ENVIRONMENTAL-NUCLEAR TECHNOLOGY ACTIVITIES AT ARGONNE NATIONAL LABORATORY – WEST

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ABSTRACT

Argonne National Laboratory-West (ANL-W) has a full suite of nuclear facilities including two large hot cell facilities, analytical chemistry laboratory, sodium processing facilities, two operating reactors, electron microscopy laboratory and various support facilities. ANL-W is located on the Idaho National Engineering and Environmental Laboratory, but is operated by University of Chicago under the Department of Energy Chicago Operations office. Although the primary funding source is from the Office of Nuclear Energy, Science and Technology, many of the programs are focused on solving waste management problems. The Spent Fuel Treatment project is treating sodium-bonded spent nuclear fuel and recovering uranium for interim storage. The fission products and transuranic elements from this fuel are being incorporated into two high level waste forms: a metal waste and glass bonded ceramic. This project includes treatment operations, process implementation, remote equipment design, and waste form qualification. These activities involve all aspects of waste management and new technology application.

The second large ANL-W project involving DOE-NE is the Plant Closure Project which involves the processing of a large quantity of elemental sodium coolant and the placing of the Experimental Breeder Reactor-II (EBR-II) into a industrially and radiologically safe condition. The sodium process has been developed and implemented at ANL-W and has been processing sodium for the past eighteen months. The EBR-II work involves deactivating systems and removing hazards so that minimum surveillance will be required until the reactor is decommissioned.

In addition to these large projects, ANL-W is using its unique suite of facilities to address waste management problems throughout the DOE complex. Various waste process operations are preparing many different streams for disposal including visual examination of WIPP wastes, gas generation experiments, phytoremediation of soils, solidification of hazardous liquids and sludges, characterization of greater than class C wastes and immobilization of HEPA filters. New non-destructive examination methods are also being developed and tested in support of spent fuel and waste characterization requirements. All of these activities are possible because of the existing infrastructure that enables the ANL-W site to handle large quantities of transuranics and high activity radioactive materials in a safe manner while implementing new and innovative technologies.

INTRODUCTION

Argonne National Laboratory (ANL) first established research and demonstration facilities in Idaho in 1950. ANL's Idaho presence has supported the country's emerging advanced nuclear reactor research programs. The first reactor demonstration project for the newly created ANL-W was the Experimental Breeder Reactor – I (EBR-I), the world's first nuclear reactor to produce electricity. EBR-I first reached criticality in 1951 and was shutdown in 1963. Also in 1963, EBR-II achieved its first "wet" criticality with routine operations commencing in 1964 at the present ANL-W location. EBR-II operated as an irradiation test facility and as the centerpiece of the Integral Fast Reactor (IFR) program until its shutdown in September 1994.

To support the reactor development programs, ANL constructed a suite of support facilities (Figure 1) that are still in operation today. These facilities include remote analytical chemistry laboratories (AL), the Transient Reactor Test Facility (TREAT) reactor for transient tests of nuclear fuels, inert atmosphere hot-cells including those at the Hot Fuel Examination Facility (HFEF) and Fuel Conditioning Facility (FCF), Sodium Processing Facility (SPF), Electron Microscopy Laboratory (EML), Radioactive Scrap and Waste Facility (RSWF), and others. Although originally constructed to support energy research and demonstration programs, these facilities have become useful for a variety of other important programs involving radioactive material handling and processing. Today, ANL-W is involved in a variety of environmental-nuclear technology projects including spent nuclear fuel treatment, transuranic waste characterization, radioactive material stabilization, facility decontamination and decommissioning, environmental remediation, waste form development and testing, and environmental chemistry process development, to name a few.

Fig. 1. Argonne National Laboratory-West

We present a summary of environmental-nuclear technology projects underway at ANL-W. The largest of these programs, the EBR-II spent nuclear fuel treatment program and the EBR-II plant closure project, will be the focus of the majority of ANL-W facility operations resources through FY02, with the spent fuel treatment project extending through FY10. The activities associated with these projects are described in some detail. Also, a summary of waste management activities, including those in direct support of Idaho National Engineering and Environmental Laboratory (INEEL) waste management and environmental technology programs is discussed including the status of the planned Remote Treatment Facility (RTF). This facility will be constructed and operated to receive, characterize, stabilize and package remote handled wastes located at ANL-W for shipment from Idaho.

