

**Report to the Governor:
Recommendations of the Nuclear Review Task Force**

June 27, 2011



Nuclear Review Task Force
NJDEP Commissioner Bob Martin, Chairman

Nuclear Review Task Force

Task Force Chairman Bob Martin
Commissioner, New Jersey Department of Environmental Protection

Lee Solomon
President, State Board of Public Utilities

Charles B. McKenna
Director, State Office of Homeland Security and Preparedness

Col. Rick Fuentes
Superintendent, New Jersey State Police

TABLE OF CONTENTS

| | |
|---|-----------|
| INTRODUCTION..... | 5 |
| THE JAPAN EVENT | 6 |
| SCOPE OF REVIEW..... | 8 |
| MONITORING THE NRC FINDINGS | 8 |
| EARLY LESSONS LEARNED..... | 11 |
| FACILITIES THAT IMPACT NEW JERSEY RESIDENTS | 13 |
| NEW JERSEY’S RISKS: FLOOD, EARTHQUAKE, HURRICANE AND TSUNAMI RISK FACTORS..... | 13 |
| CONTRASTING NEW JERSEY’S BWR REACTORS TO FUKUSHIMA DAIICHI | 14 |
| RESPONSES TO FUKUSHIMA DAIICHI FROM EXELON AND PSEG..... | 15 |
| INITIAL OBSERVATIONS..... | 15 |
| RECOMMENDATIONS..... | 19 |
| EVALUATION OF OUTCOME – TIMETABLE..... | 21 |
| SUMMARY | 21 |

INTRODUCTION

On March 25, 2011, the Department of Environmental Protection (DEP) announced the creation of a nuclear review task force to conduct a thorough assessment of operations and emergency preparedness plans for the State's four nuclear generating facilities, Oyster Creek in Lacey Township, Hope Creek in Lower Alloways Creek Township, and the Salem Units One and Two reactors, also in Lower Alloways Creek Township.

This review focused on any early lessons from the ongoing nuclear emergency in Japan that could enhance New Jersey's current comprehensive nuclear response protocols. Of special concern to the Task Force are the State's emergency communications, power supply, spent fuel storage, emergency response protocols, and expansion of the current 10-mile evacuation zone.

The Task Force consists of the following members: DEP Commissioner Bob Martin, the Office of Homeland Security and Preparedness (OHSP) Director Charles B. McKenna, the Office of Emergency Management (OEM), State Police Superintendent Col. Rick Fuentes, and State Board of Public Utilities (BPU) President Lee Solomon.

Response to an event at any nuclear facility that would imperil New Jersey citizens is the responsibility of the State. In that regard, DEP, OHSP, and OEM each have a role in securing the safety of our residents. In the event of an actual nuclear emergency, we all work in close coordination and report up to the Governor, who makes the final decision regarding evacuations or sheltering in place. In a nuclear event, DEP is the lead agency for accident assessment, with knowledge and expertise of nuclear operations, radiation monitoring and analysis, and compliance with requirements issued by the Nuclear Regulatory Commission. DEP's job is to collect nuclear facility operational data, monitor air, water, food and milk for radiological contaminants in the environment and to coordinate closely with our Federal counterparts at the Nuclear Regulatory Commission (NRC), Federal Emergency Management Agency (FEMA), Department of Energy (DOE) and Environmental Protection Agency (EPA).

OHSP is responsible for preparedness oversight for all hazards, including a radiation emergency. In addition, OHSP plays a lead State role in the development and analysis of information and intelligence if a radiological event is suspected or determined to be the result of an act of terrorism. The OEM exercises operational control during any threatened or actual radiation emergency. They are also responsible, in cooperation with DEP, for the testing and evaluation of all emergency response plans developed pursuant to the Radiological Accident Response Act. BPU's role is to ensure that any loss of generating power from an event is quickly restored through alternative sources.

Based on the assessment and analysis of the radiological impact on the environment, the DEP develops Protective Action Recommendations to ensure the health and safety of the public. This includes making recommendations to the Governor as to evacuating or sheltering in place potentially affected residents. DEP also directs nuclear facilities to take certain actions necessary to protect our residents, such as protecting our surface and

ground waters. In cooperation with our OEM, DEP conducts mock exercises about a dozen times a year at the State's nuclear plants to assess the integrity of each facility's operational plans and the State's Radiological Emergency Response Plan.

The Task Force began its analysis of New Jersey's nuclear facilities at its first meeting on March 29, 2011. Members of the Task Force also testified on April 6 before the Assembly Telecommunications and Utilities, Environment and Solid Waste and Homeland Security and State Preparedness Committees, informing the Legislature of the roles carried out by various State agencies to ensure that the State is prepared in the event of a nuclear emergency. In addition to speaking with the Legislature about the State's nuclear preparedness, the Task Force held numerous discussions with PSEG and Exelon, which own and operate the nuclear reactors in New Jersey (which the Task Force visited), and with the Regional Administrator for the NRC. The Task Force's observations and recommendations were informed by the opportunities presented through those exchanges.

