing practices. If any current practices were determined to not be sufficiently robust, they should be discontinued and replaced with those that are sufficiently robust. The code reflects current legislation, of which nuclear operators are obliged to follow. It does not judge the appropriateness of any existing legislation as that is a role for politicians and their expert advisors. The document has been broadly circulated and comments are welcomed from all stakeholders. Many comments have been received and incorporated coming from regulators, sector experts, NGO's and regulators. To date, this work has been very positively received by all.

The industry is now in the phase of implementation. Open visible implementation is a positive sum game. It engenders trust with all stakeholders and promotes confidence of the industry. Everyone has a part to play to make this part of the process a success. The industry has to sincerely apply it, the regulators expect its application and inspect against it, and other stakeholders challenge for confirmation that the system is working. In a mature situation with a healthy degree of positive tension, we will all be winners.

Risks to human health

Potential risks to human health from the reuse of debris from the decommissioning of nuclear sites was one of the first issues raised at the PSG. The view of those representing the nuclear industry is that this issue is the responsibility of expert groups such as ICRP and the NRPB in the UK. To the industry, it is these independent and impartial groups that analyse dose pathways and determine what levels of radioactivity are significant with respect to risk to human health. It was not intuitively obvious that some people hold a view that these groups are not impartial and are associated with the industry.

The industry representatives on the PSG viewed this issue as out of scope of the project as there are already established legal limits, set by politicians based on ICRP, and that it was not the role of this consultation exercise to challenge this situation. However, there was the contrary view that this issue may not be so clear cut. There are many views and perceptions regarding societal risks. There are regional differences also and various views on the validity of clearance limits. It was also pointed out that there is continued debate surrounding the amount of uncertainty that exits in some of the ICRP dose calculations and that for some scenarios the uncertainty may be an order of magnitude greater than first thought [8]. In the end, the PSG did not delve deeply into this issue. This was largely due to the general rejection of pursuing the 0.4 to 4 Bq/g band in the original terms of reference. However, it was clear that this was still an issue to be further

considered regarding public acceptability of reuse of potentially contaminated materials from nuclear sites.

The concept of a "risk society" is an issue that arose related to risks to human health. This is the concept that we cannot truly isolate various risks and that many may have compounding synergistic effects on human tissues. Couple this with the fact that many of these risks may be unavoidable, or not chosen by the recipient, i.e. they did not receive the benefit or choose to be exposed to the risk. The issue as raised is a challenge to ICRP public dose limits, whether the isolation of the radiation effects is valid in a risk society or whether public dose limits should be lower to account for possible synergies with other societal risks.

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