CRCPD's Committee on Emergency Response Planning (HS/ER-5)

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Subject: State Comments on Fukushima Daiichi Accident

The purpose of this correspondence is to provide NRC with comments, feedback and concerns that have been expressed to me by individuals working within state radiation protection programs that were responsible for the coordination of state activities as they related to the impact of the accident at the Fukushima Daaichi nuclear power plant in Japan. As Chair of the CRCPD's Committee on Nuclear Emergency Response Planning and the Manager of the New Jersey Department of Environmental Protection's Bureau of Nuclear Engineering, I have been closely following the events in Japan, the federal response and the impact on the environment in the United States particularly in New Jersey.

Over the past several months, I also have had the opportunity to discuss the event with many of my colleagues from other state radiation control programs, state emergency management agencies and my federal contacts within the various agencies involved with the response. I understand that each of the federal agencies that played a role in the U.S. response to the event are engaging in the process of evaluating that response and identifying lessons learned. To my knowledge, there has been no effort at the federal level to reach out to state organizations for input. Based on the comments I have received and my own personal observations, I believe it is critical for state programs to provide input to the process since there are numerous issues that have been identified that are of great concern to state organizations. The following discussion is not limited to observations concerning the NRC response and discusses in general all the concerns that I have received. To reiterate, I know of no other mechanism at this point to express these concerns therefore, I have selected the NRC as a conduit for the state perspective.

By far the most glaring issue that was expressed by nearly all was the lack of coordination and information sharing between the federal government and the states. To my knowledge, the only federal agency that engaged constructively and responsively to state concerns and questions was CDC/HHS and that avenue still took some time to establish. I do not think that any one would argue that because it was an international event that the data acquired would be protected to a certain degree. However, while the event was in a foreign nation, it certainly had implications within the United States and therefore was a state issue as well. The main difficulty was determining what the most reliable source for data was and who had the most up to date information.

Another concern is the decision (at the federal level) to not implement the National Response Framework for the Japanese incident, because there was "no domestic public health threat." Many people would argue that a "perceived" public health emergency is a public health emergency, and the NRF should have been activated. Based on the calls and inquiries from the public to state radiation programs, many of our citizens perceived the Japanese incident as a public health emergency in the U.S. Because the NRF was not activated, there was no Lead Federal Agency identified and no framework for coordination between the responding federal agencies. Without a clear leader in the federal government providing information to the citizens and to the state radiation control programs, the public's perception, in many cases, was that the government was being secretive/untrustworthy/hiding information/etc. The NRC appeared publicly to be the lead agency, but was unprepared to provide information about the public health issues and environmental issues related to the radiation release from Japan. Because the NRF was not implemented, there appeared to be a general lack of coordination between federal agencies in sharing information. There was not a single reliable source of information state agencies could access to get information, data, plant status, or public information during the first days to weeks of the accident.

At the state level, there were hundreds of public inquiries as to what effect the Japan power plant accident would have on the state residents from a public health perspective related to; water resources, agricultural resources, tourism, milk etc. Lacking any real data points, source term or modeling projections, it was difficult to speak with any certainty and answer the public's questions and concerns. Granted, from a technical perspective we all could agree that based upon historical information that the release of radiation would have no impact on public health and safety within the U.S. borders. At the same time, from a purely scientific and technical perspective, we had no hard data to support our statements, which places us in a very vulnerable position. It is very difficult to ease the anxiety levels and calm the fears of the public with no real technical basis for our assessment. It is critical that state radiation control programs are provided data, including predictions, much earlier than they were made available.

The NRC was able to provide very little information regarding the status of the plant. Most interested state organizations needed to turn to other sources of information to get any information. NEI was one source that seemed to have more information than the NRC. Even after the NRC arrived in Japan, the amount of information and the level of detail provided by NRC was of little or no value to state staff responsible for assessment.

