

**WILL AMERICAN NUCLEAR SITE CLEANUP METHODS
SUCCEED IN THE UNITED KINGDOM?**

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ABSTRACT

This paper examines some aspects of what it may take for US nuclear site cleanup methods to be adapted for use within the United Kingdom's nuclear site cleanup program. Barriers to success are discussed, as well as other issues. The Nuclear Decommissioning Authority, charged with leading the nuclear site cleanup program for Her Majesty's Government is off to a good start. However, most of the world's nuclear site cleanup expertise was developed in America, where over \$6 Billion per year has been spent on cleaning up the former Weapons Complex for most of the last 15 years. How can the US experience be imported into the UK and improved upon? Successful nuclear site cleanup will require sound technical work cast in a setting of the right contract terms and conditions, using modern program management techniques, and supported by an energized workforce. Current site Life Cycle Baselines are felt to be too long, and questions remain regarding what the actual cleanup costs will be. The US experience says that decades can be saved on schedules for site cleanup completion and the cost of doing the work can be materially reduced through finding faster, better, cheaper, and safer ways to get the work done. Let the work begin, and good luck to all!

INTRODUCTION

The simple answer is "yes", American nuclear site cleanup methods will succeed in the United Kingdom. This paper describes some of the challenges likely to be experienced in achieving that success. The USDOE EM nuclear site cleanup program has evolved over more than 15 years from a fairly expensive, slow moving effort to predominantly commercially driven, cost effective delivery of work scopes at the several sites which comprise the former Weapons Complex. The sometimes painful contracting options which developed from the Contract Reform activities of the USDOE led to the Cost Plus Incentive Fee (CPIF) contracts of today, with the Rocky Flats and Fernald contracts being two of the best examples. The tremendous schedule acceleration and life cycle cost reductions demonstrated, not just promised, at these two former Weapons Complex sites have been nothing short of miraculous, with results similar to those hoped for in the United Kingdom.

In the UK, the nuclear site cleanup program will be managed by the Nuclear Decommissioning Authority (NDA), an arm of the UK Government's Department of Trade and Industry. Wisely, the NDA and its predecessor organization, the Liabilities

Management Unit, have started where the US nuclear site cleanup program left off. This should enable the NDA to avoid many of the early problems experienced by the US program for nuclear site cleanup and to add improvements of its own. The Heads of Terms for the anticipated NDA site Management & Operations contracts have been published in draft, and specify a CPIF style contracting environment with NDA retaining most of the associated liabilities. If carried out as planned, the UK's nuclear site cleanup program will be commercially similar to the USDOE's EM program, with attractive financial rewards available to be earned through excellent performance. The amount of annual funding expected will attract the best contractors, including firms experienced in the US program. Funding estimates set the total annual funding at about the £2 Billion level (\$3.6 Billion) for the twenty or so sites to be owned and managed by the NDA.

This paper examines some of the challenges that may be faced by firms which seek to become the Tier 1 (prime) contractors to the NDA, with special focus on importing ways of working and lessons learned from the American experience. The body of the paper has been organized into categories of challenge for ease of presentation, such as Technical, Cultural, Commercial and Regulatory. The simple answer is definitely "yes" in the author's opinion, but success may not come as easy as hoped for. Success is defined as completed cost effective, safe, accelerated nuclear site cleanup.

TECHNICAL

This is the category that should pose the fewest problems. British engineering and overall technical capability is excellent, and in many fields world renowned. A Rolls Royce jet engine on one's transatlantic airplane is a comforting aspect, as is a Landrover SUV when on difficult terrain anywhere in the world. The nuclear industry began with British scientists working closely with Oppenheimer and Fermi throughout the Manhattan Project, beginning a cooperative arrangement that continues to this day. The UK's first generation of civilian nuclear power plants are just now being shutdown and some will continue to operate until 2010. Calder Hall, the very first Magnox plant operated for 47 years (a world wide longevity record) until shutdown in March 2003. British nuclear cleanup technology has been imported into the US as well, such as for the new Vitrification Plant at Hanford and the Advanced Waste Treatment Plant at INEEL.