The Task Force acknowledges that Congress granted regulatory authority of nuclear power plants to the NRC. While both the NRC and States share the goal of public health and safety, only the NRC (not the States) has the power to make change within the plants themselves. Accordingly, the Governor decided that this Task Force was necessary so that New Jersey could identify early lessons learned from the Japanese nuclear crisis that might further the current health and safety protections for our citizens, while understanding that any change in the operation of nuclear facilities is the responsibility of the NRC.

THE JAPAN EVENT

On March 11, 2011, Japan suffered two horrific natural disasters: an earthquake of epic proportions registering 9.0 on the Richter scale and a tsunami that produced a 33-ft high wave, easily overwhelming the 19-ft high sea wall that protected the critical safety systems of the Fukushima Daiichi nuclear power plant (the plant). The plant is 120 miles north of Tokyo in the City of Sendai. First commissioned in 1971, the plant consists of six boiling water reactors (BWR). The boiling water reactor (BWR) is one of two types of nuclear reactor used for the generation of electrical power. It is the second most common type of electricity-generating nuclear reactor after the pressurized water reactor (PWRs)¹. The reactors for Units 1, 2, and 6 were supplied by General Electric, those for Units 3 and 5 by Toshiba and Unit 4 by Hitachi. Units 1–5 were built with Mark I type (light bulb torus) containment structures. Of the 104 reactors nationwide, 23 utilize the

¹ Commercial power plants generate electricity by converting mechanical power into electrical power. This is done by using steam to spin turbines. The steam is generated by heating water with gas, coal, oil or nuclear reaction. In a nuclear plant, the heat is generated by a nuclear reaction. Thousands of fuel rods are stacked like straws in a pressure vessel. The rods can reach a temperature of 2,200 degrees Fahrenheit. In order to keep the rods from melting, they are submerged in water. It is the heating of this water that generates the steam. In a BWR plant, water is heated to steam by uranium in its reactor vessel where it directly spins a turbine. When the steam cools back to water (which is radioactive) it is re-circulated as the process repeats itself. With a PWR plant, the uranium heated water is pressurized and kept as liquid. It is then pumped into a steam generator through tubes which become heated when the water passes through them. The hot tubes then convert other circulating non-radioactive water into steam which spins the turbine.

Mark I design, inclusive of New Jersey's Oyster Creek and Hope Creek facilities. Salem I and Salem II are PWRs.

According to news reports, the plant was immediately shut down when the earthquake first hit. As a consequence of the quake, all power was lost. This stymied the plant's ability to circulate water to the fuel rods for proper cooling. Diesel generators at the plant were activated and for approximately one hour they functioned properly. However, reports have stated that the tsunami affected the fuel supply and the generators failed. There was a battery backup system that kicked in when the diesel generators failed. After approximately 8 hours the batteries failed and the plant suffered a total loss of power.

The result of the loss of power was that the water in the reactors heated up and steam pressure built up in the containment vessels. Because of the increased pressure the reactors had to be vented. The vented steam was tainted with radioactive material which went into the atmosphere. With no power to pump additional water into the reactor, the fuel rods became exposed to the air, were not cooled and overheated. This led to explosions. Ultimately, a decision was made to pump seawater into the reactors to cool the cores. However, as this is done, steam is generated which must be vented to release the pressure that builds up in the containment vessel. With each venting, radioactive material is released.

The Japanese reactors appear to have responded as designed: they shut down during the earthquake. The problem was the tsunami, which washed away the plant's aboveground fuel tanks and flooded the electrical switching equipment. Both are critical to cooling the reactor and the hot uranium fuel rods in the spent-fuel pools. Over the following three weeks there was evidence of a partial nuclear meltdown in units 1, 2 and 3: visible explosions, suspected to be caused by hydrogen gas, in units 1 and 3; a suspected explosion in unit 2, that may have damaged the primary containment vessel; and a possible uncovering of the units 1, 3 and 4 spent fuel pools. Radiation releases caused large evacuations, concern about food and water supplies, and treatment of nuclear workers. As recently as May 11, fresh water spraying was still being performed for the spent fuel storage pool in Units 1, through 4. On May 15, Japanese officials finally admitted what had long been suspected: a nuclear meltdown at the crippled Fukushima I Nuclear Power Plant had occurred, with a pool of molten fuel discovered at the bottom of its No.1 reactor.

The Japanese Government ordered a 12 mile evacuation zone around the facility, with a shelter in place order for those up to 19 miles out. The NRC issued a contrary protective action recommendation for U.S. citizens residing within 50 miles of the site to evacuate.

Updates and directions on the Japanese disaster were provided by the Japanese government.