At the outset of the incident, even prior to the release, states asked questions about population and cargo monitoring at the U.S. borders to prevent contaminated people and cargo from entering the country. This question was raised during an NRC Region 1 conference call with state liaison officers. NRC provided a response to that question indicating that issues related to Customs and Border Patrol should be directed to the National Operations Center and a number was provided. When the NOC was contacted, states were informed that monitoring at airports, harbors and other points of entry was being handled at the federal level. No information could be provided regarding the process used, the screening methods or threshold values. In fact

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there were instances where Customs and Border Patrol refused to provide screening methods and values claiming it was protected under national security. Two days later contaminated network news equipment arrived at a warehouse located in New Jersey via a New York airport. When the state again looked to the federal government for guidance, we were informed that since it was within the state borders that it was our responsibility to manage the situation. The issue of monitoring of incoming populations and cargo was not addressed timely or effectively. This needs to be accomplished much more quickly. It would be best to have a plan and procedures in place with screening values established. Modifications can be made if necessary as the event unfolds, but a plan needs to be in place for future events.

Laboratory analysis and reporting was another major concern. At both the national and state level, there seemed to be an overall shift away from standard protocols and methods for analyzing radiological samples in an effort to "find a real number". As a result, count times, sample size and preparation methods were altered from the "standard" in order to find real numbers for the analysis. The result was an inability to readily and easily compare data being collected across the country. For example, a water sample collected in New Jersey was analyzed and reported on RadNet with a positive reading for iodine. The reality is that the sample came from an underground aquifer at a level in excess of 300' below the surface. The number was reported was obviously not real, but the count time for the sample was altered sufficiently long to yield a real number instead of non-detect had standard protocols been followed. Upon closer examination, the value of the sample reported fell well within the error of the analysis. To further complicate the issue, EPA was posting positive analysis results to RadNet without providing the state with advanced notification. Many state programs were blindsided by the public inquiries related to that data because it was posted on the EPA website before the state had time to review the data and validate the results or in many cases was even aware the data existed. There was a significant effort required to regain credibility with public after that. All data should be reported and if necessary discussed between EPA and the state agency collecting the samples. This is particularly important if there are positive readings so that the EPA and state can discuss the implications and have public information prepared before the data is posted. A better method must be developed for reporting results on RadNet that are not the usual background.

The DOE began putting up information and data from flyover missions on their CMWeb site at the outset of the response. Within days, that information was removed and was not accessible to state radiological assessment staff. As the DOE continued to collect data over the next few weeks and months, the data was never made available to state agencies. Access to the DOE web pages is limited through an established application and approval process. Usernames and passwords are provided to individuals based on their need to access the site. It is not a publicly accessible site. It appears that there was an underlying level of distrust that state agencies will release information not for public disclosure rather than the partnership we have been working for years to develop. States do not understand why they were not able to access this important data. Further, there is some indication that there was a deliberate decision made within the executive branch of the federal government to withhold information that state agencies were seeking.

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The NRC protective action recommendation made during the initial days of the accident remains a concern for nearly all states. That press release states; "Under the guidelines for public safety that would be used in the United States under similar circumstances, the NRC believes it is appropriate for U.S. residents within 50 miles of the Fukushima reactors to evacuate." Since that time, NRC has been spending a great deal of time and effort to defend its position.

However, the NRC defense of the decision is not consistent. I have heard the rationale behind the decision explained in a variety of ways from a variety of NRC staff. Some are dose based using the RASCAL model to perform calculations. The RASCAL model is not developed to evaluate accident sequences from multiple reactor cores and spent fuel pools simultaneously. If RASCAL is used to do "what if" type calculations for these types of accidents, the results need to be carefully evaluated as the source term can be overestimated by several orders of magnitude. Other NRC staff have stated that the recommendation was a travelers warning issued by the State Department as a precautionary measure. Others have explained the basis using the EPAs 1 year relocation PAG limits. Still others use plant safety function explanations based upon the extreme uncertainty of plant safety systems and mitigation strategies to recover reactor fuel. To date none of the explanations seems to validate a 50-mile evacuation as it is so clearly stated in the press release.

