

Elements of a Performance Based Emergency Preparedness Regulatory Regimen

1.0 Introduction

In SECY-06-0200 the staff of the U.S. Nuclear Regulatory Commission (NRC) conceptualized a voluntary performance-based emergency preparedness (PBEP) regulatory regimen. The premise of the PBEP regimen is that it could be adopted in lieu of the existing EP regulations contained in Title 10, Part 50, "Domestic Licensing of Production and Utilization Facilities," of the *Code of Federal Regulations* (10 CFR Part 50). The Commission directed the staff to explore the PBEP regimen and develop a recommendation for Commission consideration. The staff expects to provide its recommendation to the Commission in late 2008. This document outlines a possible PBEP regulatory regimen for nuclear plant EP programs. This PBEP regulatory regimen is only in the conceptual stages and is not part of a formal rulemaking effort. The staff intends to incorporate stakeholder input in the development of the concept, which will be included in the staff recommendation to the Commission.

2.0 Why Consider Change to the Current EP Regulatory Regimen

The current emergency preparedness (EP) regulatory regimen provides for reasonable assurance that adequate protective actions can and will be implemented to protect public health and safety in the unlikely event of a severe reactor accident. It has been successfully implemented for many years. Inspection records show that EP programs are largely in compliance and the relatively few issues noted are addressed in a timely manner.

However, the current EP regulations are deterministic in that specific requirements were promulgated without regard to the actual performance outcome, e.g., training must be provided and attended irrespective of whether the recipient can perform the response task assigned; the response organization may not be changed irrespective of whether a different organization could implement the plan more effectively.

The planning standards of 10 CFR 50.47(b) are the key elements of the current regimen and they rely on the guidance in NUREG-0654 to support the regulations as the standard to judge adequacy of plant commitments documented in the emergency plan. Since the regulations themselves cannot be used to determine adequacy, the emergency plan became the measure of adequacy. Emergency plans were individually approved through judgment of compliance with the guidance and hence the regulations. This resulted in variation among approved programs at similar plants in such areas as staffing, activation times and emergency action levels. The current process to change approved plans is through 10 CFR 50.54(q).

Enclosure

Since nuclear plant EP programs have matured and industry performance has improved, the staff considered the benefits of a PBEP regulatory structure. Whereas the current regimen tends to emphasize compliance with, and control over, emergency plans and facilities, this regimen has little control over drill and exercise scenarios used to demonstrate adequacy. The PBEP regimen would focus oversight and licensee efforts on actual performance competencies during drills and exercises, rather than compliance issues. This could provide a higher level of assurance that the site is prepared because it would focus on demonstrated results rather than compliance. It is also likely that the PBEP regimen would require minimal increase in NRC resources for oversight, provide licensees with greater flexibility to meet requirements and increase the level of emergency preparedness at nuclear plants.

The potential benefits of a PBEP regimen are great. If properly constructed, regulatory oversight would be less involved with licensee processes and procedures and instead focus on performance. Variations in plans would not matter so long as performance was acceptable. In this sense, emergency plans would become part of the licensee response band. Changes to the plans would be permissible as long as performance was maintained. Regulatory focus would be on performance during drills and exercises and correction of weaknesses identified.

For the PBEP regimen to be successful it must be implemented at nuclear plants. This will only happen if licensees see it as advantageous. More importantly, NRC will only implement PBEP if it can provide reasonable assurance for public health and safety. These two objectives are not necessarily opposed, but reconciling them may be a challenge.

3.0 PBEP Regimen Performance Goals

A set of overarching Performance Goals for the PBEP regimen have been identified. These goals may not be required in regulation, but would be included in the statements of consideration and the rulemaking plan and would guide development efforts.

NPP Emergency Planning Performance Goals:

- The licensee can eliminate or substantially reduce public radiation exposure during a nuclear accident through the implementation of protective measures.
- The licensee can mitigate nuclear accident sequences to prevent or reduce radiological releases.
- The licensee can immediately notify State and local officials of emergency conditions.
- State and local officials can make and implement protective action decisions.
- The public can be rapidly alerted and informed in a manner which supports State and local official implementation of protective action decisions.
- The licensee and State and local officials can ensure emergency worker health and safety while responding to a radiological emergency.