In the United States, several States (Washington, California, New Jersey, Pennsylvania, and Massachusetts) reported evidence of increased levels of radiation apparently resulting from the Japanese disaster. Iodine-131 (a byproduct of nuclear radiation release) was

discovered in rainwater and States immediately began monitoring soil and milk for evidence of elevated levels of radiation. Similar to many States with nuclear reactors, New Jersey routinely monitors for radiation. In response to the Japan disaster, DEP increased the frequency of the monitoring to verify levels were not a concern to public health and continued monitoring until the presence of Iodine-131 was no longer detectible. Notice to the American public made clear that the radiation levels noted were of no consequence to public health and safety.

SCOPE OF REVIEW

Lessons learned from a multi-catastrophic event as significant as the earthquake and tsunami striking Japan are very complex and require time to develop and understand. Recognizing those limitations, the Task Force focused on early lessons learned and how they can be applied in a timely manner in New Jersey. The Task Force explored emergency response protocols, technical reviews of plant operations, the chain of command and control at each nuclear facility, evacuation plans, and emergency communications to the public. Potential impacts from reactors in neighboring Pennsylvania and New York were also examined.

MONITORING THE NRC FINDINGS

The Task Force also closely monitored the observations from the NRC. On May 12, the NRC released the results of inspections (Temporary Inspection Instruction TI-183) that were done to assess the capabilities of United States Nuclear Plants to respond to similar major losses of plant equipment as in the Fukushima Event. The results of these assessments are being incorporated into the 90-day review by the NRC of the Japanese nuclear crisis. The 90-day study includes a 30-day and 60-day status update so that current information and progress could be presented based on the developing events.

30-Day NRC Findings

The NRC conducted inspections at all 104 facilities in the United States. The intent of the inspections was to provide a broad overview of the industry's preparedness for events that may exceed the current design basis for a plant. According to the NRC, the focus of the inspections was on (1) assessing the licensee's capability to mitigate consequences from large fires or explosions on site, (2) assessing the licensee's capability to mitigate station blackout conditions, (3) assessing the licensee's capability to mitigate internal and external flooding events accounted for by the station design, and (4) assessing the thoroughness of the licensee's walkdowns and inspections of important equipment needed to mitigate fire and flood events to identify the potential that the equipment's function could be lost during seismic events possible for the site.

This is the initial round of inspections that the NRC will be conducting. The NRC has not committed if all 104 facilities will be re-inspected but they have made clear that American utilities had until June 10 to confirm that they have the equipment "in place and available" to prevent a catastrophe like the one at the Fukushima Daiichi nuclear

plant. Each facility in the United States received its individual report on the NRC 30-day inspection.

After this initial 30-day period, the NRC was satisfied that its regulations adequately address the events that occurred in Japan and that licensees have developed capabilities to respond to major losses of equipment, electrical power, and flooding on a site specific basis.

The NRC did report some general non-compliance issues that were discovered during this 30-day period, including testing and maintenance of equipment and maintenance of procedures. The NRC further reported that their findings do not significantly degrade the licensees' ability to mitigate challenges to key safety functions. Overall, the NRC concluded that for each individual plant the issues do not significantly degrade the overall mitigation strategies:

Our inspectors found all the reactors would be kept safe even in the event their regular safety systems were affected by these events, although a few plants have to do a better job maintaining the necessary resources and procedures.

Eric Leeds, Director of the NRC's Office of Nuclear Reactor Regulation

One issue was found at Oyster Creek (concerning its fire mitigation strategies) which they immediately addressed. For Salem and Hope Creek, the NRC had minor observations for non-required enhancements. All of New Jersey's nuclear plants are in compliance.

60-Day NRC Findings

On June 15, the NRC conducted a two-hour public meeting to reveal the results of its 60-day analysis. It noted that the actions taken since its 30-day analysis include:

- Continued discussion on technical topics
- Site visits
- Developing background and evaluation of focus areas (1. protection from natural phenomena; 2. mitigation for long-term station blackout; 3. emergency preparations; 4. evaluating NRC programs for potential enhancements)
- Reviewing results of its temporary instructions (Temporary Instruction 183 focusing on mitigating a station blackout coordinations, mitigating large fires and explosions; Temporary Instruction 184 reviewing severe accident management guidelines)
- Reviewing input from various stakeholders

Although the NRC has not yet noted any conclusions or recommendations, it identified four themes as part of its 60-day analysis:

Protection of Equipment from External Hazards

Protecting safety equipment from natural phenomena is a key foundation of safety for which the NRC's rules and guidelines have continually evolved. It recognized that plants have different licensing bases and associated safety margins depending upon their time of licensing. As a result, updated design criteria required of newer plants are not applied to older plants.