So what will be the issues with using US developed nuclear site cleanup technology and approaches to project delivery in the UK's program? There may be some NIH (Not Invented Here) effect, linked with national pride, but this obstacle should be overcome through pressure from the commercial performance based incentive fee arrangements built into the site contracts. The more likely barrier will be the common practice of addressing technical challenges by turning to the research and development community for a technical solution. This frequently invites some development work, sometimes involving laboratory and pilot plant testing, leading to offsite testing of prototype and/or actual plant equipment and finally an operational solution. This path can be very time consuming and costly, although there may be times when it becomes necessary.

The more commercial, market driven approach is to find an existing solution that has worked in a similar situation elsewhere, or at least a solution that can be quickly adapted to the situation at

hand. Pond (fuel pool) cleanout is an example. Nuclear plant operators have been cleaning their fuel pools for years, and as a result there are firms in the US, UK, and elsewhere that supply this service commercially, as subcontractors. There are several ponds in the UK that will require cleanout under the NDA program. The approach to date has been to invent the means to perform the pond cleanout, not buy it. This situation may change as financial incentives are applied under the NDA. There is indication that this change may already have started, as some US firms, working in partnership with UK firms, are starting to propose the use of proven technologies to support nuclear site cleanup work.

Another side of the Technical category is the traditional role of the engineer in British industry. Some engineers in the UK, as in the States, feel their work should not be reviewed or challenged, except by peers. The engineering processes are important and are to be respected. After all, are not engineers highly educated professionals and part of a respected technical community? The answer here is "yes" as well. However, we engineers are simply a part (albeit an important one) of the technical solution and are answerable to the commercial conditions of a project, including the all important cost and schedule requirements. We have come to realize this through sometimes hard and humbling experience in the US program. The "challenge everything" philosophy in place at Rocky Flats included challenging technical solutions. Is there a faster, cheaper, better, safer way to get the job done? This question was asked every day, many times. Some very elegant technical solutions were scrapped as a result, in favor of less elegant but much more cost effective and usually less time consuming ones. The tendency to favor the use of robotic methods when ordinary tools in the hands of skilled workers would do the work much more quickly and cheaply, while still meeting safety standards, is an example. The human hand, attached to a human wrist, elbow and shoulder is still the best end effector ever designed!

Another consideration related to engineering and design is that plants and equipment for nuclear cleanup will normally not require application of the same design and quality standards as will new build plants, such as nuclear power plants. For example, design lifetimes are likely to be much shorter. A "graded approach" to engineering design and quality standards, if the US experience is adopted, will be found to provide the "fit for purpose" designs required by the many and varied technical challenges encountered within nuclear site cleanup activities. Temporary systems require a special category of design, as these may be used for only a single application, and then only for weeks or months vs. years. Buildings once used for nuclear materials processing may be reutilized for waste storage. Where this is to happen, the engineering, quality and safety standards should be modified accordingly. The graded approach will help avoid the extra costs which can result from over design, while still achieving the requisite safety performance.

The author's conclusion is that technical issues will be decided by a combination of safety, technical and commercial factors applied on a case-by-case basis. The CPIF reward and penalty scheme being proposed by the NDA may turn out to be the ultimate decider in many cases. A final point, for nuclear site cleanup projects, the engineering community, may have to shift from a lead role to a support role, albeit an important one. If the US experience proves valid in the UK, nuclear cleanup experienced program and project managers will appropriately assume leadership roles to achieve cleanup objectives. In the author's opinion this can and will occur as the UK's nuclear site cleanup program gains momentum under the NDA.

REGULATORY

The regulatory environment in the UK's nuclear program is defined by three regulatory bodies, the Nuclear Installations Inspectorate (NII), the Environment Agency (EA), and the Office of Civil Nuclear Security (OCNS). The overall purpose of the regulatory regime established is the same as that of the equivalent US agencies, essentially to ensure public, worker, and environmental safety and health, now and in the future. The major difference that will be experienced by US firms is that the NII, as the lead regulator for nuclear facilities, is not prescriptive, as are the USDOE and the Nuclear Regulatory Commission.

The NII has established 36 license conditions, which all nuclear site licensees must comply with. How that compliance is achieved is up to the licensee, who is obligated to propose to the NII exactly how each of the 36 license conditions will be met. If the NII feels the licensee's plans for achieving compliance are not adequate, they will comment accordingly and ask for a more robust approach.

