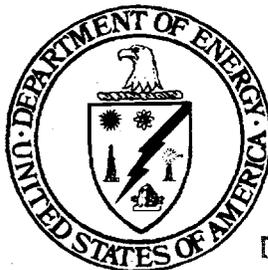


# EM INTERNATIONAL ACTIVITIES

FEBRUARY 1997 HIGHLIGHTS



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United States Department of Energy  
Office of Environmental Management

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# **SUMMARY OF EM INTERNATIONAL ACTIVITIES**

Prepared By International Technology Systems Application, February 1997

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# SUMMARY OF EM INTERNATIONAL ACTIVITIES

Prepared By International Technology Systems Application, February 1997



**EM International Highlights** is a brief summary of on-going international projects within the Department of Energy's Office of Environmental Management (DOE/EM). We encourage you to direct any comments or questions to the appropriate point-of-contact listed for each activity. Additional information can be found on the last page of this document.

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## I. GLOBAL ISSUES FACING EM

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The **Department of Energy (DOE)** is now implementing a new nuclear weapons nonproliferation policy. On May 13, 1996, DOE, in consultation with the **Department of State (DOS)**, issued a research reactor spent nuclear fuel acceptance policy as specified in the *Record of Decision on a Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel*. Under this policy, the United States is accepting and managing approximately 20 metric tons of spent nuclear fuel and target material (containing uranium enriched in the United States) from 41 countries. These countries have converted, or plan to convert, research reactors to use low enriched uranium fuels. Aluminum-based spent fuel will be managed at DOE's **Savannah River Site (SRS)** in South Carolina, and non-aluminum spent fuel will be managed at the **Idaho National Engineering Laboratory (INEL)** in Idaho. The spent fuel will be shipped to the United States over the next 13 years through two military ports, the **Charleston Naval Weapons Station** in South Carolina, and the **Concord Naval Weapons Station** in California, and will proceed to DOE management sites by either truck or rail. Canadian shipments will be transported by truck to SRS.

In September 1996, six casks containing aluminum-based spent fuel from research reactors in Europe (Germany, Sweden and Switzerland) and two casks from South America (Chile and Colombia) were received at SRS. The schedule for foreign spent fuel shipment is under development; the next shipment is expected in early 1997. Overall, DOE anticipates receiving about one or two shipments per month over the 13-year duration of the program.

With this program to accept foreign research reactor spent fuel in place, DOE is working to transition research reactor operators into managing their own spent fuel. The Department is also assisting countries in converting highly enriched uranium to low enriched uranium fuels. In addition, the United States is reaching out to new partners, such as China and Russia, in the *Reduced Enrichment for Research and Test Reactors program*.

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Contact: Charles Head, EM-67, (202) 586-9441

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## II. ACTIVITIES IN WESTERN EUROPE

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### GERMANY

Both the United States and Germany have active research and development (R&D) programs underway in the field of radioactive waste management. Under a previous agreement with the **German Bundesministerium für Forschung und Technologie**, EM-76 engaged in a cooperation and technical information exchange to evaluate the safety and efficiency of radioactive materials transport. This cooperation also addressed technical issues of concern to the **International Atomic Energy Agency (IAEA)**. Reactivation of the agreement is in process and will focus on fracture mechanics design methodology, air transport package analysis/design issues, seals and other closure mechanisms, sea transport, risk assessment, decontamination and decommissioning (D&D) of nuclear facilities, and thermal and structural analyses.

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*Contact: Ashook Kapoor, EM-76, (301) 903-6838*

### NORWAY

See Section VIII: INTERNATIONAL ORGANIZATIONS

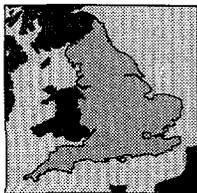
### SWEDEN

See Section I: GLOBAL ISSUES FACING EM

### SWITZERLAND

See Section I: GLOBAL ISSUES FACING EM

### UNITED KINGDOM



EM-50 has contracted with the United Kingdom's **Atomic Energy Authority (AEA)** to jointly identify strengths and weaknesses of the United States waste cleanup program and to identify methods to improve that program at reduced costs. Under a *Memorandum of Understanding* to collaborate in energy research and development between DOE and the UK, AEA work focuses on risk-based decision making in restoration optimization, programmatic and technical benchmarking, management and infrastructure analysis as related to rapid and cost effective implementation of technologies, and integrating international technology developments at DOE sites. Projects of special note:

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*Mixing of Compacted Sludge in Horizontal Storage Tanks Using Fluidic Pulse Jets* for a full-scale hot demonstration of pulse jets mixing systems to mobilize sludge in the Oak Ridge Bethel Valley Evaporator Service Tanks in Fiscal Year (FY) 1997; and *Demonstration of Fluidic Pumps* for sampling radioactive liquids in underground storage tanks at SRS.