Mitigation Equipment and Strategies

Mitigating against long-term station blackout (resulting from multiple concurrent failures including loss of multiple independent off-site power sources and redundant safety related on-site emergency generators) requires strategies that prevent core or spent fuel damage. However, long-term station blackout can also result from beyond design basis external events. Current station blackout coping requirements do not contemplate the loss of off-site power due to widespread natural phenomena, such as earthquakes or floods, that could impact both on-site and off-site power. As a result, these requirements assume near-term restoration of AC power within four to eight hours though extreme external events (such as in Fukushima) suggest near-term restoration of AC power may not be possible.

Mitigation explosion or fire equipment required under 10 CFR 50.54(hh)(2), also known as B.5.b equipment, may provide additional mitigation against long term station blackout caused by natural phenomenon. However, recent NRC inspections identified maintenance, availability, and training deficiencies at some plants. In addition, the current requirements do not cover some elements of the Fukushima scenario (such as protecting the B.5.b equipment from flooding or seismic events).

Severe accident mitigation guidelines (SAMG's) provide guidance to prevent or terminate core damage progression, maintain containment integrity, and minimize radioactive releases, however they do not address spent fuel cooling. As a voluntary initiative, they have not received rigorous oversight by many licensees.

Hardened wetwell vents (installed in all Mark 1 Boiling Water Reactor plants) are not part of a specific inspection program, though the NRC has conducted some inspections at some sites. In addition, hardened wetwell vents vary among sites because each licensee installed a plant-specific design. These vents, not specifically designed for operation during a long-

term station blackout, may be challenged by an event scenario like in Fukushima.

Emergency Preparedness

Existing emergency preparedness, generally not reflective of multi-unit events, could be tasked by long-term station blackout. In such a case, as was evident in Fukushima, communications (transmission capabilities on-site and communications between a licensee and government decision makers, and government decision makers and the public) could be challenged. Staffing, facilities, equipment, and dose projection models are primarily based on a single unit event.

NRC Programs

Past NRC decisions for beyond design basis events have led to variability in licensee and NRC programs. Regulatory analysis guidelines do not provide sufficient clarity for balancing cost/benefit and defense-in-depth considerations. Voluntary initiatives by the licensee have limited regulatory treatment.

The NRC advised that its 90-day findings and recommendations report will be released on July 19, 2011. This report will also recommend actions and topics for a longer-term review. A steering committee will be created to provide oversight of the functions related to the July 19th recommendations and findings. The committee will also look at all the lessons learned to evaluate applicability beyond the power reactor community and to have a more open series of public meetings and involve “the fullest range of external & internal stakeholders”.

EARLY LESSONS LEARNED

1. Safety of Power Plant Design

In the United States, the NRC has sole jurisdiction over the design of a nuclear facility. For our purposes in this Report, we recognize the Federal government’s jurisdiction in this area but look forward to working cooperatively with the NRC to ensure the safety of our citizens. It does appear from information known at this time that the Fukushima Daiichi facility reacted as designed to the impacts of the earthquake. The tsunami, however, which followed shortly thereafter, disabled the emergency diesel generators which were necessary to provide power to cool the fuel within the reactors and the spent fuel pools. It is also clear that after the tsunami the utility was unable to provide power to the critical safety systems required to keep the plant stable.

2. Evacuation Zone

The scope of an evacuation zone is declared by the governor of the State in which the facility in question is located. To support his decision, the governor of New Jersey relies upon Protective Action Recommendations offered by the DEP and the facility. The 10-

mile emergency planning zone is an NRC guideline for nuclear emergency training and is the basis for the extent of evacuation. States are free to consider broadening the evacuation zone. We are prepared should circumstances require that the emergency planning zone be extended beyond 10-miles.

The NRC issued a Protective Action Recommendation in Japan to evacuate United States citizens to 50 miles from the Fukushima Daiichi site. This direction is far more conservative than that of the Japanese government (which issued a 12-mile emergency evacuation order). In New Jersey, our nuclear exercises simulate Protective Action Recommendations based upon a technical assessment of the data provided. Because the NRC's recommendation to United States citizens in Japan was contrary to the Japanese government's recommendation on evacuation, the Task Force raises concerns about communication coordination between Federal and State agencies. The Task Force wants to ensure that the Federal and State governments, who are responsible for declaring the scope of evacuation zones, speak with one voice and provide consistent guidance to the public.

3. Multiple Natural Disasters

In the United States, single events have always been the focus of emergency response planning. That should be expanded to cover multiple natural disasters, given the recent Japanese crisis. The impact of multiple events like an earthquake and tsunami need to be evaluated in terms of our planning and communication procedures. As an example for New Jersey, evaluating the impact of a Category 3 hurricane event with a simultaneous blackout in the Northeast may provide insights into response capability gaps at various levels in our response structure.

