Decommissioning, Decontamination, and Reutilization Division of the American Nuclear Society
SPRING 2010 - Newsletter

MESSAGE FROM THE CHAIR – SUE AGGARWAL

I would like to thank all the DD&R members for giving me the opportunity to serve as the DD&R chair for the past year. I have thoroughly enjoyed serving as the DD&R chair. My special thanks to the officers and executive members of the committee for their continued support which I greatly appreciate. I would also like to congratulate and welcome all the new executive members.

The DD&R Division had a very successful year from June 2009- June 2010. Some of the Division's accomplishments are listed below:

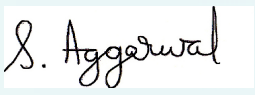
- Shared lessons learned from completed projects and projects currently underway in the technical area.
- Sponsored technical sessions during ANS National Meetings.
- Distributed a DD&R newsletter to all DD&R members.
- Supported the ANS Young Members Group.
- Provided support for students to attend the ANS Student Conference.
- Awarded both an undergraduate & graduate level scholarship.
- Gained new members.
- Participated with other International Professional Societies.
- Supported D&D Training Courses, Workshops and Continued Education Programs.
- Supported Non-Meeting Publications.

We also have our topical meeting in Idaho Falls, Idaho USA from August 29 to September 2, 2010 so please visit http://ddrtopical2010.org/ to get all the details and don't miss out on the early registration special. It is a wonderful way of exchanging and sharing information and knowledge about some of the exciting DD&R projects worldwide.

Please visit our website at http://ddrd.ans.org to find current information on activities of the DD&R Division as well as upcoming meetings. Also please encourage your friends and colleagues to become members of the DD&R Division. Membership details for joining the DDR Division can be found at the division's website: http://ddrd.ans.org . The newsletter is for members only and can be accessed by using "ddrd" as the user ID and "memberlogon" as the password.

Please continue to support DD&R and making it a successful Division. Contact me at saggarwal@nmnuclear.com or call (303) 984 5788 if you have any ideas or suggestions for the DD&R Division.

Sincerely,



Sue Aggarwal
DD&R Chair, 2009 – 2010

MESSAGE FROM THE VICE CHAIR – LARRY ZULL

During the DD&R Topical Meeting in Late August, I will assume the duties of DD&R Chair from Sue Aggarwal. I think Sue has done a fantastic job as DD&R President, and I will try and carry on the tradition. Sue recruited many new members during her tenure, and as Past Chair will be responsible for obtaining nominations for officer positions for the next election. If you are interested in being placed on the ballot for the position of member of the Executive Committee send an email to Sue at saggarwal@nmnuclear.com. I also hope that many of you will be able to attend the DD&R Topical Meeting, August 29-Sept 2, 2010, at the Shilo Inn in Idaho Falls, ID.

DD&R has had a gradual reduction in membership since about 2000 because decommissioning work in the U.S. has been decreasing. However, decommissioning work is picking up outside of the U.S, and our division has been actively recruiting new members from outside of the U.S. In the U.S., as well as the world as a whole, the emphasis is on building new nuclear power plants and license renewal that will extend the life of operating plants. However, the U.S. Department of Energy and several European countries are actively engaged in or planning decommissioning work. At the present time, there is a need for consensus standards that can be used to help plan and document decommissioning work.

During my year as Chair of the DD&R Division, I propose to establish a Standards Committee group to develop consensus standards for the decommissioning of nuclear facilities. I have recently been elected a member of the Nuclear Facilities Standards Committee, and believe this can help to start the development of decommissioning consensus standards. I hope that the leadership and membership of the division will support this activity. I will let you know in the next newsletter, and provide more details. I will also be asking for your help, and asking for volunteers to be members of the consensus standards team.

DD&R EXECUTIVE COMMITTEE – SUE AGGARWAL

I want to welcome our newly elected Officers and thank our returning Executive Committee members for serving on the committee. The officers and executive members for the Division from June 2010 to June 2011 are listed below.

OFFICERS 2010 - 2011		
Chair Dr. Lawrence M. Zull DNFSB 625 Indiana Avenue, NW Washington, DC 20004-2901 Phone: 202-694-7154 email: larryz@dnfsb.gov	**Vice Chair/Chair-Elect** John Bowen Mega-Tech Services 11118 Manor View Dr. Mechanicsville, VA 23116 Telephone: 804-789-1577 email: jbowen@mega-techservices.biz	**Secretary** Nadia Glucksberg HALEY & ALDRICH 75 Washington Avenue, Suite 203 Portland, Maine, 04101 Phone: 207.482.4623 nglucksberg@haleyaldrich.com
Treasurer Ms. Lisa Mullen email: lisakm23@gmail.com		

EXECUTIVE MEMBERS		
2011	**2012**	**2013**
Frazier Bronson Canberra Industries, Inc. 800 Research Pkwy Meriden, CT 06450 Phone: 203-238-2351 email: fbronson@canberra.com	Dennis Ferrigno CAF & Associates, LLC 6354 S Yates Ct Littleton, CO 80123 Phone: 303-794-6789 email: dennis.ferrigno@cafllco.com	Mark S. Campagna 1000 Mango Court Wilmington, NC 28409 Phone: 910-616-5077 e-mail: mark@hyperionpowergeneration.com
Andrea Hopkins Hanford Site 12515 Eagle Reach Ct. Pasco, WA 99301 Phone: 509-373-5395 email: andrea_m_hopkins@rl.gov	David Hillyer The Shaw Group 30A Stillman Rd. North Stonington, CT 06359 Phone: 617-589-1115 email: dave.hillyer@shawgrp.com	William A. Franz, Jr. LATA 67 Tanager Ct Chillicothe, OH 45601-1067 Phone: 740-897-2203 e-mail: bfranz@lpports.com
	Erhard Koehler Department of Transportation 1200 New Jersey Avenue SE Washington, DC 20590-0001 Phone: 202-366-2631 email: erhard.koehler@dot.gov	W. Randall Ridgway (Non-US) AECL Whiteshell Laboratories Pinawa MB R0E 1L0 CANADA Phone: 204-753-8424 x3006 e-mail: ridgwayr@aecl.ca

PROGRAMS – NADIA GLUCKSBERG

With the Annual Meeting approaching in June 2010 in San Diego, DD&R will host one session. During a year where we are proud to also host our topical meeting, we also received enough papers to support a full session at the Annual Meeting. We are excited that the following presentations will be given on Monday June 14th 2010 afternoon.

