

STUDENT SUMMER INTERNSHIP TECHNICAL REPORT

Office of Environmental Management International Program

DOE-FIU SCIENCE & TECHNOLOGY WORKFORCE DEVELOPMENT PROGRAM

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Principal Investigators:

Joel McGill (DOE Fellow Student)
Florida International University

Ana Han, Mentor
DOE HQ EM- 2.1

Florida International University Program Director:

Leonel Lagos Ph.D., PMP®

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Applied Research Center
FLORIDA INTERNATIONAL UNIVERSITY

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ABSTRACT

During the summer of 2013, Mr. Joel McGill attended his internship at the Office of Environmental Management at Department of Energy Headquarters located in downtown Washington, DC. Throughout the summer, Joel supported Mrs. Ana Han, Lead Foreign Affairs Specialist for the Office of Environmental Management's International Program (EM- 2.1). The mission of the EM International Program is to foster international cooperation in addressing environmental and waste management issues leading to the reduction of technical, financial, and programmatic risks for the EM Program. The International Program is responsible for the facilitating and approving potential areas of collaboration between EM's mission units/ national laboratories and foreign entities.

Mr. McGill's primary directives were to attend meetings and report on those proceedings, as well as gather and develop briefing materials for overseas travel to Russia and the UK by Senior Advisor of the Office of Environmental Management, Mr. David Huizenga, and Associate Principal Deputy Assistant Secretary, Mrs. Alice Williams. This report will give a detailed overview of the tasks completed in support of EM-2.1 and the EM International Program.

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1. INTRODUCTION

In 1989, the Department of Energy's (DOE) Office of Environmental Management (EM) program was established with a commitment to the environmental clean-up, and to achieve safe compliant disposition of US nuclear waste and obsolete nuclear facilities. The environmental clean-up pertains primarily to the nuclear waste resulting from five decades of nuclear production spanning the Cold War Era when the United States' top priority was to produce nuclear weapons as well as years of government sponsored nuclear energy research. Nuclear weapons were produced by placing uranium into a nuclear reactor. This process produced a large amount of toxic waste that was placed in unreliable containers and stored underground. Over the course of time, containers have leaked and contaminated the soil and groundwater, producing many new complex issues to solve and broadening the scope of EM. Thus, EM has remained dedicated to "completing the safe cleanup of the environmental legacy brought about from five decades of nuclear weapons development, production, and government-sponsored nuclear energy research (EM 2013)." "Over the last 20 years, new technologies and approaches have been developed and successfully applied to meet EM's needs (EM 2010)." With issues within the nuclear and environmental management industry including waste management, soil and groundwater remediation, decontamination and decommissioning (D&D) of facilities, and spent nuclear fuel/spent nuclear material (SNF/SNM) disposition/storage or its reprocessing, the need for the U.S. and foreign entities to work cooperatively is great. It is of mutual benefit that the U.S. works on a global scale with the nuclear and environmental management community to aid others as well as learn from counterparts and avoid repetition of work while improving innovation towards EM's mission.

To assist EM in accomplishing this goal, the International Program (EM-2.1) is set up to act as liaison and point of contact for the EM Mission Units. "The International Program links the DOE Office of Environmental Management (EM) to the world's evolving environmental remediation and radioactive waste management practices (EM 2010)." The Program is responsible for the contact and establishment of formal and multilateral relationships with international entities, whether country or corporation. They also aid in identifying beneficial technologies as it relates to the EM mission and the objectives of the EM Mission Units. Seeking out these advances and potential collaborative efforts abroad on visits, it assists on advising and identifying projects agreed upon between mission units and foreign entities as well as awarding funding. Essentially, EM's International Program promotes sharing the lessons learned while leveraging national and international expertise and experience which has the potential to expedite the EM cleanup mission at a reduced cost.

To see the International Program's place within the EM office as well as other mission units, please refer to appendix A.

EM has been collaborating with Russia and the UK since 2004 and is currently under deliberation to proceed with new potential projects with both of these countries. For example, during the St. Petersburg, Russia, visit in June of 2013, the Scientific Industrial

Association (SIA) RADON provided an initial demonstration that cold crucible induction melting (CCIM) can provide significant increases in waste loading and melt rates for challenging EM tank wastes. They also intended to offer initial insight into the structural role of specific glass ions on waste glass properties.

All projects were not new start-up projects; others were continuations such as with the Koplin Radium Institute (KRI) projects in which the topics of interest included: determination of barrier characteristics of soils with respect to mercury, soil decontamination, and determination of barrier characteristics of soils after treatment.

2. EXECUTIVE SUMMARY

This research work has been supported by the DOE-FIU Science & Technology Workforce Initiative, an innovative program developed by the US Department of Energy's Environmental Management (DOE-EM) and Florida International University's Applied Research Center (FIU-ARC). During the summer of 2013, a DOE Fellow intern (Mr. Joel McGill) spent 10 weeks doing a summer internship at DOE Headquarters Office of Environmental Management at the Forrestal Building in Washington, D.C. under the supervision and guidance of Ana Han, Lead Foreign Affairs Specialist for EM's International Program (EM-2.1). The intern's project was initiated on June 3, 2013, and continued through August 10, 2013 with the objective of assisting EM's International Program.

The International Program is an effective mechanism in coordinating national laboratory, university, and industry activity at an international level that produces tangible results in the cleanup efforts by identifying challenges of mutual concern with foreign countries in the areas of waste management, soil and groundwater, decontamination and decommissioning (D&D), and spent nuclear fuel/spent nuclear material (SNF/SNM).

Mr. McGill also played an instrumental role in the communications of meetings and upcoming events within the EM department. This effort entailed acquiring information concerning each mission unit's affairs, meetings and events to input into a database, which would be organized, managed and distributed. This effort serves to keep all mission units and sub-departments abreast of events and exchange of information between their EM counterparts and other entities, such as foreign nationals, national labs and corporations. For examples, please see appendix B.

Mr. McGill assisted in the preparation of speeches, presentations, and position papers for senior management which communicated EM program goals and initiatives; assisted in the coordination of EM's participation in international conferences; assisted in the preparation of foreign visits; and facilitated in the preparation of the government-to-government agreements for radioactive waste research and development cooperation that advance EM program goals.

3. WORK DESCRIPTION

Joel McGill enjoyed his time at DOE Headquarters. Mr. McGill attended and participated in high-level international affair meetings with senior management such as Senior Advisor for Environmental Management and Principle Deputy Assistant Secretary of DOE-EM; as well as discussions/meetings for overseas energy and nuclear technology relations with various countries, between DOE's EM, EM Mission Units, National Nuclear Security Agency (NNSA), Energy Efficiency and Renewable Energy (EERE), and Overseas Presence Advisory Board (OPAB); as well as attended the DOE Overseas Corps Orientation Seminar 2013.