4. Communication with the Public

The flow of information to the public during the initial stages of the events in Japan was slow and many times inconsistent. The credibility of all of the agencies involved suffered greatly. In any catastrophic event, certainly one involving a nuclear power plant, public information needs to be released timely and frequently to build trust in government officials and response agencies.

5. Communication between the Facility and Government

There was an apparent lack of communication between the facility and the Japanese government during this crisis. At times, the majority of information was being communicated by the facility representatives with little information coming from the government regulatory agencies. At other times government statements appeared to take the lead but were not consistent with previously released facility information.

In contrast, New Jersey government and utility officials would work together at the Joint Information Center/Emergency News center to ensure the public receives one accurate and consistent message as the event unfolds. New Jersey will continue to work closely

with the nuclear industry on an ongoing basis to ensure that in the event of a problem at a nuclear plant there is a rapid, candid and coordinated message for all of its citizens.

6. Culture/relationship between Regulator and Industry

Media reports have stated that a culture of complicity between the Japanese regulators and the utilities resulted in inadequate rules and cover-ups when problems became known. Although it is not within the purview of this Task Force to comment on whether this is accurate, the statement does lead to a paramount regulatory principle. Government cannot rely on industry itself to develop rules and regulations and must have an established, unbiased inspection program in place to ensure the safety of the citizens in the community surrounding the facility.

One of the NRC's monitoring mechanisms has been to assign at least two NRC inspectors to work full time at nuclear plants so that they have an ongoing presence at each location. Critics have raised concerns over the fact that these NRC inspectors, stationed at the United States facilities, are scheduled in those facilities for a period of six consecutive years. At times, the six year term is extended or shortened dependent upon the NRC's staffing needs. The concern is that lengthy tenures of NRC inspectors may compromise their objectivity.

FACILITIES THAT IMPACT NEW JERSEY RESIDENTS

New Jersey has four nuclear reactors: Oyster Creek in Lacey Township, Hope Creek in Lower Alloways Creek Township, and the Salem Units One and Two reactors, also in Lower Alloways Creek Township. In addition, New Jersey's citizens may be impacted by reactors in New York (Indian Point) as well as in Pennsylvania (Limerick, Peach Bottom).

New Jersey's nuclear emergency response protocols are routinely exercised and evaluated. Annually, the State conducts an exercise, graded by the Federal Emergency Management Agency (FEMA). This exercise evaluates New Jersey's compliance with FEMA's requirements for radiological emergency response. State graded drills and non-graded exercises are also conducted several times a year. Modifications are continually incorporated to address changes in population, special needs, and infrastructure.

NEW JERSEY'S RISKS: FLOOD, EARTHQUAKE, HURRICANE AND TSUNAMI RISK FACTORS

All U.S. nuclear facilities are designed to withstand the natural risk events likely to impact that specific location based upon geology and historical data. In New Jersey, it is not reasonable to expect an earthquake to occur with a magnitude even remotely close to the one experienced by the Japanese. Damage in New Jersey from earthquakes has been minor: items knocked off shelves, cracked plaster and masonry, and fallen chimneys. The highest magnitude earthquake registered in New Jersey is 5.3, occurring in 1783.

New Jersey's nuclear facilities are designed to withstand an earthquake of magnitude of 6.5.

While it necessary and important to learn from Japan, it is equally important to focus efforts on events that have a reasonable likelihood of impacting the reactors in our State. The most likely catastrophic event to impact New Jersey would be a direct hit by a hurricane. Floods can occur because of hurricanes, too. New Jersey's nuclear facilities can withstand flood levels 18 feet above the highest recorded level in the area of the State of which they are located. For the Oyster Creek area, the highest recorded level was 4.5 feet above sea level in 1962. For the Salem I, Salem II, and Hope Creek area, the highest recorded level was 8.5 feet above sea level in 1950. Our nuclear facilities are also designed to withstand winds from a category 4 hurricane, which have sustained winds from 131 to 155 miles per hour. The last category 4 hurricane directly impacting New Jersey was in 1821.

The worst case scenario for nuclear power plants is hurricane surge. The highest storm surge recorded in New Jersey was 5.2 feet in 1962. Nuclear facilities are designed to withstand this challenge in multiple ways. Flood protection at nuclear facilities in New Jersey include water tight structures containing emergency equipment, flood barriers within buildings, elevated concrete pads and emergency pumps for excess water removal. The design of each of the facilities includes bulkheads and flood walls to ensure the integrity of the shoreline. The sites also employ incorporated barriers where protection is provided by special design of walls and penetration closures. The walls are usually reinforced concrete designed to resist the static and dynamic forces of the Design Basis Flood and incorporate special water stops at construction joints to prevent in leakage. Pipe penetrations are usually sealed with special rubber boots and flanges.

Every United States nuclear facility, including those in New Jersey, uses historical meteorological and seismic data to ensure the plants are designed for rare and extreme events. The nuclear facilities in New Jersey advise that they have multiple redundant systems in place to ensure that safety requirements can be met for the improbable, worst case natural events.