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*Contact: John Wengle, EM-53, (301) 903-8491*

In coordination with **Oak Ridge National Laboratory (ORNL)** and in cooperation with **British Nuclear Fuels, Inc.**, EM is conducting work on high-level tank waste retrieval and processing. The initiative involves the development of physical tank waste stimulant and tank waste retrieval criteria.

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*Contact: Dave Geiser, EM-53, (301) 903-7640*

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### III. ACTIVITIES IN CENTRAL AND EASTERN EUROPE

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#### REGIONAL

EM co-sponsored the *Third International Symposium and Exhibition on Environmental Contamination in Central and Eastern Europe in Warsaw (Warsaw '96)*. This symposium was held September 10-13, 1996 and focused on problems related to hazardous waste and toxic substances, including radioactive and mixed waste in the context of contaminated air, water, and land. Initial planning has begun for the *Fourth International Symposium*, which will be held in the region in the Fall of 1998. In addition to waste management and technology development issues addressed at the first and second symposia, the third meeting featured a special session to highlight the EM cooperative project and technology demonstrations with the **Institute for Ecology of Industrial Areas (IETU)**, in Katowice, Poland.

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*Contact: Elizabeth Flage, EM-54, (301) 903-7955*

Central European country profiles currently exist on the environmental characteristics and requirements of Hungary, Poland, and the Czech and Slovak Republics. Country studies also examine the roles of government and non-government environmental organizations, their programs and priorities, the universities and research centers involved in environmental research and education, and contacts for more information.

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*Contact: Elizabeth Flage, EM-54, (301) 903-7955*

EM's principal partner for cooperative research and demonstration projects in the Central/East European region, IETU, has established a **Risk Abatement Center for East and Central Europe (RACE)**, which opened in September in Katowice on the eve of *Warsaw '96*. RACE is a not-for-profit, non-governmental, international, cooperative research, education and implementation center working on regional environmental needs. Its efforts focus on international environmental policy development, education, and know-how transfer, providing a forum for implementing significant policy changes, technology transfer and increasing public awareness. It utilizes risk-based tools for prioritizing problems and managing the environment with regard to social, legal, economic, and political considerations.

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RACE was developed in response to the critical need for comprehensive, cost effective environmental risk assessment and reduction strategies in Central and Eastern Europe (CEE), as well as in response to the call for more independent regional environmental centers as outlined in the October 1995, *UN ECE Declaration of Ministers in Sofia*. EM anticipates conducting cooperative projects with RACE in the areas of R&D project identification and regional workshops.

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*Contact: Elizabeth Flage, EM-54, (301) 903-7955*

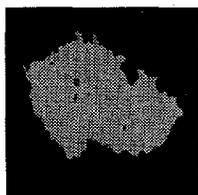
EM, **Florida State University (FSU)**, and IETU have agreed to adopt a *Framework for Establishing a Central/East Europe Joint Coordinating Committee for Environmental Systems (JCCES-CEE)*, to identify and implement joint projects in Poland and other countries in CEE. IETU has designated RACE as the implementing organization for management of the JCCES-CEE Framework.

Through this Framework, EM has established a process for efficient and systematic identification and initiation of joint research projects, new technologies, and other activities to address environmental issues of national interest and mutual concern in the CEE region. Joint actions will be taken in FY 1997 to begin Framework implementation so that new project proposals can be prepared and approved for funding in FY 1998. The first annual JCCES-CEE program review meeting is planned for the April-July timeframe to review and approve a proposed FY 1998 work program and preview EM research priorities for FY 1999.

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*Contact: Elizabeth Flage, EM-54, (301) 903-7955*

## **CZECH REPUBLIC**



EM has established a project with the **Czech Technical University** to perform a laboratory evaluation of the radioactive and chemical stability of polyacrylonitrile (PAN) as a binder material for use with inorganic ion exchangers in the separation of radionuclides in a variety of acidic, neutral, and alkaline liquid radioactive waste forms. This evaluation will also address the compatibility of the PAN binder with a select number of absorbers that are currently applicable to the ongoing EM waste separations programs.

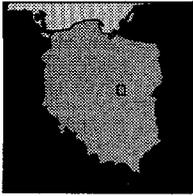
Under a contract with EM, the Czech Nuclear Research Institute is conducting a *Review of Advanced Separations Technologies in the Czech Republic* project. The review covers technologies in use or

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under development that deal with solvent extraction, ion exchange and adsorption.

*Contact: Kurt Gerdes, EM-53, (301) 903-7289*

## **POLAND**



Characterization and soil decontamination remediation technology demonstrations, collaboration on risk assessment, and other activities are being carried out under a *Memorandum of Cooperation* between EM and IETU in Katowice, Poland. DOE's primary objectives for the project are to advance R&D of EM technologies for use at DOE facilities in the U.S. and to promote commercial development between U.S. and Polish environmental technology firms.

Expedited Site Characterization technologies were demonstrated in Katowice in May-June, 1996. A bioremediation technology demonstration began in late summer 1996, and will continue through May 1997.