SPENT FUEL TREATMENT

Within the Department of Energy (DOE) complex, there is a quantity of spent nuclear fuel containing elemental sodium that was used within the fuel elements to provide a thermal bond between the fuel matrix and the cladding. Most of this fuel was generated during operation of the EBR-II at ANL-W in Idaho and Fermi-1 reactor in Michigan. Both were fast reactors using metallic fuel and sodium coolant. Some sodium-bonded experimental fuel was also produced as part of testing in the Fast Flux Test Facility (FFTF) at Hanford. The sodium within the fuel matrix is highly reactive. Because of its presence, the fuel is unsuitable for direct disposal in a geologic repository and requires treatment.

Argonne National Laboratory has demonstrated the electrometallurgical treatment technology, which is shown in Figure 2, to prepare these fuel types for eventual disposal[1].

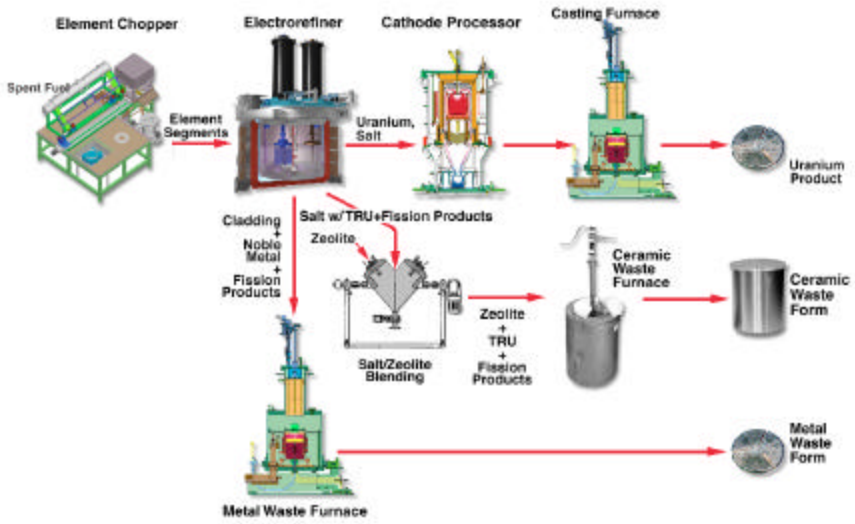

Fig. 2. EBR-II Spent Fuel Treatment Flowsheet

During this demonstration, which was conducted between June 1996 and August 1999, 100 EBR-II driver and 13 EBR-II blanket assemblies were treated[2]. This was a small but representative quantity of sodium-bonded fuel. The development of waste forms for stabilizing the fission products and transuranics was part of the demonstration. A committee of the National Research Council was established to review the progress and to evaluate the results and their final report noted the following:

- Finding: The Committee finds that ANL has met all of the criteria developed for judging the success of its electrometallurgical demonstration project.

- Finding: The committee finds no technical barriers to the use of electrometallurgical technology to process the remainder of the EBR-II fuel[3].

As required by the National Environmental Policy Act (NEPA), an Environmental Impact Statement (EIS)[4] was prepared to evaluate available and appropriate treatment options for DOE sodium-bonded fuel shown in Table I. DOE has identified electrometallurgical treatment as its Preferred Alternative for the treatment and management of all sodium-bonded fuel, except Fermi-1 blanket fuel. Because of the different physical characteristics of the Fermi-1 sodium-bonded blanket spent nuclear fuel (about 34 metric tons of heavy metal), DOE has decided to continue to store this material while alternative treatments are evaluated. Should no alternative prove more cost affective for this spent nuclear fuel, electrometallurgical treatment (EMT) of the Fermi-1 spent nuclear fuel remains a key option. In September 2000, an EIS Record of Decision (ROD) selected the preferred alternative and production operations began.