CONTRASTING NEW JERSEY'S BWR REACTORS TO FUKUSHIMA DAIICHI

The reactors in the United States are specifically designed to withstand the potential severe events associated with local geography and historical earthquakes, floods and hurricanes. Additionally, over the years plant upgrades and modifications have been implemented based on NRC requirements and operating experience.

The two boiling water reactors in New Jersey (Oyster Creek and Hope Creek) each utilize the Mark 1 Containment similar to the Fukushima Daiichi facility. The specific design of the reactors in New Jersey has been modified to reflect NRC requirements. In the United States, numerous improvements to the reactor designs have been implemented since 1980. Improvements required by the NRC include significant control room

modifications, primary containment (Torus) strengthening, physical separation of safety systems, hardened containment vent to prevent hydrogen buildup, enhanced battery capability, and redundant generator and pumps.

The design of spent fuel pools has also been upgraded. Redundant pumps are available to ensure cooling, alternative fuel pool capabilities were added, and multiple sources of water and power are available for cooling beyond the design bases.

RESPONSES TO FUKUSHIMA DAIICHI FROM EXELON AND PSEG

Both Exelon and PSEG have undertaken a series of self-evaluations and critiques to reconfirm their abilities to respond to nuclear emergencies. Both implemented media and stakeholder outreach programs to address public concerns raised as a result of the Japanese situation. They verified inventory, onsite fire and flood mitigation procedures, and emergency diesel operations. Further, they verified offsite response capabilities, agreements and contracts to ensure these are current and that the parties are capable of mitigating event consequences. Some additional responses include:

- Revising procedures to move emergency fire protection equipment before onset of hurricane or flood.
- Exploring creating a centralized regional response facility with redundant equipment for multiple nuclear site.
- Establishing additional monitors to view fuel pool level from multiple locations.
- Augmenting existing responder resources to include PSEG Fossil Plants, regional nuclear workers and local emergency responders.
- Investigating a dedicated emergency generator to be exclusively used to recharge batteries.

Exelon and PSEG also hosted site visits for the Task Force members, focusing on the reactor building, including the spent fuel pool, the emergency diesel generators, control room (Oyster Creek), and B.5.b (fire pumps and generator) equipment. They also participated in numerous discussions with the members to discuss ongoing efforts to implement lessons learned to date from Fukushima Daiichi.

INITIAL OBSERVATIONS

Based upon the Task Force's review and observations of the early lessons learned from the events that occurred in Japan, the Task Force offers the following observations on these four categories.

1. Power Supply

- Roadway infrastructure and impediments may delay/obstruct the movement of essential items such as generators and pumps to the plant. Government response agencies would likely be required to assist with the movement of these large pieces of equipment.

- The interconnection of backup generators for Salem I, II and Hope Creek so that they can power each other if necessary may provide additional redundancies. It is understood that the impact of a single fault affecting the entire system would have to be adequately addressed.
- For sites with multiple reactors, ensure that there is sufficient power/fuel to operate all pumps that provide cooling water to systems that will require emergency cooling (i.e. power for pumps to each reactor and spent fuel pool located on the site).
- Alternate fuel supplies for generators and pumps in the immediate area to supplement the initial supplies for protracted events should be considered. Identify backup sources from outside the immediate area of the facility in the event that local suppliers are affected by natural/man-made disasters and cannot deliver additional fuel to the site.

2. Spent Fuel Storage

- The identification, approval and construction of a long term storage repository in the United States is critical.
- Recycling of fuel rods may be a viable alternative until a national repository is approved and functional.
- Consider modifying (via request through NRC) B.5.b rule to expand the number of emergency diesel driven pumps so that emergency cooling can be provided for all systems that may be damaged. Separate pumps should be available for each reactor and spent fuel pool on the site.
- Consider regional agreements between licensed operators to provide access to redundant pumps and generators in the event there are failures of the equipment onsite. Establish procedure methods for the acquisition and delivery of backup resources for each site.
- Consider additional monitors to view fuel pool level from multiple locations.

3. Emergency Planning Zone (EPZ) Expansion

- Based upon all of the factors affecting the nuclear industry in this State, New Jersey's 10-mile emergency planning zone is protective of the public and consistent with current science. While current training utilizes a 10-mile EPZ, the Governor has the discretion to evacuate beyond the EPZ to protect the health and welfare of the residents of the State. Although the EPZ is set by the NRC, New Jersey will continue to evaluate it and remain engaged with FEMA to ensure that effective plans are in place to safeguard the residents of New Jersey.

