



**Savannah River  
National Laboratory™**

OPERATED BY SAVANNAH RIVER NUCLEAR SOLUTIONS

We put science to work.™

# A Technological Edge for Cleanup Success

**Dr. Terry Michalske**

Laboratory Director

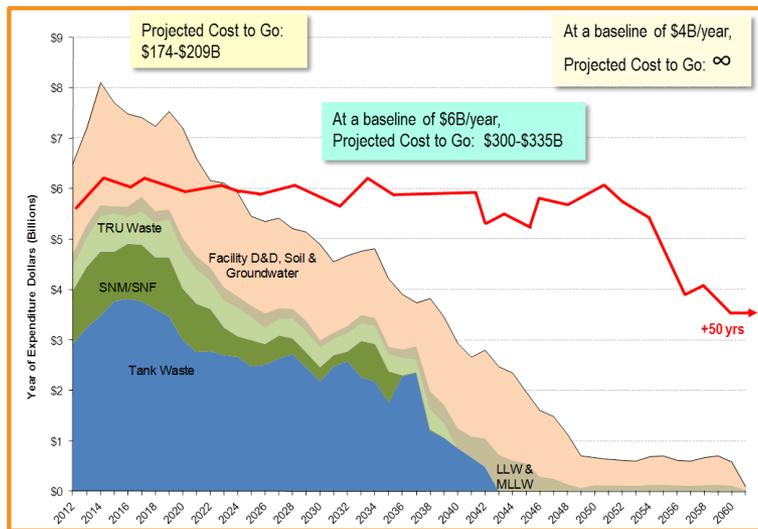
*U.S. DOE Cleanup Workshop  
September 15, 2016*

# Nuclear Waste Cleanup is Technically Challenging

“Without the application of mature technologies from chemical and manufacturing industries, it is not clear that the cleanup can be completed satisfactorily or at any reasonable cost...”

Secretary of Energy Advisory Board Report  
Taskforce on Technology Development for Environmental Management  
December 2014

## Nuclear Waste To-Go Cost and Schedule



**\$335B + 100 years**

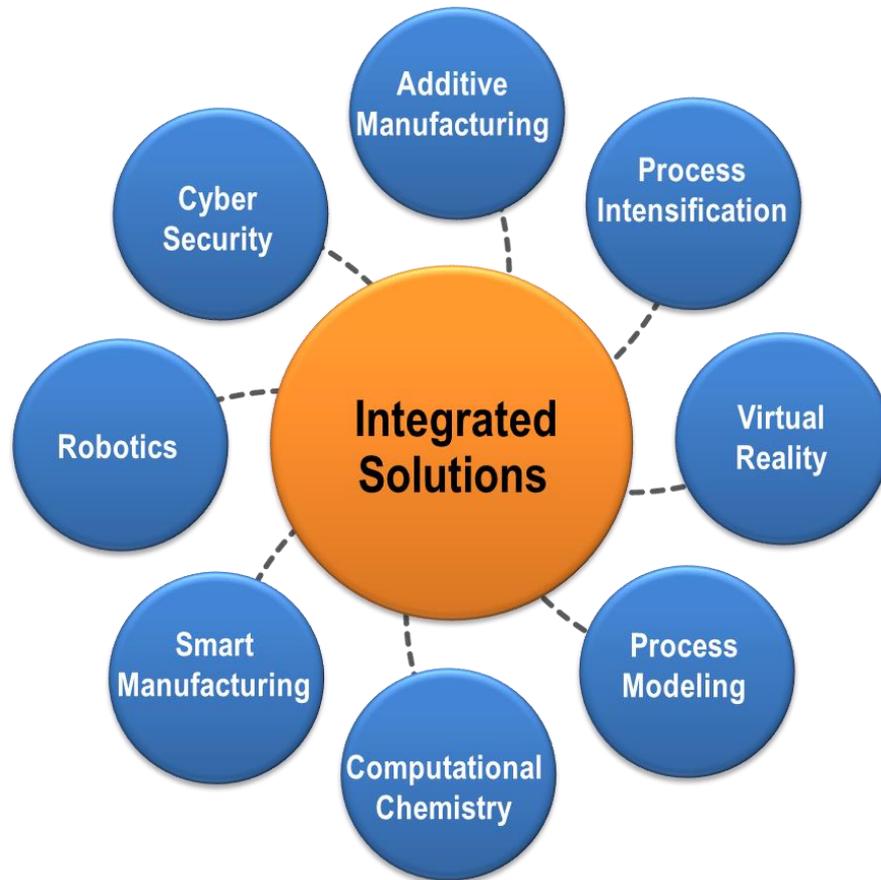


- Reduce capital and operating expenses
- Shorten the life cycle
- Enhance intrinsic worker safety
- Reduce environmental risk
- Meet regulatory requirements

