



Across The Pond

A Quarterly Update on Joint UK NDA/US DOE Activities and Initiatives

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Successful 6th NDA-DOE Standing Committee Meeting held on the Margins of the Waste Management 2010 Conference in Phoenix

The sixth Standing Committee Meeting between DOE's Office of Environmental Management (EM) and the UK's Nuclear Decommissioning Authority (NDA) was held on March 10, 2010, on the margins of the Waste Management 2010 Conference in Phoenix, Arizona.

The Committee monitors collaboration activities between the two organizations and was pleased to hear of the progress being made by the respective expert groups in the current five topic areas: Fuel Drying, Glass Chemistry, Hot Isostatic Pressing, D&D, and Tank Corrosion & Structural Integrity. The Committee agreed that these topic area discussions had led to enhanced collaboration and identification of joint projects in a number of areas. Several new items were proposed for potential future collaboration, including other thermal treatment technologies, nuclear materials management, sludge/slurry retrieval and handling, and groundwater & soil remediation. In addition, the Committee will be examining the potential for future staff exchanges between Savannah River National Lab and Sellafield Limited by middle to senior managers in order to further enhance exchange of good practice.

The US DOE lead was Jack Craig, Director of the Environmental Management Consolidated Business Center and currently Acting Site Manager at DOE's Savannah River site. The UK NDA lead was John Mathieson, Head of International Relations. John gave a high level update on the NDA program, including general progress with the clean-up mission and geological disposal implementation. The US delegation was made up from representatives from EM's Office of Technology Innovation & Development (EM-30). Yvette Collazo, Director for EM-30 was the technical lead for all the topic area discussions and also gave the high level update on the US DOE program, covering EM-30's mission and how solving highly complex technical problems with transformational technologies was a key focus within the Office. NuVision Engineering also participated as facilitators during the discussions focusing on the review of the primary exchanges.



John Mathieson and Yvette Collazo

This bi-annual meeting supports the "Statement of Intent for Exchange of Information Concerning Management of Radioactive Waste" (SOI) signed March 2007 by Assistant Secretary for Environmental Management and the Chairman of the Nuclear Decommissioning Authority. The SOI outlines the interest of both parties in exchanging information and personnel concerning the management of radioactive waste and the decommissioning and clean-up of nuclear installations. Commenting on the NDA-DOE relationship, John Mathieson said "The NDA and DOE have much in common and it is good to see us focusing in on specific areas for collaboration and getting value for money". Yvette Collazo said "Our international co-operation with the NDA is a good example of where real leverage can be achieved to help us with our accelerated closure mission".

DOE Hosts Next Generation Melter Technology Workshop

The Next Generation Melter Technology Workshop, hosted by the DOE's Office of Environmental Management (EM-30), was held in Washington DC March 3-5. UK

interests in the field were well represented by Nick Gribble (National Nuclear Laboratory) and Carl Steele (Sellafield Ltd). The aim of the meeting was to bring together nuclear waste vitrification expertise from around the world to share experience of their operating facilities, to discuss the waste types processed, including certain key elements of interest to the USA, the scale of the equipment and its performance, plant improvements implemented to enhance their facilities, alternative glass compositions and, most importantly, new technologies or operational techniques that will enhance throughput, waste incorporation and plant availability.

The meeting was organised at short notice and it is a tribute to Gary Smith that so many of the international authorities from the principal countries with vitrification facilities attended the meeting. More than 70 delegates attended from the USA, Germany, France, UK, China, India, Japan, South Korea and Russia.

Yvette Collazo, director of EM-30, welcomed the delegates and highlighted the need for melter technology improvements for future US waste vitrification. She then

handed over to Steve Schneider, Acting Director of EM-31 (The Office of Waste Processing) who gave an overview of the scale and diversity of the wastes currently stored in the US. He explained that the goal is to significantly reduce the cost for waste processing and he outlined the key potential contributors, one of which was melter technology. The aim of the DOE is to down-select to three or fewer available options by 2014 as a replacement technology for existing facilities. Gary Smith continued the introduction and emphasised the need to process waste faster and cheaper, but also to have improved diagnostics so as to maximise plant availability by avoiding downtime caused by operational problems. Presentations were given addressing all US past, current and future operational vitrification facilities. The scale and complexity of the waste stored in the US was made apparent to all and the achievements to date and issues were explained. Operational problems were discussed and improvements, such as the addition of the airlift mixer and the proposed bubblers to increase throughput at Defense Waste Processing Facility (DWPF) at Savannah River and the melter design for WTP at Hanford were highlighted. The other key proposed improvement to increase throughput and avoid spinel formation was a higher operational temperature which brings with it new challenges for materials of construction.