Table I. DOE Sodium-Bonded Fuel Covered by EIS

Fuel Type	Spent Fuel Treatment Demonstration (kg HM)	Spent Fuel Treatment (kg HM)	Miscellaneous Fuels (kg HM)	Fermi-1 Blanket Fuel (kg HM)	Total DOE Sodium-bonded Fuel (kg HM)
Driver Fuel	400	2,950	84	0	3,434
Blanket Fuel	600	21,800	0	34,200	56,600
Total	1,000	24,750	84	34,200	60,034

The Spent Fuel Treatment activities will treat the remaining EBR-II and FFTF fuel and recover the uranium for interim storage. Also, the fission products and transuranic elements from this fuel and the previously treated demonstration fuel will be placed in waste forms suitable for geologic disposal. Table II details these fuel quantities and their present storage locations.

Table II. Sodium-Bonded Fuel Included in Spent Fuel Treatment Activities

Fuel Type	EBR-II Driver at ANL-West (kg HM)	EBR-II Driver at INTEC* (kg HM)	EBR-II Blanket at ANL-West (kg HM)	FFTF Fuel at FFTF (kg HM)	Total Fuel (kg HM)
Driver Fuel	700	2,000	0	250	2,950
Blanket Fuel	0	0	21,800	0	21,800
Total	700	2,000	21,800	250	24,750

* INTEC – Idaho Nuclear Technology and Engineering Center at INEEL

Uranium is recovered from both blanket and driver fuel. For driver fuel, the uranium is isotopically diluted from high enriched uranium to low enriched uranium (<20% U-235). The uranium product from the spent fuel treatment will be stored on the ANL-W site until the DOE decides on its future use or disposal. Likewise, the waste forms will be handled as high-level waste and stored in retrievable containers at the ANL-W Radioactive Scrap and Waste Facility (RSWF), which is a dry storage facility for spent nuclear fuel and remote handled radioactive waste.

Spent Fuel Treatment involves all aspects of fuel management from interim fuel storage, process development, process operations, waste form development, waste form qualifications and full-scale radioactive waste operations. Presently, the process equipment is available for treating 2,200 kg uranium per year and activities are in progress to increase the capacity to 5,000 kg uranium per year. The two high level waste processes have been developed and demonstrated on the 1-2 kilogram size with radioactive materials. Full scale equipment which will produce waste forms in the 150 – 250 kilogram size is being built and tested with non radioactive materials. This equipment will be installed in the Hot Fuel Examination Facility to support the 5,000 kg uranium per year operations that are conducted in the Fuel Conditioning Facility. The waste forms have been characterized and shown to perform equivalent or better than defense high level waste glasses in the repository environment. As the full-scale equipment is implemented the waste processes and forms will be qualified to meet the requirements for the proposed geologic repository at Yucca Mountain.

With electrometallurgical treatment, Argonne National Laboratory has assembled a new innovative fuel treatment process from the initial fuel handling to the final radioactive waste disposition. These processes involve technical expertise in process chemistry, process engineering, remote equipment design, materials characterization, materials accountability, safety analysis and nuclear facility operations.

EBR-II PLANT CLOSURE

With the termination of the IFR program, DOE decided the EBR-II should be shutdown and placed in a radiologically and industrially safe condition. The EBR-II Plant Closure activity has three clear objectives: (1) removal, processing and disposal of the metallic sodium coolant within the EBR-II reactor, (2) processing and disposal of the Fermi-1 sodium in storage at ANL-W, and (3) the deactivation of the EBR-II and its related systems[5]. The first step, defueling of the reactor, was completed in 1995. Before the sodium coolant can be disposed, it must be converted to a non-reactive form. This conversion was initially designed to be a two step process wherein the sodium was reacted to 50 weight percent sodium hydroxide then converted to sodium carbonate. This process was installed in the Sodium Processing Facility (SPF) during 1995-1998. When initial testing with the sodium carbonate system identified problems with the scale-up operations, the disposal options were re-evaluated and a 70 weight percent sodium hydroxide product was found to be suitable for shallow landfill disposal. After process modifications were completed to operate at the higher temperatures for the 70% product, SPF started operations with sodium coolant from the Fermi-1 reactor and has disposed of 63,400 of the original 76,000 gallons that were stored at ANL-W. The EBR-II secondary sodium was processed and disposed in 1999. In August 2000, sodium drain of the EBR-II primary sodium was initiated and was completed in January 2001. Afterwards, the remaining Fermi-1 sodium, which is less radioactive than the EBR-II primary coolant, will be used to flush out the process equipment and the facility will be maintained in hot stand-by while other possible missions are evaluated.