Session Title: Hot Topics and Emerging Issues

Chair: - Mark Price – SCE

Papers:-

Addressing Challenging Remote-Handled Deactivation and Decommissioning Wastes at ORNL by Bradley D. Patton, Robert T. Jubin, Sharon Robinson, Ken Schneider, Dirk Van Hoesen (ORNL)

Trenchless Technologies for Minimizing Impacts for Pipeline Replacements in Radioactive Environments by Sharon Robinson, Bradley D. Patton, Robert T. Jubin, Kathy P. Bugbee, Nicholas M. Sullivan (ORNL)

Dismantling Nuclear Facilities for Reutilization: An Illustration on Marcoule UP1 Site by Jean-Michel Chabeuf (AREVA NC)

Development of Computer Program for Estimating Decommissioning Cost by HakSoo Kim, TaeWon Hwang, YoungBu Choi (KHNP)

If you are attending the meeting in San Diego, please join us is supporting the authors and presenters.

DD&R 2010 TOPICAL MEETING – JIM BYRNE

The ANS Topical DD&R 2010 Meeting will be held in Idaho Falls, Idaho USA from August 29 to September 2, 2010. This meeting serves as a forum for the discussion of the social, regulatory, scientific, and technical aspects of decontamination, decommissioning, and reutilization, and waste management. The 2010 conference program will include commercial, government, and international project updates as well as present project management, technology, and regulatory developments in the areas of decommissioning, waste management, site closure and legacy management.

We have 115 papers from five continents. Papers will be presented in three tracks:

"Clearing the Way" – Project status reports
"Clearing the Way Made Easier" – Lessons Learned, Project management issues, regulations, and technologies
"After Clearing the Way" – Legacy management and site reuse after completion of Decommissioning Activities

In addition to a comprehensive technical program, there will be a Technology Expo, technical tours, and numerous fun activities and opportunities for attendees and guests. The **early registration special** deadline is July 29th 2010. The website for DD&R 2010 is http://ddrtopical2010.org/. For more information or any questions about the meeting please contact Jim Byrne at jbyrne4424@comcast.net.

DD&R WORKSHOPS – LARRY BOING

During the period March 22-25, a spring session of the "ANL Decommissioning Training Course" was conducted in sunny Las Vegas, Nevada at the beautiful Tuscany Suites Hotel & Casino. The 3-day classroom session was supplemented with a tour of the DOE/NNSA Nevada Test Site – focusing on D&D activities, radioactive waste management facilities / activities and other site historic attractions of note. This tour was especially interesting and contained an 'extra treat' – the explosive demolition of the concrete building structure of the Reactor Maintenance Assembly/Disassembly (R-MAD) facility from the nuclear rocket program of the 1960's in Area 25 of the NTS site. The structure was explosively demolished on the day of the site tour and the tour group got to witness first-hand the results of one concrete structure dismantling technology. The session had 36 total attendees – 7 foreign attendees including Canada, Slovakia and Lithuania and 29 US attendees. The US attendees included – power reactor operators, regulators, contractors and military personnel. A total of 6 speakers presented some 20 lectures on the steps of and various aspects of the decommissioning process. 3 of the 6 speakers were DD&R members.

Over the last 13 years, a total of nearly 1400 attendees from over 45 countries have attended one of our decommissioning training course sessions.

For more information about the course, venue and dates please visit www.dd.anl.gov/ddtraining

SCHOLARSHIP – FRAZIER BRONSON

The DD&R division this year awarded two scholarships of $3000 each. One of them is the endowed undergraduate scholarship that we award every year. The other is a graduate student scholarship of $3000 which is offered in those years that the financial situation of the Division allows. In addition to the money from the award, DD&R also reimburses the student to attend one or both of the ANS national meetings during the year of his award.

Each year, by February 1, the candidates apply for all ANS and Divisional scholarships using a standardized ANS form. The applications and supporting information is then distributed to the committee. Each committee member reviews all the information and scores each of the candidates to arrive at the consensus winner. This year we had 7 candidates for the undergraduate award and 5 candidates for the graduate award.

The Undergraduate DD&R scholarship awardee for 2010-2011 is Jacob Planinsek from Penn State University. He is majoring in Nuclear Engineering with a minor in Environmental Engineering. He will be entering his senior year with a 3.76/4.00 GPA.

The Graduate DD&R scholarship awardee for 2010-2011 is Jenny Martos from Rensselaer Polytechnic University. She will be receiving her BS in Nuclear Engineering from RPI this May, and will begin her graduate studies this fall at UC Berkeley in Nuclear Engineering.

We wish them both success in their studies and future careers.

BUDGET – SUE AGGARWAL

Below is a table of DD&R Divisions budget. Some of the Budget/Expenses will be paid in June/July.

Division Finances	**Budget 2010**	**Actual 3/31/2010**
Budget Funds		
Carry Forward from 2009	$ 31,369	$ 29,152
Member Allocation	$ 1,952	$ 1,952
Division Income		
Total Budget Funds	**$ 33,321**	**$ 31,104**
Budget Expenses		
Newsletter/website/communications	$ 3,000	$ 0
Awards and Plaques	$ 500	$ 0
National Meeting Costs	$ 1,000	$ 53
Scholarship / NEED Funding	$ 6,000	$ 0
Division Expenses	$ 200	$ 0
Student Support	$ 1,500	$ 0
Miscellaneous	$ 1,000	$ 0
Total Expenses	**$ 13,200**	**$ 53**
Excess of Budgeted Funds over Expenses	**$ 20,121**	**$ 31,051**

DD&R MEMBERSHIP UPDATE – SUE AGGARWAL

During the past 10 months (October through May 2010), the membership of the ANS DDR division has increased by 52 new members. A listing of these new members and their respective organizations is presented below. When convenient and as we deal with them, please welcome them to our Division. Thanks to everyone for their ongoing efforts to promote.