*Contact: Elizabeth Flage, EM-54, (301) 903-7955*

Three new joint research projects are being developed for implementation with IETU in FY 1997 that address heavy metals contamination of soils, a priority research topic for the EM Subsurface Contaminants Focus Area. The projects address phytoremediation, bioavailability, and plant stress monitoring.

*Contact: Jef Walker, EM-53, (301) 903-7966*

As part of the FY 1996 emphasis on characterization technologies in the CEE region, EM sponsored research on the topic in Poland. The resulting publication, entitled "*Characterization Technology Opportunities in Poland: A Market Assessment*" (August 1996), is available from EM-54 and on-line at [HTTP://em-52.em.doe.gov/ifd/intl/intl.html](http://em-52.em.doe.gov/ifd/intl/intl.html)

*Contact: Elizabeth Flage, EM-54, (301) 903-7955*

## **BELARUS**



DOE continues to support and enhance collaboration between the **Tulane/Xavier Center for Bioenvironmental Research** and the **Institute of Radioecological Problems of the Academy of Sciences**, Minsk, Belarus. Research involves two Chernobyl-

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related modeling projects: 1) transport of radionuclides in marsh and forest fires, and 2) the Iput River, which flows through the "Bryansk Cesium Spot," one of the most heavily contaminated regions. Two graduate students from Minsk, currently enrolled in Ph.D. programs in the Tulane University School of Engineering, are analyzing data using computer simulations for applicability to the situations in Belarus.

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*Contact: Elizabeth Flage, EM-54, (301) 903-7955*

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## IV. ACTIVITIES IN RUSSIA

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### BACKGROUND

Activities in Russia are conducted under the auspices of a *Memorandum of Cooperation (MOC)* in the fields of Environmental Restoration and Waste Management signed in 1990 by DOE and the **Ministry of Atomic Energy for the Russian Federation (MINATOM)**. A Joint Coordinating Committee for Environmental Restoration and Waste Management (JCCEM) was established as the managing body for the MOC and is responsible for selecting specific joint project activities in eleven areas of cooperation: Separations Technologies, Contaminant Transport and Site Characterization, Mixed Waste Processing, High-Level Waste (HLW) Tank Remediation, Decontamination and Decommissioning (D&D), Scientist Exchanges, Risk Assessment, Transuranic Stabilization, Solidification Experiences, Spectral Tables, and Internet Home Pages.

The 7th JCCEM meeting will be held in St. Petersburg, Russia, in May 1997.

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Contact: Elizabeth Flage, EM-54, (301) 903-7955

### PROJECTS UNDER THE JCCEM

#### *Separations:*

Over the past four years, the **Khlopin Radium Institute (KRI)** has been under contract to EM to perform an "*Experimental Research Program on Applicability of the Russian Separation Technology to Processing of Defense HLW.*" The cobalt dicarbollide technology underwent a third testing at INEL in the spring of 1996. Final results are pending, but look promising. Patent discussions are underway between KRI and DOE.

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Contact: Kurt Gerdes, EM-53, (301) 903-7289

In FY 1995, a technology development project was initiated with the **Institute of Chemical Technology** in the area of "*Crown Ethers for Chemical Separation of Radioactive Wastes.*" The project studied the use of crown ethers for removing radionuclides and toxic metals from low-level waste (LLW) and HLW, as well as the potential of crown ethers to control the chemical (redox potential) conditions in alkaline waste and process solutions. This

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project was expanded in FY 1996 to address the *"Application of Extraction Technology Using Crown Ethers for Removal of Cesium from HLW on the Acid Side."*

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Contact: Kurt Gerdes, EM-53, (301) 903-7289

In FY 1995, the following technology development projects were initiated with the **Institute of Physical Chemistry** in the area of separations technologies:

- *"Recovery of Cesium-137 from Actual INEL High-Level Waste by Sorption Technique with Copper Ferrocyanide."* This technology was tested on actual waste at INEL in July, 1996
- *"Investigation on the Application of Homogeneous and Heterogeneous Catalysis for Alkaline Waste Treatment,"*
- *"Investigation on the Removal of TRU from Alkaline Waste Solutions on Carriers Obtained by the Method of Appearing Reagents."* A patent application has been filed on behalf of the Russian inventor
- *"Investigation on Disproportion of Plutonium (V) in Alkaline Media of Various Composition in Liquids and Model Sludges,"*
- *"Investigation on Isolation of Technetium from Alkaline Solutions."*

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Contact: Kurt Gerdes, EM-53, (301) 903-7289

In FY 1996, the following additional projects were initiated in the Separations area:

- *"Evaluation of Russian Liquid/Liquid Extraction Technologies Using Crown Ethers for Decontamination of Low- and High-Level Radioactive Wastes from Long-Lived Radionuclides and Toxic Metals,"* Institute of Chemical Technology
- *"Crystallization of Sodium Nitrate from Radioactive Wastes,"* Institute of Physical Chemistry