4.0 PBEP Regimen Design Considerations:

- The PBEP regimen would be parallel to current regulatory regimen and optional. Since the existing regimen is adequate, there is no safety issue that would require implementation of the PBEP regimen.
- Oversight would focus on licensee performance demonstrated during drills and exercises with specificity in the competencies to be demonstrated and standards to judge success
- The PBEP regimen would be supported by a set of performance indicators that measure performance across (perhaps) 2 years. Performance indicators would trend broad ERO performance and participation, equipment and facility availability. Input to the performance indicators and implementation of corrective actions would be regularly inspected.
- The proposed performance based requirements would replace the 16 planning standards of 10 CFR 50.47(b), much of Appendix E to 10 CFR 50 and 50.54(q).
- Emergency plans would become part of the licensee response band. The process to change plans would be simplified, because emergency plans would be acceptable as long as performance remained at a high level.
- Potential Program Specifics Proposed by the NRC
 - Implementing procedures, facilities, organization, training, activation processes, duty roster qualifications, shift staffing, response organization, communications systems, facility location and emergency equipment would become licensee response band issues. (The radiological hardening of the TSC would be reflected in performance standards.)
 - The licensee would develop a drill and exercise plan which would be reviewed against standards and approved by NRC.
 - Scenario content would be reviewed by NRC to ensure drills and exercises are an adequate test of required demonstrations.
 - Emergency action level and protective action recommendation schemes would be inspected by NRC.
 - The EPZ would be approved by NRC.
 - Notification requirements would not be changed.
 - The staff intends that requirements related to offsite EP would not change, or would have minimal change. Though the staff anticipates there will be no significant changes to offsite agency programs due to implementation of the PBEP regimen, the impacts will be assessed during the program development.

- Biennial exercises and selected drills and exercises would be inspected. The regulations would state the required performance demonstrations and the standards for adequate performance would be contained in supporting guidance.
- NRC would inspect the conduct of critiques and the correction of weaknesses identified.
- NRC with input from the Federal Emergency Management Agency would still make a reasonable assurance determination in accordance with the current regulations but the basis for the determination would shift from compliance with regulations to demonstration of a suite of competencies.
- Licensees must implement the emergency response organization used in the function demonstrations. Specifically, the shift and augmented emergency response organization (ERO) that demonstrates the required functions must be maintained by the licensee.
- Licensees must not use the same response team for sequential evaluated exercises.
- Licensees must not use the same scenario in sequential evaluated exercises.
- Emergency teams must not have knowledge of scenario specifics before performing in drills and exercises.
- The PBEP regimen must enhance regulatory oversight and not increase NRC EP oversight resources after initial implementation.
- Increased oversight would result from crossing performance indicator thresholds, significant corrective action failures, indicator input data problems or failures during actual events. In general, increased oversight would include inspection of additional drills and/or exercises, remedial drills/exercises, scenarios, performance indicator input data, corrective action program records to include verification of the action through physical inspection of appropriate licensee response band elements, (e.g., facilities, procedures, training, emergency plan, etc.).
- It is possible that public warning systems could be included in the PBEP regimen through demonstration and public survey, but this element requires additional study.
- The PBEP regimen must greatly increase licensee flexibility and allow innovative solutions that maintain performance at a high level.
- Licensee EP performance must be maintained at a level comparable or higher than it is today.

- NRC oversight must be capable of ensuring that a high level of emergency preparedness exists that provides reasonable assurance that public health and safety is protected.

5.0 Performance Demonstrations

The PBEP regimen would require the demonstration of important functions during each 6 year inspection cycle. Since not every demonstration would be inspected routinely, performance indicators would measure success between inspections. Biennial exercises could provide the venue for many performance demonstrations, but drills and off year exercises would also be used to demonstrate elements not amenable to large biennial exercises, e.g., shift organization development of protective action recommendations (PARs). The frequency requirements for demonstrations would drive a drill program that supplements the required exercises without the need for a specific regulation on drills. Performance indicators would also drive the frequency of supporting drills.