- The NRC issued a Protective Action Recommendation in Japan to evacuate United States citizens to 50 miles. The NRC based this decision on a worst-case scenario; namely that the Japanese crisis could readily escalate to where all reactors and fuel pools would be compromised. It is clear that the decision was not technically an evacuation order as we understand it here in the United States. Evacuation is the movement of populations to avoid acute exposure to radiation that may result in immediate health impacts. Relocation is the movement of populations to avoid chronic (long-term) exposures to radiation that may have carcinogenic effects over a protracted period of exposure (one year, two years, 50 years are used as a default in the United States). The sequence of events and the resulting offsite doses to the Japanese population does not contradict the current planning basis for a 10-mile EPZ in the United States. There is no technical or scientific basis to expand the EPZ at this point based on information and data collected in the areas around the Fukushima Daiichi site. The DEP has dose modeling methods and procedures to extend the evacuation area beyond 10 miles if necessary to avoid acute doses of radiation but it is more likely that areas beyond 10 miles will require relocation efforts to avoid long-term chronic exposures.

4. Communication

- Presently, in order to notify residents who live near the States nuclear plants that there is a situation occurring, a system of sirens has been installed that will act as an alert mechanism. While appropriate for the technology that existed when installed, an augmentation of that system should be considered. Reliance on sirens may be problematic given the extent of large-scale natural disasters, which could destroy a significant, if not the entire, network of warning sirens.
- Battery back-up to the siren network is essential, however not currently required of licensees. Oyster Creek does not have battery back-up to its siren network, Salem/Hope Creek has a battery back-up system.
- The Emergency Alert System (EAS) network is a radio and television mechanism of delivering public safety messages. The EAS system can be activated by one of the pre-identified radio stations for each nuclear power plant or directly from the Regional Operations and Intelligence Center (ROIC), the State Emergency Operations Center.
- It is reasonable and prudent to explore technological enhancements to our existing methods of communicating with the public/at-risk populations. Alternative or additional information technology (IT)/communication systems may be available to increase the effectiveness and efficiency of these critical activities.
- Continuity of communications (i.e., catastrophic failure of infrastructure to support emergency communication to the public) should be evaluated.

- Historically, single events were the focus of response planning. The impact of multiple catastrophic natural disasters (earthquake, hurricane surge) on emergency response and effective communication should be evaluated.
- Prompt notification to the public regarding consumption of food stuffs, milk, water and crops that may be contaminated is essential in order to contain the spread of contamination and protect public health. Benefit may be realized by exercising the drills related to notification on a more frequent basis with the responsible stakeholder agencies.
- The use of reverse 911 calls, social media and the rapidly emerging cellular mobile alert system (CMAS) would be beneficial. CMAS will provide for the broadcast of emergency alerts to targeted geographic areas within the State, such as the EPZs around nuclear plants. Currently a Federal pilot between the Federal Communications Commission and FEMA, this technology is being tested in New York City and Washington, D.C. OHSP and OEM would be the key players for this technology.
- Write public messages that would address specific events that are likely to occur for every nuclear power plant accident that would help expedite communications to the public. These are particularly valuable for post-plume type messages for medical advice and precautions, population monitoring, self-decontamination, and food, water and milk advisories and embargoes. Pre-established public messages are more efficiently circulated to the public, promote consistent messages and will be more effective for protection of public health and safety.

5. General Observations

The following observations do not fit into the categories discussed above but the Task Force offers them here for further consideration.

- Joint exercises where the scenario calls for interaction between Federal and State government would be beneficial. Goals and objectives for these exercises would be to examine the policy level engagements between these governmental levels, and experience the dynamics of situations where the Federal officials seek to re-direct State response strategies.
- Staffing the security guard booth at the entrance to Salem/Hope Creek and creating a protection gate operated from a remote position where it could be closed at the request of the guard may further enhance existing security efforts.
- States' access to Federal data and information was non-existent during the United States response to the Fukushima accident. A mechanism is needed to share critical data between State and Federal agencies so that appropriate protective measures can be taken not just within the immediate area but within contiguous

States that may be affected. As noted in the releases from Japan, all States were affected by the radioactive plume in some manner. While there was no immediate public health impact, States could have been better prepared if the Federal government effectively shared information.

- Coordinating public information between Federal, State, county, local and agencies will foster a consistent public message. Public information needs to be released timely and frequently to build trust in government response agencies and government officials.
- The coordination of Pennsylvania's, New York's, and New Jersey's emergency response plans is vital to protecting the interests of our residents.
- The current protocols of potassium iodine (KI) should be analyzed.

RECOMMENDATIONS

As can be seen from the observations above, there are many similar and overlapping issues. The recommendations set forth below combine those similarities and direct the appropriate State agency to address specific areas in the coming months. Please note that although one agency may be the lead on any particular initiative, in most cases multiple agencies will be required to support the effort. In cases where the regulatory authority for the recommendation rests with the NRC, or other Federal agency, the direction to the appropriate State agency will be to make such a request.