Presentations by the international delegates then followed. The history and variety of vitrification processes was shared and to a large extent the discussion regarding, waste types, operating experience, processing limitations and future plans was open and frank. Commercial matters only occasionally restricted debate. It was ascertained that



Attendees of the Melter Technology Workshop

future international facilities are likely to be based on either joule ceramic melters or cold crucible. Existing developments included the proposed French cold crucible with under floor heating, currently at an early stage of development that allows much larger throughput than traditional cold crucible melters, since the system can be expanded in a modular fashion without loss of heating efficiency.

Following the presentations and discussions there was a brainstorm session that generated a list of development needs in the areas of melter feeding, materials of construction, diagnostics, glass composition and other related subjects. All those attending considered the meeting extremely well organised and of great value. The result of the 3 days was a clear summary of the historic development and capabilities of the world's existing vitrification facilities and a good indication of where development is targeted and the gaps that need to be addressed.

Advanced Thermal Treatment Studies At Sellafield

Sellafield Ltd has been operating a vitrification plant for a number of years to convert highly active waste into a glass product. In the past twelve months we've seen the processing of the 5000th container of product and the return of the product canisters to customers in Japan and The Netherlands. Furthermore, Sellafield Ltd has been evaluating Hot Isostatic Pressing in collaboration with the National Nuclear Laboratory in the UK and the Australian Nuclear Science and Technology Organisation (ANSTO). This has been applied to high plutonium containing material that is regarded as a waste form. This work is in the process of being handed over to the project delivery team for implementation.

Grout encapsulation has been the baseline technology for the treatment of Intermediate Level Waste (ILW) and operational Low Level Wastes (LLW) and has a good track record at Sellafield with four operational plants performing well. However, in the

Topic Area Update: Continued Progress Being Made

The Topic Area Conference calls were attended by technical experts from the DOE and NDA as well as Site Contractors and National Lab personnel. A wealth of technical knowledge has been shared in these calls and it is becoming much clearer as to which topic areas lend themselves better to the development of joint R&D and technology development programs and which are best managed as focused information exchange fora.

Topic Area	Number of Calls Held	Topic Area Leads	Summary of key information discussed
Fuel Drying	3	Paul Gilchrist – NDA Bill Hurt – INL	<ul style="list-style-type: none"> • Significant information exchange completed. • There is agreement that the next step should be a detailed technical exchange meeting to be scheduled 8th/9th September. • Topic Areas to be discussed are: <ul style="list-style-type: none"> *Regulatory principles *Corrosion issues in fuel storage *In situ monitoring of canisters *Types of storage systems *Secondary handling *Future proofing
Glass Chemistry	4	Gary Smith – DOE Jim Marra – SRNL Carl Steele – Sellafield Ltd	<ul style="list-style-type: none"> • Two joint projects have been identified: <ul style="list-style-type: none"> *Spinel Formation *Glass additives • SRNL and SL have essentially merged their respective programs.
Hot Isostatic Pressing	3	Steven Ross – DOE Graham Jonsson – NDA	<ul style="list-style-type: none"> • A staff exchange is to be considered between Idaho and Sellafield.
D&D	5	John Inkester – NDA Andy Szilagyi – DOE	<ul style="list-style-type: none"> • A structured review of current (FY10) and proposed (FY11) research efforts is underway. • Areas of collaboration identified e.g. <ul style="list-style-type: none"> *Sodium passivation *In situ entombment • A 'roadshow/exchange' concept is being developed (Cillit Bang in DOE and Decon Gel in NDA)
IX Resin disposal and transportation	2	Graham Jonsson – NDA Christine Gelles – DOE	<ul style="list-style-type: none"> • NDA's needs in this area are being discussed with EPRI in the US since their approaches are more similar than those of NDA and DOE
Tank Corrosion and Structural Integrity	1	John Inkester –NDA John Shultz –DOE	<ul style="list-style-type: none"> • The first call reached agreement that there was some ground common to both the DOE and NDA.

drive for ever improving performance the deployment of thermal processing for these wastes forms and ILW in particular offers significant benefit. The attraction of thermal technologies for Sellafield Ltd lies primarily with the dual benefits of volume reduction and the production of an extremely durable product form. It also has the potential to add flexibility into the early stages of pre-treatment where less segregation/ sorting is required therefore aiding process development. However, the applications in mind are seen as relatively immature, costly and requiring an extensive plant to manage the behaviour of the volatile waste constituents such as caesium, technetium and ruthenium.

The wastes being considered for thermal treatment cover a range of physical forms from sludges from legacy fuel storage ponds through to solid wastes arising from historic operations, the majority of which are classified as ILW with a significant beta/ gamma challenge. Included in the wastes for study were Plutonium Contaminated Material (PCM), a waste form currently arising from operations in our alpha plant facilities and consisting of operational process wastes such as glass, plastics, metal objects, protective equipment and increasing amounts of decommissioning wastes such as brick work and concrete.