There remains a great deal of concern at the state level on what the impact of this decision will have on nuclear emergency response planning as we move forward. If the NRC continues to defend the position that the recommendation was appropriate given the conditions, it could have far-reaching implications in the U.S. To simplify the issue, will there be a 50-mile emergency planning zone for sites having multiple reactors and spent fuel pools? Does the NRC intend to change the planning basis for U.S. reactor sites with multiple reactors? Wouldn't it be easier for the NRC to recognize the term "evacuation" was used but the actual recommendation was essentially a relocation or something else? The NRC has not yet presented a plausible argument from the NRC why they would not consider a 50-mile evacuation in the United States for a similar situation.

Further, the NRC made this decision and publically released the recommendation when it was in direct opposition to the decision made by Japan. Should we expect the same NRC response for events that might occur within U.S borders? If the NRC does not agree with the state decision makers, will they make a separate recommendation at the federal level and release it to the public without prior discussion and consultation with the state? The actions and decisions of NRC during the Japan response have created a new level of skepticism and distrust at the state level of exactly how the NRC will respond to an incident in the U.S. The question of a 50-mile planning basis and the NRC authority to make unsolicited public protective action recommendations for the state without consultation are not issues that will not go away soon, nor will they be ignored by the public. These can be very difficult issues for state agencies to address without NRC support.

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As an example of the immediate impact of NRC's Japan 'evacuation' recommendation, the emergency manager of Miami-Dade County was called to testify before congress about local nuclear power plant accident response plans. Some of the questions directed at the local official directly related to a potential response beyond the 10 miles EPZ, should a larger area of impact be required. At that time this official was sitting before a congressional panel, there was little information regarding the basis for the 50-mile evacuation order from our federal partners, specifically NRC, to give him. As a result, support staff could not adequately prepare him for questions related to evacuation planning beyond the 10 mile planning standard. This federal action and lack of support information put an extremely capable and knowledgeable local official in a very difficult position in front of Congress. He, like state and local officials across the country were put in the difficult position to answer questions about 50 mile evacuations zones with no plausible explanation or technical basis provided by the federal agency that made that decision.

Other difficulties arose out of the apparent discrepancy between the derived intervention level for iodine in water and milk. EPAs drinking water MCL for the radionuclide iodine-131 is 3 picocuries per liter. It is important to note that this drinking water MCL was calculated based on long-term chronic exposures over the course of a lifetime 70 years. There is some concern regarding applying this standard to this particular accident understanding that I-131 production stopped when the reactors went subcritical. It is impossible to get a 70-year dose from a radionuclide that has an 8-day half-life and the source of production has ceased. What happened to the idea of optimization that allows for the situational analysis of conditions to drive decision making including the modification of applied intervention levels based on real time analysis? The 3 picocuries per liter MCL for drinking water needs to be evaluated with respect to nuclear power plant accidents. Adding to the confusion and difficulty answering public inquiries is the DIL for milk. FDA's DIL for iodine-131 in milk is 4,770 picocuries per liter (1,250 times higher than water). It is impossible to explain this discrepancy to the public and in some instances to other technically capable individuals. It lacks consistency and needs to be addressed.

Building on existing relationships between state and federal governments and agencies is critically important to CRCPD. As such, it is our hope that NRC will not only identify concerns, but also take action to overcome challenges experienced by state and local governments during this international incident. From the state perspective, lessons were identified during the Fukushima event, but they are not learned until changes are made to policy and procedure to bridge federal communication gaps within the federal family, and with state and local governments.

Sincerely,

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Fukushima Nuclear Reactor Accident Response
Department of Energy (DOE) Lessons Learned