It is important to note that the NII is not obligated, and normally will not tell a license holder (or applicant) if the plans for compliance with any or all of the license conditions are too extensive or expensive in that, if implemented, they may commit the licensee to more than is required to achieve the requisite outcomes. This aspect is subtle, but can add significant cost to cleanup projects as well as day-to-day site operations.

The solution may be for a business case to be performed for each major safety case analyzed. In principle, much like the "dollars per man-rem" cost benefit analyses performed by US nuclear companies, a best value approach to meeting license conditions for nuclear site cleanup is recommended. A potential barrier to success in applying American nuclear site cleanup methods in the UK might be the failure to recognize that the best value analyses are needed, and that Regulators will not advise a licensee that they are spending too much money to meet license conditions. As best value, value for money criteria, and other elements of cost comparison become more prominent in selecting Tier 1 and Tier 2 and even Tier 3 contractors, business cases supporting safety cases may become the rule rather than the exception in the UK's nuclear site cleanup industry. We all agree that being and working safe is mandatory, but why spend more than is necessary to achieve the requisite safety?

Another element of working with the Regulator is the need for upfront openness and transparency between the Site License Holder, Stakeholders, and the Regulators. The more successful firms get the Regulators involved in their site's operations and cleanup plans early, discuss challenges and proposed responses with the Regulators long before regulatory approvals are required, and solicit their input and advice as to how to proceed. While this is done to some extent in the UK, it may have to be done to a greater degree as cleanup activities become more prevalent, especially where long-standing safety concerns exist and/or innovative technical solutions are being proposed. This can be done, but it will take a behavior change in some instances.

A note regarding the Regulators themselves. It is to their credit that the NII has recognized that the nuclear cleanup environment will be different from the new build and nuclear facility operations environments. To this end, the NII has undertaken to consider the differences and how their procedures and processes may have to be revised. Additionally, there have been joint meetings between the NII and the Department of Trade & Industry/Liabilities Management Unit/Nuclear Decommissioning Authority to work out how each will meet their individual responsibilities while also working together in as cooperative a manner as possible. These are very positive actions, which should help the nuclear site cleanup work of the NDA to proceed safely and efficiently.

COMMERCIAL

While not a barrier to achieving successful nuclear site cleanup, the European Union procurement and contracting guidelines will have to be taken into account. The EU guidelines are expected to be invoked by the NDA for procurement and contracting actions under the nuclear site cleanup program. The guidelines are established to ensure as far possible that contracts are competed for, that competitions are fair, that requirements for bidding and performing the work are clearly explained to all interested parties, and that there is openness, fair-play and transparency throughout. Upcoming competitions will be announced in the Official Journal of the European Union (OJEU), which is much like the US Governments Commerce Business Daily (CBD).

Contractors with US cleanup experience will also be interested to know that there is no equivalent to the Defense Contract Audit Agency (DCAA) in the UK, nor is there a body of procurement regulations as extensive as the Federal Acquisition Regulations (FAR), and therefore not an enormous body of case law arising from court cases involving those regulations. Lastly, there are not the small, small disadvantaged, minority owned, woman owned and other special classes of contractors, nor the equivalent of the Small Business Administration that looks after all small businesses, especially those in the categories mentioned above

There will be emphasis on “buying local” near the various nuclear cleanup sites, especially near the larger sites, such as Sellafield and Dounreay, where so much of the local economy depends upon the monies spent by the nuclear site. The challenge for incoming US contractors in particular will be determining how to contract under the EU guidelines while also ensuring that the local supply chain firms are adequately looked after. This is another area in which capable British business partners with local knowledge could greatly help incoming US firms.

The last item to mention under the Commercial heading is that “turnkey” contracting against functional performance standards is not yet in wide use in the UK nuclear cleanup industry. This and other contracting innovations will most likely become commonplace when market pressures are such that these options are commercially advantageous and therefore provide a competitive advantage and/or deliver better value for money.