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Contact: Kurt Gerdes, EM-53, (301) 903-7289

*Contaminant Transport and Site Characterization:*

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In FY 1994, a team of EM scientists and engineers participated in a two week field sampling at the Mayak Site in Chelyabinsk, Russia. The following three jointly authored articles were submitted to technical and scientific journals:

- *“Joint Russian - U.S. Radiometric and Surface Water Chemistry Measurements within Lake Karachi - Mishelyak River System, Southern Urals, Russia”*
- *“Joint Russian - American Hydrogeological-Geochemical Studies on the Karachi-Mishelyak System, Southern Urals, Russia”*
- *“Resistivity and Induced Polarization Survey at a Russian Nuclear Waste Site”*

As a result of FY 1994 field work, a second expedition took place in September 1996. The objective of the trip was to conduct field experiments of plume migration in fractured rock using multi-packer tests, conduct research on modeling contaminant migration in the Mayak region, conduct field experiments to investigate the capacity of the Mishelyak River to “self-cleanse,” and collect comparative radiometric measurements of the Mishelyak River.

Results of the September 1996 demonstration, along with existing site characterization data, will be used to develop joint computer models for predicting contaminant plume migration in this type of fractured system. It is anticipated that in 1997 the maturity of the characterization strategy (i.e., low-cost monitoring combined with computer modeling) will enable the collaborative effort to direct its focus in evaluating a similarly contaminated U.S. site.

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Contact: *Caroline Purdy, EM-53, (301) 903-7672*

*Mixed Waste Processing:*

In FY 1995, EM tasked the Institute of Chemical Technology with constructing the *“Pilot Scale Apparatus for Treatment of Solid Mixed Radioactive Wastes: Plasmatron with Induction Cold Crucible Melter (PICCM).”* The unit was constructed and Beta tests in Russia were completed successfully. A patent application has been filed on behalf of the Russian inventors. The unit is being leased and installed at the **Georgia Institute of Technology** in Atlanta, Georgia. The Russian inventor has entered into commercialization discussions with U.S. counterparts.

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Contact: *Jenya Macheret, DOE-ID, (208) 526-2708*

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Additionally, in FY 1995, the following projects were initiated with the Institute of Chemical Technology (Final Reports are available upon request):

- *“Technology and Apparatus for Solidification of Radwaste by the Method of High Temperature Adsorption of Metals on Inorganic Matrices (silico-gel).”* In FY 1996 this project was transferred to the Tanks Focus Area (See description below)
- *“Recovery of Noble Metals from Complex Concentrates by means of Continuous Countercurrent Metal Extraction in Induction Furnaces.”*

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Contact: Jenya Macheret, DOE-ID, (208) 526-2708

In FY 1996 the following projects were initiated in support of the Mixed Waste Focus Area:

- *“Pilot Scale Apparatus for Treatment of Solid Mixed Radioactive Wastes: Plasmatron with Induction Cold Crucible Melter (PICCM),”* Institute of Chemical Technology
- *“Experimental Investigation of Cold Crucible Technology Applications to Converting Mixed Low-Level Wastes into Stable Low Volume Glassy Slags,”* Khlopin Radium Institute
- *“Assessment of Russian Waste Treatment Technologies and Their Applicability to US DOE Mixed Waste Focus Area Needs,”* Khlopin Radium Institute
- *“Development of Mixed Waste Technologies Monitoring and Demo Capabilities,”* Khlopin Radium Institute
- *“Experimental Investigation of Low Temperature Iron-Phosphate Ceramic for Solidification on Mixed Waste LLW,”* Khlopin Radium Institute
- *“Experimental Investigation of Radionuclide Partitioning In a High Frequency Induction Melter,”* Khlopin Radium Institute
- *“Cold Process of Solidification and Stabilization of Solid Wastes Containing Radionuclides and Harmful Impurities Using Orthosilicic Acid Derivatives,”* Institute of Chemical Technology

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Contact: Jenya Macheret, DOE-ID, (208) 526-2708

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### *High-Level Waste Tank Retrieval:*

In FY 1995, a project was initiated with the **Integrated Mining Chemical Combine** to "*Develop Equipment for Extraction of Radioactive Pulps and Cakes from Storage Facilities in Krasnoyarsk-26 and Hanford.*" A Final Report is currently in preparation. A technology development workshop was held in January 1996 in Savannah River to discuss progress and to determine the next steps of the project.