With the completion of the primary sodium drain, the reactor systems will be placed into an industrially and radiologically safe configuration. This is defined as a condition that does not pose any unusual, unexpected or additional industrial safety risk and does not pose a radiation or contamination risk beyond the normal ANL-W levels for controlled access areas. The achievement of these conditions will require a commitment for surveillance and maintenance until decontamination and decommissioning. As part of a radiologically and industrially safe configuration, the exposed surfaces of residual sodium within the primary and the secondary sodium system will be converted to a non-reactive layer of sodium carbonate, which is formed by changing the argon cover-gas to carbon dioxide. Although carbon dioxide is inert to sodium at ambient temperatures, the introduction of small amounts of moisture allows the formation of a sodium carbonate film. Other deactivation activities include lifting the load end of electrical systems, sealing radioactive sources, removal of sodium potassium alloy from small systems and sealing any small sources of sodium that cannot be drained and passivated. In addition, configuration control and documentation will be prepared that details identified hazards.

The Plant Closure activities are providing important experience that can be applied to other sodium cooled reactors. ANL is currently working with the Republic of Kazakstan on the shutdown and deactivation of the sodium-cooled BN-350 reactor. This work includes defueling, interim fuel storage and the design of a sodium processing facility.

WASTE MANAGEMENT AND ENVIRONMENTAL REMEDIATION ACTIVITIES

In addition to the spent fuel treatment project and plant closure, ANL-W is involved in a variety of other waste management and environmental technology development projects. These projects typically draw on ANL-W strengths in the study, handling, and treatment of materials contaminated with radioactive substances including transuranics. These projects include long-standing efforts in support of TRU waste shipments from the INEEL, gas generation in organic sludges stored on the INEEL and development of stabilization methodologies for HEPA filters stored at both the INEEL and ANL-W. Additionally, ANL-W is involved in on-site site remediation including the phytoremediation of soils contaminated with Cs-137. We present a summary of each of these projects below.

TRU Waste Characterization

Characterization of mixed-transuranic (TRU) waste is required by the State of New Mexico (NM) in order to dispose of waste at the Waste Isolation Pilot Plant (WIPP) facility near Carlsbad, NM. The requirements for characterization are spelled out in the Waste Analysis Plan of the Resource Conservation and Recovery Act (RCRA) permit issued to the DOE by NM. The types of characterization activities required are dependent on waste type, e.g., debris or homogeneous solids (e.g., sludge). Besides the RCRA permit, additional characterization requirements are imposed by WIPP facility operational requirements, which are specified in DOE's WIPP Waste Acceptance Criteria document. The full range of these characterization requirements include: real-time radiography (e.g., x-ray) to determine and verify the physical form (e.g., presence of liquids, confinement layers, waste materials and waste form); headspace (of the drum) gas sampling and analysis to determine the presence of volatile organic compounds; non-destructive assay to determine the radionuclide content; visual examination on a small fraction of the drums to confirm radiography results; and chemical analysis on a small fraction of the homogeneous solid waste forms to determine and verify the type of regulated hazardous constituents. The amount of visual exam and solid sampling is partially dependent on the "acceptable knowledge," i.e., qualified documentation (e.g., its generation and storage history) that is available for the waste, and is dependent on results of previous visual exam and solids analysis.