WORK FORCE RELATED ISSUES

There are several work force related issues which will have to be addressed, including work hours, job classifications, work rules, use of overtime, and incentive compensation. All of these have been successfully addressed for the US nuclear site cleanup program between labor and management, and in almost all cases have been satisfactorily dealt with. That these matters were dealt with in the USA in no means assures an easy passage in the UK. However, it does indicate the importance of dealing with the appropriate work force issues early on. Going back to the question raised by this paper, American site cleanup methods have only been successful where the workforce was willing and able to implement them!

Some examples: Nuclear process operators do not automatically convert to become decontamination and decommissioning (D&D) specialists. Training is required, plus a new set of work rules, one that permits more multi-tasking and flexibility of assignments regarding where each D&D specialist works and as to what tasks they perform, even on a day-to-day basis.

Another example, to efficiently accomplish a given cleanup action, it may be necessary for a working team to work more than the standard 35-40 hour work week. Overtime may be required, shift work and/or weekend and holiday work may be necessary. Incentive pay, that is, pay for performance which exceeds standards, can be used to compensate productive teams. This practice is not widely used within the UK nuclear cleanup industry, but can be if satisfactory agreements can be worked out with labor. At Rocky Flats for example, workers are able to significantly increase their take home pay for through incentive compensation schemes.

Historically, middle and upper managers haven't spent large percentages of their time in the plants where the vast majority of the work is performed. Because of the non-repetitive nature of D&D work and the use of innovative technologies, plus the presence of unique safety hazards, it may be beneficial for management to spend more time in the plants and other locations where work is being performed. This practice has paid dividends in the US nuclear site cleanup program, and will be important in the UK if the US approaches to nuclear site cleanup are to be successfully integrated into the UK's nuclear site cleanup program.

Perhaps the most important element of all in the workforce area is the ability to deliver work using labor leasing arrangements. Much of the success enjoyed by the US nuclear site cleanup program has been through the use of labor leasing. Labor leasing is very useful where several Tier 2 level subcontractors are needed to do work which requires the efforts of the industrial workforce. The Tier 1 (prime) contractor, under the labor lease agreement, assigns the necessary number and kind of craft and technicians to the various subcontractors to perform the specific scopes of work for as long as needed. The costs for the leased employees are established in the contracts between the Tier 1 and Tier 2 contractors. The workforce members remain as employees of the Tier 1 contractor, complete with seniority and benefits (including pension) and continue as members of their respective labor unions. When the work for the subcontractor companies is completed, the leased employees are returned to the Tier 1 contractor for reassignment.

There are many advantages to a labor leasing scheme, including a readily available workforce to perform the work, avoiding the need for Tier 2 contractors to ramp up and down in employment levels, the almost immediate availability of site trained, security cleared local labor, and the assurance to the workforce that their pay and benefits will continue uninterrupted. Most mobilization and demobilization costs are also avoided for each subcontract or project as well.

Labor leasing is not widely used in the UK, but should probably be implemented for the nuclear site cleanup program under the NDA. Labor leasing made all the difference in the equivalent US program, and if American nuclear site cleanup methods are to work in the UK, labor leasing may have to be implemented for the UK program as well.

CONCLUSION

Achieving a successful nuclear site cleanup program in the UK will require bringing the best know-how from around the UK and around the world. As important as technology is, it is only part of the required body of knowledge. The reason that the American experience is important to the success of the UK nuclear site cleanup program is that more nuclear site cleanup work has been performed in the US than in the rest of the world combined. The US program provides a long list of lessons learned, both good and bad. The NDA is poised to begin the management of the UK program taking full advantage of the USDOE Environmental Management program experiences and then moving forward using the substantial experience available in the United Kingdom.

A key lesson learned from the US experience is that the commercial terms of the contracts used to employ the cleanup contractors are at least as important the technologies used to cleanup the sites. Additionally, equally important as the contract terms and conditions are the terms and conditions for the workforce engaged in nuclear site cleanup activities. The American experience shows how the technology, contract terms and conditions and workforce restructuring all can work together to bring about success in cleaning up nuclear sites safely, cost effectively, and to accelerated schedules.

The challenge now in the UK is to import the US experience where applicable, combine it with UK expertise, and produce results even better and in less time than has been achieved in America. The next few years should prove very interesting.