1) **Best Practice: Prompt activation and deployment of DOE emergency response and other technical assets to obtain situational awareness and provide technical advice**
   a. Once it was clear that information from the site was very limited, the White House made a quick deployment decision. Technical assets were immediately activated. This timeliness enabled initial environmental radiation monitoring results to be obtained by March 17, 2011, providing much-needed data for U.S. leadership.
   b. DOE's Nuclear Incident Team (NIT) was tasked by the White House to collect information and send out twice daily Sitreps to the U.S. Interagency. DOE Situation Reports (Sitreps) encompassed environmental measurements and plume modeling projections. This was an effective way of capturing and disseminating a nearly complete set of information. The Sitreps were crucial in facilitating proper protective action decisions and mitigating potential over-reactions.
   c. DOE established a Nuclear Energy Response Team (NERT), which collected and assessed reactor plant data, as well as performed diverse set of analyses, which provided more reliable descriptions of reactor plant conditions to the United States and Japanese Government leadership. NERT deployed Federal and National Laboratory personnel to Japan who had previous working experience and contacts in Japan, and they, along with DOE personnel assigned to the Embassy, were instrumental in establishing timely and accurate communication channels. NERT coordinated analysis activities of National Laboratories, which provided an understanding of current reactor plant conditions, possible future outcomes, and possible mitigative actions. NERT responded to numerous information requests from the Government of Japan, and senior U.S. Government leadership, including the Ambassador to Japan.
   d. DOE's permanent presence at the U.S. Embassy, Tokyo expedited initial interactions in Japan for the arriving personnel. The large Department of Defense (DoD) presence in Japan also greatly facilitated a rapid employment of DOE's capability.

2) **Best Practice: Use of Aerial Measuring System (AMS) to collect data during the early phase of the emergency**
   a. The AMS provided the only feasible means to obtain a rapid snapshot of the overall radiological environment. The rugged terrain, infrastructure damage, and large impacted area made a quick assessment from ground-based measurements impossible. AMS data enabled the military to pursue its humanitarian activities with assurance that its disaster assistance teams were safe. They were also used by the Government of Japan (GOJ) in its communications and decision making.
   b. AMS produced and delivered data products rapidly. NIT was able to incorporate AMS products into their twice-daily Sitreps, often within a few hours of the aircraft landing. This timeliness, despite having to coordinate with a home team back in the United States, complemented the ability to gather data rapidly and aided situational awareness.

c. AMS provided greater responder safety than ground-based monitoring teams would have. Time in the contaminated area was decreased and distance between the contamination and the monitoring personnel was increased, thus limiting dose to responders.

3) **Best Practice: Ongoing partnerships and those established during the first days of the crisis were integral to the success of the mission**
   a. United States Forces Japan (USFJ) at Yokota Air Base provided aircraft and other support to DOE emergency response team without which the radiological monitoring mission would not have succeeded. The USFJ valued having DOE radiation experts on base to provide data and advice to ensure the safety of the service members and their families.
   b. The U.S. Embassy in Tokyo relied heavily on the twice-daily DOE Sitreps and on data and advice from subject matter experts on the radiological conditions in Japan. In a briefing at Yokota Air Base, Ambassador Roos conveyed that the Sitrep and AMS data were the "first things he looked at every morning." Additionally, DOE established an automated air monitoring system on the Embassy roof. These efforts served to inform the non-technical staff at the Embassy about the relatively low threat to the metropolitan Tokyo area and mitigate calls for extreme measures, such as a general evacuation of the island of Honshu.
   c. By providing reliable data quickly, the United States' teams were able to build a relationship with the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Japanese equivalent of DOE, as well as with other ministries. The GOJ embraced the technical capability deployed to Yokota, which allowed an operational partnership to develop quickly, without the usual formalities of inter-government relationships. DOE team responded to the data collection and analysis needs of the GOJ by sharing data, equipment, and even scientific personnel to provide surge capacity. Lab analysis equipment was loaned to multiple ministries and one AMS system was loaned to MEXT. These interactions facilitated effective and rapid exchange of information leading to data products used to support public safety decisions.
   d. DOE also had a significant working relationship with Japanese organizations before the events of March 11, 2011, which facilitated effective cooperation. DOE Federal and National Laboratory personnel with working experience and contacts deployed to Japan, which enabled timely communication on ongoing events and technical support to the Japanese response effort. Laboratory experts obtained access to Government of Japan and TEPCO severe accident engineers for collection of information and views on the evolving conditions of the reactors and the spent fuel pools and they provided support to analysis activities by Japanese engineers. Another expert, in response to a request from the Government of Japan, developed a plan for remediation of contaminated river, groundwater, and soil and developed recommendations on types, locations, and frequency of radionuclide monitoring.