The majority (65%) of DOE's mixed TRU waste is stored at the INEEL. ANL-W has been supporting characterization of the INEEL mixed TRU waste at the ANL-W Waste Characterization Area (WCA) since March 1991[6]. Over 500 drums have been characterized in this time, of which approximately 100% were visually examined; 50% were core sampled for solids analysis; and 20% were headspace gas sampled. These activities are planned to continue through FY02.

Gas Generation Experiments

ANL-W is presently involved in two separate projects involving the characterization of gas generation properties of radioactively contaminated materials. The first of these gas generation experiments (GGE) is sponsored by the DOE Carlsbad Area Office to support the WIPP performance assessment. The purpose of this GGE is to study the interaction mechanisms at conditions similar to those at WIPP and to collect gas generation rate and composition data from metal corrosion and microbial degradation of organic materials as well as radiolysis of WIPP brines and organic wastes. The results of the GGE have been used as a check of the gas generation computer model used in the initial WIPP performance assessment.

These studies began in 1996 with the placement of fourteen GGE sample chambers in a argon atmosphere glovebox located in the ANL-W Zero Power Physics Reactor (ZPPR) facility[7]. The test containers were loaded with various mixtures of transuranic wastes and brine. A total of approximately 102 gas samples were collected, each approximately 3 ml in volume. The samples were analyzed at the ANL-W site for the presence and abundance of various constituents (specified by Sandia National Laboratory (SNL)) using gas chromatography. The final gas samples were collected and analyzed in summer 2000; SNL is reviewing the final results to confirm their agreement with the WIPP performance assessment assumptions.

Additional similar gas generation studies have been performed in recent years including characterization of gas production in cemented high-plutonium residues to support rapid closure of the former Rocky Flats Plant. Yet another ongoing project was initiated in FY00 to determine a waste stream encompassing relationship between ionizing energy absorbed in a waste sample and radiolytic gas generation, i.e. the "G-value", for a particularly problematic TRU waste stream of organic set-up sludges. The goal of the experiments was to characterize the G-value so that these wastes could be recategorized as TRUPACT-II Analytical Category wastes.

For the organic sludge study[8], 50-gram sludge samples were sealed in four canisters each fitted with sampling ports and pressure monitors. Gas samples were extracted from the canisters in four separate test periods where the sampling intervals were varied from 61 days to 9 days. Of the four test periods, three were conducted at a temperature of 57 ^{o}C and one at a temperature of 20 ^{o}C. The measurements and subsequent analyses resulted in additional questions regarding the possibility of uncharacterized hydrogen storage in the waste and the presence of more complex radiochemistry. Based on these data, efforts are continuing in FY01 to further characterize the phenomena observed.

HEPA Filter Treatment

High-efficiency particulate air (HEPA) filters are used at many sites in the DOE complex. HEPA filters containing both radioactive and hazardous constituents, or mixed waste HEPAs, may be formed in the filtration of hot-cell, glovebox and fume hood emissions from processes containing regulated hazardous metals. Even processes using only trace

quantities of regulated metals (such as, cadmium, mercury and lead) can lead to accumulations of regulated quantities of hazardous metals in HEPA filters over long term use. Mixed waste spent HEPA filters from analytical chemistry laboratories in the DOE complex have been identified as sources for this type of mixed waste spent HEPA filter due to the combination of long-term filtration duties and thermal sources.

Disposal options for a mixed-waste HEPA filter depend on whether the filter requires contact handling (CH) or remote handling (RH). CH-mixed (non-TRU) filters can be treated as mixed waste debris at the Envirocare facility, which is a low level waste disposal facility in Utah. This involves a macro-encapsulation process and the use of additional dense filler or shielding resulting in waste volume increases of up to a factor of eight. No treatment or disposal path exists for non-TRU RH-mixed filters.

ANL-W is studying the applicability of low-temperature oxidation (pre-treatment) followed by cementation as a treatment methodology for RH-mixed HEPA filters. The same methodology could also be used to treat CH-mixed HEPA filters for disposal and yield a tremendous improvement in "waste minimization" of disposal mass and volume. Cementation has been shown to be a suitable stabilization approach for a variety of wastes. For HEPA filter stabilization, cementation has been found to require disassociation of the HEPA media into a very fine powder. Available grinding technologies are not readily applicable for large-scale, remote application.