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*Contact: Dave Geiser, EM-53, (301) 903-7640*

At the 6th JCCEM meeting it was agreed to begin the following projects in support of the Tanks Focus Area:

- "*Technology and Apparatus for Solidification of Radwaste by the Method of High Temperature Adsorption of Metals on Inorganic Matrices (silico-gel),*" Institute of Chemical Technology. A patent application has been filed on behalf of the Russian inventor
- "*Development and Manufacturing of a High Capacity Pulsating Pump,*" Institute of Physical Chemistry
- "*Radioactive Sludge Storage Modeling,*" Mining and Chemical Enterprise (Krasnoyarsk-26)
- "*Solid Liquid Phase Separation of HLW using U.S. and Russian Technology,*" Mining and Chemical Enterprise (Krasnoyarsk-26)
- "*Russian Retrieval Equipment Demo,*" (Krasnoyarsk-26)
- "*U.S./Russian Joint Retrieval Users/Development Working Group,*" Khlopin Radium Institute

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*Contact: Dave Geiser, EM-53, (301) 903-7640*

### *Decontamination and Decommissioning:*

At the 5th JCCEM meeting in Berlin, it was mutually agreed to add D&D as a new area of cooperation. Based on the proposals submitted by MINATOM, the following three proposals were selected for FY 1996 funding:

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- “*Cryogenic Technology and Development of Equipment for the Production of Granulated Materials,*” Institute for Chemical Technology
  - “*Biotechnological Decontamination of Open Ponds Contaminated by LLW,*” Khlopin Radium Institute
  - “*Use of Supercritical Fluid Extraction for Transplutonium Element Decontamination of Solid Materials,*” Khlopin Radium Institute

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Contact: Paul Hart, METC, (304) 285-4358

Additionally, a technology development workshop in the area of D&D technologies was held in the summer of 1996 to further define possible areas of collaboration.

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Contact: Paul Hart, METC, (304) 285-4358

#### *Scientist Exchanges:*

Twelve Technology Development Workshops have been held since February 1992. They have provided a technical exchange forum from which both countries have greatly benefited.

Four Russian graduate students from the Chelyabinsk region are employed as EM research assistants at INEL. The students are enrolled at **Idaho State University** during the academic year and work in the environmental management areas at DOE laboratories and private companies during the summer.

The **National Academy of Sciences** is administering an EM-sponsored program that provides grants of \$16,000-\$30,000 to support Russian scientists at U.S. national laboratories. This program hosts Russian students and scientists to conduct research at national labs and universities. Eight exchanges have been conducted to date and six more are planned.

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Contact: Elizabeth Flage, EM-54, (301) 903-7955

EM is sponsoring a Russian post-doctoral researcher at the **Seaborg Institute** in Berkeley, California to perform research in the area of separations technologies.

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Contact: Kurt Gerdes, EM-53, (301) 903-7289

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## JCCEM: NEW AREAS OF COOPERATION

Four new areas of cooperation were added in FY 1996.

### *Risk Assessment*

To initiate Risk Assessment as a new area, a workshop was held in Seattle, Washington, in August 1996. The U.S. and Russian delegations discussed several potential risk assessment topic areas worthy of further exploration. Important considerations were given to the role of stakeholder involvement, regulatory framework, continuing budget pressures, incorporation of scientific innovation, near-term and long-term risk, prioritization of risks, and other issues.

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*Contact: Carol Henry, EM-50, (202) 586-7150*

### *Solidification Experiences*

A second workshop was held in Seattle, Washington, in August 1996, to initiate Solidification as a new area. It was noted that there are currently two JCCEM projects relevant to the topic of waste solidification: the silica-gel project and the hybrid melter project. Opportunities for future collaborative projects were discussed, including potential projects that could be accomplished under contract.

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*Contact: Dave Geiser, EM-53, (301) 903-7640*

### *Spectral Tables*

KRI and the Russian Gamma Ray Spectrometry community have proposed a relationship with DOE and the International Committee on Radiation Measurements for evaluation of nuclear structure and decay data.

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*Contact: Russ Heath, INEL, (208) 526-4447*

### *Transuranic Stabilization*

A workshop was held to establish Transuranic Stabilization as a new area. The stated goal of this workshop was to initiate the exchange of information regarding plutonium stabilization successes and problems in the U.S. and in Russia, and to identify opportunities for cooperative plutonium stabilization research and technology demonstrations. It was noted that the production of

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plutonium was stopped in 1986, and another year was taken to finish the processing of plutonium that was already in process.

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*Contact: Bill Scott, DOE-ID, (208) 526-8189*

## **OTHER PROJECTS WITH RUSSIA**

DOE, in cooperation with Russian scientists, is exploring the use of electrokinetic technology to remediate soil and groundwater contaminated with heavy metals. Russian scientists are applying this technology to uranium contaminated sites, driving the contamination deeper into the soil where interaction (adsorption) takes place in the subsurface clay layers. Teams of Russian electrokinetics experts travel periodically to the K-25 Site in Oak Ridge, Tennessee, to work with their U.S. counterparts on samples of uranium contaminated soil.

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*Contact: Skip Chamberlain, EM-53, (301) 903-7248*

### *Internet Home Pages*

JCCEM Internet Home Pages are under development to improve Russian scientists' access to information about the agreement. KRI will serve as the Russian coordinator for development of the Web site, including text, photographs, and other graphic data about the JCCEM. MINATOM retains authority to approve content for the site.