A period of research and assessment of market capability had identified that over the past few years significant improvement in the performance and deployment of thermal technologies had occurred since previous reviews. In late 2008 a series of demonstration trials was commissioned with a number of vendors providing thermal technologies.

The technologies trialled were Joule Heated In-Container Vitrification (Impact Services Inc), Joule Heated Ceramic Melters (Energy Solutions), Plasma Arc (Tetronics/WMT) and Calcination/Hot Isostatic Pressing (ANSTO). In addition technical reports and assessments were commissioned looking at plasma torch technology (Retech) and pyrolysis-steam reforming (Studsvik). The surrogate wastes evaluated included sludges of magnesium containing wastes, PCM and even buckets of concrete to simulate future decommissioning wastes. The trials were considered to be successful in that not only did they successfully immobilise the surrogates into varying glasses and ceramic waste forms but they also demonstrated that the technologies had the potential to be deployed at Sellafield and a positive response has been given by the Radioactive Waste Management Directorate (RWMD) to disposability of vitrified product. Currently a number of projects are considering the deployment of these technologies and further evaluations are planned in the near future. In addition, much of the experience gained in this work is being shared with DOE through the Bilateral Agreement.



Hot Isostatic Pressing - Test Sample of surrogate for Fuel Pond Sludge



Joule heated Ceramic Melter – SandClimo



Joule Heating In Container Vitrification of Plutonium Contaminated Waste with subsequent “feed whilst melt” co treatment of Fuel Pond Sludge



Plasma Arc - Treatment of Concrete, Steel and Magnox Metal

NDA Visits Thermal Treatment Technology Vendors In The USA

The NDA operates 19 sites across the UK. The site operators (Site licence companies or SLC's) are required to treat operational wastes and retrieve historical raw wastes and package them into a disposable form and then transfer them to an engineered interim store. The packaged wastes will be stored until the availability of a geological disposal facility (GDF) or longer term storage in line with Government policies. As part of this process, the SLC's have developed baseline positions for the treatment of Intermediate level wastes (ILW) for example with the encapsulation in a cement based matrix. NDA encourages site operators to optimise baseline treatment by consideration of alternate treatment options that deliver better value. One of the alternative treatment options under consideration is the use of thermal treatment technologies for use with ILW.

Although vitrification of high level waste has been undertaken at Sellafield, the consideration of thermal treatment technologies for intermediate level wastes presents different challenges especially given the range of wastes and characteristics that need to be treated.

As part of this evaluation, and in order to support the development of the UK business case for Thermal Treatment Technologies, Graham Jonsson (Head, Higher Activity Level Waste, NDA) visited Richland, WA to witness first hand the operation of the Geomelt, bulk vitrification process. In addition, Graham had a series of meetings with other US thermal treatment technology vendors while attending the Sixth Standing Committee Meeting between DOE's Office of Environmental Management (EM) and the UK's Nuclear Decommissioning Authority (NDA).

Following the meetings, Graham acknowledged that these technologies still require development before they can be deployed on UK sites but he noted that the work completed to date has demonstrated the potential that thermal treatment technologies offer. Such is the level of interest in this field that the NDA and DOE have agreed to add the topic to the current list of special interests for further discussion and focused collaboration.

The Integrated Project Team (IPT) has recently completed a preliminary business case that outlines the benefits that thermal technologies could bring. The next steps in the UK will be about developing the business case and identifying target areas.

NDA To Progress UK Graphite Disposition Strategy With Transatlantic Support From Studsvik

The UK holds one of the largest inventories (90000 tonnes) of irradiated graphite in the world. Determining a viable method for the treatment or disposal of the graphite, and its radionuclides, is an important step in the overall planning of the decommissioning of the UK nuclear fleet by the NDA. In support of its revised disposition strategy, the NDA has instigated a number of projects to review alternative options to the current approach of deep underground burial in a future deep geological repository. Alternatives being considered include shallow burial and small scale testing to investigate the potential use of Studsvik's THOR® technology to thermally treat the graphite.



Graphite Reactor Core

The THOR® process utilises pyrolysis/steam reforming technology, which effectively immobilizes radionuclides and heavy metals in highly durable, leach resistant mineral product for a range of liquid, sludge, and solids radioactive wastes. In addition, the THOR® process can effectively heat-treat or “roast” graphite with controlled gas flows and thereby fully gasify the graphite into CO and/or CO₂ by using steam and oxygen. It is also capable of destroying organics and achieving a substantial reduction in volume. THOR® has been in full-scale commercial use by for a wide variety of radioactive materials for the past ten years at the Studsvik plant in Erwin, TN.



