This is the story of the Radiological Operations Support Specialist (ROSS) Program, which has grown from one person in 2014 to almost 500 trained radiological and nuclear emergency response and recovery subject matter experts through incredible volunteer efforts supported by federal agency funding and scientific development.

A 10-Year Personal History of the Radiological Operations Support Specialist

William Irwin[1]

Abstract: *The Radiological Operations Support Specialist Program accomplished one of the hardest outcomes—to build and sustain an all-volunteer organization from a few people to hundreds. Even more, the organization created a cadre of newly certified technical specialists able to help the local, state, and federal authorities respond better to a radiological or nuclear catastrophe so our nation can recover faster. The effort has had the endorsement of the United States Congress and the support of three important federal agencies and the national partnership for radiation protection, the Conference of Radiation Control Program Directors. The development of the Radiological Operations Support Specialist (ROSS) occurred over the same time when numerous other references, tools, trainings, and exercises were ushered in. A 10-year period that may be the most remarkable unified radiological emergency preparedness effort yet undertaken. This article describes the key motivators and many of the guidance documents and technical tools and capabilities that came together over the last 10 years that helped build not just an organization of radiological and nuclear emergency response and recovery subject matter experts that the nation needs, but also nearly everything to sustain them effectively for decades to come. Health Phys. 128:240–247; 2025*

Key words: *operational topics; education, health physics; emergencies, radiological; emergency planning*

INTRODUCTION

THE RADIOLOGICAL Operations Support Specialist or ROSS was one of many solutions to problems identified when officials from across the United States evaluated our vulnerabilities to catastrophic radiological and nuclear incidents after the terrorist attacks of September 11, 2001. According to the Federal Emergency Management Agency (FEMA) Office of Emerging Threats (OET), the "ROSS is a radiological/nuclear incident subject matter expert that acts as a state and local resource to assist emergency managers and first responders in navigating the unique challenges of radiological incidents and emergencies" (FEMA 2023a).

I, William Irwin ScD, CHP, had the honor of representing the states for the Conference of Radiation Control Program Directors (CRCPD) first as a ROSS in 2014, and then as a member of the ROSS Steering Committee. The other organizations on the ROSS Steering Committee, which provides national policy for the ROSS, are the FEMA OET, the Department of Homeland Security (DHS) Science and Technology Directorate National Urban Security Technology Laboratory (NUSTL), and the Department of Energy (DOE) National Nuclear Security Administration (NNSA) Consequence Management (CM) Program. I also chair CRCPD Homeland Security/Emergency Response Committee-4 (HS/ER-4), a collection of volunteers that help manage the ROSS cadre nationally and in each of the states.

THE MOTIVATING FACTORS

Motivation for a volunteer effort is critical to accomplishing the challenges of building and sustaining what is essentially becoming a new profession in health physics. The first motivator is to help each of the states

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be better prepared for the worst calamities—a catastrophic nuclear power plant release, a major transportation incident involving radiation, terrorist incidents like a radiological dispersal device, or a nuclear detonation. The second motivation is to expand one's skills, knowledge, and abilities in health physics as broadly as possible because emergencies usually result in lost control of radiation sources, many things becoming contaminated, and many people becoming physically and mentally harmed. The third motivator is working with some of the smartest people in our professional community.

Concurrent developments in radiological/nuclear preparedness

The ROSS fills a major gap identified in our national, state, and local preparedness for catastrophic radiological and nuclear incidents. Other significant developments include tools like RadResponder, the national standard for the management of radiological data, and the Radiation Emergency Medical Management (REMM) website with exceptional tools and guidance for healthcare providers and first responders (*RadResponder* 2023; *REMM* 2023). They include numerous National Council on Radiation Protection & Measurements (NCRP) reports, Commentaries, and Statements including:

- Report 165, Responding to a Radiological or Nuclear Terrorism Incident: A Guide for Decision Makers (NCRP 2010);
- Report 175, Decision Making for Late-Phase Recovery from Major Nuclear or Radiological Incidents (NCRP 2014);
- Report 179, Guidance for Emergency Response Dosimetry (NCRP 2017);
- Commentary 28, Implementation Guidance for Emergency Response Dosimetry (NCRP 2023); and
- Statement 14, Instrument Response Verification and Calibration for Use in Radiation Emergencies (NCRP 2019).