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*Contact: Elizabeth Flage, EM-54, (301) 903-7955*

An Environmental Management Project Office has been established in Moscow and is staffed by one full-time support person and a part-time administrative support person. The purpose of the EM Project Office is to coordinate work conducted at Russian institutes on behalf of EM. The Russian EM program manager is responsible for the coordination of proposal solicitations, general program management, workshop logistics, communication interface with Russian institutes and ministries, and the management of an EM technical literature repository. EM Project Office personnel coordinate activities through direct interaction with EM headquarters program managers.

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*Contact: Elizabeth Flage, EM-54, (301) 903-7955*

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## V. ACTIVITIES IN ASIA AND THE PACIFIC RIM

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### CHINA



An investigation of Chinese environmental needs and expertise is being conducted by the **Office of Science and Technology (OST)** to coordinate opportunities in the Chinese environmental industry with EM Focus Area needs and expertise. This FY 1997 activity includes the development and implementation of strategies for cooperation between EM and Chinese research institutes; activation of relationships between EM and potential Chinese partners; identification of opportunities for technical exchange; research into China's technologies and environmental conditions; and communication of EM industry partner experience in China.

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*Contact: George Economides, EM-54, (301) 903-7249*

### JAPAN



Bilateral meetings were held in October and November 1996, to further negotiations between DOE and the **Power Reactor and Nuclear Fuel Development Corporation (PNC)** of Japan for the reinstatement of the *Agreement for Cooperation in the Area of Radioactive Waste Management*. The objective of this cooperation is to study topics associated with, and to develop technology and techniques necessary for, the safe management of high-level waste (including spent fuel) and transuranic waste. Renewal of the agreement extends for five years from the date signed.

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*Contact: Judd Lilly, EM-42, (301) 903-7218*

Under DOE's Agreement with PNC and the **Work For Others Program, Pacific Northwest National Laboratories** and PNC have been collaborating on a research program to acquire thermodynamic, kinetic, and adsorption data for performance assessment of geological disposal systems. The objective of the joint research is to develop fundamental thermodynamic and adsorption data on radionuclides that will be used to reliably estimate both radionuclide releases through multi-barrier systems and their impacts on the environment.

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*Contact: Dhanpat Rai, PNNL, (509) 372-6410, or Elizabeth Flage, EM-54, (301) 903-7955*

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**Lawrence Berkeley National Laboratory (LBNL)** is engaged in collaborative activity with PNC to study theories and models most applicable for characterizing and predicting flow and mass transport in fractured and/or highly heterogeneous media. OST is overseeing this project under the Work For Others Program, which is aimed at improving the understanding of fundamental physics and chemistry that govern the processes in radioactive waste isolation/disposal in geologic systems, and developing characterization and predictive technologies of radionuclide release and transport in heterogeneous geologic media.

*Contact: Chin-Fu Tsang, LBNL, (510) 486-5782, or*

*Elizabeth Flage, EM-54, (301) 903-7955*

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## VI. ACTIVITIES IN SOUTH AMERICA

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### ARGENTINA



Activities with Argentina are conducted under the auspices of the *"Implementing Arrangement between the Department of Energy of the United States of America (DOE) and the National Atomic Energy Commission of the Argentine Republic (CNEA) for Technical Exchange and Cooperation in the Area of Radioactive and Mixed Waste Management,"* signed on May 29, 1996. A Joint Coordinating Committee for Radioactive and Mixed Waste Management (JCCRM) was established as the managing body for the arrangement, and is responsible for selecting specific joint project activities. The JCCRM has outlined 4 specific technical areas of cooperation: Characterization and Retrieval (of spent resins), Separation Methods (e.g., crystalline silicotitanate), Decontamination and Decommissioning, and Vitrification Processes. The long term objective of the arrangement is to open new markets and opportunities for U.S. and Argentine environmental technology companies.

A Solidification Workshop was held in Buenos Aires, Argentina in November of 1996. The Record of Meeting (ROM) from the workshop was signed by both parties, and work has begun on the activities identified in the ROM. These activities include:

- A scientist exchange between DOE and CNEA in the areas of pretreatment, treatment, transportation, storage and disposal of radioactive and mixed waste
- Tests which will be performed in Bariloche, Argentina, and at Clemson University, to establish the applicability of vitrification of Argentine IX materials
- A visit by an Argentine scientist to observe the demonstration of relevant D&D technologies in the U.S.
- DOE and CNEA will jointly establish performance specifications for the characterization and decontamination of the plutonium-contaminated glove boxes in the Alpha Laboratory in Argentina
- Demonstrations of one or more technologies to characterize and then decontaminate a glove box in the Alpha Laboratory in Argentina

- 
- A scientist from CNEA visited Argonne National Laboratory and Florida International University's Hemispheric Environmental Technology Center in January, 1997. The objective of this trip was to exchange information on D&D technologies
  - A Uranium Mill Tailings meeting will be held in Albuquerque, New Mexico, in June, 1997. Attendees from Argentina, Germany, and the U.S. will discuss all aspects of the DOE uranium mill tailings project, which is near completion.