1) **Shortfall: Lack of an integrated, "top-down," communications strategy**

Background

During the Fukushima crisis, an effective high-level public messaging strategy was developed by the White House for the President to communicate with the public and with

State Governors and other top political leadership. This strategy facilitated communicating the Administration's overarching message of "no harmful effects" on American soil. However, while this top-level message was effectively communicated, the Federal Government did not have an integrated "top-down" messaging strategy that included peer-to-peer communications with State/local emergency managers and radiation health experts. Hence, emergency managers and radiological professionals were not able to respond effectively to questions or requests for additional information from their State or local leaders.

Observation

This problem has been identified as an important After Action issue for the USG to address. The Council of Radiation Control Program Directors (CRCPD), a body representing State leadership for radiation control and protection, has drafted formal letters to the Nuclear Regulatory Commission (NRC) and DOE providing specifics on the problems they encountered due to communication barriers with the Federal government. These letters are included as Attachments to this document. The CRCPD letter indicates the effectiveness of Federal communications with the States varied from agency to agency; communications from Health and Human Services (HHS) were identified as good, communications from NRC, DOE, and the Environmental Protection Agency (EPA) were identified as lacking.

Recommendation

The Federal Government's integrated communication strategy should take into account State/local/tribal partners beyond top-level political leadership. For a high-profile event such as Fukushima, the messaging strategy should be coordinated by the White House and should address communication to emergency managers and technical experts within the State and local governments. Presumably, the Department of Homeland Security (DHS), and the Federal Emergency Management Agency (FEMA) would serve as the primary conduits for communicating with State/local emergency managers and the technical Federal agencies – DOE, EPA, NRC, and HHS – would coordinate communications with State/local radiological professionals.

2) Shortfall: Improvements to atmospheric modeling

Background

The Department of Energy maintains the National Atmospheric Release Advisory Center (NARAC) at Lawrence Livermore National Laboratory to provide atmospheric dispersion modeling projections for various situations: an emergency at a DOE site, an emergency at a nuclear/radiological facility, an event such as a satellite re-entry or launch vehicle explosion where nuclear/radiological material may be released, or a nuclear/radiological terrorist attack or threat. NARAC supports such plume modeling both domestically and internationally.

The NARAC infrastructure is leveraged by DHS to provide the primary operational capability for all-hazards plume modeling for the Interagency Modeling and Atmospheric Assessment Center (IMAAC). The National Oceanic and Atmospheric Administration (NOAA) has the responsibility for developing the official meteorological predictions for the Federal Government.

During the Fukushima crisis, NRC had the responsibility for estimating the amount of material released – the radiological source term – from the damaged facilities. The source terms were calculated using computer models run by the NRC's technical experts.

In the Fukushima response, NRC developed source-term estimates based on various hypothetical scenarios, not on plant conditions as little or no on-site information was available. These source-term files containing lists of different isotopes were transmitted to NARAC along with weather information provided by NOAA. NARAC ran transport calculations for the various scenarios for both Japanese impacts and trans-Pacific U.S. impacts. The trans-Pacific modeling was non-standard and computationally challenging for NARAC due to the required distance of propagation of the radiological materials.

Observations

a. Nuclear reactor subject matter experts were not optimally integrated into the core members of the plume modeling community - NARAC, NOAA, and NRC Protective Measures Team.
b. Because the transfer of source-term and weather information from NRC and NOAA into NARAC models was not automated, it was time consuming and prone to error.
c. Complex reactor source terms and release scenarios took many hours to run on NARAC's aging computer system, hindering the timely delivery of products to senior leaders.
d. Product distribution is not optimized. A Web portal exists for posting products that can be downloaded. However, NOAA weather forecasts were not available on the NARAC site, nor were all cognizant parties aware of the existence of NARAC's site.
e. This emergency highlighted the need for additional products that are not currently part of the routine NARAC suite – projections based on probability for the hypothetical modeling, and tailored products for airborne or seaborne plumes for Federal Aviation Administration (FAA), NOAA, and Department of Defense (DoD) customers.
f. The results of the hypothetical modeling were kept closely held at the direction of the White House due to the gross uncertainties involved in estimating the source terms. The policy for the very limited release of the hypothetical models needed to be conveyed to other Federal/State/local stakeholders through a messaging plan (see Shortfall #1).