In these meetings, a variety of topics were covered, including: non-proliferation, transport of spent nuclear fuel and radioactive waste, various storage methods of containing high-level radioactive waste, various methods and advancements in sustainable energy, and how to advocate for American companies to have an equal opportunity market abroad. Also included among these topics were various projects pertaining to purposes with countries such as China, Korea, Japan, Germany, and the UK.

Mr. McGill assisted in preparing talking points, briefings, and presentations for DOE executives. For instance, he gathered information and assembled the briefing materials for a visit by the DOE Senior Advisor for Environmental Management to St. Petersburg, Russia in June of 2013, which consisted of an International Atomic Energy Agency (IAEA) conference and bilateral meetings. Mr. McGill also regularly briefed his supervisor on meetings he attended. In addition, he served as a focal point of communication between mission unit offices as it pertained to upcoming meetings and EM events or conferences in which EM would be participating. This entailed contacting mission unit offices and gathering information about their affairs or exchanges of information with foreign entities.

Some of the administrative duties which he has performed include the following: QA/QC of documents, coordination of meetings and teleconferences, contacting contractors and private industry executives/specialists, and budgeting: organizing travel expenses, outlining and calculating reimbursement funds, and reviewing and outlining project funding and available funds. He feels these experiences have given him an in-depth look into the federal government and corporate world and is very grateful for the opportunity.

4. DETAILS & OVERVIEW

Russia Briefing Project 4.1

KRI

The first topic discussed was the barrier characteristics of model soil samples with respect to mercury, which were determined using an original percolation cell developed at the Khlopin Radium Institute (KRI). The liquid phases, deionized water and model ground water typical of the site of interest were used. A special focus was made on the contribution of colloid migration. It was discovered that the basic mechanism controlling the behavior of mercury and its compounds in contaminated soils is sorption on clay. Mobility of mercury is governed by the release rate of the finest clay fraction to the aqueous phase. Natural organics (fulvics) considerably increase the amount of mobile mercury species in the pore water by virtue of formation of soluble organo-mineral complexes. In contrast, iron hydroxide, which acts as a strong collector for mercury and a structuring agent for soils, decreases the mobility of ionic mercury species.

The second topic of soil contamination discussed was the progress and completion of tasks as they relate to soil remediation advances. KRI performed a study for evaluation of the efficiency of washing of soils contaminated with different mercury species. Specifically, supercritical carbon dioxide with modifiers such as argon, toluene and tributyl phosphate (TBP) were used to wash the soil contaminated with various forms of mercury. They also used solutions of alkali metal sulfides, polysulfides and iron (III) – edetic acid (EDTA) to wash soil contaminated with different forms of mercury. Simultaneously, some oxidants were utilized for elemental mercury, merging the oxidation and soil washing process. They also attempted thermal treatment involving thermal remediation of mercury, by treating contaminated soils with microwave heating.

Their experiments proved that there was a viable treatment possibility as demonstrated by using solutions of argon, toluene and tri-n-butyl phosphate in compressed carbon dioxide for removal of mercury from soils. They considered the special features of fluid extraction available and derived a method of increasing the specific flow rate of a solution to attain more efficient mercury removal.

IBRAE

The work which EM-12's Office of Soil and Groundwater Remediation is coordinating with the Russian Nuclear Safety Institute of the Russian Academy of Sciences (IBRAE RAN), is the fundamental research of contaminant transport processes in geological media to support the Advanced Simulation Capability for Environmental Management (ASCEM). The project is being managed by EM-12's Mr. Kurt Gerdes and Mr. Justin Marble, while U.S. efforts are being carried out at U.S. national labs: Lawrence Berkeley National Lab (LBNL), Los Alamos National Lab (LANL), Pacific Northwest National Lab (PNNL), Savannah River National Lab (SRNL), and Oak Ridge National Lab (ORNL).

The objective of this collaboration is the development of novel anomalous transport models for geological media and efficient numerical methods for 3D radionuclides propagation simulation. The research conducted will serve as a safety assessment of geological radioactive waste disposal and polluted sites. Novel theoretical approaches and numerical algorithms for modeling contaminant transport in heterogeneous media will support the next generation of performance assessments.

The primary focus of the research is radionuclide transport modeling theory and numerical methods as well as theoretical analysis of non-classical contaminant transport and asymptotical concentration distribution in homogeneous, dual-porosity geologic medium in the presence of a heterogeneous diffusion barrier. This collaborative project also addresses the development and testing of numerical schemes for tracking dynamic contaminant fronts while simultaneously focusing on problems with realistic parameters used in the ASCEM project for verification of codes.

The project is a three phase collaborative effort composed of a theoretical component and a numerical portion. Phase one's two part stage was the theoretical investigation of anomalous transport regimes caused by contaminant adsorption on colloid particles, and the numerical development of a new nonlinear monotone finite volume scheme for diffusion operators. Phase two is comprised of the theoretical analysis on anomalous transport regimes caused by the presence of diffusion barriers and the numerical development of a second order accurate advection operator discretization scheme for polyhedral grids. Phase one was completed between 2010-2011. The project's, phase two, completion has been estimated to be the end of 2013.

During this visit, the proposal was discussed to approve a reduced contract period of 7 months: 6 months of research work to be finished by 01/01/14 and an additional 1 month for comments and approval. One of the reasons for this is to intensify the work using the reinforced team IBRAE has recently brought in, including fresh lab technicians and employees. Accompanying this improved work force is the need to proceed to Phase III as soon as possible in order to provide DOE (LANL) with the essential and timely results.

LETI

For thirteen years, the Department of Energy has collaborated with St. Petersburg Electro Technical University (ETU, LETI) in attempts to investigate key operational parameters of CCIM technology. Parameters and topics varied from automated control, CCIM modeling for design and optimization of melters and drains, innovative draining enhancement, up-scaling of the melting apparatuses, and the CCIM of various U.S. glass by-products. Throughout this collaborative effort, many meetings have taken place similar to this one, for instance, on November 1, 2010. They have since completed 20 scientific technical meetings, 100 plus tests, and 50 scientific technical reports. They have developed and validated three electro-hydrodynamic models of the CCIM process. This effort has also uncovered and tested 14 variations of a new electromagnetic drain, which possesses a larger melting capacity of up to 100 kg of the glass compositions BSG,

FePG, and HC-BSG, borosilicate glass and iron phosphate based glasses. Many hardware and software technologies have been produced to develop an operational data acquisition system, which include advanced sensors, filters and fiber optic lines to eliminate high frequency interferences. They have also discovered techniques to increase the reliability of the high-frequency equipment.