The 2nd JCCRM meeting will be held in the U.S., in September, 1997.

*Contact: Elizabeth Flage, EM-54, (301) 903-7955*

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## VII. ACTIVITIES IN NORTH AMERICA

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### CANADA



ORNL, in cooperation with the **American Petroleum Institute/BP America** and a research consortium organized by the **University of Waterloo, Canada**, is testing and evaluating in situ remediation technologies for source control and mass removal of DNAPLs compounds in low permeability media. Controlled contaminant releases and pilot-scale testing will be conducted in Sarnia, Ontario. Subsequent testing and evaluation is planned for contaminated sites such as Portsmouth, Ohio.

*Contact: Skip Chamberlain, EM-53, (301) 903-7248*

The Tanks Focus Area, is managing a multi-laboratory and industry effort to complete the development and transfer to the user four Light-Duty Utility Arm (LDUA) Systems for remediation of large underground storage tanks at Hanford, Idaho Falls, and Oak Ridge. The first two LDUAs were delivered by **Spar Aerospace Limited of Canada** in FY 1996 to the Hanford Site. One of those arms was used to support the characterization of Hanford tank T-106 and will be used for characterization of Hanford tank Ax-104 in support of the Hanford Tanks Initiative. The third LDUA was modified for retrieval purposes, delivered to Oak Ridge, and is scheduled to operate in Gunite Tanks W-3 and W-4 in March 1997. The fourth arm is scheduled for delivery to Idaho in 2nd quarter FY97. The LDUA deploys end-effectors that perform safety, characterization, and retrieval activities inside radioactive waste tanks.

*Contact: Dave Geiser, EM-53, (301) 903-7640*

### MEXICO



Collaboration has been initiated between ORNL and **El Instituto Mexicano del Petroleo, Mexico City**, under the U.S./Mexico North American Free Trade Agreement (NAFTA), to share in development of new technologies and modification of existing technologies for remediation of hazardous waste sites. This project is specifically addressing dense non-aqueous phase liquids (DNAPLs). The soils used in this study were near-surface soils (30-50 cm) collected from the south of Mexico (Minatitlan/Veracruz, Mexico) with a contaminant level of 10-60% weathered hydrocarbons. Laboratory experiments are designed to determine

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the potential for biologically degrading the weathered crude oil found in contaminated soil. This initial joint venture establishes a foundation for future cooperation and technology transfer.

*Contact: Skip Chamberlain, EM-53, (301) 903-7248*

Scientists from Mexico are adapting an EM technology being developed at **Los Alamos National Laboratory** to treat thousands of barrels of hazardous waste containing polychlorinated biphenyls (PCBs), highly toxic organic materials used in high-voltage insulating oil. Discussions are underway on cost-sharing a full-scale joint demonstration of a truck-mounted version of the Packed-Bed/Silent Discharge Plasma System in Mexico in 1996. This system could bring relief to the burgeoning pollution problem associated with industrialization along the U.S.-Mexico border.

*Contact: George Economides, EM-54, (301) 903-7249*

EM is working to enhance the interaction between the **U.S.-Mexico Border Environment Cooperation Commission**, U.S. industry, DOE laboratories, border region governments and other U.S. and Mexican organizations, and to facilitate the formation of partnerships focused on joint development and implementation of technology that can be applied at sites along the U.S.-Mexico border and throughout the DOE complex.

*Contact: George Economides, EM-54, (301) 903-7249*

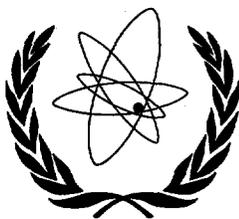
EM-50 is currently working to establish mutually-beneficial technology exchanges with Mexico to advance technology systems for improved environmental management in the United States and Mexico. Initial areas of joint cooperation reflect mutual priorities for the detection and characterization of contaminants, treatment and disposal of hazardous/solid waste, remediation of storage tanks, bioremediation, and information management. Implementation of this proposed program will be conducted through information and staff exchanges, collaborative R&D, joint technology demonstrations, and technology deployment to DOE and Mexican sites.

*Contact: George Economides, EM-54, (301) 903-7249*

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## VIII. INTERNATIONAL ORGANIZATIONS

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EM provides U.S. representatives to the **International Waste Advisory Committee** of the International Atomic Energy Agency (IAEA). EM also provides approximately 15 technical consultants per year in support of IAEA activities regarding radioactive waste management and transportation.

The IAEA provides a forum for the discussion of waste management policy and priorities by participating countries including the U.S., Russia, Great Britain, France, Germany, the Nordic countries, Japan, and South Korea. Among the benefits to EM is the promotion of environmental technologies. EM has made an award to the IAEA to support the activities of the **Contact Experts Group**, focusing on review of radioactive waste management in the Former Soviet Union. Russia is being given priority attention.

