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RECOVERY, RESILIENCE AND REALITY: GOING BEYOND NCRP REPORT NO. 175

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Abstract

Published in December 2014, National Council on Radiation Protection and Measurements Report No. 175, *Decision Making for Late-Phase Recovery from Major Nuclear or Radiological Incidents*, emphasizes the importance of local, state, and national plans addressing late-phase issues and decision-making processes concurrently with emergency response requirements. The report includes eight recommendations ranging from a broad call for a national strategy promoting community resilience as a preferred approach for preparing to recover from nuclear or radiological incidents to more specific calls for research and strategies for cleanup and waste management. This paper highlights how additional guidance may improve the nation's readiness to recover from a low-probability but high-concern incident.

Keywords

National Council on Radiation Protection and Measurements; accidents, nuclear; emergency planning; nuclear weapons

INTRODUCTION

FEDERAL LATE-PHASE recovery guidance recommends an inclusive stakeholder process for setting incident-specific goals rather than prescribed standards for remediation. In 2014, the National Council on Radiation Protection and Measurements (NCRP) issued Report No. 175 (National Council on Radiation Protection and Measurements 2014) that expands on the nation's radiation incident response and recovery guidance. NCRP Report No. 175 gave recommendations on processes guiding how decisions should be made in the late phase and provided emergency preparedness planners much needed detail on the steps needed to plan for recovery. However, the guidance does not include detailed considerations as to when and how government intervention may be terminated. In this paper, the authors will highlight positive experiences with the stakeholder involvement process, possibilities for using that

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process to define an exit strategy, and suggestions for future additional guidance needed to better implement a successful recovery from an almost unthinkable disaster.

STAKEHOLDER INVOLVEMENT PROCESS

Working with stakeholders is a necessary part of the long-term recovery mitigation/cleanup guidance per the U.S. Environmental Protection Agency's (EPA) *Protective Action Guides and Planning Guidance for Radiological Incidents* (PAG Manual) (U.S. Environmental Protection Agency 2017) and NCRP Report No. 175 (National Council on Radiation Protection and Measurements 2014). Setting up a stakeholder group early in the response enables an ongoing conversation among responders and community members to set goals that are well informed by, and will inform, the emergency response activities to reduce risk.

According to the PAG Manual, the stakeholder working group should be convened as soon as practicable—ideally within days or weeks of the incident. The function of the stakeholder working group is to provide input to response leadership concerning local needs and desires for site recovery, proposed cleanup options, and other recommendations. The group should present local goals for the use of the affected area, prioritizing current and future potential land uses and functions, such as utilities and infrastructure, industrial, downtown business, and residential land uses. The stakeholder working group is not a decision-making body. The stakeholder working group should include selected federal, state and local representatives, and local nongovernmental representatives as well as local and regional business stakeholders. The exact selection and balance of stakeholders is incident-specific.

Stakeholders ideally should be armed with plenty of information about how to assess the risks. One function of stakeholder engagement is to educate community leaders so they can help carry the message to broader communities about risk and safety measures being taken. One specific challenge associated with radiation is that, unlike other hazardous materials, radiation can always be detected in natural background. It is very easily detected with instruments that are readily available to and usable by lay people, but the fact that it can be detected does not mean that it is cause for concern. It takes millions of times the natural level received in a relatively short period of time (e.g., hours to weeks) to cause any appreciable risk. After the Fukushima releases, EPA detected minute levels of radiation in the United States and territories far below PAG levels that would warrant taking action like evacuation, shelter-in-place, relocation, or use of potassium iodide. Radiation technical experts need to help the stakeholder working group understand radiation risk; they need to clearly explain the risks associated with various levels of radiation exposure. Providing stakeholders with independent studies and sets of data may be useful in allowing them to come to their own informed conclusions about radiation risk. Once stakeholders have more knowledge about real health risks, they can help other members of the community put their fears of radiation in perspective. It seems that the more people know about radiation and the risks, the less concerned they are.

The stakeholder working group would be managed by the Incident Command System Planning Section Unit assigned responsibility for cleanup options analysis. When assembling and working with members of the community, it may be worth engaging public

affairs staff working in the response Joint Information Center. The Public Information Officer could assemble a team to help establish a process for identifying group members, setting up regular meetings, and establishing a process for the stakeholder group to report its recommendations back to the decision makers.

The stakeholder working group is not a decision-making body; it is a consulting body with specific knowledge of the local area and interests of the residents and business that reside in that area.

Facilitated stakeholder decision making was demonstrated during a dirty-bomb recovery exercise, Liberty RadEx, in 2010. For this exercise, a stakeholder working group made up of actual community members was convened to discuss cleanup priorities and waste management options. After a series of educational discussions with experts and working through an internal consensus building process, the stakeholder group came back with a decision that was a hybrid of the options presented to them. One of the more notable lessons from this stakeholder process was how it demonstrated the stakeholder group's willingness to consider the interests of the community as a whole, not just their own self interests. They were willing to sacrifice their own self-interests to some extent if they believed the community as a whole was being better served. The community panel really liked working with the technical working group, who advised them on risks and realities of a protracted and complex mitigation process impacting their home town. The group decided, in the end, to accept the technical working group's recommendations. They accepted the need for waste staging in their communities. They agreed to the cleanup strategy that started at the highest levels of contamination and worked outward, effectively cleaning Center City first and then moving into the working-class neighborhoods where most of the stakeholder group members lived. Their discussions were incredibly nuanced. They liked the idea of starting cleanup at both ends and meeting in the middle, but Center City was the most important to the most people.