The DD&R Division provided a membership incentive at the beginning of 2010, during which the first 65 new members will receive a complimentary subscription to RadWaste Solutions magazine. Please encourage your colleagues and those working on projects in the nuclear decommissioning industry to join you in becoming a member of ANS and our DD&R Division.

BENEFITS OF DD&R MEMBERSHIP – SUE AGGARWAL

- Opportunities to network with leaders in the nuclear community.
- Access to our semi-annual DDR newsletter.
- Obtain ANS publications at member discount prices.
- Participate in planning for international topical meetings on the Decommissioning.
- Participate in peer-recognition awards unique to the field and which are presented for exceptional performance on DDR projects and for DDR area lifetime achievement.
- The first 60 new members receive a complimentary 1 year (4 issues) of Radwaste Solutions.

All new members are listed in the table below.

NAME	ORGANIZATION	DATE JOINED
Mr. Daniel D. Doenges	MISSOURI UNIVERSITY OF SCIENCE	10/13/2009
Mr. Frank A. Strantz	MISSOURI UNIVERSITY OF SCIENCE	10/13/2009
Mr. John W. Beagles	MISSOURI UNIVERSITY OF SCIENCE	10/19/2009
Mr. Joseph H. Rustick	VANDERBILT UNIVERSITY	10/20/2009
Dr. Dariush Adli	ADLI LAW GROUP PC	10/21/2009
Miss Junghyun Lee	KINAC	11/10/2009
Mrs. Heather N. Klebba	NUCLEAR FILTER TECHNOLOGY	11/23/2009
Mr. Kevin P. Schambach	BEACON GROUP, LLC	11/24/2009
Ms. Ruthanne G. Neely	UX CONSULTING COMPANY	11/25/2009
Mr. John W. Collins	IDAHO NATIONAL LABORATORY	12/1/2009
Mr. Kiyoshi Yamashita	IHI INC.	12/1/2009
Mr. Tim A. Groover, P.E.	WILEY	12/1/2009
Mr. Michael J. Cain	BECHTEL POWER CORP	12/1/2009
Dr. Jin Beak Park	KOREA RADIOACTIVE-WASTE MGMT.	12/1/2009
Mr. Shuichi Ohashi	ENERGY U.S.A. INC.	12/1/2009
Ms. Karen Meyer	NORTHROP GRUMMAN	12/1/2009
Miss Krista I. Kaiser	OREGON STATE UNIVERSITY	12/10/2009
Dr. Cornelius A. Swift	WESTINGHOUSE ELECTRIC CO.	12/29/2009
Miss Alexandra L. Niska-Burja	UNIVERSITY OF MICHIGAN	1/4/2010
Dr. Donald C. Booher	INNOVATIVE ENVIRONMENTAL TECHN	1/8/2010
Mr. Brant D. Campbell	IDAHO NATIONAL LABORATORY	1/8/2010

NAME	ORGANIZATION	DATE JOINED
Mr. Roger J. Alsop	JBS HEALTH PHYSICS PTY LTD	1/11/2010
Ms. Olga Beketova	COLLEGE OF THE CANYONS	1/19/2010
Mrs. Allison K. Wilding	SAIC	1/28/2010
Mr. John J. Girard	UNIVERSITY OF MASSACHUSETTS LO	1/28/2010
Mr. Patrick Sandlin	NUCLEAR FILTER TECHNOLOGY	1/29/2010
Mr. Greg Hunter, P.E.	PERFORMANCE CONTRACTING INC.	1/29/2010
Ms. Sunita Kumar	AREVA INDIA	2/1/2010
Mr. Travis S. Anderson	U.S. NAVAL NUCL POWER TRAINING	2/4/2010
Mr. Steven L. Stribling	UNIVERSITY OF TENNESSEE-KNOXVI	2/8/2010
Mr. Patrick Tracy	N/A	2/18/2010
Mr. Laurin R. Dodd, P.E.	BECHTEL	2/22/2010
Mr. William R. Rath	EXCELSIOR COLLEGE	2/22/2010
Mr. Robert B. Heamer	PILLSBURY WINTHROP SHAW PITTMA	2/24/2010
Mr. Christopher N. Dean	BECHTEL POWER CORP.	2/24/2010
Mr. Abraham G. Lin	UNIVERSITY OF MICHIGAN	2/25/2010
Mr. Neil A. O'Brien	OREGON STATE UNIVERSITY	2/25/2010
Mr. Richard Brady, P.E.	RICHARD BRADY & ASSOCIATES	2/26/2010
Mr. Eric L. Harvey	ERIN ENGINEERING	3/8/2010
Mr. Everett J. Chretien	PERFORMANCE STRATEGIES, INC.	3/9/2010
Mr. Zachary D. Whetstone	UNIVERSITY OF MICHIGAN	3/16/2010
Mr. Richard A. Meigs, P.E.	RJR ENGINEERING, P.C.	3/23/2010
Mr. Warren L. Harris	BECHTEL MARINE PROPULSION CORP	3/23/2010
Mr. Benjamin M. Gustafson	EXELON CORP.	3/30/2010
Mr. William L. Harrell	AIR FORCE INSTITUTE OF TECHNOL	3/31/2010
Mr. William D. Stephens, PMP, P.E.	AREVA FEDERAL SERVICES, LLC	4/5/2010
Mr. Ted Grochowski, Jr.	ROBATEL TECHNOLOGIES LLC	4/8/2010
Mr. Michael A. Zurlo	ABSOLUTE CONSULTING, INC.	4/14/2010
Mr. Michael M. Kane	OHIO STATE UNIVERSITY	4/16/2010
Mr. Joseph A. Seeman	OHIO STATE UNIVERSITY	4/16/2010
Mr. Kyaw S. Win	CITY COLLEGE OF NEW YORK	4/16/2010
Mr. Michael MacDonald, P.E.	ATOMIC ENERGY OF CANADA LTD.	4/27/2010

REMOVING RISKS AND ACCELERATING CLEAN-UP TO SUPPORT A NEW VISION FOR PADUCAH (Reprint from Waste Management, 2010, Phoenix, Arizona)

Reinhard Knerr, DOE Site Lead, Paducah Gaseous Diffusion Plant
William Murphie, DOE PPPO Manager
Dennis Ferrigno, Site Manager, Paducah Remediation Services, LLC

In the early 1950s, the Atomic Energy Commission selected a former World War II munitions plant in western Kentucky as the future home of the nation's second of three planned uranium enrichment plants. Construction began in 1951 and in 1952 the first operating cells of a new gaseous diffusion plant went on line at the approximately 3,500-acre site west of Paducah, KY.