There were also numerous guidance documents created by a collaboration of federal agencies including:

- Planning Guidance for Response to a Nuclear Detonation (FEMA 2023a);
- Improvised Nuclear Device Response and Recovery: Communicating in the Immediate Aftermath (FEMA 2013a);
- Communicating During and After a Nuclear Power Plant Incident (FEMA 2013b);
- The Nuclear/Radiological Incident Annex to the Response and Recovery Federal Interagency Operational Plan (US DHS 2023);
- Radiological Dispersal Device (RDD) Response Guidance—Planning for the First 100 Minutes (US DHS 2017a); and
- Using Preventative Radiological Nuclear Detection Equipment for Consequence Management Missions (US DHS 2017b).

There have been numerous exercises sponsored by the US DOE as well as ROSS Job Aids and a ROSS Toolkit funded by DHS that are described below. There are also scores of additional relevant papers, studies, reports, and guidance documents. A goal for ROSS competency maintenance is to look for these resources, engage meaningfully with them, learn from them, and become better able to implement the capabilities and recommendations within them.

A PERSONAL BEGINNING

I got into the ROSS effort when one of its most important benefactors, Dr. Dan Blumenthal of the DOE NNSA CM Program at the time, briefly described the ROSS and asked me if I wanted to play one at a nuclear detonation exercise in Indiana in 2014. He said the exercise was called Vibrant Response and it was run by the US Army Northern Command, and it was going to be in Indiana in two months. I, of course, said yes. There is not much more exciting for a health physicist who has immersed himself in rad/nuc emergency preparedness than a national level nuclear detonation exercise.

I knew it was going to test me. I knew I had to be well-prepared. Despite reading every nuclear detonation guidance document I could find and the draft ROSS Guidebook, I underestimated what I was getting into.

I knew things were going to be different as we drove into the Muscatatuck Urban Training Center in southern Indiana. It is described by the Indiana National Guard as "the Department of Defense's (DODs) largest and most realistic urban training facility serving those who work to defend the homeland and win the peace" (Indiana National Guard 2023). After convincing the heavily armed soldiers at the perimeter that we were from the government and we really were there to help, we drove through smoke from numerous staged fires, saw helicopters in the sky, heard sirens in the distance, and saw bed sheets with messages about needing help, medicines, and food and water hanging out the windows of buildings. See Fig. 1.

Dr. Blumenthal was leading the CM Advance Party, and I was with him. As we pulled up to the most forward incident command post near the moderate damage zone, I learned my first lesson—the civilians and the DOD don't work together. The DOD had their stuff in one place, and they appeared fully engaged and with good situational awareness. This was nuclear war, and they knew how to respond. When I met with them, they really had no interest in a ROSS. I moved on.

When I found the civilian Incident Management Team (IMT), it was the total opposite. The Incident Commander, Safety Officer, and Operations Section, Planning Section, and Logistics Section Chiefs were well-practiced at tornadoes and floods, but they had no idea what to do with a nuclear bomb going off at the Indianapolis Motor Speedway. They were in the mobile

FIG. 1. Muscatatuck Urban Training Center, Indiana, during Vibrant Response 14. Photo by the author.

incident command post. Because I heard radio transmissions from firefighters, emergency medical services, and law enforcement near the front lines, my first recommendation was to withdraw all the first responders and get them inside protective shelter and to stay inside until conditions were determined safe. Otherwise, I said, they might all die.

My second recommendation was to do what they always do for disasters but talk to me and the DOE people about what they were going to do so we could give them special precautions for radiation, which was likely at lethal levels in their area of responsibility.