The exercise organizers also noted there was too little time (total of four 3-h sessions) for the technical and stakeholder groups to play out any overarching issues—like “how clean is clean”—in very much detail. This was why the exercise focused on waste staging areas and cleanup prioritization. Options were developed ahead of time to give the groups a chance of completing their tasks. The success of the exercise was not the choices the stakeholders made in the end; it was their recognition that they had to make choices between difficult, complicated options, and no one option was perfect.

The authors are proposing that new guidance is needed. It could aid in determining when the cleanup goal has been achieved based on up-front stakeholder consensus using statistics and metrics. The guidance should be designed to reduce public fears and improve the speed of decision making. New guidance could focus on metrics and a process for defining an exit strategy, both for ending monitoring plans and for wrapping up the optimization process.

DEFINING AN EXIT STRATEGY

A critical component of any emergency response is the development of an exit strategy. Most successes or failures in an emergency response are determined within the first 48 h when much of the energy and decision making occurs to save human life or protect critical infrastructure. Depending on the scale of the incident, these actions may linger for several days to weeks, and the concept of ceasing operations is not considered until much later. A successful exit strategy should be developed early in the response and include specific criteria and objectives that are clearly communicated to responders and members of the public up front. This was successfully demonstrated during the Hurricane Katrina response in coordinating medical care for evacuees (Mattox 2006). The command staff planned an exit strategy from the very beginning by clearly communicating that the medical clinic would be open for 2 weeks only or until the population reached 3,000. These criteria were shared with the media and an entire collaborative network of partners. The evacuees became part of the exit strategy by integrating into the process and developed a “can do” mentality associated with the exit strategy. When exit strategies are not clearly defined and communicated, as in the two examples below, the outcome can be both politically and financially costly.

Removing post-Chernobyl sheep controls

Shortly after the Chernobyl nuclear reactor accident in 1986, the United Kingdom identified potential food safety concerns in sheep meat that had grazed in certain areas contaminated by the fallout. The U.K. Foods Standards Agency initiated a program to monitor the radiocesium contamination levels in meat and to conduct animal husbandry for protecting consumers as well as the industry. This task involved more than four million sheep in more than 9,800 U.K. holdings and lasted for 25 y (Wearne 2012). The sheep controls included actions such as paying farmers a small fixed-fee (£1.30, never corrected for inflation) for every sheep monitored to compensate them for the costs incurred in gathering and holding sheep for monitoring; placing controls on the movement of sheep in designated areas contaminated by the fallout; preventing sheep from entering the food chain for 3 mo if their measurement exceeded $1,000 \text{ Bq kg}^{-1}$; and, lastly, providing clean feed to the sheep during the 3-mo holding period. Similar monitoring programs ceased operations in Northern Ireland in 2000 and Scotland in 2010 but continued in England until 2012.

These control measures became the new normal for the farmers and consumers in that it gave them the confidence that the meat was safe to eat. The monitoring level of $1,000 \text{ Bq kg}^{-1}$ was never intended to be a safety limit in the sense that it would be unsafe to eat any amount of meat above that level. Instead, it was used as a means of controlling the maximum radiation dose to which consumers might be exposed. An independent peer-reviewed risk assessment concluded that the cesium contamination levels at this value presented a very low consumer risk, even to those who may have a diet containing large amounts of sheep meat.

The initial exit strategy developed for ceasing sheep monitoring varied across the United Kingdom but required a full-flock survey conducted during the summer months showing no sheep above the $1,000 \text{ Bq kg}^{-1}$ level for two consecutive years. Later, it was deemed that this exit strategy was too restrictive and resulted in a continuation of a monitoring program

that was no longer proportionate to the very low risk. In other words, the controls became ineffective in further minimizing the already low doses and advising the public/farmers that consumer safety would not be compromised if they stopped. As a result, the Foods Standards Agency revised the exit strategy by engaging the affected farming and consumer industries to reinforce the message that the scientific assessment has shown the risk to the consumers is very low even if the monitoring program is terminated. Resistance from some in the farming community was driven by concerns of losing customers who may doubt the safety of the meat due to negative media stories. It took local and national media coverage, including prime-time television viewing, to reinforce the message that the consumer's risk is very low. As a result, they received no adverse comments from consumers during follow-up stakeholder surveys, and the monitoring program came to an end in July 2012, 25 y after the Chernobyl accident.