Recommendations

a. Improve coordination among technical agencies responsible for plume modeling (NRC, NOAA, DOE, and White House Office of Science and Technology Policy (OSTP)). Reactor experts should interact directly during an emergency and liaisons should be exchanged as appropriate at both the operations and technical levels. Clear roles and responsibilities for the technical agencies should be established to make more efficient use of the USG's overall plume modeling capability and limited pool of experts.
b. Increase throughput of modeling calculations. This requires automated processes for exchanging data among the various components of the calculations as much as it requires upgraded hardware and software to take full advantage of parallel processing. The subsequent generation and distribution of products need to be improved to include "one-stop shopping" for NOAA forecasts, NRC source terms, and NARAC plume projections. To bind all of the above activities, an interagency

consensus must be reached on acceptable performance metrics for end-to-end turnaround of products.

c. Investigate new modeling products. Poll the agencies to determine what high-level questions are of interest. Research techniques to produce products that more effectively address some of the questions that arose during this response (e.g., probability mapping). Incorporate existing capabilities such as those used by NOAA into NARAC's process and develop proposals related to researching new techniques.
d. Develop an interagency implementation plan prioritized by performance enhancements versus resource investment; continue with technical group meetings to track progress of improvements; and execute a realistic plume modeling drill to determine what product delivery tempo can be achieved.

3) Shortfall: Interagency and international coordination of radiological monitoring, assessment, and technical product dissemination for an international incident

Background

Within the United States, the Nuclear Incident Annex to the National Response Framework defines the role of the Federal Radiological Monitoring and Assessment Center (FRMAC) to coordinate off-site environmental radiological monitoring and assessment in support of States/ local/tribal governments, FEMA, and the Federal coordinating agency. No corresponding policy is in place for international incidents. Hence, during the Fukushima crisis there was no formal policy for coordination of monitoring, assessment, and product development among DOE, DoD, Department of State (DOS), and the Japanese government.

Observations

In Japan, several ad hoc working groups were established to fill this void. A radiological monitoring meeting was held daily at Yokota Air Force Base for DoD entities and DOE to discuss monitoring on behalf of DoD active duty and civilian personnel and dependents. Another set of meetings was facilitated by the Embassy with GOJ representatives, DoD, and DOE. Both meetings were operationally valuable, but high level monitoring priorities were never established nor were monitoring tasks assigned. Data product coordination was also an issue. DOE ended up developing customized sets of products for all of its major customers: DOS, DoD, the United States Interagency, and GOJ. Several weeks into the event, it was found that DOE was providing raw data to the National Geospatial-Intelligence Agency (NGA) to use in developing products for use by USFJ; DOE was also independently developing similar products to transmit directly to USFJ. Coordination among these entities could have saved days to weeks of product development.

At the national level in Washington D.C., the White House established the policy that NRC would be responsible for source-term generation, NOAA would be responsible for weather predictions, DOE would be responsible for capturing and disseminating Japanese data and executing plume modeling, and EPA would be responsible for capturing and disseminating data collected within the United States. This process worked reasonably well, but was an ad hoc decision that was not communicated or understood by all stakeholders.

Recommendation

Establish a policy for how the U.S. Government coordinates monitoring, assessment, and product development for an international incident. The policy should define the roles and responsibilities of all stakeholder agencies: DOS as the Federal coordinating agency, DoD as

a likely resource provider, DHS/FEMA within their role in emergency preparedness and management, and the technical agencies such as DOE, EPA, HHS, Food and Drug Administration (FDA), and NRC. The policy should encompass how monitoring priorities are established, resource allocation and coordination, and coordination of assessment and product development for all stakeholders. It is expected that much of this policy can be simply an addition to existing domestic guidance.

Attachments

Mulligan, Patrick, Conference of Radiation Control Program Directors Committee on Emergency Response, letter to Josephine Piccone, NRC, "State Comments on Fukushima Daiichi Accident," dated June 8, 2011

Fisher-Tyler, Frieda, Conference of Radiation Control Program Directors letter to Colleen O'Laughlin, DOE Field Program Manager for the FRMAC, "Federal/State Response to Fukushima Reactor Accident," dated June 16, 2011