Eventually, tents got set up, command and general staff organized, communications were established, and things started to get into a battle rhythm with tactics and planning meetings. We progressed to getting radiation-related safety content into the Incident Action Plan, developing safety instructions for each of the work assignments in the ICS 215 forms, and it seemed that most of the responders were safe awaiting new orders outside the dangerous radiation zone.

On Day 2, we got things organized around modeled perimeters for the dangerous radiation zone and the hot zone. We used those to plan for search and rescue in the moderate damage zone and to set up triage, treatment, and transportation to trauma centers and burn centers outside the light damage zone. We got the NARAC deposition plot for fallout and with the IMT GIS team identified access control points (ACPs) on the perimeter surrounding the dangerous radiation zone and the hot zone. These ACPs were used to only let responders who had signed in and gotten some form of device for assessing dose enter, and for screening people who were self-evacuating for possible acute radiation syndrome (ARS).

On Days 3 and 4, I went to the Indiana State Emergency Operations Center (SEOC). This is where I learned my second lesson—relying on the nuclear power plant model of response can cost many lives. Before I arrived, scarce resources were being poured into decontamination facilities, when the real problem was acute radiation syndrome (ARS). Instead of instructing hundreds of thousands of people on how to conduct self-decontamination, hundreds of responders were hastily trying to set up community reception centers. See Fig. 2.

I recommended that we address the ARS concerns directly by creating a custom National Atmospheric Release Advisory Center (NARAC) data product showing where people received lethal doses, where people received doses requiring immediate care otherwise they would die, where people should be able to care for their injuries themselves, and where people were not affected at all. Denoting the vast area where people were not affected was vital to mitigating an inevitable medical surge while also focusing care on those who could die without care. We directed those people in dire need of rapid assessment and treatment, thousands of people who were in the Moderate Damage Zone, to contact their healthcare providers. I had earlier worked with public information officers from the Joint Information Center to prepare guidance for healthcare providers on ARS care. Health provider guidance was sent out to the whole community using the Health Alert Network.

While I was the ROSS in Vibrant Response 14, a pair of contractors watched everything I did and took notes. They interviewed people I served about what I was doing and whether it was helpful. This evaluation was included in a job task analysis (JTA) for the ROSS. Similar engagements occurred for Southern Exposure 15 where Ken Yale of Michigan served as the ROSS for a nuclear power plant national level exercise and Vibrant Response 16 where Jeff Semancik of Connecticut served as a ROSS for that nuclear detonation full-scale exercise. At the same time, Brooke Buddemeier of Lawrence Livermore National Laboratory (LLNL) and his team led an effort to share the ROSS idea with those who might become ROSS and more importantly those who might use ROSS. He and others

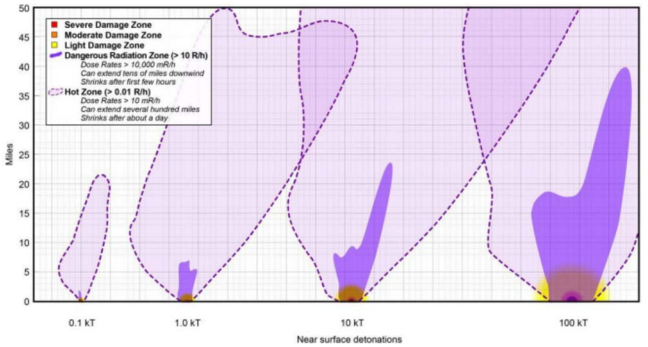

FIG. 2. Severe, moderate and light zones, dangerous radiation zone, hot zone. Planning guidance for response to a nuclear detonation, 2023 (FEMA 2023a).

shared the ROSS at the National Radiological Emergency Preparedness, Health Physics Society, and CRCPD annual meetings. The feedback obtained from those stakeholders also informed the JTA.