# Combining Technologies to Create Solutions

Applied research, development and deployment of

## Technologies



- Reduce Risk
- Reduce Cost
- Improve Safety

## The Science of Safety

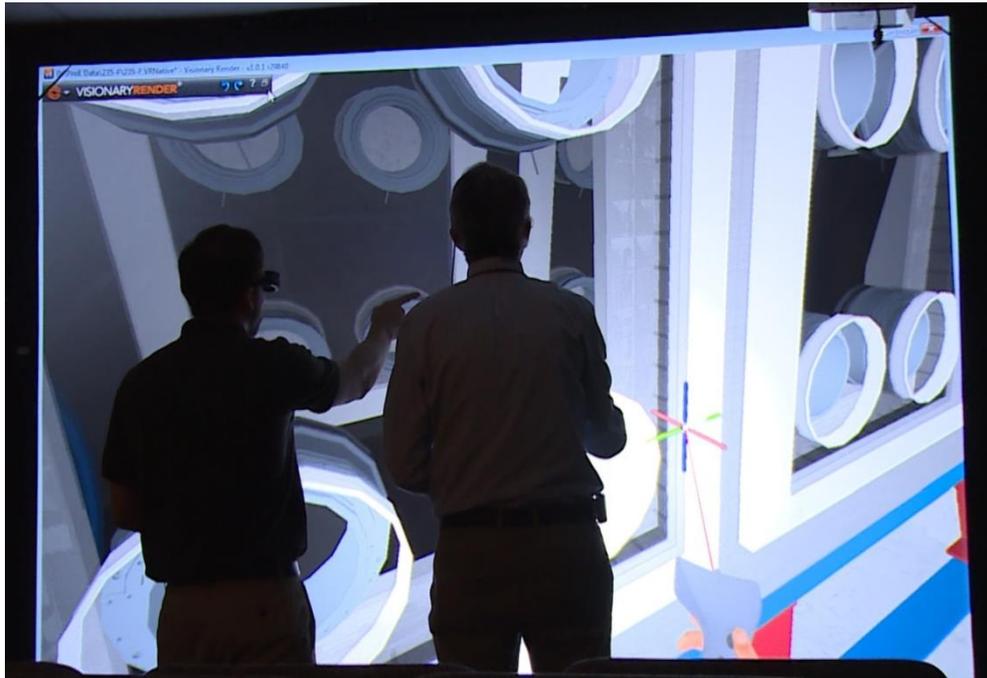


# Decommissioning Pu-238 Contaminated 235-F

Visionary technology for

## Dose Reduction

**Projected 25% reduction in work planning cost and exposure hours**



**Learn virtually – Execute safely**

## Advantage

- Aids work planning, design reviews, and virtual walk-downs
- Includes off-normal events in training
- Allows improved tool design and selection

Virtual Reality



# GrayQb™ : Spatial Images of Contamination

Nondestructive technology for

## Safe Identification



### Advantage

- Combines radiological and optical imaging
- Uses commercial technology
- 3D printed, cheaper, flexible design for specific application
- Robotic placement

Additive  
Manufacturing

Robotics



# GrayQb™ for Hanford Plutonium Finishing Plant

Map radiological contamination and safely locate

## Hot Spots

### Significant Work Scope Reduction



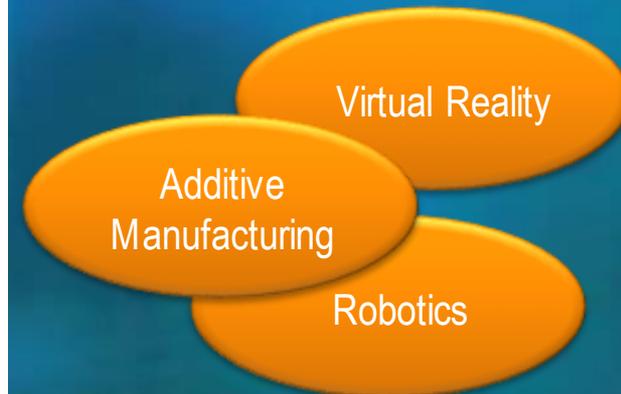
Baseline image

Uniform radiological contamination distribution

Hot spot locations

### Advantage

- Verifies location of radioactive contamination & hot spots
- Significant redesign of decontamination strategy
- Reduces scabbling of concrete surfaces by 50%