A solution to the filter size-reduction problem was proposed after initial off-gas studies on the pyrolysis of the organic binder were performed. It was observed that after removal of the binder by pyrolysis, the glass media coalesced into a brittle glass. It was found that this product could be easily ground to a fine powder for cementation. The lower furnace temperatures significantly reduced the loss of RCRA-regulated metals due to vaporization. The total treatment based on low-temperature oxidation (630 ^{o}C) followed by cementation appears to be a possible treatment path for HEPA filters.

To further characterize off-gas concerns with oxidation, eight experiments were performed at a 1/20th scale (250 grams filter media) that evaluated the off-gas products resulting from the thermal pyrolysis of the organic coating. Pyrolysis in an inert atmosphere produced copious quantities of methane, carbon monoxide in excess of several thousand part per million and substantial levels of formaldehyde. Pyrolysis in air produced mainly carbon monoxide and carbon dioxide with reduced concentrations of formaldehyde and methane. Analysis of Toxicity Characteristic Leaching Procedure (TCLP) leachate from filter media processed to temperatures approaching 630 ^{o}C using purge and trap gas chromatography showed that residual benzene, toluene, xylene and cresol in the glass product was below the regulated limit of 500 ng/ml, 500 ng/ml,1500ng/ml and 280ng/ml, respectively. Development of this methodology is continuing through FY01.

Phytoremediation at the ANL-W Site

In 1998, the DOE, along with the EPA and the State of Idaho, selected phytoremediation as the preferred remedy for the clean-up of the five ANL-W sites which had levels of contamination that were a potential concern. The selection of phytoremediation was based on results from bench-scale testing of the soils in a greenhouse experiment conducted in 1998. ANL-W was granted permission to demonstrate the effectiveness of phytoremediation during a two-year field demonstration project.

Phytoremediation is a methodology that utilizes plants to remove contaminants from soils. Phytoremediation is used in-situ to remove the metals and radionuclides from the soils via normal uptake mechanisms of the plant. Sample results of the ANL-W sites showed the contaminants are predominantly bound in the upper one foot of soils. Thus, most of the contaminants are already within the plant root zone and no major movement of soil is necessary. The plants require additional irrigation and soil supplements. The plant stalks along with the wetted soil condition help control the spread of windblown contaminants. The plant vegetation is then harvested, sampled, and possibly shipped to an incinerator for volume reduction. The resultant ash is then sampled and sent to a permitted disposal facility. Phytoremediation will eliminate the need for long-term monitoring and maintenance activities, surface water diversions, land use and access restrictions for 100 years, and long term environmental monitoring (air, sediment, and groundwater).

The effectiveness and technical feasibility of phytoremediation are very site-specific[9]. ANL-W estimates that five growing seasons would be required to meet the established Remediation Goals (RGs) for cesium-137. This estimate assumes natural decay of the cesium-137 along with approximately five percent per year uptake by the plants. The cesium-137 RGs were calculated to produce a human health risk of 1 E-04 for a future resident 100 years from now. For other chemical contaminants, RGs were also determined by back calculating a hazard quotient that equals ten times the hazard quotient calculated from INEEL background soil concentrations. The removal of the chromium, mercury, selenium, silver, and zinc will take an estimated seven years to meet the RGs because of lower plant uptake rates and no natural decay. Table 3 shows the receptor of concern, site identification, contaminant, initial concentration, and RGs. Verification samples will be collected at each of the sites after phytoremediation and compared against the established RGs. If the contaminant concentrations are below the established RGs for the site, the risks to the human and ecological receptors will be mitigated and no further action will be required under in accordance to the signed Record of Decision.