THE FIRST PILOTS

By the summer of 2016, LLNL had used the JTA to draft lesson plans for an initial ROSS training course. The skills, knowledge and abilities identified in the JTA formed training objectives. The collection of tools and resources developed for radiological and nuclear emergency response became the craft to be taught using those objectives. These included the broad and diverse capabilities of numerous federal agencies as described in the Nuclear Radiological Incident Annex to the Response and Recovery Federal Interagency Operational Plan which was at that time an annex to the National Response Framework (US DHS 2023). Other resources included all the assets of the DOE NNSA radiological and nuclear emergency preparedness program called the Nuclear Emergency Support Team (NEST) (DOE 2023a).

An equally important part of the training was indoctrination in the Incident Command System. We relied on Jim Rogers of FEMA for this. Jim was not only the ROSS Program Manager, but he was a member of one of the nation's leading IMTs. Helping HPs understand and use ICS was challenging, but critical. To paraphrase Brooke Buddemeier: we could have chosen to turn incident responders into health physicists (HPs) or to turn HPs into incident responders; we chose the latter. If HPs could not fit into the fast-paced and intense environment of an Emergency Operations Center (EOC), they would hardly survive their first day in any emergency environment.

Another pillar of the training was interpersonal communication. The training modules incorporated briefings by all the students multiple times a day for five days. Each briefing was timed. Despite instructions to keep them between 30 and 60 seconds, the first iterations were two to three minutes. By mid-week, people were getting their timing right, but they had to be reminded when they were not giving the right guidance to respond appropriately, especially to save lives. By the end of the week, they had the timing right and they knew that contamination control and managing public fear were the key issues for radiological dispersal devices (RDDs), that complicated isotopic mixes with only a limited capacity to result in ARS were key to NPPs, and acute radiation dose and the rapid decay of fallout were key to managing response and recovery to nuclear detonations.

The first ROSS class was held in September 2016. Sixteen students were accepted from those that applied, sending in resumes and cover letters to support their being chosen. They were all health physicists, and they came from every part of the country representing state government, academia, healthcare, consulting, and private industry. They were taught while they ate lunch; they stayed up late into the night working on team assignments; they learned from the best—Brooke Buddemeier and John Nasstrom of LLNL, Jim Rogers of FEMA, Brendan Palmer of Chainbridge Technologies, and people who played the ROSS, Ken Yale of Michigan (now of the EPA) and me. There were evaluators from LLNL, DHS NUSTL, FEMA, DOE NNSA, Emergency Management Services International (EMSI), and Counterterrorism Operations Support (CTOS) who took copious notes, gave feedback every evening, and provided a summary of class progress each morning.

A second class was held a year later after LLNL revised the lesson plans from lessons learned during the pilot course. While the inaugural course in 2016 was sponsored by the CRCPD, the second was sponsored by the Centers for Disease Control and Prevention (CDC). The second course had 31 students and was conducted at the Georgia Institute of Technology. There were now almost 50 trained ROSS.

This is a good time to highlight the organization probably most responsible for the ROSS being where it is today—the National Urban Security Technology Laboratory (NUSTL). NUSTL executes the Department of Homeland Security's research and development for radiological and nuclear emergency response and recovery issues. They "built training courses, job aids and tools to support the Radiological Operations Support Specialist (ROSS) position, a nationally recognized emergency response position to ensure incident commanders have access to subject matter experts with verified skills, knowledge and abilities during a radiological incident" (US DHS NUSTL 2017). In the early years Ben Stevenson ran NUSTL's ROSS development. More recently, Orly Amir brought it through its final development and turned it over to FEMA and the States.

THE CRITICAL MILESTONES

After the second pilot, CTOS took over the ROSS training program. CTOS operates out of the DOE NNSA Nevada National Security Site and is a member of the National Domestic Preparedness Consortium. They develop and conduct courses for the FEMA National Preparedness Directorate National Training and Education Division (DOE 2023b). CTOS hired several of the best ROSS and certified them to teach the initial ROSS course. In 2018, initial ROSS classes were taught in Texas, Maryland, and Arizona. The Maryland course was formally evaluated for FEMA National Training and Education Division (NTED) course certification. The course was revised for the comments collected during the Maryland FEMA pilot in 2019. At the end of 2018, there were 101 trained ROSS.