The construction of the plant created an enormous economic boom in the region. It is hard to comprehend today the size of that economic expansion. The population of the area soared as more than 20,000 construction workers came to the area to build the enrichment plant and the two large coal-fired plants needed to provide electricity for the enrichment cascades. A uranium hexafluoride (UF_6) manufacturing plant was built across the Ohio River in Metropolis, IL.

School enrollment more than doubled. Retail sales increased more than 200 percent and local building permits doubled. The plant created a boomtown environment and continued to provide thousands of higher-paying jobs, even after construction was completed.

Employment at the site today remains at more than 2,000 people as the nation's last uranium enrichment plant continues operation while environmental restoration and facility demolition occurs. The site's tenants are comprised of the following organizations:

- DOE Paducah Site Office and its support contractor, Performance Results Corporation (PRC)—Forty personnel responsible for contract management and operations oversight;
- Paducah Remediation Services, LLC (PRS)—A small business whose 800-plus personnel are responsible for the site's environmental restoration, waste management, and Decontamination and Demolition (D&D)activities;
- Uranium Disposition Services, LLC (UDS)—Its 150 personnel are responsible for commissioning a newly constructed CAT 2 nuclear facility to convert over 36,000 14-ton depleted UF_6 (DUF_6) cylinders into uranium oxides;
- Swift and Staley Mechanical Contractor (SST)—A local small business whose 85 personnel are responsible for site safeguards and infrastructure activities; and
- United States Enrichment Corporation (USEC)—A private company with 1,100 personnel that leases and operate the site's enrichment facilities under NRC oversight.

The DOE Portsmouth/Paducah Project Office (PPPO), located in Lexington, KY, provides senior management and oversight for activities at the Paducah Gaseous Diffusion Plant, as well as its sister facility, the Portsmouth Gaseous Diffusion Plant.

Eventually, the Paducah Gaseous Diffusion Plant, the last vestige of the industrial complex that enriched uranium for our national defense, will close as newer, more efficient facilities come online elsewhere in the

country. Currently, DOE and its contractors share the site with USEC, a private company that leases and operates the site's enrichment facilities under NRC oversight, while DOE's contractors complete the remediation of over more than 40 years of government enrichment operations.

Preparing for the Future

The DOE with its contractors are accelerating clean-up to prepare the site for transfer and ultimate redevelopment. DOE's ongoing remediation project is making it possible for the local community to create a new vision for Paducah and to create a sustainable enterprise in Western Kentucky; it's about jobs and enterprise.

What that future is, DOE cannot say. However, that future is being determined by the local community with the support of DOE and its contractors, even though environmental remediation activities are expected to continue into the next decade. The community has stated that it wants to take advantage of several key resources:

- There are more than 2,000 nuclear trained workers at the site who have won national recognition for their safety and production records.
- The facility has site infrastructure to support transmission of more than 3,000 megawatts of power.
- The site has road and rail access, a near-by airport, and river access sufficient to support major industries.
- The site is within 1 mile of the main artery of the Ohio River.
- The region is centrally located to the mid–USA, with quick access to three additional states.
- The area is an industrialized area that embraces new industry and industrial development.

On-Going Cleanup Actions

DOE has been working to remove environmental risks created by past operations at the site since the first off-site contamination was discovered in 1988. The department has made significant progress in protecting the public and removing contaminants from the environment. The speed of this progress began to accelerate in 2004 with the resolution of long-standing regulatory issues and kicked into an even higher gear in 2009 with the passage of the American Recovery and Reinvestment Act (ARRA).

Some of the significant projects underway now include these:

- Early this year (2010) DOE completed acceptance construction and is proceeding in acceptance testing and cold system check-out for the C-400 Electrical Resistance Heating (ERH) project. We began operating the first phase of this groundwater treatment system to remove an estimated 75,000 gallons of dense nonaqueous-phase liquid (DNAPL) trichloroethylene (TCE), an industrial degreaser, from up to 100 feet below the surface. The second phase will go on line later this year, incorporating lessons learned from phase one operations, and will operate into 2011 until project goals for removing TCE have been achieved. This project will significantly reduce contaminant volume at the largest single source of what are the DOE complex's largest off-site groundwater contamination plumes.
- In late 2009, ARRA provided the site with $78.8 million in additional funds to complete the D&D of two large uranium chemical and metallurgy processing facilities and one contaminated nickel smelting facility that have been inactive since the mid-1970s anywhere from one to 22 years ahead of schedule. These facilities consist of approximately 300,000 square feet of floor space and are contaminated with radionuclides, chemical hazards, and beryllium.

- Within the next 12–18 months, DOE expects to make remedial action plans for old burial grounds that contain radioactive, hazardous, and pyrophoric material. The Paducah Site has more than 60 acres of old burial grounds and remediating these sites could cost more than $400 million, making it the largest single project yet undertaken at Paducah.
- Within that same time frame, DOE will make a remedial decision about what to do with the waste materials generated by ongoing and future clean-up activities. We are nearing completion of a feasibility study that is evaluating off- and on-site disposal alternatives. Future remedial and D&D projects at Paducah will generate enough waste material to fill a waste cell approximately 40 acres in size.
- Some facts about the Paducah Project:

  — Safety is paramount; progress continues to be made toward the goal of zero accidents/zero incidents
  — DOE contractor PRS hired over 200 new craft and technicians with little or no experience at DOE facilities as a result of ARRA funding; a 33 percent increase in staffing for PRS. As a result, PRS has implemented aggressive new training programs, increased safety and health oversight, and implemented more proactive communication protocols pertaining to worker protection activities.
  — By June 30, the site will remove and ship approximately 1 million cubic feet of waste to its on-site Subtitle D landfill, which has established Authorized Limits that allow trace levels of radiological contaminants, and to permitted off-site disposal facilities.
  — The site predominantly employs a unit train approach for its rail shipments that is similar to the coal trains you see on the rail system today. A mixture of between 30 and 55 high-sided and low-sided gondolas are used in a single unit train to ship wastes that range from contaminated soils and sediments to debris, equipment, and rubble. These compliant rail shipments currently go to Utah and trucks are used to ship wastes to Nevada as dictated by waste acceptance criteria.
  — Buildings that have potential uranium, beryllium, hazardous chemicals [e.g., hydrogen fluoride (HF)] are being demolished and will be off-site this calendar year as a result of ARRA funding. This represents a 1- to 22-year acceleration in clean-up and risk reduction at the site.
  — Large volumes of contaminated soils and materials (over 16,000 yards) are being removed in a matter of weeks, not years.
  — The site is working closely with its regulators to complete and approve all regulatory documentation within a six-month period to allow removal of one of the site's burial grounds, SWMU 4, which is believed to be the primary source of one of the site's three dissolved-phase groundwater plumes (Southwest Plume). In parallel, long-lead time procurements and development of contractor procedures are underway. The start of SWMU 4 excavation represents an acceleration of approximately two years and will set site records for both the volume of material excavated and the complexity of the excavation. This will all occur within FY 2010.
  — The site installed more than 70 new monitoring wells in the last few months in preparation for remediation of its three contaminated groundwater dissolved-phase plumes and optimizing operation of one of its groundwater pump-and-treat facilities. The data collected from these wells are critical to determining effectiveness of over 15 years of ground water pump-and-treat operations, confirming the location of the dissolved-phase plumes' leading edges, determining whether plume migration has occurred, and to validate groundwater modeling. Thirty-six wells were installed and operable within six weeks, a site record in itself.

Each of these projects illustrates how DOE is driving the timely clean-up of the site and preparing the site for a new vision for Paducah, but this paper will focus on how one of those projects, the ARRA-funded D&D work, as an example of how our goal is being accomplished.

Paducah Has Special Challenges

(1) First, Paducah is one of the smaller DOE site, with a small business as the prime contractor. We have a historical environmental remediation workforce of approximately 400–425 people. Adding just 200 people, which at the larger environmental remediation sites, such as Hanford, Idaho, Savannah River or Oak Ridge, would be almost unnoticed, was a significant event for us. In addition, we face a challenge unique in the DOE complex—we conduct environmental remediation operations in the middle of an operating nuclear facility run by a private corporation that is regulated by the NRC. As a result, this shared site requires significant communication and interfaces to minimize impacts to safety and mission.

(2) Our work must be carried out without affecting operations of USEC. The industrial area of the plant consists of approximately 700 acres, more than 15 percent of which is under roof. The plant utilities are leased to USEC, but are used by DOE and USEC operations. Although similar to many DOE sites, various utilities, such as power and steam, may be routed through multiple facilities/areas. As some facilities/grounds are leased to USEC and other retained by DOE, careful coordination and planning is required to avoid negatively impacting the other organizations operations. As a result, some environmental remediation activities have been deferred to post plant closure because to do it today would hamper plant operations. Given the size of the industrial area and the number of companies and personnel performing work, it makes for a very busy site, with lots of pedestrian and vehicle traffic that we must work around. This not only includes golf carts, bicycles, and small trucks, but trains, semis, and cylinder haulers that move 14-ton cylinders of UF_6 from one part of the plant to another. When one of those is on the move, not much else can move.

Paducah American Recovery and Reinvestment Act of 2009 Work Scope

The American Recovery and Reinvestment Act of 2009 (ARRA) funds are being used, in conjunction with base funding, to complete the D&D of three facilities at the Paducah site—the C-410 Complex, the C-340 Complex, and the C-746-A East End Smelter, two large uranium chemical and metallurgy processing facilities and one contaminated nickel smelting facility that have been inactive since the mid-1970s. These facilities consist of approximately 300,000 square feet of floor space and are contaminated with radionuclides, chemical hazards, and beryllium.

One of the three facilities PRS now is demolishing, the C-410 Complex, is located right in the middle of the plant, in fairly close quarters with critical operating facilities. The C-410 Complex comprises several attached or closely located facilities that consist of more than 200,000 ft^2 of floor space.

The Green Salt Plant, the seven-story western portion of the building, is where uranium oxides were reacted with HF to make UF_4. Uranium oxides processed in the Green Salt Plant included both naturally occurring uranium ore, and spent reactor fuel that had been that had been reprocessed from Hanford and Savannah River Sites, or “reactor returns”. The reactor returns were processed in the C-410 complex between 1953 to 1964 and between 1968 to 1977. As a result of the reactor return processing, the C-410 Complex became contaminated with transuranic elements such as neptunium, plutonium, thorium, and americium, as well as fission products such as technetium-99.

The Feed Plant, located in the center of the complex, consists of a large one-story structure that contains basements and mezzanines where UF_4 was combined with fluorine to make UF_6 and where equipment was used to trap UF_6 and drain it into cylinders for transport to the cascades for enrichment.

The Far East end of the building, also a one-story structure, was the old Fluorine Plant, where fluorine was generated. Fluorine was generated by electrolysis of a salt mixture of hydrogen fluoride, potassium bifluoride, and lithium fluoride in fluorine generating cells. The fluorine generating cells have been removed from the facility, decontaminated, and either transferred to other government agencies or private industries for reuse.

The C-746-A East End Smelter is a multi-story building with a high bay covering about 20,000 ft^2 of floor space. The main structure is a 1950s-era metal warehouse, but in the mid-1970s the height of the building was increased and the roof extended in order to allow the installation and operation of a large smelter in the facility. The room-sized smelter was a coreless electric induction furnace. It operated until 1986 making ingots, primarily nickel. Nearly 10,000 tons of nickel ingots are stored to the north of the smelter.

The C-340 Complex is where DUF_6 was converted into other forms of uranium for use elsewhere in the DOE weapons complex. Consisting of three adjacent multistoried facilities and two ancillary facilities, the C-340 Complex contains approximately 65,000 ft^2 of floor space. At the northern end of the complex, C-340-A is the seven-story chemical reactor tower where UF_6 was converted to UF_4 and HF recovered for reusein the C-410 Complex for fluorine production. In C-340-B, the one-story central portion of the complex, UF_4 was converted to uranium metal in a foundry-type operation. C-340-C, located at the southern end of the complex, is the four-story Slag Plant, where magnesium fluoride was recovered from the UF_4 conversion operations and processed for reuse.

