

## **Managing Radiological Accidents: A Responder's Perspective - 11362**

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### **ABSTRACT**

This paper describes actual responses to two radiological accidents from the perspective of first responders. Lessons learned on how to manage radiological accidents effectively are also described. The paper also offers insights into the effectiveness of training programs offered by the Department of Energy's (DOE) Transportation Emergency Preparedness Program (TEPP).

### **INTRODUCTION**

The Department of Energy's Transportation Emergency Preparedness Program (TEPP) helps prepare local jurisdictions to respond to transportation accidents involving radioactive material, offering a comprehensive approach that includes needs assessments, training, and exercises. Since its inception in 1990, TEPP personnel have worked with state, local and tribal officials to train emergency thousands of responders on how to handle transportation accidents involving radioactive material. Because TEPP is able to simplify how to respond to radiological transportation events, focusing on important risks, response actions, and basic equipment use, while avoiding inundating students with more information than they need, DOE-Headquarters consistently receives positive feedback about the program's effectiveness. But the best proof of the program's value is the feedback from those who have responded to actual accidents involving radioactive materials.

Responders have put TEPP training to the test a number of times since the program began in 1990, and several times in the past two years. On February 29<sup>th</sup>, 2008 an employee of Sabia, Incorporated, a private industrial facility in Idaho Falls, ID, ruptured a Strontium-90 (Sr-90) source. The employee inhaled an unknown amount of radioactive contamination when the source capsule broke open while he was attempting to extract the material from a gauge in preparation for proper disposal. Sabia, which is licensed by the U.S. Nuclear Regulatory Commission (USNRC) to service and support fixed nuclear gauges, nuclear analyzers, and associated radiological sources, made the required NRC notification and locked down the facility. The Idaho Falls 911 Center was not called and local emergency responders were not notified on the day the accident occurred. The



**Figure 1 - Covering sources with shielding caused a Bremsstrahlung effect, resulting in increased radiation rates in the facility.**

contaminated employee went to a hospital-owned clinic. A physician at the clinic contacted the Radiation Emergency Assistance Center/Training Site (REAC/TS), which in turn contacted the DOE Region 6 Radiological Assistance Program (RAP) Team. Other employees potentially spread contamination as they left the facility and went to a local grocery store to purchase cleaning supplies for clean-up of contaminated areas. Other businesses that were potentially contaminated by the employees included a local motel and another industrial facility where employees went to retrieve a different contamination instrument. The employees' vehicles and homes were also potentially contaminated.

On March 1, 2008 the NRC contacted the State of Idaho Radiation Duty Officer at Idaho Department of Environmental Quality (DEQ). The call was facilitated by Idaho Department of Health and Welfare's State Communications agency. Following that notification, an Idaho

Bureau of Homeland Security conference call was initiated and included all the federal, state, and local agencies listed previously. Plans were made that would satisfy expectations and requirements of all agencies. Several more conference calls occurred during the evening of March 1<sup>st</sup>. On March 2<sup>nd</sup> a planning meeting was convened at the DEQ Radiation Safety Office in Idaho Falls. Incident Command Structure positions and entry plans were established. Entry into facility was made following a safety briefing conducted in a business adjoining the Sabia facility.

Monitoring, measuring, and documenting activities continued March 2<sup>nd</sup> and were completed the evening of March 3<sup>rd</sup>. Interior activities went smoothly due to cooperative effort between the Idaho Falls Fire Department, State of Idaho Regional Response Team #7 and the DOE Region 6 RAP Team.

Many of those involved were on a first name basis. Communication was frequent and clear between the entry team



**Figure 2 - Emergency responders conducted surveys at the Sabia facility, detecting both radiation and contamination.**

and Incident Command. Off-site monitoring and evaluation of other businesses, homes and vehicles worked well also due to the established working relationship and trust in each other. Responders discovered the source of contamination to be a 100 millicurie Sr-90 source from a NER 592 gauge, manufactured on August 9, 1984. The source strength at the time of the accident was only approximately 57 millicuries due to normal radioactive decay. Due to increasing levels of surface contamination leading into the facility and the uncertainty of conditions, entry team responders wore double sets of protective clothing and full-face respirators. Responders characterizing the release found Sr-90 and decay product Yttrium-90 (Y-90), to include:

- Contamination levels as high as 151,000 disintegrations per minute (dpm) beta/gamma, and 2 millirad/hour at two inches from the surface of the contamination area.
- Radiation levels measured as high as 1 rad/hour at one foot from the lead “pig” in which the ruptured source had been stored.
- Potential for Bremsstrahlung radiation production
- Potential internal exposure hazard (bone)
- Potential external exposure hazard (skin and lens of eye)
- Potential airborne radioactivity of multiple Derived Air Concentration (DAC), assuming complete dispersion and nine cubic meters of work space volume. DAC was calculated to be 2E-09 microcuries per cubic centimeter Sr-90, Class Y, and 3E-07 microcuries per cubic centimeter (Y-90, Class Wand Y)

On March 4<sup>th</sup> interviews and other investigations continued until all agencies had fulfilled expectations and regulatory requirements.