Concurrently, another critical milestone was the development of

documents required to make the ROSS a qualification for personnel within the National Incident Management System (NIMS). These documents are the Position Qualification (FEMA 509), which may be accessed here: https://www.fema.gov/sites/default/files/documents/fema_radiological_operations_support_specialist_03023.pdf; and the Position Task Book (PTB), which may be accessed here: https://www.fema.gov/sites/default/files/documents/fema-nqs-ptb_radiological-operations-support-specialist.pdf. See Fig. 3.

The 509 describes the Type 1, 2, 3, and 4 ROSS and the education, training, and experience that differentiates each type. People who take the CTOS course PER-388 and complete the course prerequisites may ask FEMA to become a Type 4 ROSS (FEMA 2017b). They are then assigned a PTB to begin working on their Type 3, then Type 2, and finally their Type 1 certification. In all, it requires completing 63 tasks to advance from Type 4 to Type 1. It is important to have ROSS of different Types. Like all work, there is work to be spread amongst beginners, intermediate levels, and highly experienced subject matter experts.

It takes a lot of work to become a Type 3 ROSS because that is where tasks that demonstrate you have all the skills, knowledge, and abilities to work independently as a ROSS are accomplished. Type 2 ROSS accomplish tasks that demonstrate they are a subject matter expert for three key scenarios—the RDD, an NPP incident, and a nuclear detonation. Type 1 ROSS have accomplished tasks to demonstrate they can advise any decision-maker at any level of government on any radiological or nuclear emergency.

An important caveat to all Types is that they cannot make public health and safety decisions themselves unless they are also the authority having jurisdiction (AHJ) for the decision. AHJs are typically designated by statute and for specific kinds of authority within specific areas of jurisdiction. There are some ROSS who are designated to make decisions during a radiological or nuclear emergency in their jurisdiction, but most ROSS would fall into a support role for the AHJ.

Important ways to keep volunteers motivated and engaged is to share news and celebrate progress. We have long had a ROSS LinkedIn group to connect with other professions. The ROSS public-facing website is with the CRCPD at https://crcpd.org/ross-portal/. Here one can find links, stories, references, and tools for all to use. The ROSS password-protected website is the Homeland Security Information Network ROSS Community of Interest. Our cadre management software is MissionEdge, which is a product of Chainbridge Technologies who has created another important resource portal and workspace, CBRNResponder.

As for celebrations, we recognize every new ROSS advancing by type at our ROSS Quarterly Calls, which we have held nearly every calendar quarter since 2017. We already have many ROSS attending the CRCPD, NREP, and HPS annual meetings, and hope to have a dedicated ROSS get-together at each of them annually. Perhaps most importantly, we celebrate the inclusion of the Radiological Operations Support Specialist position in numerous guidance documents and as a planner and player in many jurisdictions as well as in exercises.

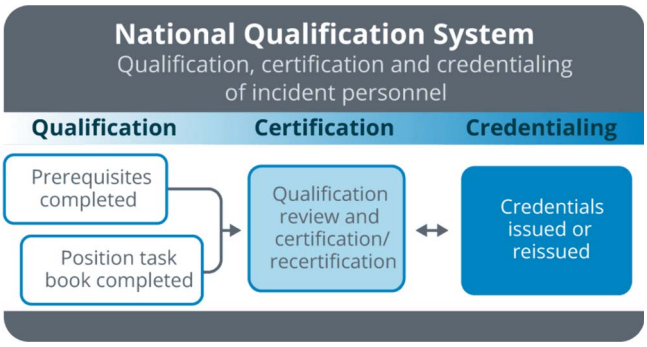

FIG. 3. FEMA National Qualification System: https://www.fema.gov/sites/default/files/2020-05/fema_nims_nqs_guideline_0.pdf (FEMA 2023b).