Table III. Final Remediation Goals for the WAG 9 Sites

Receptor	Site	Contaminant	Initial Concentrations	RG Concentration[1]
Human	Interceptor Canal-Mound	cesium-137	30.5	23.3
Human	Industrial Waste Pond	cesium-137	29.2	23.3
Ecological	Industrial Waste Pond	chromium III	1,030	500
Ecological	Industrial Waste Pond	mercury	2.62	0.74
Ecological	Industrial Waste Pond	selenium	8.41	3.4
Ecological	Industrial Waste Pond	zinc	5,012	2,200
Ecological	Ditch A	mercury	3.94	0.74
Ecological	Ditch B	chromium III	1,306	500
Ecological	Ditch B	zinc	3,020	2,200
Ecological	Main Cooling Tower Blowdown Ditch	chromium III	709	500
Ecological	Main Cooling Tower Blowdown Ditch	mercury	8.83	0.74
Ecological	Sewage Lagoons	mercury	3.2	0.74
Ecological	Industrial Lift Station Discharge Ditch	silver	352	112

[1] - Concentrations in mg/kg or pCi/g

In 1999, both kochia and willows were planted in the ANL-W remediation areas to remove cesium 137 and selected metals, respectively. At the close of the growing season, the kochia was harvested (root and stalk). The results of the cesium 137 in the plants and the remaining cesium-137 concentrations in the soils were determined using a high purity germanium gamma radiation detector in-field, and analytical chemistry. The bales were subsequently placed in steel weather proof storage boxes awaiting analytical results prior to incineration. In the field, five small bales were weighed and analyzed using the high purity germanium gamma detector. The results showed that between 0.6 to 1.1 pCi/g of cesium-137 was contained in the baled plant material. These results will tend to be slightly higher than those of the actual plants since trace amounts of soils are attached to the fine root hairs. Six plant samples were collected and submitted to ANL-East analytical chemistry. The plant tissues were washed and separated into three root samples and three stalk samples. The results of the root samples were 0.61, 0.69, and 0.86 pCi/g while the stalk samples were 0.47, 0.62, and 0.70 pCi/g. The calculated uptake levels of the first year phytoremediation effort are 3.5 percent, which would result in cleanup of the soils in six field seasons. Results of the inorganic removal of mercury, silver, chromium, selenium, and zinc using the willow trees will not be known until the trees are harvested and analyzed.

Phytoremediation is not a quick fix to the removal of the contaminants from the soil. However, the real advantage of phytoremediation is that it costs approximately one-half

of the typical excavation with off-site disposal or on-site capping with continued monitoring technologies.

REMOTE TREATMENT FACILITY

Argonne's nuclear energy R&D programs required the construction of the Radioactive Scrap and Waste Facility (RSWF) in the mid-1960s. This dry, sub-surface storage area for radioactive materials presently contains highly radioactive, remote handled transuranic wastes co-mingled with other radioactive wastes. Additionally, the Radioactive Sodium Storage Facility (RSSF) was constructed to accommodate radioactive, sodium-bearing components used in the operation of EBR-II.

As outlined in the INEEL Site Treatment Plan (STP), a Remote Treatment Facility (RTF) is required to provide a path-forward for the radioactive waste stored in these facilities, in order to meet State of Idaho permitting requirements and to meet the 1995 Settlement Agreement and Consent Order milestones for TRU waste removal from Idaho.

An RTF Annex to the Hot Fuel Examination Facility is presently being planned to provide the infrastructure necessary to accept, sort, characterize, treat, and package remote-handled wastes presently stored at the RSWF and the RSSF. The essential features of the RTF Annex are: a 22 ft by 42 ft by 25 ft high air atmosphere hot cell with thirteen work stations, a hot repair area, waste cask handling capabilities, nondestructive assay station, and direct linkage with HFEF via the cask tunnel. The present RTF schedule includes formal issuance of the mission need statement by DOE in FY00, initiation of preliminary design activities in FY01, approval of PSAR and initiation of final design activities in FY03, initiation of construction activities in FY05, start of operations in FY09, and completion of the present waste treatment mission by 2015.

SUMMARY

The Argonne National Laboratory-West site has a complete set of nuclear facilities and supporting infrastructure that supports environmental technology activities from process development through final waste operations. Although the primary focus has been reactor development, the spent fuel treatment, plant closure and the other environmental and waste projects are examples how the capabilities can be utilized to solve significant challenges in waste management.

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