While in St. Petersburg, the LETI institution would cover the general proposed direction of research which would cover a variety of cold crucible induction melting (CCIM) related issues, such as the continued processing of the different types of DOE high level waste (HLW). The CCIM process can be seen below.

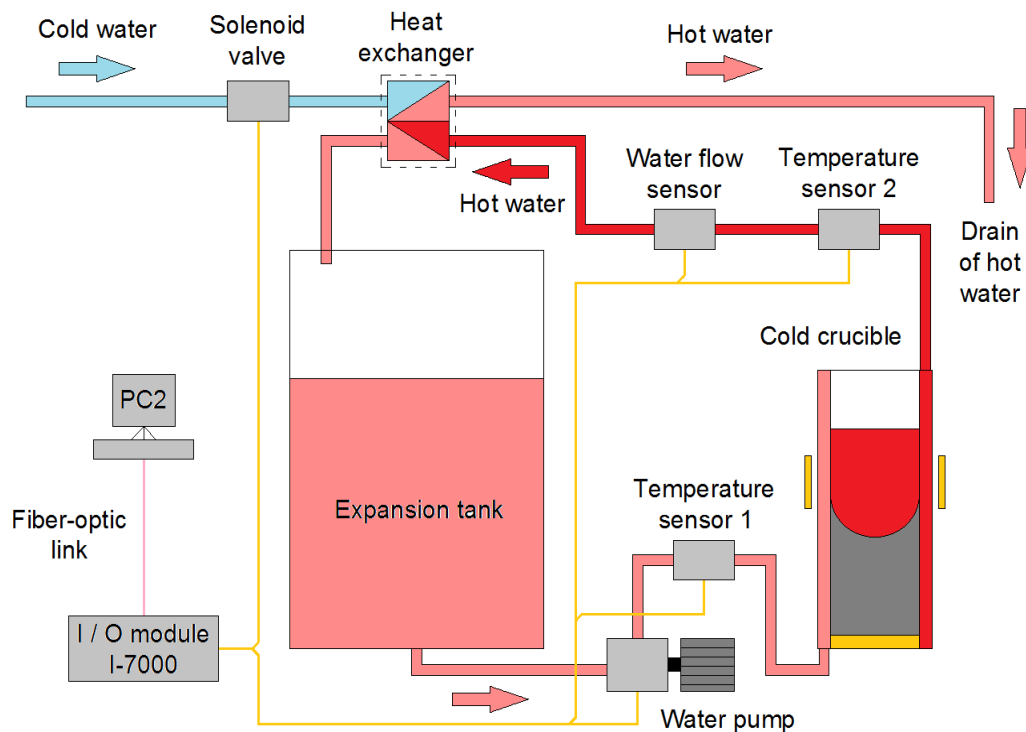


Figure 1. Cold crucible induction melting process.

CCIM is the primary backup for the Department of Energy EM HLW stabilization. Certain infrastructure has been implemented to conduct research and testing in a cost-effective manner. A certain point which was conveyed, was that the areas of interest and focus could be adjusted to support priorities of DOE EM needs. DOE EM has managed to contribute minimal investment and yet maintained good momentum and progress.

In the past, it has been demonstrated that CCIM can provide significant increases in waste loading and melt rates for challenging EM tank wastes. CCIM has been considered the primary backup technology in the event that baseline technologies derived at Hanford and Idaho (e.g., hot isostatic processing (HIP) of calcine) is incapable of reaching a standard level of performance as planned. Testing and resulting data from Russian collaborations led DOE-Nuclear Energy Office (NE) to begin investigation of CCIM for

application to challenging waste streams resulting from advanced separations processes associated with next generation.

Kryukov Meeting

The second highlight of Senior Advisor Huizenga's St. Petersburg visit was a meeting with his Russian counterpart, Mr. Oleg Kryukov, Director for Public Policy on Radioactive Waste (RAW), SNF Management and Nuclear Decommissioning of the Russian State Atomic Energy Corporation (ROSATOM) organization. In this meeting, they briefly touched on past collaborations with ROSATOM Institutions (i.e., Khlopin Radium Institute, SIA Radon, etc.), as well as other Russian institutions (i.e., Electro-technical University "LETI", Russian Academy of Science, IBRAE, etc.). They also discussed more technical areas such as environmental restoration, which would address soil contamination cleanup efforts. This remediation would primarily pertain to mercury complexation in the environment. Other technical areas which were covered included tank waste management and disposition, whose particular subtopics were tank waste retrieval and tank closure, glass chemistry/formulations experience with non-borosilicate compositions, and long term glass performance. Non-technical areas of potential collaboration were a key topic of interest in this meeting, including DOE-EM's acquisition process for waste processing/treatment/D&D systems and overall project management approach as well as collaborative efforts being channeled through the EM International Program.

UK/ NDA Briefing Project 4.2

The primary purpose of EM-2.1's visit to the UK this past July was three fold. Its first function was to allow EM participation in the United Kingdom's Decommissioning & Waste Management Conference (UKDWM), while simultaneously allowing the Associate Principal Deputy Assistant Secretary to meet with the company Atomic Energy of Canada Ltd (AECL) for potential projects, as well as allowing EM representatives to meet with the UK Nuclear Decommissioning Authority (NDA). The UKDWM conference allows companies and entities to gather and cover all aspects of the this sector of the nuclear communities topics, and provides a forum or platform for those in the industry to discuss progress, issues, share technological advances, and build new relationships and collaborative efforts.

NDA

During this visit to the UK, the Associate Principle Deputy Assistant Secretary, Mrs. Alice Williams (EM-2.1), met with the Chief Operating Officer of the Nuclear Decommissioning Authority (NDA), Mark Lesinski, to discuss past accomplishments and potential future collaborative efforts.

More material on the NDA can be found in appendix C.

AECL

The Atomic Energy of Canada Ltd (AECL) organized a meeting to discuss the commencement of a project which would identify complementary areas of mutual interest in current technology development and operational efforts at AECL and DOE EM as well as the exchange of information acquired and lessons learned. NuVision Engineering's experience and related work will be the building block on which to identify synergies, overlaps in interest and technology, and programmatic gaps which will aid in promoting joint efforts towards quicker, more efficient and financially feasible cleanup programs.

With technology and research budgets around the world dwindling, this collaborative effort serves to reduce the manpower required and the redundancy of research between these two organizations, towards the same goal. To that end, these organizations have signed an Statement of Intent (SOI) to share knowledge and information, as well as to work together for mutual benefit in a number of areas including spent fuel management, decontamination and decommissioning (D&D), and waste processing.

For further details on this project see appendix D.