ROSS IN EXERCISES

By the end of 2019, the ROSS Program was at its healthiest. Of 101 people trained as ROSS, 57 were certified as Type 4, 28 as Type 3, 10 as Type 2, and 6 as Type 1. Sixty-four ROSS had participated in 34 different exercises across the nation. The full-scale exercises included:

- Four Vibrant Response (VR) nuclear detonation exercises (VR 14 in Indiana, VR 15 in Missouri, VR 16 in Pennsylvania, and VR 19 in Michigan);
- The Gotham Shield 17 and Dense Urban Terrain 19 nuclear detonation exercises;
- The Cobalt Magnet 19 NASA Pu-238 satellite launch anomaly exercise;
- Four NPP exercises in Iowa, Connecticut, Massachusetts and Rhode Island; and
- The Vigilant Guardian 17 RDD exercise in California.

ROSS also played in the more than two dozen Silent Thunder RDD and Isotope Crossroads highway route-controlled quantity (HRCQ) transportation incident exercises.

Like all Vibrant Response (VR) exercises, VR 16 was a nuclear detonation scenario. One of the more important lessons learned here is how one of the states with the most NPPs can find themselves fooled by the NPP response paradigm they practice so well. The best example of this is the determined focus players in Pennsylvania paid to potassium iodide (KI) distribution. KI is an important protective action for NPPs because a large fraction of dose is that from radioactive

iodines, especially to children. FEMA Type 1 ROSS Jeff Semancik of Connecticut pointed out that in a nuclear detonation scenario, KI distribution would be less beneficial since radioiodine dose is a very small fraction of overall dose, but it also takes enormous resources to distribute KI in a timely manner for a no-notice release that does not occur at a fixed facility.

There were many interesting aspects to Gotham Shield 17. This was a nuclear detonation exercise near New York City. ROSS participated as a Strike Team in this case, with one ROSS in the city, one in the New York state capital in Albany, one in New Jersey and another operating as the ROSS Strike Team Leader helping to ensure a common operating picture among all the ROSS. This Strike Team approach is important operationally since work must be coordinated, and because certified Type 2 ROSS can lead a ROSS Strike Team, while a certified Type 1 ROSS can lead multiple ROSS Strike Teams. An important observation was the insistence by some government agencies to delay lifesaving efforts until every responder had a respirator and personal dosimeter. Planning guidance for response to a nuclear detonation describes how internal dose from the respiratory tract is a minor contribution to dose compared to direct gamma radiation whole body dose from fallout (FEMA 2023a). NCRP guidance has documented how group dosimetry and other alternatives may be acceptable for individual dose monitoring during the lifesaving phase of the response (NCRP 2017).

CM19 was fascinating because it dealt extensively with alpha radiation monitoring, which is generally a weakness among state and local responders. It was also interesting to recognize that the likelihood of a plutonium-238 release was remote and limited to a few seconds during initial rocket engine ignition and liftoff. From the ROSS perspective, we again used a ROSS strike team, but also used a ROSS "Home Team." It was recognized that many tasks, including research and extensive calculations, could be done by ROSS from their homes. A lesson confirmed by all during the COVID pandemic of 2020 through 2022.

VR 19 was interesting because it was the first time we had ROSS play as ROSS *and* help design and implement the exercise as planners. We were also fortunate to send other ROSS as observers. This distribution of ROSS is planned for CM25, an NPP exercise scheduled for March 2025 in Michigan.

Also related to exercises is the participation by FEMA Type 1 ROSS Matt McKinley of Kentucky in the Dense Urban Terrain full-scale exercise in Michigan and a Silent Thunder exercise in Florida. Matt is unique in that his job with the National Guard Bureau is like that of a ROSS. As an Army National Guard CBRN Specialist, Major McKinley advises decision makers on the situation and recommendations for various decisions to be made at nearly every Vibrant Response Exercise. Major McKinley used the Dense Urban Terrain 19 exercise to help share the ROSS and lessons learned within it with his colleagues in the National Guard who implement DSCA, the Defense Support of Civil Authorities. In Florida, Matt shined in a demonstration of the ROSS for a visiting delegation from Japan. The ROSS logo is not specifically tied to the United States, in hopes of exporting the capability to other countries over time.