Nuclear plant emergency response occurs in two phases: immediate response provided by shift personnel and augmented response through activation of emergency response facilities. The proposed performance demonstrations are similarly segregated. Specific examples of possible demonstration criteria are as follows in Sections 5.1 and 5.2:

5.1 Shift ERO Performance Demonstrations:

The shift ERO would perform in simulator control room while responding to transients specified by the scenario. They will demonstrate the following (not inclusive list – to be developed):

1. Operations

- safely operate plant during accident transient while managing emergency response (command and control, (every 2 years)
- classify emergencies, (every 2 years)
- make protective action recommendation, (every 2 years)
- implement on site protective actions, (every 2 years)

2. Notifications/Communications

- notify state/local offsite response organizations, (every 2 years)
- activate ERO, (every 2 years)
- brief the augmenting ERO, (every 2 years)
- notify NRC, (every 2 years)

3. Radiological Protection

- perform dose projections, (every 2 years)
- perform onsite survey, (every 2 years)
- perform offsite survey, (every 2 years)

4. Repair and Corrective Actions

- conduct mechanical repairs: valve manipulation and minor repair to mitigate accident, (every 6 years)

- conduct electrical repairs: breaker manipulation, electrical cable installation to mitigate accident, (every 6 years)
- conduct I & C activities: verification of off scale readings to mitigate accident, (every 6 years)
- conduct fire fighting with offsite support, (every 6 years)

5. Personnel protection

- perform accountability, (every 6 years)
- evacuate the site, (every 6 years)
- shelter from hostile action, (every 6 years)

6. Security Functions

- implement onsite protective actions in response to hostile action, (every 6 years)
- coordinate with security during armed attack, (every 6 years)
- coordinate with offsite assistance, (every 6 years)

Performance Standards would be developed for each element demonstrated.

Examples of Scenarios to be used over a 6 year period might include:

- Fire in control room requiring evacuation, control of plant from remote locations, fighting fire and implementation of emergency plan
- Early radiological release from LOCA and containment bypass with failed fuel but not total fuel melt
- Armed attack on site with penetration and loss equipment (full target set,) adversaries neutralized after loss of equipment. Target set information is safeguards information and must be handled appropriately.

NRC approval of scenarios for evaluated demonstrations is required. Review of other scenarios is optional. Increased oversight may include Inspection of scenario content.

5.2 Augmented ERO Performance Demonstrations

Augmented ERO teams will perform in actual emergency response facilities. They will demonstrate the following:

- Demonstrate ability to make the Technical Support Center (TSC), Emergency Operations Facility (EOF) and Operations Support Center (OSC) functional (this does not mean fully staffed) within 90 minutes of declaration of an Alert or higher level classification (every 2 years)
- Demonstrate ability to make the Joint Information Center (JIC) functional within 120 minutes of a Site Area Emergency. (every 2 years)

Technical Support Center/Emergency Operations Center

The ERO teams assigned to these facilities must demonstrate the following competencies. Division of responsibilities between facilities is within the licensee response band:

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- Accurate classification of emergencies (every 2 years)
- Accurate and timely notification of OROs and NRC (every 2 years)
- PAR development and notification (within 15 minutes) to OROs (every 2 years)
- Diagnosis of accident symptoms (every 2 years)
- Engineering of mitigative actions to include use of equipment and procedures for response to loss of large areas of the plant (every 2 years)
- Preparing work scope for damage repair teams (every 2 years)\
- Radiological support of damage mitigation efforts (every 2 years)
- Response to hostile action (every 6 years)
- Interface with local law enforcement (every 6 years)
- Offsite dose estimates (every 2 years)
- Demonstrate effective deployment of damage repair teams in a security environment (every 6 years)
- Requesting and effective interface with offsite fire and medical assistance (every 2 years)
- Medical response to contaminated injuries (every 6 years)
- Protection of onsite workers during radiological accident including accountability (every 2 years)
- Protection of onsite workers during hostile action (every 6 years)
- Survey of in plant emergency radiological conditions (every 2 years)
- Brief OROs and NRC on plant status (every 2 years)
- Interface with Federal, state and local law enforcement (every 6 years)
- Survey of crops, water and land areas (every 6 years)
- Assist JIC in development of press releases (every 2 years)