Terminating U.S. EPA temporary radiation monitoring

A recent real-world example highlighting the need for a clear, well-communicated exit strategy is the case of increased RadNet monitoring and sampling following the Fukushima nuclear plant releases in March 2011. Per the Nuclear Radiological Incident Annex (Federal Emergency Management Agency 2017) of the National Response Framework, EPA has a leadership role in the event of an overseas radiation incident potentially impacting the United States. That role specifically is to conduct nationwide radiation monitoring and to provide the public with assessments of public health impacts based on that information.

Looking back at the increased monitoring and sampling the Agency did for about 6 wk after the initial releases, one challenge encountered was how to be clear with the public about when that increased monitoring should transition back to routine RadNet monitoring and sampling. EPA's leadership deliberated early on in the development of the increased monitoring plan parameters. While there was plenty of pressure to quickly fill *perceived* geographic gaps in RadNet's coverage of the United States and territories, there was also demand for a more frequent analysis of what radioactivity might have made it to our monitoring and sampling points.

Stakeholders in increased monitoring were intergovernmental organizations, specifically the governments of Guam and Saipan (Commonwealth of Northern Mariana Islands). Since RadNet includes a set of portable monitoring stations to be placed in the event of an emergency, some of those portable stations were sent to Alaska, California, Guam, and Saipan. EPA's day-to-day emergency preparedness partnerships enabled EPA regional staff to coordinate with the State of Alaska and facility owners who were cooperative and helpful. EPA's radiation senior scientists coordinated with Guam and Saipan, leveraging close relationships built over years of collaboration. Guam and Saipan are U.S. territories independent of one another, but they are similarly geographically isolated. Their emergency preparedness programs usually focus on weather and natural disasters like earthquake, tsunami, and drought.

EPA's leadership agreed to continue increased monitoring until one full set of data points showed no discernable difference from natural background; this was EPA's monitoring exit strategy. Public information officers were asked to begin crafting messages, to make it clear

that returning to the normal monitoring frequency would still allow the RadNet system to evaluate any potential public health impacts, as the system always does. When the airborne releases from Fukushima plants had stopped, it would also make sense to return the portable emergency stations to the laboratory and resume the regular sampling and analysis frequency. The U.S. Environmental Protection Agency's (EPA) public message pointed those interested to our routine monitoring data, and while there were still clearly some fears of more radioactivity coming to the United States, we continue to publish normal background results. Our partners in Guam and Saipan were understandably reluctant to relinquish the portable monitoring stations. Since they are so geographically remote, it takes time to get equipment there and the concern was for more releases, or another emergency involving radiation. The portable monitors are not meant for continuous use and need routine maintenance in EPA's Las Vegas facility. Just one fact enabled to the return of the portable monitors: the existence of another monitoring system the islands could rely on in addition to RadNet's U.S. coverage, the Comprehensive Test Ban Treaty Organization's International Monitoring System (IMS). The IMS continuously monitors for evidence of nuclear weapon testing using seismic, infrasound, and hydroacoustic sensors as well as for radioactive particulates in air, and some stations also detect radioactive noble gases. Knowledge of this monitoring system and public data access was of some assurance to island leadership.

It is the assertion of these authors that the outset of radiation emergency monitoring is an ideal time to begin the conversation with stakeholders about what the return to normal monitoring will look like. This includes defining what normal monitoring is: intent, form and format, frequency, tolerance for variation, and what the usual results from natural background look like.

A metric that could be used for returning to normal monitoring (or terminating emergency response monitoring) is observing that background levels have been shown one or more times, as agreed upon by stakeholders and technical experts. Getting agreement about something that is hypothetical—that is, assuming the releases will terminate and the detections of radiation will return to natural background—will undoubtedly be difficult. During the heat of the emergency, tensions may be running high about the risks from radiation exposure. An area that deserves further guidance is exit strategies, and it could take the form of a template or roadmap for decision making.

FUTURE DIRECTION

This paper proposes new guidance for processes and metrics leading to cessation of monitoring during the initial phases of a large-scale emergency response. EPA often is asked to examine unusual radiation problems from an unbiased, third-party or “white hat” standpoint. The Agency does confirmatory monitoring, co-located sampling, and independent exposure surveys when appropriate under regulatory and statutory authorities.

The authors identified another gap: the lack of *awareness* of guidance on optimization. While it is difficult to interest members of the public in these esoteric areas, as radiological and nuclear scenarios are increasingly included in regular disaster preparedness efforts, first

responders have learned the unique actions necessary in a radiological or nuclear incident to protect public health. The authors note that several organizations are supporting increased awareness of existing good guidance through their emergency preparedness efforts. These include the National Radiological Emergency Preparedness Conference, the Conference of Radiation Program Control Directors, and the National Alliance for Radiation Readiness. The PAG Manual (U.S. Environmental Protection Agency, 2017) and NCRP Report No. 175 (National Council on Radiation Protection and Measurements, 2014) provide much of what is needed to guide longer-term decision making on optimization. In summary, we conclude that some additional guidance would aid with reaching the end of both monitoring and remediation in a radiological incident, using recommended stakeholder involvement processes. Making communities more resilient *prior* to a radiological incident is the subject of a separate paper (Lipoti and Bennett 2018).

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