Finally, the NPP exercises were important to show how ROSS could provide significant assistance in a situation often cloistered from external influences. Very often NPP exercises are tightly controlled by state emergency management officials and the NPP operators who are reticent to change. Our experiences have shown the ROSS can be incorporated efficiently and effectively into NPP response and recovery planning, staffing, training, and exercising.

In four states, ROSS assisted the state and local authorities in their NPP exercises with initial plume surveys, NARAC data product interpretation, dose assessment as calculated from environmental media radiochemistry results, and protective action recommendations based on the surveys and environmental media samples. Demonstrating ROSS proficiencies relative to NPPs is important because jurisdictions responsible for NPP emergency preparedness execute a significant number of exercises. The ROSS need exercise experience to help them improve their competencies and potentially advance their ROSS typing. Having ROSS involved in NPP exercises would help immensely in this objective.

Nearly all the exercises listed above are part of the DOE NNSA Consequence Management Program or its Office of Radiological Security. They are essential to competency development and maintenance and there is no substitute. For almost every other responder resource like hazardous material technicians, wildland firefighters and IMT Command and General Staff, there are many opportunities to develop and sharpen skills. This is not the case for radiological and nuclear emergencies. Exercises are an important way to help ROSS advance their skill for events we hope will never happen, like nuclear detonations, RDDs, and NPP accidents.

As a concurrent source of support of the ROSS, NUSTL funded the development of three ROSS Job Aids on Incident Management, the Incident Planning Cycle, and Emergency Operations Centers. They are in a document library in CBRNResponder, another concurrently developing radiological and nuclear emergency response and recovery tool. These job aids help ROSS recognize what kind of support they could provide the IMT from the start of each operational period to the development of the Incident Action Plan for the next. NUSTL also funded the ROSS Toolkit in CBRNResponder. According to the FEMA launch site, CBRNResponder is: "A single, secure platform for

all chemical, biological, radiological, and nuclear (CBRN) incident data sharing and multi-hazard event management. CBRNResponder integrates with federal assets and incorporates national-level policy guidance, providing a one-stop shop for all CBRN planning, preparedness, and operational tools and resources" (FEMA 2017a).

Though built for ROSS, the CBRNResponder ROSS Toolkit, another resource developed by the folks at LLNL and funded by NUSTL, is useful for anyone involved in a radiological or nuclear incident. The ROSS Toolkit provides guidance on interpreting NARAC plots, conducting 10-point monitoring, establishing perimeters and zones, conducting population monitoring, and deciding when shelter is safer than evacuation. It also provides resources for recovery and worker safety and has links to isotope fact sheets, gamma constants, the CRCPD, the Radiological Assistance Program (RAP) Teams, and the Advisory Team for Environment, Food and Health. Recommendations for specific situations are typically provided in tables with references to the organizations that made them and explanations of when it is best to use the recommendation.

This is where another NUSTL-funded project comes in. It is the Virtual Evaluation Scenario Tool or VEST, which provided a virtual exercise that requires the ROSS to work to assess the situation, develop recommendations, and help implement decisions. The VEST focuses on activities where ROSS can demonstrate competencies and complete tasks in their PTBs, allowing them to advance from Type 4 to 3 to 2 to 1. The first VEST, based on a nuclear detonation, was developed by Type 1 ROSS with the assistance of LLNL and piloted in 2021. An RDD VEST is in development with a launch hopefully in the second half of 2024.

These VESTs are critical to the now 360-plus trained people, many of whom want to advance by type as ROSS, though some simply want to improve their competencies without PTB advancement by Type. They are critical, too, because it is only through repetitive and ever-evolving skills, knowledge, and abilities development that the ROSS will be able to help incident managers respond better so we all recover faster.