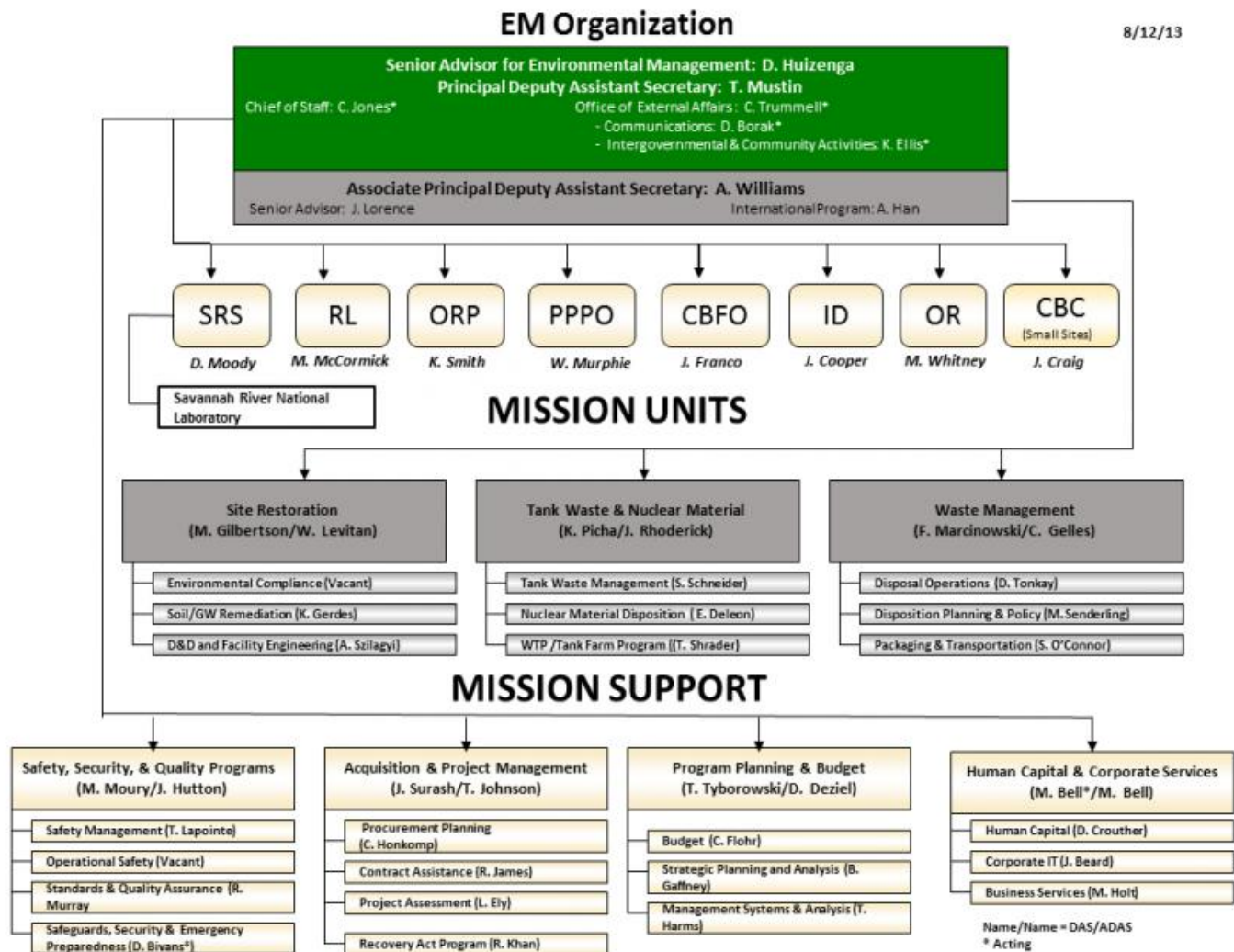
5. CONCLUSION

In order to achieve EM's goal of reducing the footprint left behind by the Cold War, it is imperative that the DOE EM International Program continue to engage with countries around the world as they are facing similar adverse environmental effects. The International Program has developed and maintained relationships with countries across the globe and continues to expand collaborative technology development with international partners. Without the International Program, we would not have the advantage of working with Russia and the UK in transformational solutions. This work allows for the advancement of technologies and sharing of lessons learned in hopes of reducing the cost and time of the mission. The tasks completed by Mr. McGill as well as all those involved in the United States and around the world in EM's mission are providing a cleaner, safer environment for the next generation.

6. REFERENCES

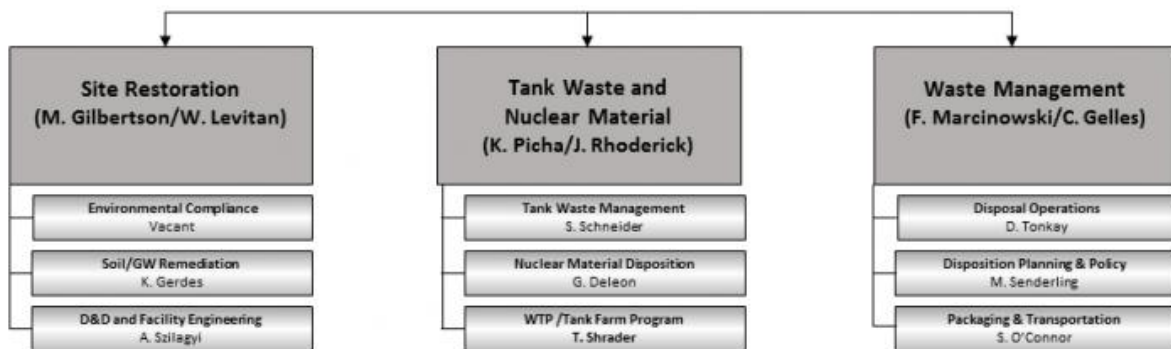
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2. Cold Crucible Induction Melting A cool way to make radioactive wastes safe for disposal. <http://www.inl.gov/research/cold-crucible-induction-melting/#sthash.HxSkauHA.dpufhttp://www.inl.gov/research/cold-crucible-induction-melting/> Accessed on (09/02/13).

APPENDIX A.