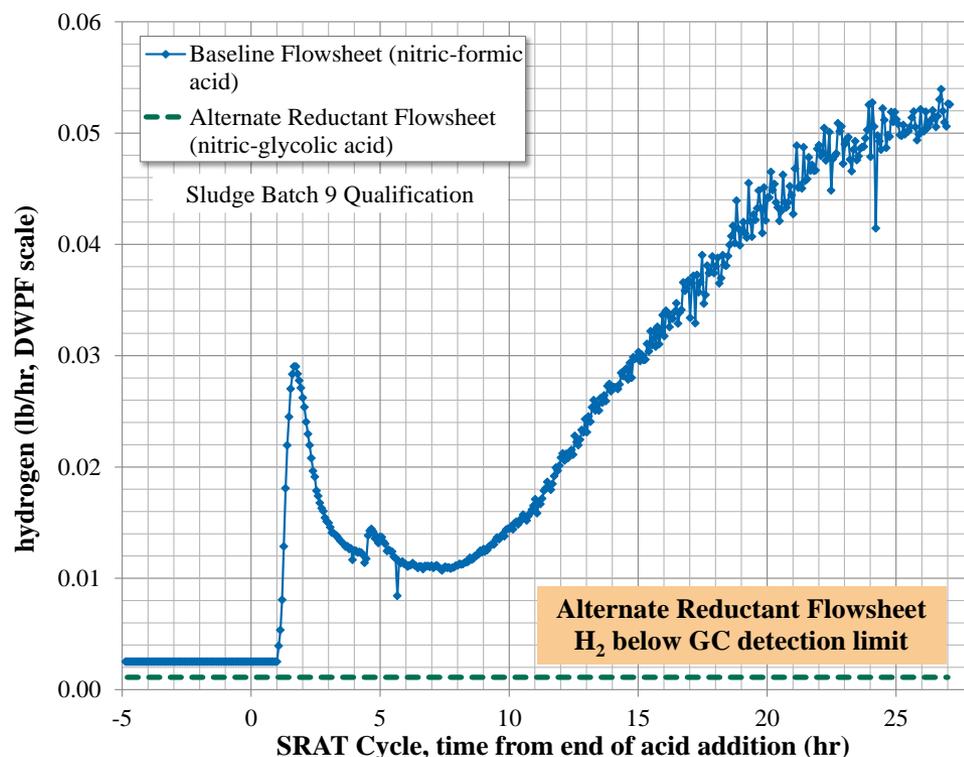


# HLW Processing at DWPF (Alternative Reduction Chemistry)

Significant Cost &

**Risk**  
**Reduction**

## Total Hydrogen Generated



## Advantages

- Eliminates hydrogen generation by more than 98% (below detection)
- Simplifies safety basis
- Removes safety significant systems
- Increases flowsheet flexibility

Process  
Intensification

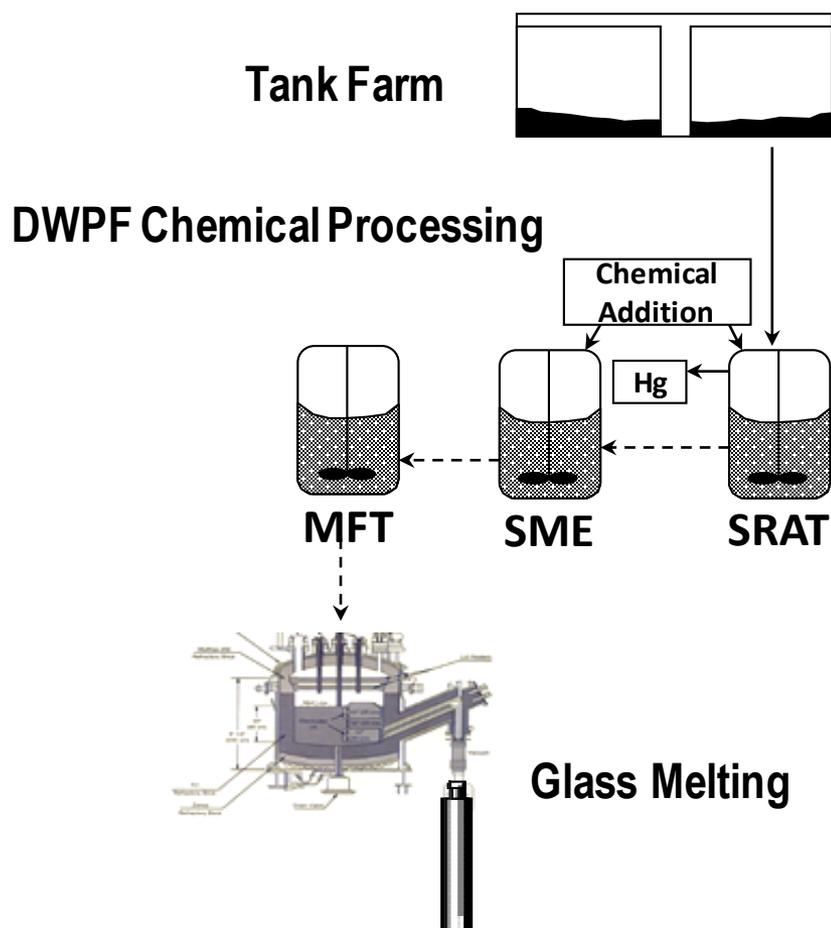
DWPF Chemical Processes using Formic Acid Reductant Technology