1. Power Supply

- Work with Exelon and PSEG to develop procedures for government assistance in the movement of essential equipment to the facility in a timely and effective manner. (OEM)
- Request that the NRC evaluate the interconnection of generators at the Artificial Island site to make them available to all three reactors. (DEP)

2. Spent Fuel Storage

- Request that the NRC consider modifying the B.5.b rule to expand the number of emergency diesel driven pumps so that emergency cooling can be provided for all systems that may be damaged. Separate pumps should be available for each reactor and spent fuel pool on site. (DEP)
- Support regional agreements between licensed operators to provide access to redundant pumps and generators in the event there are failures of onsite equipment. (DEP)

- Support additional monitors to view spent fuel pool level from multiple locations. (DEP)
- Restate the urgency of a national depository for spent fuel to the NRC and Department of Energy. (DEP)

3. Emergency Planning Zone

- Request NRC confirmation of the Task Force conclusion that there is no technical or scientific basis to expand the current 10-mile emergency planning zone in the United States based upon the events in Japan. (DEP)

4. Communication Tools

- Work closely with Exelon to ensure that battery back-up is installed in a timely manner for the siren network surrounding Oyster Creek. (OEM)
- Explore alternative/additional IT/communication systems to increase the effectiveness and efficiency of delivering emergency messages to the public. (OHSP/OEM)
- Support any Federal initiatives to exercise response to multiple natural disasters. Prior to the modification of existing Federal requirements, incorporate multiple event scenarios where possible. (OEM/DEP)
- Draft pre-written public messages that address the likely events that are expected to occur for a nuclear power plant accident. Pre-established public messages are more efficiently circulated to the public, promote consistency, and are more effective for the protection of public health and safety. (OEM/DEP/OHSP)

5. General Recommendations

- Incorporate the interaction between Federal and State government into exercises to clearly define roles and responsibilities. (OEM/DEP/OHSP)
- Implement the appropriate IT upgrades to permit Plant condition information to be available to appropriate technical staff at the ROIC during exercises and actual emergencies. (OEM)
- Coordinate with New York and Pennsylvania to plan and exercise those reactors that impact New Jersey. (OEM)
- Evaluate the current KI distribution protocol and modify as necessary. (DHSS)

EVALUATION OF OUTCOME – TIMETABLE

The Task Force anticipates filing a final report in the Fall 2011. During the interim period, the utilities and the NRC are invited to respond to the report.

SUMMARY

The Task Force affirms that the State's nuclear facilities have multiple effective, protective and mitigation procedures in place to ensure the safety of our residents. The State's Emergency Preparedness plans and exercises are responsive to our needs while providing enough flexibility to be modified quickly should circumstances require. But the tragedy in Japan reminds us that we must continue to think ahead and plan ahead, to review and where possible boost the safety operations of nuclear facilities and our emergency response system. In this report, recommendations are made on a variety of issues, including power supply at the State's nuclear plants, emergency planning zones, communications, interaction between the State and Federal government, and coordination between New Jersey and neighboring States regarding reactors located outside of our borders. Recommendations include:

- **Power Supply:** Ask the NRC to evaluate interconnections of generators at all three nuclear plants on Artificial Island in Lower Alloways Creek; and work with Exelon and PSEG to develop procedures to quickly move essential equipment to deal with potential emergencies.
- **Spent Fuel Storage:** Increase the number of emergency diesel pumps at nuclear plants to handle cooling for all damaged systems; add monitors to view the spent fuel pool level from multiple locations; create regional agreements between nuclear plant operators to provide access to redundant pumps and generators; press the NRC and Federal Department of Energy to create a national depository for spent nuclear fuel.
- **Emergency Planning Zone:** Request NRC confirmation that there is no technical or scientific basis to expand the current 10-mile emergency planning zone.
- **Communications:** Ensure battery backup is installed in a timely manner for siren network surrounding Oyster Creek; seek alternative methods to increase the effectiveness of delivering emergency messages to the public; support Federal initiatives for emergency preparedness drills that feature multiple natural disasters.
- **General Recommendations:** Coordinate with New York and Pennsylvania to plan emergency response exercises for those reactors that impact New Jersey; more clearly define the roles and responsibilities of the State and Federal government in handling potential emergencies; implement needed IT upgrades at the State's emergency response headquarters.

Moving forward, the Task Force will continue to evaluate New Jersey's nuclear operations and emergency preparedness plans in order to identify any possible enhancements and to implement them. In particular, the Task Force will continue to examine:

- The power supply in the State's nuclear facilities;
- The facilities spent fuel storage capacities and future implications;
- The State's emergency planning zones; and
- Communications among and between Federal, State, local officials, our residents, and our neighboring States.

The Task Force will issue a final report in the Fall. During the interim period the Task Force will monitor the reports from the NRC, including its 90-day report due July 19, 2011, and invites the NRC and utilities to respond to this interim report.