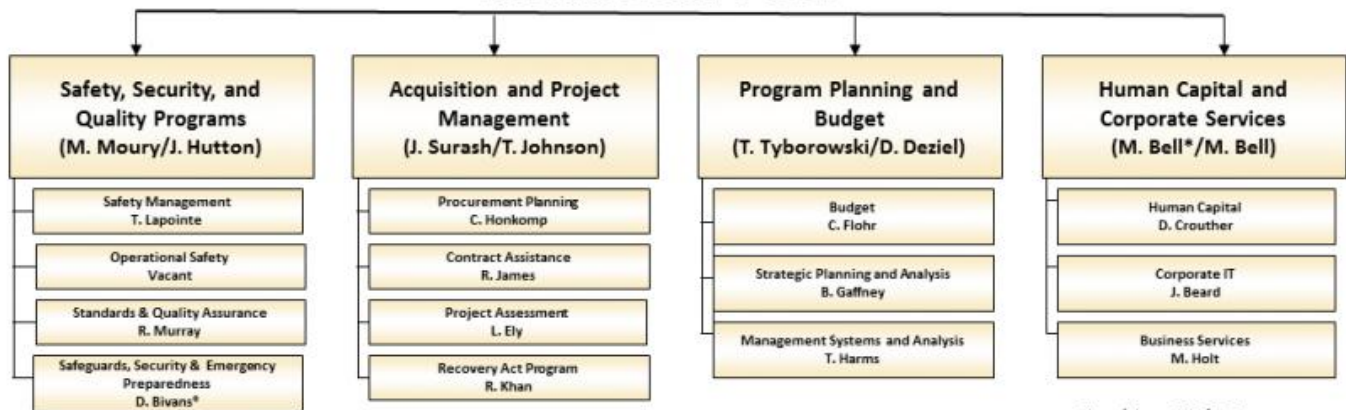


8/12/13

MISSION UNITS



MISSION SUPPORT



Name/Name = DAS/ADAS
* Acting

APPENDIX B.

International Action Matrix of July

Subject	Lead Office	Engaging Country	Meeting Location	Purpose	Status	Date of Event
IAEA Transport Security Working Group	EM-33	Multilateral	Vienna, Austria	Discuss transportation security and identify opportunities for enhancements in coordination with IAEA initiatives.	TBD	July 1-5, 2013
Meeting at UK Decommissioning and Waste Management (UKDWM) 2013 Conference	EM- 2.1	United Kingdom	Rheged Center, Penrith, Cumbria	EM 2.1 to participate in a meeting covering all aspects of Nuclear D&D and Management.	EM 2.1 to provide opening Plenary Speech and EM-40 Matt Moury to Present.	July 10-11, 2013
American Society of Mechanical Engineers (ASME) 2013 PVP Conference	, EM-33	Multilateral	Paris, France	Provide information exchange on technical issues, lessons learned, and application of ASME code.	EM-33 plans to participate and provide support for DOE technical papers.	July 14-18, 2013
Japan Workshop	EM- 21	Japan	Japan	Follow-up meeting to address Fukushima clean-up.	Working with DOE-Japan and coordinating with EPA to prep for meeting.	July 17-18, 2013
White House Fukushima Sharing Forum	EM -2.1	Japan	Truman Rm. White House Conf. Center	Discuss the role of USG in foreign disaster, and the role of the USG in Fukushima.	Participants to this meeting being identified.	July 18, 2013

Subject	Lead Office	Engaging Country	Meeting Location	Purpose	Status	Date of Event
17th International Symposium on Packaging and Transportation of Radioactive Material (PATRAM 2013)	EM-33	Multilateral	San Francisco, CA	Meetings to exchange information on all aspects of packaging and transporting radioactive materials around the globe.	EM-33 is working with NE, industry, IAEA, international community, and other federal agencies in the planning.	August 18-23, 2013
IAEA Consultancy Meeting on Model Use in Environmental Remediation	EM-11	Multilateral	Vienna, Austria	Follow-up consultants meeting to finalize IAEA publication on model use in support of environmental remediation.	TBD	August 12-16, 2013
CIDER IAEA Meetings	EM-30	Multilateral	Vienna, Austria	Produce a baseline report, supporting technical documents, and an action plan to improve current levels of performance on decommissioning and remediation projects.	Coordinating Working Group meeting scheduled for August 24-30, 2013. Follow up discussions are planned for March 2014. The first output is planned for March 2015.	August 24-30, 2013
ICEM 2013	EM-2.1	Multilateral	Brussels, Belgium	Presenting for the International Program.	In the process of confirming EM participation.	Sept. 8-12, 2013

Subject	Lead Office	Engaging Country	Meeting Location	Purpose	Status	Date of Event
IAEA General Conference	EM-2.1	Multilateral	Vienna, Austria	A Han to support EM-1 and S1.	Preparing briefing materials for S-1.	Sept. 16-20, 2013
4th US-German Workshop on Salt Repository Research, Design and Operation	EM-22	Germany	Berlin, Germany	Exchange information on salt repository R&D and conduct technical visits of salt sites.	Topics include safety case, rock/salt mechanics, repository design and operations. Technical tours of ASSE, ERAM, Staßfurt.	Sept. 17-20, 2013
Plutonium Technical Meeting	EM-22	United Kingdom	Manchester , England	Discuss the results of stress corrosion cracking R & D activities and related plutonium issues.	Agenda under development.	Sept. TBD, 2013
IAEA Transport Safety Standards Committee Meeting	EM-33	Multilateral	Vienna, AU	Assure revisions to IAEA Radioactive Material and Waste Transport Safety Regulations (TS-R-I) do not have potential impact on DOE/EM missions.	EM-33 plans to participate and represent DOE interests along with DOT and NRC as the US Delegation.	October 28 - Nov 1, 2013
MOU between US DOE and Hungary's Public Limited Company for Radioactive Waste Management (PURAM)	EM-22	Hungary	Hungary	Fulfill MOU commitments to exchange information on dry storage facilities.	Visit deferred from FY11 to FY13.	TBD, 2013

Subject	Lead Office	Engaging Country	Meeting Location	Purpose	Status	Date of Event
GTRI Materials	, EM-22	Italy/Belgium	Ispra, Italy	Participate with NA in planning, coordination, and acceptance review of GTRI materials at European Commission's Joint Research Center, Ispra site.	Preliminary discussions with NA are ongoing.	TBD, 2013
AECL Info Exchange Under the SOI	EM-2.1	Canada	TBD	Establish info exchange under the 2013 SOI.	EM-2.1 is reviewing project.	TBD, 2013
10th meeting of the U.S.-Argentina Joint Standing Committee on Nuclear Energy Cooperation (JSCNEC)	EM -2.1	Argentina	Oak Ridge National Lab in Oak Ridge, Tennessee	Discuss potential collaborative activities with Argentina's Comision Nacional de Energia Atomica (CNEA); specifically soil and ground water remediation.	Participant from PNNL will be Mark Freshly and from DOE HQ Kurt Gerdes.	TBD, 2013
Implementing Arrangement between DOE and the UK Office of Nuclear Regulation (ONR)	EM-2.1	United Kingdom	Phoenix, Arizona	Possible Implementing Arrangement w/ ONR for exchange of information on safety, security and quality programs.	Agreement is under negotiation. Discussions will be held on the margins of WM 2014 conference.	February 2014