THE COVID YEARS

Like most of life, many elements of the ROSS Program were stifled by the COVID Pandemic. While there were no exercises and no CTOS initial ROSS training courses between the beginning of 2020 and the end of 2022, a lot was accomplished by CRCPD Committee HS/ER-4 that works with FEMA to run the ROSS. For example, every calendar quarter we continued with the ROSS Quarterly Calls. These two-hour calls provided updates, but also were used for ROSS competency maintenance. Problem sets linked to scenarios and PTB tasks are usually created. Another important effort was to share a better understanding of the Emergency Mutual Assistance Compact (EMAC). CRCPD HS/ER-4 is developing Mission Ready Packages for jurisdictions supplying ROSS as mutual aid and Resource Support Agreements for jurisdictions seeking ROSS as mutual aid using EMAC.

One of the most important developments during COVID was a report requested by DHS NUSTL of its Homeland Security Operational Analysis Group. NUSTL asked them to conduct an audit of the ROSS, and the report, authored by the RAND Corporation, recognized the program had accomplished much by getting the ROSS included in the National Incident Management System, developing an initial ROSS training curriculum, and training about 150 people at that time. It noted, however, it was time to shift the maturing program from federal control to state and territorial control for future development.

The RAND Report also recommended that each of the 50 states have a Type 1 ROSS and at least three additional Type 2, 3, or 4 ROSS. It further recommended that the larger, more populated states have more with the total active ROSS for robust capability in the United States at or above 362. The report also noted how difficult the challenges of building and sustaining a volunteer organization are.

POST-COVID YEARS

Once we could start to return to something more normal, our focus for the ROSS Program turned to training. The FEMA Office of Emerging Threats worked with the FEMA National Training and Education Division to increase the number of Initial ROSS training courses. One course was offered at the end of 2022, three were offered in 2023, and there are currently seven set for 2024. These offerings should push the number of people trained to over 500. Another training effort has been engaging ROSS and others from around the country in annual ROSS-oriented and ROSS-led training at the National Radiological Emergency Preparedness (NREP), CRCPD, and HPS Conferences.

Continuing training is our biggest priority now that we have built the initial cadre to near its goals. In addition to the Virtual Evaluation Scenario Tool (VEST) and the quarterly competency maintenance problem sets, we will continue offering ROSS-centered and ROSS-led training at NREP and the CRCPD and HPS annual meetings. Several hundred people have attended these training courses where a team of ROSS and Wendy Renno of Radiation Emergency Services and Christine Allston of Chainbridge Technologies shared the new paradigm of radiological and nuclear emergency response described in the DHS guidance for RDDs and nuclear detonations along with new tools in RadResponder and in training simulation software. Training allowed students to use the new paradigm and tools in an RDD drill in 2022 and in a nuclear detonation drill in 2023. In 2024, the students discussed and recorded their perspectives on the new paradigm and that used

currently in NPP response and recovery. This engagement is important because the approaches to NPP response and recovery have not evolved significantly from the paradigm mostly developed after the accident at Three Mile Island.

CLOSING

Ten years ago, I served as the first ROSS from one of the states. Two years later, three more state ROSS were tested in exercises, and we held the first ROSS Initial Training Course for the next 16 ROSS candidates. With the help of FEMA and CTOS, by the end of 2024, there will likely be more than 500 people who have been trained to certify with FEMA and their state as a Type 4 ROSS. The earliest trained ROSS have been working in their Position Task Books to advance to Type 3, 2, and 1 ROSS. The CRCPD has built a 15-person committee to help all the states manage their ROSS and integrate them into the states' radiological and nuclear emergency preparedness organization, planning, training, and exercising. We are well on our way to meeting and surpassing the goals identified in the Rand Report.

While it has been a very rewarding endeavor personally, all of us leading this effort take great pride in knowing that our team is filling the gap identified in the beginning: To ensure there are state and local men and women who now know better how to respond to and begin to recover from a catastrophic radiological or nuclear incident. The first 10 years of the ROSS objectively improved our nation's preparedness thanks to the hard work and dedication of many volunteers from the states and their partners at FEMA, US DHS, and US DOE.

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