Our current accelerated schedule is to demolish the East End Smelter to slab this summer, begin demolition of the C-340 Complex by January, 2010, and begin demolition of the C-410 Complex by Spring of 2011. This schedule is aggressive and more than nine months ahead of the approved September 2011 ARRA completion milestone dates.

While all three of the buildings are structurally sound, a lot of precursory work was needed to get inside and begin preparation for demolition. For example, all three of the buildings contain radiologically contaminated miscellaneous debris and trash that had to be sorted, characterized, and disposed of before our asbestos abatement and decontamination crews could get to work. Although the operations in these facilities were shutdown in a controlled manner, this consisted of running the operations until all of the product material was withdrawn. However, very few systems were purged, and in some cases, contain large quantities of hold-up, including radioactive materials and contaminants. In some cases, infrastructure has decayed or was no long functional, which meant we had to do things such as elevator repairs or provide a new power supply for a building where a water leak had destroyed the internal power system.

The presence of the fission products and the transuranic materials complicates the decontamination and decommissioning of the C-410 Complex, and to a lesser extent, at the C-340 Complex, since these materials present greater hazard to the workers than uranium. At C-340, the foundry type operations not only created a very dusty and dirty work environment, resulting in widespread uranium contamination throughout the building, but also created a chemical form of the uranium which is highly breathable. As a result, extensive use of personal protective equipment, most specifically respiratory protection, is necessary during the decontamination activities. Additionally, extensive engineering controls, primarily the vacuuming of surfaces to remove contamination and the widespread application of fixatives to seal surfaces are being implemented to control airborne contamination.

Half body monitors have been installed at primary exit points from the buildings to allow workers to be monitored when leaving, to ensure no radioactive contamination is carried out with them. The key exit points, or “boundary control stations, also have been equipped with “downdraft tables” (similar to an air hockey

table, but with air being pulled down into the table, rather than being blown out) for surveying tools and equipment when they come out of the buildings. These tables capture any radiological contaminants or particles that might be on the equipment or tools and trap it in filters, to prevent the contamination from getting out of the buildings.

In addition to working with aging infrastructure, ongoing enrichment plant operations provide challenges. The C-410 Complex is surrounded by operating USEC facilities. For example, on the eastern side of C-410 there is a piping system or "tie line" that transfers uranium hexafluoride from one operating USEC building to another. This tie line requires monitoring for an accidental criticality, and a system to notify workers if a criticality were to occur. Even though a criticality accident is extremely unlikely to ever occur, DOE Contractors installed and operate a portable criticality accident alarm system, or PCAAS in a part of the C-410 Complex to ensure workers will be warned if a criticality accident were to occur in the adjacent facilities.

The C-340 Complex is also located near operating USEC facilities. The C-340 Complex is bounded to the north and south by two of the four large electrical switchyards that provide electrical power to the electricity intensive gaseous diffusion plant. The demolition will have to avoid impacts to the operation of the switchyard, e.g. avoid extensive dust generation, etc.

Shortly after the ARRA funds were received, it was determined that it would be possible to further accelerate the work, accelerating the schedule from a September 2011 completion to a 2010 completion. We are aggressively attacking the schedule to accomplish that goal. Getting there requires a major effort, including:

Support Staff—Adding the number of personnel required to complete ARRA work on schedule required PRS to add staff in all support areas, such as human resources, procurement, engineering, payroll, and training. In addition, we brought in more people in safety, training, and other support services. This enhancement of capabilities had to be accomplished simultaneously with growing the workforce by more than 220 craft and professionals. It was a tremendous challenge for a small company; it was accomplished successfully. Today, we have a team of just over 700 people working on the Paducah remediation project.

Field Crews—As originally envisioned, PRS would hire about 150 people. To meet the accelerated completion schedule, that number would nearly double. To obtain enough applicants for the positions, PRS conducted a series of Job Fairs throughout the area. Four jobs fairs were held, two in Paducah, one in neighboring Illinois, and one in another Kentucky country. Backed by an aggressive advertising campaign and online applications, PRS received more than 5,000 job applications by the time the last fair was over.

Training—Most of the new people we hired had no background in working at a nuclear facility. While they were trained and skilled mechanics, electricians, heavy equipment operators, or other skilled craftspeople, they had never worked in a place where they had to protect themselves against chemical and radiation hazards in order to do their jobs. To train these people to work safely in a hazardous environment, PRS opened a new training center to move our new hires through training in an expedited manner. We partnered with the West Kentucky Community and Technical College to provide hands-on training for these new workers. Working with PRS, the college created a program for our workers to learn how to setup and operate plasma arc cutting torches. Workers received college credit for the training classes.

Facilities—Adding hundreds of new workers in a short time frame put considerable strain on our facilities. In the office environment, we were able to double up in many offices, including the management staff. But in the field, we lacked offices, break rooms, changing rooms, and other facilities to house well over 200 new workers. Before work could begin, we had to plan and build 30,000 ft^2 of new facilities on the plant site. A

local HUBZone certified contractor was hired to install the new facilities, providing additional jobs to the regional economy.

Safety—Deploying new workers in the field meant the development of work packages and safety plans. Detailed operating plans, procedures, and necessary regulatory documents had to be developed in order to move the new work crews into the C-410 Complex, C-340 Complex, and the C-746-A East End Smelter. Enhanced safety programs, additional manpower for health and safety and radiation control divisions was needed as well. In the case of the East End Smelter, these plans included developing a beryllium program. We were not sure until we began planning for the demolition of this long-closed facility that the structure is contaminated throughout with beryllium. During the 1970s and 1980s, the Paducah plant performed work for other federal facilities, which introduced contaminants such as beryllium onto the site. Crews are working under additional control and decontamination measures to prevent exposure to beryllium. It is making work take longer than in other facilities without this potential hazard.