Operations Support Center

The ERO teams assigned to the OSC will demonstrate the following competencies:

- Briefing of damage repair teams (every 2 years)
- Radiological support of damage mitigation efforts (every 2 years)
- Deployment of damage repair teams in a security environment (every 6 years)
- Interface with offsite fire and medical assistance (every 2 years)
- Medical response to contaminated injuries (every 6 years)
- Field repair teams in high radiation areas (every 2 years)
- Survey of in plant emergency radiological conditions (every 2 years)
- take and analyze effluent samples, (every 2 years)
- take and analyze coolant samples, (all shifts every 6 years)

The Joint Information Center

The ERO assigned to the JIC will demonstrate the following competencies:

- Perform press briefings providing information regarding simulated plant accident conditions (every 2 years)
- Issue accurate press releases regarding the simulated plant accident conditions (every 2 years)

Performance Standards would be developed for each element demonstrated.

Scenarios to be used over a 6 year period would include:

TBD, but a nexus to the core damage frequency (CDF) analysis should establish that a high percentage of CDF is included in the scenario set. There must also be a wide spectrum of events including realistic events with minimal offsite consequences.

NRC approval of scenarios for evaluated demonstrations is required. Review of other scenarios is optional. Increased oversight may include Inspection of scenario content.

6.0 Performance Indicators (PIs)

Development of PIs requires significant effort in order to ensure the measurements actually indicate the intended performance. Further, careful definition of numerical parameters is necessary for clarity during implementation. The PIs proposed below include the existing and fully developed indicators as well as new ones that will require detailed work.

6.1 Drill and Exercise Performance

The current PI for classification, notification and PAR development is adequate for those areas and could be used as defined.

6.2 Team Performance

A PI would be developed to indicate the timeliness and success of teams to include damage control teams, radiological survey, radiological personnel protection and engineering teams. These would be successful opportunities divided by opportunities, but the definition of opportunities and success would require detailed development efforts.

6.3 ERO Participation

The current PI would be a good basis, but would be expanded to all personnel who implement required performance demonstrations.

6.4 Alert and Notification System

The current PI would be modified to indicate system availability.

6.5 Facility and Equipment Availability

A PI would be developed to indicate the availability of facilities, equipment and telephone systems.

7.0 Communicating Reasonable Assurance to Stakeholders

The term "reasonable assurance" does not effectively communicate the status of emergency response to the public. It generally means that NRC has made a judgment that the EP program is "adequate" (another poor term). The PBEP regimen would adopt different language such as "a high level of emergency preparedness exists" to better communicate the nuclear plant regulatory status to stakeholders. This word string could be defined by performance standards, e.g., the licensee has demonstrated a high level of emergency preparedness in response to simulated severe reactor accidents (that reflect X% of site-specific core damage frequency). The accident scenarios themselves would be defined and performance standards for emergency response would be issued and inspected. These elements would deliver a stronger message as to the depth and detail of our oversight and a positive message about licensee capabilities (for licensees that adopt the system).

8.0 Further Development Actions

If the decision is made to pursue PBEP, a series of development activities would be necessary. A small team of EP professionals would be assembled, perhaps with National Lab assistance to develop PBEP. The issues that would have to be addressed include:

- Development of new PIs
- Performance standards to judge adequacy of all demonstrations
- Rulemaking

- Development of a pilot program for implementation (with industry volunteers)
- Updating of inspection procedures
- Development of a significance determination process for noncompliance issues
- Development of radiological performance standards for the TSC
- Roll out of the program and inspector training to all stakeholders, especially licensees

Stakeholder input would be sought frequently, but within the parameters allowed in the rulemaking process. However, the PBEP regimen would be open to public scrutiny. Performance Indicator data, inspection results and compliance issues would be open to the public through posting on the NRC website.