International Matrix of August

Subject	Lead Office	Engaging Country	Meeting Location	Purpose	Status	Date of Event
IAEA Consultancy Meeting on Model Use in Environmental Remediation	EM-11	Multilateral	Vienna, Austria	Follow-up consultants meeting to finalize IAEA publication on model use in support of environmental remediation.	TBD	August 12-16, 2013
17th International Symposium on Packaging and Transportation of Radioactive Material (PATRAM 2013)	EM-33	Multilateral	San Francisco, CA	Meetings to exchange information on all aspects of packaging and transporting radioactive materials around the globe.	EM-33 is working with NE, industry, IAEA, international community, and other federal agencies in the planning.	August 18-23, 2013
Coordination Working Group (CWG) on Constraints in the Implementation of Decommissioning and Environmental Remediation (CIDER)	EM-30	Multilateral	Vienna, Austria	Produce a baseline report, supporting technical documents, and an action plan to improve current levels of performance on decommissioning and remediation projects.	Coordinating Working Group meeting scheduled for August 24-30, 2013. Follow up discussions are planned for March 2014. The first output is planned for March 2015.	August 24-30, 2013
Spent Nuclear Fuel Management Meeting DOE/EM and SKB International	EM- 22	Sweden	DOE HQ, Cloverleaf	To exchange information on SNF storage, packaging, and disposition with SKB international	Draft agenda drawn up. Presentations are being due by Friday Aug. 23 rd for review to EM- 22.	September 4-5, 2013

Subject	Lead Office	Engaging Country	Meeting Location	Purpose	Status	Date of Event
ICEM 2013	EM-2.1	Multilateral	Brussels, Belgium	Presenting for the International Program.	In the process of confirming EM participation.	September 8-12, 2013
UK NNL Briefing on Decommissioning and New Build	EM- 2.1	United Kingdom	DOE HQ, Forrestal	Recent events in the UK's Nuclear Industry. Discussions on potential future areas of cooperation.	Agenda and topics being developed.	September 12, 2013
UK NNL Briefing on Decommissioning and New Build	EM- 2.1	United Kingdom	DOE HQ, Forrestal	Recent events in the UK's Nuclear Industry. Discussions on potential future areas of cooperation.	Agenda and topics being developed.	September 12, 2013
IAEA General Conference	EM-2.1	Multilateral	Vienna, Austria	A. Han to support EM-1 and S1.	Preparing briefing materials for S-1.	September 16-20, 2013
4th US-German Workshop on Salt Repository Research, Design and Operation	EM-22	Germany	Berlin, Germany	Exchange information on salt repository R&D and conduct technical visits of salt sites.	Topics include safety case, rock/salt mechanics, repository design and operations. Technical tours of ASSE, ERAM, Staßfurt.	September 17-20, 2013
32nd meeting of the U.S.-ROK Joint Standing Committee on Nuclear Energy Cooperation (JSCNEC)	EM- 2.1	South Korea	Dept. of State, D.C.	To host working group meetings on the topics of Nuclear energy technology, R&D, fuel cycle, Export Control & Security, and safety & regulation.	Drafted agenda under review.	September 25-27, 2013

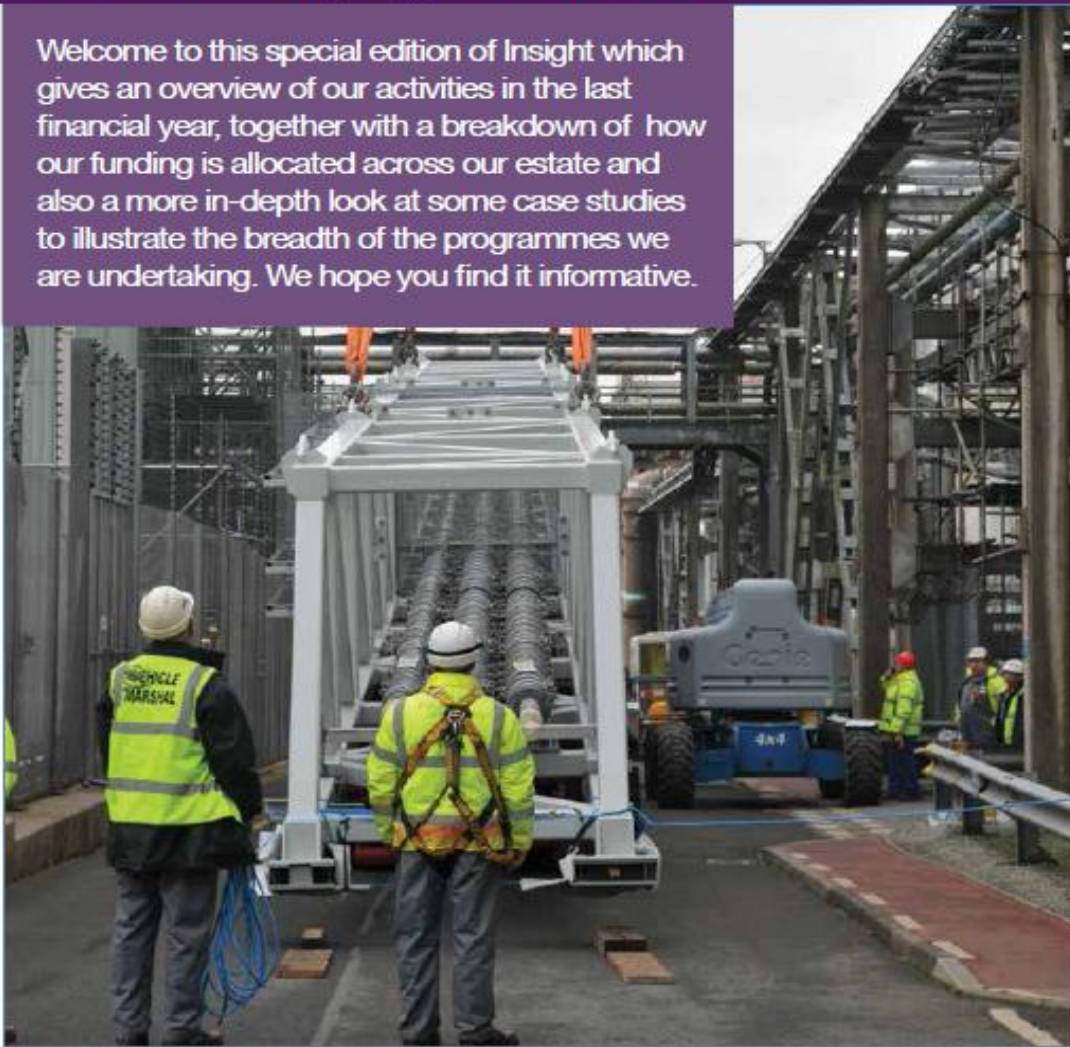
Subject	Lead Office	Engaging Country	Meeting Location	Purpose	Status	Date of Event
Plutonium Technical Meeting	EM-22	United Kingdom	Manchester, England	Discuss the results of stress corrosion cracking R & D activities and related plutonium issues.	Agenda under development.	September 30, 2013
UK NDA Visit to Savannah River	EM- 2.1	UK	Aiken, SC	Discussion on site security measures.	A tentative agenda is being developed. Information for badge request being gathered.	Week of October 14, 2013
IAEA Transport Safety Standards Committee Meeting	EM-33	Multilateral	Vienna, Austria	Assure revisions to IAEA Radioactive Material and Waste Transport Safety Regulations (TS-R-I) do not have potential impact on DOE/EM missions.	EM-33 plans to participate and represent DOE interests along with DOT and NRC as the US Delegation.	October 28 - Nov 1, 2013
Japan-U.S. Decommissioning and Remediation Fukushima Recovery Forum, Tokyo, Japan	EM-21	Tokyo, Japan	Tokyo, Japan	Traveler to attend the Decommissioning and Remediation Fukushima Recovery Forum.		November 18-19, 2013
MOU between US DOE and Hungary's Public Limited Company for Radioactive Waste Management (PURAM)	EM-22	Hungary	Hungary	Fulfill MOU commitments to exchange information on dry storage facilities.	Visit deferred from FY11 to FY13.	TBD, 2013