# HLW Processing at DWPF

25 years of pushing the boundaries for  
Process

## Improvement



## Advantages

- Uses PM predictions to potentially reduce processing time by 30%
- Reduces sample analysis
- Minimizes sample transport operations
- Simplifies sludge batch qualification

Process  
Modeling

Smart  
Manufacturing

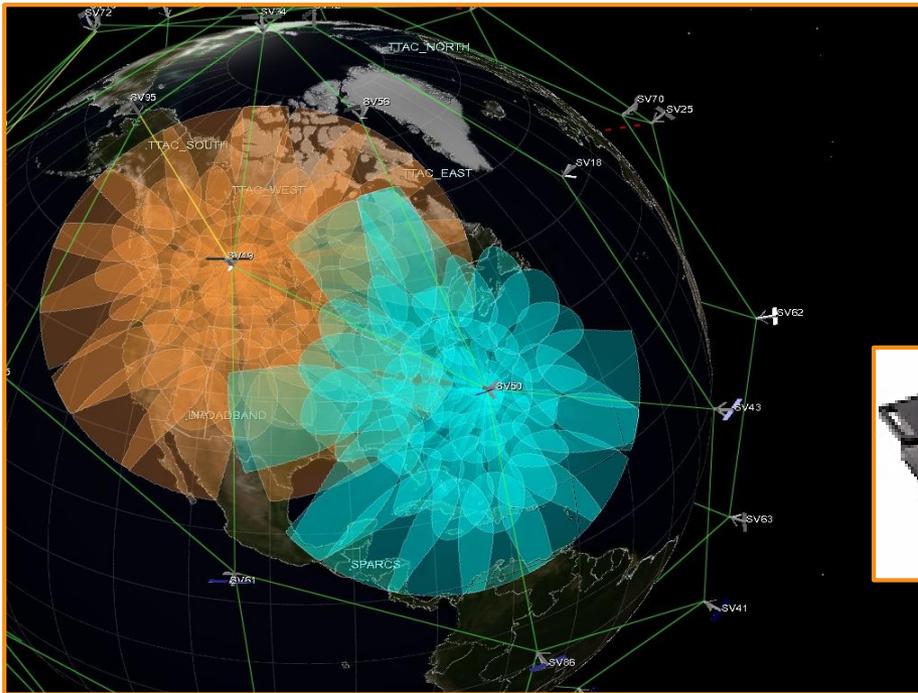


# Secure Tagging and Tracking

World-wide nuclear material tracking for a

**Secure World**

## Rapid Deployable Global Sensing Hazard Alert System (SAV-EM)



Iridium/GPS Receiver

## Advantage

- Dual GPS / Iridium
- Highly resistant to jamming
- Virtually impossible to spoof
- Remote worker safety
- Penetrates buildings further

Cyber Security



# Processing Target Residue Materials

Robotic Off-Loading of  
Highly Radioactive

## Solutions

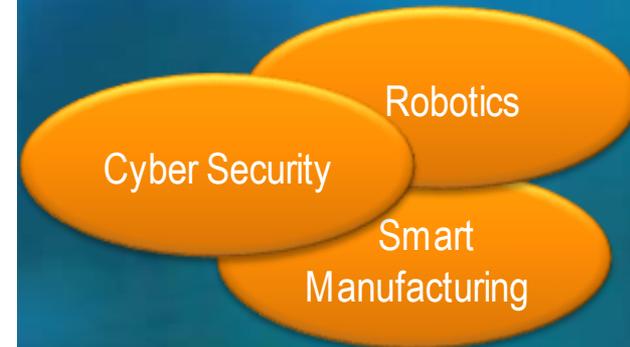
Allows safe retrieval of very high dose containers (>100R)



Container Retrieval System

## Advantage

- Reduces operator exposure to ALARA administrative control levels
- Uses NSA-approved secure wireless controls
- Expands capability of H-Canyon



# Our workers and U.S. taxpayers **deserve** the best approaches

- **Faster**
- **Smarter**
- **SAFER**

