

## 1.4 Deactivation and Decommissioning Focus Area Applied Research Opportunities

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### Abstract

The Department of Energy (DOE), National Energy Technology Laboratory (NETL) on behalf of the Office of Environmental Management (EM), Office of Science and Technology (OST), Deactivation and Decommissioning Focus Area (DDFA) is seeking innovative and improved technologies that will reduce cost, accelerate D&D schedules, and reduce the health and safety risk to D&D workers and the public at DOE former weapons production sites. The procurement objective is to expedite applied research and development (R&D) leading to innovative and improved technologies to meet needs in the D&D area. The five research areas, including subtopics, anticipated in the Program Research and Development Announcement (PRDA) are as follows:

1. Characterization
  - a. Facilities and equipment characterization
  - b. Facilities monitoring to support long-term surveillance and maintenance
  - c. Characterization to support segregation/disposition of TRU-contaminated material
2. Next Generation Decontamination Technologies
  - a. Metal
  - b. Concrete
3. Improved Size Reduction and Demolition Techniques
4. Worker Health and Safety
  - a. Systems to reduce worker heat stress
  - b. Airborne contaminants/emissions monitoring and control systems
5. Remote/Robotic Deployment and Manipulation Systems
  - a. Advanced manipulators and end effectors for D&D operations
  - b. Tetherless power and communication systems
  - c. Advanced systems control and task planning

These research areas represent needs identified by several DOE offices including Albuquerque, Chicago, Richland, Idaho, Ohio, Savannah River, Rocky Flats, and Oak Ridge. In addition, several basic research projects have been completed in these areas. The knowledge gained from these studies may provide the required new scientific data to achieve the highest level of potential for technological advances.

The focus of this solicitation is for Applied and Exploratory Development Research. It is the expectation of this PRDA that successful research will progress through the Advanced and Engineering Development stages and yield, within five to seven years, a solution to a DOE technology need ready for field-scale demonstration and/or deployment within a Large-Scale Demonstration and Deployment Project (LSDDP).

# Applied Research Needs

**D&D Focus Area  
October 17, 2000**

**Bob Bedick**



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# DDFA AR Needs

- **Characterization**
  - Facilities & Equipment Characterization
  - Facilities Monitoring to Support Long-Term Surveillance and Maintenance
  - Characterization to Support Segregation/Disposition of TRU-Contaminated Material
- **Next Generation Decontamination Technologies**
  - Metal
  - Concrete
- **Improved Size Reduction and Demolition Techniques**



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# DDFA AR Needs

- **Worker Health and Safety**
  - Systems to Reduce Worker Heat Stress
  - Airborne Contaminants/Emissions Monitoring and Control Systems
- **Remote/Robotic Deployment and Manipulation Systems**
  - Advanced Manipulators and End Effectors for D&D Operations
  - Tetherless Power and Communication Systems
  - Advanced Systems Control and Task Planning



# DDFA AR Needs

## Facilities & Equipment Characterization



- Ability to measure contamination, on a contaminant-by-contaminant basis, down to free-release levels
- Integrated characterization methods for radiological, hazardous (i.e., solvents, oils RCRA metals etc.), and toxic materials (i.e., PCBs, asbestos, etc)
- Real time integrated approach (i.e., mapping capabilities, electronic downloading of data, data integration and analysis, etc.)
- Verify existence or absence of contamination in inaccessible areas such as underground tanks and process piping, drain lines, ventilation ducts, and wall cavities



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# DDFA AR Needs

## Monitoring of Facilities to Support Long-Term Surveillance and Maintenance

- Remote in-situ techniques to visually inspect facilities and structures as well as to detect, spatially locate and quantify contaminants of concern in, around, and under facilities
- System capable of storing and tracking data
- System capable of receiving input data from facility drawings, photographs, videos, etc.
- Capable of sending and accessing data from anywhere via phone, computer, or cable lines



# DDFA AR Needs

## Characterization to Support Segregation/Disposition of TRU-Contaminated Material



- Improved techniques (e.g., in situ or non-destructive techniques) that eliminate the necessity to size reduce or dismantle equipment such as pipes, ducts, tanks, gloveboxes to characterize
- A new class of field-applicable neutron detectors to measure and sort remote-handled (high gamma radiation) low-level waste containing transuranics





# DDFA AR Needs

## Decontamination Technologies (metal and concrete)

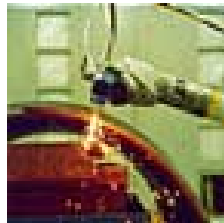


- Integrate remote deployment capabilities
- Higher decontamination factors in a single application
- Decontaminate cracks, crevices, and welds
- Decontaminate broad range of equipment geometry's and process configurations, ability to perform internal decontamination thus minimizing need to disassemble process equipment
- Decontaminating vertical and horizontal ceilings/wall surfaces leaving minimal areas along intersections of walls and floors that are contaminated
- Sensors and real-time operator feedback to evaluate the process as it proceeds
- Complete decontamination so that the material can be release for unrestricted use



# DDFA AR Needs

## Improved Size Reduction and Demolition Techniques

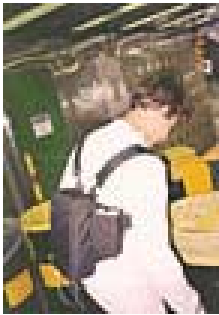


- Improved technologies to size reduce/demolish highly-contaminated equipment and facilities that reduce or eliminate the cutting residues, dust generation, and/or airborne contaminants
- Technology that can be remotely deployed or compatible with remote deployment platforms or overhead crane systems
- System that combines real-time visual feedback and other sensor capability to monitor the dismantling process



# DDFA AR Needs

## Systems to Reduce Worker Heat Stress



- New cost-effective protective clothing and heat stress mitigation systems
- Improved real-time monitoring instruments to determine the level of personal protection required, including upgrades and downgrades in the level of protection
- Improved technology for trauma related protection such as protection from falls, eye and hearing protection, and hand and head protection



# DDFA AR Needs

## Airborne Contaminants/Emissions Monitoring and Control Systems



- Real-time continuous air monitors that provide workers with an “alarm” function
- Air monitors for detecting stable tritiated particulates and stable metal tritides
- Air monitors for measuring all types of beryllium inhalation hazards, including salts, oxides, and metals
- Improved dust control methods for airborne particulate contamination created decontamination and size reduction
- Improved fixatives to control airborne contamination and to fix removable contamination on facility and equipment surfaces



# DDFA AR Needs

## Advanced Manipulators and End Effectors for D&D Operations



- New generation of actuators capable of operating under extreme conditions
- Multi-fingered end effectors that intrinsically provide stable grasping as well as greater degrees of freedom necessary to grasp complex objects



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# DDFA AR Needs

## Tetherless Power and Communication Systems

- Innovative new propulsion systems are needed that provide reasonable operating times and do not present potential fire hazards
- Data communication approach that uses modern technology (e.g. cellular communication) to achieve wireless data links



# DDFA AR Needs

## Advanced Systems Control and Task Planning



- Sensor based methods are needed to control manipulation systems
- Computer-based task planning in which task and tooling characterization are used to generate executable computer instructions for the desired task execution