The successful multiple agency response to the Sabia incident demonstrates the importance of building a strong relationship between local, state and federal agencies. After the situation was brought under control, the Operations Commander from the Idaho Falls Fire Department stated: “Because of the TEPP training and exercises we have participated in over the years, our team had a confidence and calmness with the radiological response that we would not have demonstrated had we not been trained. The efforts of your TEPP staff are commendable and I applaud your efforts in training and preparing the Nation’s first responders and their communities.”

Even more recently, in August 2009, TEPP training paid off when a state regional hazardous materials team in West Virginia was called to a tractor-trailer fire involving a shipment of Uranium Hexafluoride (UF<sub>6</sub>) being transported by a DOE carrier. The Beckley, WV firefighters who responded had participated in two-day Modular Emergency Response Radiological Transportation Training (MERRTT) classes less than three months earlier, and were able to put their knowledge to good use. The West Virginia accident occurred at mile-marker 139 on Interstate 64 near Sandstone, WV, shortly after midnight on August 2, 2009, when the driver of a pickup truck struck a guardrail. His vehicle rolled over through the median and landed in the shoulder of the eastbound lanes. The driver of a tractor-trailer hauling non-enriched UF<sub>6</sub> locked his brakes to avoid debris from the pickup truck. The tractor-trailer veered to the right, hit a



**Figure 3 – Fire Department responders from Beckley, WV were glad they went through MERRTT training before responding to an actual event involving uranium hexafluoride.**

rock embankment, overturned, and caught fire. The driver escaped before the cab of the truck burned. The fire did not affect the UF<sub>6</sub> cylinder, which separated from the trailer. The transport originated at the Honeywell Metropolis Works facility in Metropolis IL, and was headed to Portsmouth, Virginia, for export to a company in the Netherlands. The drivers of both the tractor-trailer and the pickup truck involved in the accident

suffered minor injuries. They were transported to Summers Appalachian Regional Hospital, where they were treated and released. The driver of the pickup was found to be intoxicated at the time of the crash and was cited by the Summers County Sheriff's Department. Volunteer firefighters from Summers County recognized shortly after midnight that the tractor-trailer was hauling radiological and corrosive materials, and requested closure of the interstate. Evacuations of two nearby communities, Sandstone and Meadow Creek, WV, were also ordered as a precaution. Upon arrival of the Beckley, WV state regional hazmat team, monitoring equipment was used to confirm that no hazardous materials had leaked from the truck. Lieutenant Bryan Trump, the Assistant Training Officer for the Beckley, WV Fire Department, said that when he and his crew confirmed there were no elevated levels of radioactivity, they stopped the evacuation that was underway.

“We were glad that we were able to assist someone and prevent it from being blown out of proportion,” Trump said, “it was worth sitting in the (MERRTT) class.” Trump added, “We were a whole lot calmer than we would have been because we had been through the training, and we made better decisions.”

The evacuation order for Sandstone, WV was lifted at approximately 3:30 a.m. About 100 people in the Sandstone area had been evacuated to Summers County Middle School in Hinton or to nearby Fayette County by the time the evacuation order was lifted, but they returned to their homes several hours later. The Office of Nuclear Materials Safety and Safeguards (NMSS) and NRC Region II staff, along with the Department of Homeland Security-National Operations Center, the Department of Transportation (DOT), and the State of West Virginia, monitored the incident. I-64 east was shut down in the area most of the day Sunday, but was re-opened at 6:54 p.m. I-64 west and Route 20 in the area of the accident were also closed for hours, but were re-opened earlier in the

day. Honeywell dispatched a 4-person team via chartered aircraft to assess the cylinder for damage prior to moving it to another trailer. Honeywell personnel verified that there was no visual indication of leakage, and radiation surveys confirmed that there was no contamination or leakage from the



cylinder. A subsequent inspection of the Type B

**Figure 4 - The Type B cask carrying the UF6 did not leak, but carved a small trench in the interstate concrete, as shown in the bottom left corner of the picture.**

shipping container revealed no damage to the Model 48Y cylinder, aside from one bent lifting lug. The common carrier contracted with a private hazardous materials firm to assist in the accident recovery. The cylinder was reloaded on another vehicle and was returned to the to the Honeywell facility.

## **CONCLUSION**

While incidents involving radiological materials are rare, the TEPP program has been proven to be effective in helping responders who are faced with the challenges of an actual response. So far in FY-2010, TEPP, which is managed for the Department of Energy by the Office of Environmental Management, has provided MERRTT to nearly 3,000 emergency responders in more than 150 training sessions held throughout the country. Approximately 13,000 responders have gone through TEPP training since 2004.

Ella McNeil, EM's program director for TEPP, said the successful responses by responders in Idaho and West Virginia "show that the TEPP program is making a difference to the responder community when there is an accident involving radiological materials."