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*Contact: David Huizenga, EM-60, (202) 586-5151*

The second meeting of the Steering Group and the first meeting of Project Experts of the trilateral Russia, Norway, and U.S. **Arctic Military Environmental Cooperation (AMEC) Program** took place in Moscow, November 18-22, 1996. Sixty delegates from the three countries met to develop the technical details for six initial projects approved as part of the AMEC Declaration signed on September 26, 1996, by the Secretaries of Defense of the three countries. The U.S. Team included the U.S. Department of Defense, Department of Energy, and Environmental Protection Agency personnel.

A draft Terms of Reference for organizing and managing the work of the AMEC Program and project management plans for the six current AMEC projects was prepared. Project and program financing issues were explored and will be addressed in the near future. AMEC projects include developing a dual-purpose cask for interim storage and transport of spent nuclear fuel, evaluation and implementation of liquid radioactive waste processing using sorbent technologies, identifying innovative technologies for an interim storage facility for solid radioactive waste, designing and constructing treatment systems for radioactive wastes from the decommissioning of Russian nuclear submarines, studying remediation methods for non-radioactive released materials at

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Arctic Military Sites, and designing and building a vessel for collecting and processing waste at sea.

*Contact: David Huizenga, EM-60, (202) 586-5151*

EM has requested participation as a full member of the IAEA Coordinated Research Program on "Safety Assessment of Near-Surface Radioactive Waste Disposal Facilities." The purpose of this effort is to improve understanding and confidence in performance assessments through comparative analysis of low-level waste disposal facility long-term performance assessment modeling methodologies. EM has participated as an observer in the first three Research Coordination Meetings.

*Contact: Greg Duggan, EM-332, (301) 903-7140*

The Office of **Environmental Restoration (EM-40)** continues to participate in the **Organization for Economic Cooperation and Development/Nuclear Energy Agency Task Group on Decommissioning Costs**. The Task Group is working on a project to compare D&D costs on an international basis. Current efforts are underway to develop a common language for D&D costs; developing a standardized hierarchy and list of cost categories along with definitions for each one. This work has gained even greater significance with the development of the IAEA and the **European Union**. Most of the utility companies in Europe and Japan are now working to adopt or harmonize with this cost structure. Next steps include completion of a cost data collection questionnaire and compilation of the cost information for selected projects. The next meeting is scheduled to take place in Germany in the spring of 1997.

*Contact: Bryan Skokan, EM-42, (301) 903-7612*

EM participated in the **6th Steering Committee of the Nuclear Science Committee** in June 1995. EM's involvement includes the preparation of a report summarizing U.S. work in the area of actinide separation chemistry.

*Contact: Kurt Gerdes, EM-53, (301) 903-7289*

Under a grant from EM, the **International Institute for Applied Systems Analysis (IIASA)** is cooperating with MINATOM and its laboratory facilities to address the topic of nuclear waste contamination in the Ural region. The contamination is a legacy of the cold war, resulting from Soviet nuclear weapons production.

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Project leadership interacts with Russian ministry officials and local laboratory expertise to assess impacts of radioactive contamination and to jointly develop recommendations to prevent and mitigate contamination impact. In cooperation with Russian researchers, project activities under IIASA include the collection, analysis, and validation of contamination data; describing source, type, and extent of contamination; and potential impacts on ground, air, and water resources, and on surrounding populations. EM hopes to promote technology demonstrations leading to environmental stability and to open potential commercial opportunities for U.S. environmental firms.

*Contact: David Huizenga, EM-60, (202) 586-5151*

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## LIST OF ACRONYMS

AEA	Atomic Energy Agency
CEE	Central and Eastern Europe
CNEA	National Atomic Energy Commission of the Argentine Republic
D&D	decontamination and decommissioning
DNAPLs	dense non-aqueous phase liquids
DOE	Department of Energy
EM	Environmental Management
FSU	Florida State University
FY	fiscal year
HLW	high-level waste
IAEA	International Atomic Energy Agency
IETU	(Polish) Institute for the Ecology of Industrial Sites
IIASA	International Institute for Applied Systems Analysis
INEL	Idaho National Engineering Laboratory
ITSA	International Technology Systems Application
JCCEM	Joint Coordinating Committee for Environmental Management
JCCES	Joint Coordinating Committee for Environmental Systems
JCCRM	Joining Coordinating Committee for Radioactive and Mixed Waste Management
KRI	Khlopin Radium Institute
LBNL	Lawrence Berkeley National Laboratory
LLW	low-level waste
MINATOM	Ministry of Atomic Energy for the Russian Federation
ORNL	Oak Ridge National Laboratory
OST	Office of Science and Technology
PAN	polyacrylonitrile
PNC	Power Reactor and Nuclear Fuel Development Corporation
RACE	Risk Abatement Center for East and Central Europe
R&D	research and development
ROM	Record of Meeting
SNF	spent nuclear fuel
SRS	Savannah River Site

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