Subject	Lead Office	Engaging Country	Meeting Location	Purpose	Status	Date of Event
GTRI Materials	EM-22	Italy/Belgium	Ispra, Italy	Participate with NA in planning, coordination, and acceptance review of GTRI materials at European Commission's Joint Research Center, Ispra site.	Preliminary discussions with NA are ongoing.	TBD, 2013

APPENDIX C.

Performance Highlights of 2012/2013

Welcome to this special edition of Insight which gives an overview of our activities in the last financial year, together with a breakdown of how our funding is allocated across our estate and also a more in-depth look at some case studies to illustrate the breadth of the programmes we are undertaking. We hope you find it informative.



Financial management

The NDA has remained within spending limits in the face of a difficult economic climate and some challenging issues in parts of the estate. Our Site Licence Companies have reduced overheads for the third year of a four-year programme, achieving savings of £136 million so far and freeing up funds for our core decommissioning activities. The overall target is to achieve 25% savings compared to the original projections. These efficiencies have enabled us to fund essential new construction programmes and to sanction one-off projects such as the removal of the Berkeley boilers for recycling and clearance of the Dungeness turbine halls.

Commercial income

Commercial income supplements the NDA's grant-in-aid from Government and has this year exceeded the target, reaching almost £900 million. The performance from electricity generation at Wylfa's single reactor has been higher than expected while the income from reprocessing and management of spent fuels at Sellafield has also exceeded expectations. Meanwhile, the deal to transfer Capenhurst into the private sector was completed during the year, realising around £50 million.

Front cover photograph: Winfrith's Dragon, Above: Sellafield pipe-bridge is maneuvered into place, Right page: Berkeley boilers on the move



Decommissioning progress

Two more sites, Chapelcross and Dungeness A, have now completed defuelling, leaving only 3,800 tonnes of spent fuel out of a total of 50,000 tonnes originally manufactured, to be removed from four Magnox sites.

At Sellafield, two major achievements have enabled work to progress on the ageing First Generation Magnox Storage Pond, one of the key priority programmes. The new pipe-bridge was completed 18 months ahead of schedule, while a massive crane has been completely refurbished over many years, after once being condemned as unfit for use.

At Research Sites Restoration Ltd (RSRL), an optimised plan will bring forward closure of Winfrith by 27 years and take Harwell to care and maintenance five years earlier than originally planned.

Meanwhile, the first two vaults of Dounreay's Low Level Facility are now more than half-way to completion after construction started in 2011.

Contract management

The new contract at Dounreay, awarded to the Babcock Dounreay Partnership, has been successfully incorporated into the site's Lifetime Plan, and is expected to deliver more than £1 billion in savings while achieving site closure up to 17 years earlier than originally anticipated.

At Low Level Waste Repository (LLWR), the contract awarded to UK Nuclear Waste Management (UKNWM) in 2008 has been extended for a further five years following a successful first five-year term which secured around £30 million in savings, extended the life of the facility, reduced volumes of waste sent to the Repository and saw the opening of a new vault.

We are also part-way through the last of our major competitions, the award of the £7 billion contract for the 12 sites operated by Magnox Ltd and RSRL Ltd, and are pleased to see a healthy level of interest from four high-calibre consortia.

Safety

The number of industrial safety incidents across the estate has fallen, while there have been no nuclear safety incidents above the lowest level of severity. Several SLCs have won national safety awards, notably Magnox Ltd and Dounreay Site Restoration Ltd.

Essential support work

The NDA has collaborated with a range of other public bodies to invest a combined total of £18 million in research and development projects across all sections of the nuclear industry, with the funding expected to leverage a further £13 million.

An action plan has been developed to support greater opportunities for smaller businesses seeking work in the UK's decommissioning market, aiming to almost double the proportion of contracts awarded to Small and Medium-sized Enterprises (SMEs) to 20%, representing around £300 million. Half of the NDA's annual expenditure of around £3 billion goes into the supply chain, via contracts with the SLCs.

View from the top

Sellafield focus continues

By John Clarke, Chief Executive

There is no doubt that my first full year as Chief Executive has been a time of challenge on a number of fronts, but we have also made good progress with a range of issues across the estate. When I took on the role, I stated that my top priority was Sellafield. This continues to be the case and will remain so for the foreseeable future.

At around £1.6 billion, Sellafield accounts for more than half our annual expenditure. Our focus will be to increase our understanding of the uncertainties associated with the oldest and most hazardous facilities and drive risk reduction. Before many of these plants can be accessed to allow them to be emptied and decommissioned, a significant number of major new construction programmes are required. This means that Sellafield is set to become one of the biggest construction sites in Europe over the next 20 years.

I am pleased to note good performance in other parts of our estate, particularly with the Magnox Optimised Decommissioning Programme, which has this year delivered the largest-ever programme of work. We look forward to seeing the first UK nuclear sites, Bradwell and Trsawfynydd, enter care and maintenance within the next two or three years.

Looking ahead, we will continue to support the Government's ongoing process to select a site for the Geological Disposal Facility and conclude our deliberations on the optimum way forward for the next phase of work at Sellafield.