Waste Disposition—With increased production made possible by having more hands on the job, PRS needed a plan for disposing of more waste. Working with its subcontractor, Energy*Solutions*, a plan was developed and implemented to allow waste materials to be removed, packaged, and dispositioned safely and more quickly. As mentioned earlier, each of these facilities was filled with loose materials and debris in addition to the equipment you would expect to find after 30 years of being a convenient place to store something you just might need later. In all, the removal of internal wastes, equipment and infrastructure, and the structures themselves will generate more than one million ft^3 of waste for disposal. Some of this will be disposed of on-site, the rest will be shipped off-site commercial or DOE disposal facilities.

Security—Since the PGDP is an operating enrichment plant, there are not only national security issues, but also export control and operational security issues, making security a critical item to be resolved. Getting hundreds of new workers cleared in a short-time for what are short-term jobs was neither cost-effective nor likely. This meant developing a way for more than 100 uncleared workers to work in a secure facility had to be developed. We have paired uncleared workers with cleared workers who also serve as escorts, which meets not only security requirements, but enhances safety by teaming new workers with one of our experienced hands. Accomplishing this has been a challenge because of a number of factors. For example, the C-410 Complex is a sprawling structure with numerous exits to control. Also, as we sort through the material inside, the potential for finding classified or export controlled items must be managed properly. When you are working with uncleared workers in large numbers, something as simple as a bathroom break can become an issue.

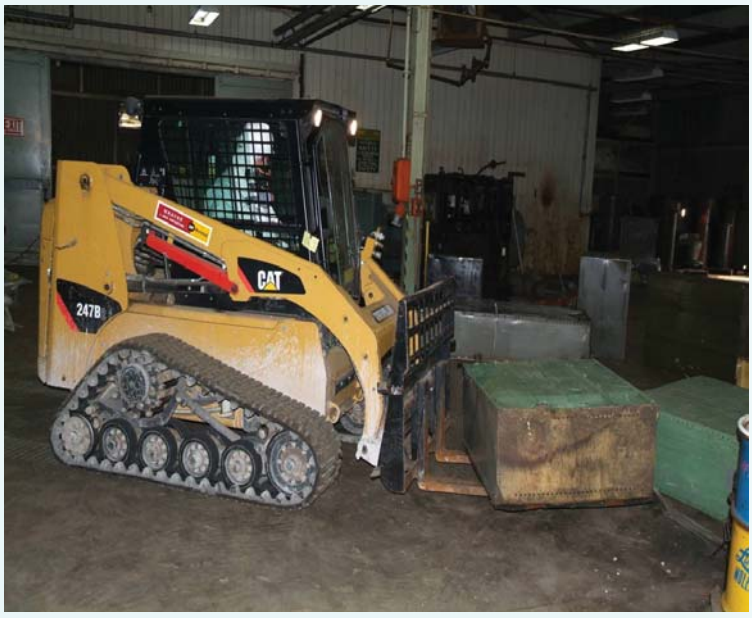
Summary

DOE and its site contractors have overcome the initial challenges and we expect that in just over a year we will complete work that had been scheduled to take much longer. This effort to move Paducah toward its future vision is important as well as sustainable for future cleanup activities, paving the way for economic redevelopment and the ultimate expansion of private sector industrialization at the site.

C-340 asbestos removal

Workers use glovebags to remove asbestos inside the C-340 Metals Plant at the Paducah Gaseous Diffusion Plant. Asbestos must be removed before the building is demolished. The demolition is funded by the American Recovery and Reinvestment Act of 2009.

A worker uses a forklift to help remove debris inside the C-340 Metals Plant at the Paducah Gaseous Diffusion Plant. The debris had to be removed prior to workers starting on the ARRA-funded demolition of the structure.



Two newly hired Paducah Remediation Services workers practice welding in a class developed in cooperation with the West Kentucky Community and Technical College.
The students are among more than 200 people hired to work on ARRA-funded D&D projects at the Paducah Gaseous Diffusion Plant.

SIMPLE TECHNOLOGIES FOR THE DECOMMISSIONING OF SMALL NUCLEAR FACILITIES: A WORLDWIDE OVERVIEW – MICHELE LARAIA (IAEA)

The implementation of decommissioning involves a wide range of activities, such as characterization, decontamination, dismantling, the handling of radioactive and other hazardous waste and site remediation. Each of these operations is specialized in nature and needs a variety of technological solutions. Decommissioning technologies are now extensively developed following a formative period starting in the 1980s, during which both new techniques and adaptations of existing technologies (from the nuclear sector and elsewhere) were explored for application in the nuclear decommissioning field, for size reduction purposes, waste handling, etc. The associated development programmes were costly in terms of time and money. The general consensus is that effective technology now exists for most decommissioning activities and is in wide use. Reviews are available of the selection of technologies for application to decommissioning problems in a systematic way [1].

However, there can be a tendency to select the most technologically advanced solution to a decommissioning problem, whereas the reality is often that simple technology solutions are more effective, both in cost terms and efficiency of deployment when due attention is paid to work planning, safety and management. Creating or perfecting a simpler solution will invariably be more cost effective than money spent on the 'high-tech solution'. The use of complex and expensive solutions should only be considered when absolutely necessary e.g. where high radiation environments dictate.

Selecting appropriate technology can be difficult in the absence of a developed nuclear infrastructure and with other resource limitations. A basic question needs to be answered in the technology selection process - should the commercial market be searched and equipment selected or should an 'in-house' solution be adopted? There are pros and cons for both approaches and the various competing factors need to be assessed before a decision can be made. For example:

- What has the pre-decommissioning characterization survey revealed?
- Can existing equipment be adapted cost effectively?
- Does the commercial technology have a proven track record in the particular application selected? (***after talking to the vendors, check with the users***)

The trade-off between the various factors should be examined and a pragmatic choice arrived at. While there may be an obvious best choice solution, experience suggests that a balanced approach is more generally adopted involving a trade-off between the various factors. In the end a judgement has to be made as to whether the preferred technology is optimum for the specific features of the facility and the available resources, noting all relevant factors above. Ref [2] is an international overview of national experiences in selecting decommissioning technologies.