Studsvik Processing Facility in Erwin, TN

As part of the NDA-funded project, samples of irradiated core graphite will be transported to the United States and subjected to a series of laboratory tests. The primary purpose of this bench-scale test programme is to demonstrate that the two-step THOR® roasting/gasification process can remove and collect C-14, tritium, and Cl-36 from the radioactive graphite samples and gasify the graphite. The test will also serve to collect parametric data for future larger scale testing.

Studsvik has a track record of successful development of the THOR® technology through the delivery of trials programmes. The most recent is the development of a treatment method for Tank 48 at the DOE Savannah River Site where THOR® was recently awarded the contract for building of a full scale facility for the treatment of Tank 48 waste.

From The US To The UK ... And Back Again

Carol and Mike Johnson have over 60 years nuclear experience between them having worked at the Savannah River, Los Alamos and Idaho sites in the US. With the recent contract award to URS Washington Division (URS-WD) of the Parent Body Organization contract at Sellafield, Mike and Carol have recently relocated to the UK to head up the Infrastructure and Waste & Effluent Disposition directorates respectively.

Since taking up their positions at Sellafield, both Carol and Mike have led the implementation of a number of work streams deriving from Sellafield Ltd's Integrated Change Programme – a

programme designed to ensure the safe delivery of six years worth of work in five. These programs have included a Conduct of Operations programme which is designed to set the operating standards for Sellafield and a Maintenance Re-engineering Programme which is designed to ensure consistency in the way maintenance activities are conducted across the business.

In order to ensure successful implementation of these programs across Sellafield Ltd, Mike and Carol have recently taken two groups of plant and maintenance managers to the Savannah River site on benchmarking visits to see first hand what the end point of the change programmes may look like.

“It is important to show the team at Sellafield Ltd some of the improvements that we (NMP) have been talking about; what the success can look like and what our words and ambitions mean in reality” said Carol.

However, as Mike goes on to point out, the visits are about more than just taking learning away:

“These visits are always about the two-way flow of lessons learnt and as such we are able to provide useful insights into some of the big projects underway at Sellafield. One of the key drivers behind the programme is to share the experience and knowledge of Sellafield Ltd with the rest of the nuclear industry” said Mike.

As well as including individuals from Sellafield Ltd, representatives from the NDA and NII were also invited on the most recent visit in February to participate in discussions about the UK and US approaches and mechanisms for managing high hazard nuclear programs.

Thanking the team at the Savannah River site, Mike added: “In both visits, we’ve been very well supported by a number of individuals including Terry Spears, Jim Folk and Phillip Giles. In addition, Savannah River Remediation President Jim French and Kim Hauer have been key to success of these visits.”

The next visit to the Savannah River site is scheduled for May 2010.



Participants of the visit

Waste Management 2010, Phoenix March 7-11

The 36th annual Waste Management conference was held recently in Phoenix. With over 2000 attendees from nearly 40 countries, this was one of the largest ever. Some 20% of the technical attendees are non-US which gives it a true multi-national flavour, with strong representation from the UK and other European countries.

Dr Inés Triay, Assistant Secretary, EM opened the Plenary Session of the conference with a talk on progressing DOE-EM's clean-up mission through achieving excellence. A complementary session on “hot topics” in DOE-EM followed, led by Dae Chung Principal Deputy Assistant Secretary, EM. Hanford was the featured DOE site with a number of well attended technical sessions. There were also a number of DOE contracting sessions and a session on contracting opportunities in the UK with the NDA, chaired by Ron Gorham, Head of Supply Chain Development & Commercial Relationships, NDA.

As expected, the fate of Yucca Mountain attracted great interest and the deliberations of the Blue Ribbon Commission are obviously eagerly anticipated. Mike Lawrence, formerly USDOE and now head of the UK National Nuclear Laboratory gave a thought provoking keynote talk on his views on the subject, believing the licence application should continue.

On the international front, the Plenary session also heard about China's HLW disposal programme and its expanding nuclear power programme. The IAEA had a number of sessions on its Environment Management Network (ENVIRONET) which facilitates global information sharing on managing nuclear liabilities. An international panel chaired by John Mathieson, Head of International Relations, NDA, heard from both EM (Christine Gelles, Director, Office of Disposal operations, EM) and Mike Johnson Exec Director, Waste and Effluent Disposition, Sellafield Ltd), amongst others, discussed the Greater than Class C EIS and the return of HLW from the UK to Japan respectively.

The conference also heard of the Carlsbad Field Office's international collaboration mission which aims to engage with other programmes around the world and assist in advancing repository science and public outreach.

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