Much has been achieved but there is more to do.



Financial management

By David Batters, Chief Financial Officer

The NDA continues to respond to the challenges set by the difficult fiscal climate through continuous pursuit of value for money across the estate whilst ensuring that real progress is maintained on the core mission.

We have met short term financial targets, whilst maintaining the necessary focus on the long term direction of the nuclear estate. The complexity of projects, particularly at Sellafield, means the future costs and schedule dates are an area of concern and focus.

Total expenditure for the year was £3,107 million (compared to last year £2,992 million). As in previous years, the majority of the NDA's funding has gone to our highest priority site, Sellafield. When looking at the overall costs of the clean-up programme over the next 120 years or so, we see a continuation of recent trends whereby life time costs are reducing in all parts of our estate with the exception of Sellafield, where some significant uncertainties remain. The net result is that the undiscounted figure for the long term clean-up programme is relatively stable.

The following charts help to understand where and how our funding is spent.



APPENDIX D.

EM International Cooperation

Project Title: Maximizing the Benefit of the Statement of Intent (SOI) on Information Exchange between DOE Environmental Management and Atomic Energy of Canada Ltd (AECL)

Country/Organizations:

Foreign: Canada

Foreign POC: Christine Fahey

U.S: NuVision Engineering

U.S. POC: Laurie Judd

Work Completed to Date: In 2010, a limited effort was conducted to identify potential areas of technology and application overlap between AECL and DOE in the fields of waste management, D&D, and spent fuel management.

Overview of Proposed Scope:

There is a Statement of Intent in place between the US DOE Office of Environmental Management (EM) and AECL that enables information exchange in areas of mutual interest, including spent fuel management, D&D, and environmental remediation. In order to maximize the benefit of this SOI, each organization needs to have a thorough understanding of the needs, priorities, and content of the other organization's programs. Since both organizations have more pressing issues on a day-to-day basis, there is a concern that opportunities for collaboration can be overlooked because of a lack of knowledge and understanding.

In this project, NuVision Engineering will use its knowledge of both AECL and US DOE cleanup programs to identify areas of overlap, synergy, and gaps in the fields of spent fuel management, D&D, and waste processing. Initial efforts will focus on revisiting collaborative discussions held in 2010 between the parties prior to the signing of the SOI to clarify whether the areas identified at that time are still relevant at the current time. This will form a baseline upon which detailed and prioritized collaboration can be built.

The project will involve a considerable amount of desk-based research as well as face-to-face discussions with key individuals in AECL and DOE in both the US and Canada.

Task 1: Revisit, Update and Prioritize Collaboration Areas: In 2010, a limited effort was conducted to identify potential areas of technology and application overlap between AECL and DOE in the fields of waste management, D&D and spent fuel management. In this proposed task, NuVision will review those areas and clarify their current importance with both AECL and the appropriate DAS's in DOE. Publicly available information will also be reviewed to gain a better understanding of the current cleanup activities and plans of AECL and one site visit will be made to Canada.

Where necessary, areas of 2010 interest will be removed from or updated on the list of candidate technologies and new topics will be added in order to assemble an updated list of candidate technology areas for further joint discussion between the parties. This list of candidate areas will be discussed with DOE EM Mission Units to agree on the top 3-5 priority topic areas, and the initial list of target areas will be issued to AECL for comment and concurrence. NuVision will then facilitate interactions between AECL and DOE to finalize the top priority list of areas which will be pursued under the SOI.

Task 2: Initial Interactions and Information Exchange Work in this task will focus on the information exchange process in the priority topic areas as agreed between AECL and US DOE. In each case, the successful approach adopted under the UK NDA/US DOE SOI will be used, i.e.:

- Identify Points of Contact (POCs) to form a Working Group consisting of participants from both the US and Canada. These POCs will be technical leads (National Labs, site contractors, etc., as appropriate) and will be supplemented with the appropriate DOE and AECL International Programs specialists.
- Arrange, facilitate, and manage a series of conference call discussions and face-to-face meetings as necessary with each Working Group to set the scene on the Bilateral Agreement, the goals and objectives of this effort, to discuss the ideas for the way forward within that group and to get a top level view of what the topic is all about, its importance, its issues, as well as to try to identify any existing User Groups /Community of Practice/knowledge sharing that already take place.
- Following each call or meeting, a set of detailed minutes will be produced which document the discussions held and the actions arising.
- Having established the focal point of the Working Group's effort, a facilitation role will be maintained to drive progress towards the overall DOE/AECL goals of closer collaboration and cost avoidance through elimination of overlapping efforts. This will include arranging and setting up additional conference calls and meetings, keeping records, and issuing minutes from the various meetings as well as monitoring and managing ongoing exchanges and capturing any information exchange.

Task 3: Newsletter Production and Dissemination: To better disseminate results from the Exchange Agreement and the diversity of tasks being conducted within it, NuVision Engineering will prepare and issue a biannual newsletter for both electronic and hard copy dissemination across the DOE and AECL complex. The newsletter will be 4 pages maximum and will be based on the information gathered from the topic meetings, as well as general information gleaned from discussions with AECL and US DOE concerning collaborative efforts.

Summary

Brief Description of Specific Project(s): In February 2013, DOE EM and AECL signed a Statement of Intent (SOI) to enable information sharing on lessons learned and the development and application of new technologies and approaches to improve the safety, cost effectiveness, and schedule of EM and the Canadian Nuclear Legacy Liabilities Program. The SOI incorporates radioactive waste management,

decommissioning, and environmental restoration and has similar objectives to that signed by DOE and the UK Nuclear Decommissioning Authority (NDA) in March 2007, and which was subsequently renewed in March 2012.

NuVision Engineering has facilitated interactions and collaboration between DOE and UK NDA under the SOI since 2008 and has made significant progress in identifying areas of common interest and information exchange/lessons learned since that time in many aspects of DOE EM's activities including, but not limited to, plutonium management, aging facilities management, thermal treatment technologies, contracting approaches, and black cell plant operation. In each of the areas identified, a number of conference calls have been arranged and facilitated by NuVision Engineering involving key technical and managerial staff from DOE Headquarters, DOE Field Offices, UK NDA, UK contractors, DOE site contractors, and National Laboratories. These calls have been recorded, minuted, and the actions progressed. In addition, monthly progress discussions have been arranged and held with DOE HQ and UK NDA to discuss broader matters and plans. Also, a Quarterly Newsletter (*Across the Pond*) has been prepared and issued that has highlighted the activities and output from the information exchange discussions.

The work proposed in this project will repeat the successes described above on the SOI between AECL and DOE EM to identify and progress areas of joint interest between the organizations.

Timeline: July 1, 2013 – December 31, 2013