Substantial R&D should not be required to support the decommissioning of research reactors and other small facilities unless unique issues apply requiring specific technical solutions. Technological solutions are available from the international market, albeit at a price. High costs, commercial or licensing issues and the need for specialist knowledge may make equipment and techniques difficult or impossible to acquire and use. Hence, continued use of operational phase equipment, or homemade developments using readily available non-nuclear equipment or tools that can be easily manufactured in a local workshop all offer cost effective approaches. Figs 1-2 show low-cost cutting tools and concrete drilling equipment that were effectively used at nuclear decommissioning projects. Existing facility cranes will often provide the necessary lifting and

deployment capability for specialist tooling to be deployed inside a reactor vessel. Existing ventilation plant may also be utilized to the support tenting or modular containments required to service decommissioning. Existing plant and services that support future decommissioning should be identified at reactor shutdown and maintained in a fit state for future use.

Simple, inexpensive and locally available technologies can also allow advantage to be taken of local labor costs, as opposed to States where automatic technology is used to avoid high labor costs. The adaptation of technologies from other industries (e.g. civil construction, military etc) for use in decommissioning activities has been successfully applied on several projects. For States with single facilities, the resources and infrastructure for sophisticated decommissioning technology development are unlikely to be available or warranted.

Semi-remote methods often offer a safe but cheaper, quicker and more appropriate option than fully remote operations. Long handled reaches with simple end effectors may have been routinely used in operations and can be readily adapted for both size reduction and handling operations when supported by closed circuit television for viewing of the work area. The use of manual or semi-remote technologies is generally sufficient in deferment strategies where sufficient time has elapsed to enable the key radio-nuclides to decay to manageable levels. In contrast, immediate dismantling may rely more heavily on remote technology, due to the much higher radiation fields present.

Dismantling procedures should be practised wherever possible using test pieces and mock-ups that mimic the components being dismantled and to test the equipment being used. By using such rehearsal training methods it is possible to optimize deployment methods, thereby minimizing working times in radiation fields and developing a better understanding of the failure modes of equipment prior to active deployment. Fig 3 shows a detail of Georgia's IRT reactor mock-up, intended to simulate entombment.

Finally, one recent case is reported below. The £1.99 ($ 3.00) household product Cillit Bang (known as Easy-Off Bang in some parts of the world) is being effectively used to help clean plutonium stains at the defunct Dounreay nuclear plant in Scotland. A different domestic product has already been applied in the cleaning of contaminated glass tubes.

The normal decontamination agents the team used needed time to dry and this slowed down the decommissioning. The acids that had been used years ago also created problems [3].

References

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Research Reactors and Other Small Facilities by Making Optimal Use of Available Resources, Technical Reports Series No. 463, IAEA, Vienna, 2008.

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Innovative and Adaptive technologies in Decommissioning of Nuclear Facilities, Final Report of a Coordinated Research Project 2004-2008, IAEA-TECDOC-1602, IAEA, Vienna (2008).

[3] BBC NEWS, House Cleaner in Nuclear Cleanup
http://news.bbc.co.uk/2/hi/uk_news/scothand/highlands_and_islands/8217772.stm

Fig 1 Core drilling tools at ASTRA reactor decommissioning project, Seibersdorf, Austria

Fig 2 Handheld mechanical cutting equipment for small contaminated pipes, BR-3 decommissioning project, Mol, Belgium

Fig 3 Mock-up of Georgia's reactor to simulate entombment

ROBOTIC ARM TO SPEED HANFORD TANK WASTE REMOVAL – US DOE HANFORD

Hanford, Washington – Testing is under way at Hanford on a new piece of equipment that, for the first time, will give tank operations personnel a single tool that will remove waste from Hanford's aging single-shell tanks. The device, known as the Mobile Arm Retrieval System (MARS), is a telescoping, robotic arm with a pump on a central mast, and a system of high-pressure water nozzles at the end of an arm that can hydraulically "rake" the waste to the pump.

Retrieval of waste from the single-shell tanks and moving it to safer double-shell storage is a primary focus of Washington River Protection Solutions (WRPS), a prime contractor to the Department of Energy's (DOE) Office of River Protection (ORP). WRPS is charged with reducing the risk to the environment posed by Hanford's 53,000,000 gallons of radioactive and chemical waste. The waste is stored in 177 underground tanks, many of which date back to World War II.

"The MARS will allow us to more efficiently and effectively retrieve the hard heeled waste from the tanks using one tool, rather than several," said DOE ORP Assistant Manager for Tank Farms Stacy Charboneau.

"We've demonstrated that MARS can effectively reach and clean not only the tank floor but the tank wall and is capable of using its elbow-joint movement, plus its multi-axle wrist movement to reach around obstacles. This means we can complete the bulk waste removal and perform the residual waste cleanup necessary to meet or exceed the retrieval goals of the Tri-Party Agreement," said Scott Saunders, WRPS Retrieval Technology and Systems Planning manager.

Depending on the type of waste, MARS can remove waste at rates from 85 gallons per hour up to nearly 1000 gallons per hour and anywhere in between. MARS was tested with materials that simulate the various waste forms in Hanford's tank. These include damp sludges, a hard concrete-like layer and even simulants resembling gravel. "In every case MARS has met or exceeded expectations," Saunders said.

When installed in a tank, MARS will be controlled by an operator using joy sticks, switches, and pushbutton controls. Three remotely controlled television cameras provide the operator a real-time view of the interior of a tank as well as the MARS equipment as it operates. Using the view from the cameras the operator controls the arm and the flow of the sluicing liquids. MARS is capable of using both water and liquid waste, depending on circumstances. The use of liquid waste to mobilize the solids is preferable because it does not add to the existing waste volume already in storage. Outside of the tank there will be a variety of hoses, valves, pumps, motors and tanks.

The first tank to be cleaned out using MARS will be tank C-107, with waste removal scheduled to begin in early 2011. MARS will be lowered through a 42" riser. To install the riser, workers will cut a 54" hole in the tank. The entire weight of the MARS assembly will be carried by the soil above the dome and no part of MARS will rest on the tank floor.

MARS was designed for WRPS by Columbia Energy and Environmental Services of Richland and fabricated in the Highline Engineering Company facility at the Richland airport.

A telescoping robotic arm with a pump on a central mast and a system of high-pressure water nozzles at the end of an arm can hydraulically “rake” the waste to the pump.