

## Emergency Preparedness Program Frequently Asked Question (EPFAQ)

<b>EPFAQ Number:</b>	<b>2019-03</b>
<b>Originator:</b>	Dean Burnett
<b>Organization:</b>	Entergy
<b>Relevant Guidance:</b>	This question requests clarity on the clock initiation for determination of a Significant Radiological Release in EPFAQ 2013-004.
<b>Applicable Section(s):</b>	N/A
<b>Date Accepted for Review:</b>	
<b>Status:</b>	<b>Rejected</b>

### **QUESTION OR COMMENT:**

#### Background

NUREG-0654, Supplement 3, Page A-3, Note 1 reads “A rapidly progressing severe incident is a General Emergency (GE) with rapid loss of containment integrity (emergency action levels indicate containment barrier loss) and loss of ability to cool the core. This path is used for scenarios in which containment integrity can be determined as bypassed or immediately lost during a GE with core damage. If this scenario cannot be immediately confirmed, assume it is not taking place and answer “no” to this decision block.”

In response to a request for additional information and interpretation of the Supplement 3 Note 1 guidance, the answer to EPFAQ 2013-004 Question 1 provides clarification for determining whether an Rapidly Progressing Severe Accident (RPSA) is occurring. The FAQ information reads in part:

“...A rapidly progressing severe accident may be defined as:

1. This protective action recommendation is the first after a General Emergency has been declared  
AND
2. There is loss of the containment barrier per the Emergency Action Levels  
AND
3. EITHER of the following:
  - a. Greater than or equal to Containment High Range Area Radiation Monitor Potential Loss EAL Threshold (20% Clad Damage)  
OR
  - b. A significant radiological release (greater than PAGs [protective action guides] at boundary) in about an hour

As noted in Supplement 3, if these conditions cannot be determined, the Emergency Director

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should assume they are not taking place...”

Supplement 3 Note 1 does not contain any timing guidance such as “in about an hour” and does not address relative start times for events such as core damage or containment failure. Note 1 leaves open the interpretation that the GE and containment loss are simultaneous or near simultaneous, but that the core damage may not have occurred simultaneous to the other events. In addition, part 3.b of the FAQ response does not tie the “in about an hour” time frame to a specific start time and could relate to differing interpretations, including the time of the GE declaration. It may be intended to be a tie to the “warning time” as used in NUREG-1150 and NUREG/CR-6953 which would be a start time of the initiation of core damage, but this is not explicitly stated.

NEI 99-01 Rev 6, Development of Emergency Action Levels for Non-Passive Reactors, states “...NUREG-1228, Source Estimations During Incident Response to Severe Nuclear Power Plant Accidents, indicates the fuel clad failure must be greater than approximately 20% in order for there to be a major release of radioactivity requiring offsite protective actions...” NEI 99-01, Rev. 6 provides a containment radiation monitor reading to be considered as a GE condition alone because of the severity of core damage and the related fission product inventory available for release should containment fail. This containment radiation monitor reading is used in the EPFAQ 2013-004 guidance to define the core damage state for an RPSA.

With a strict application of the information provided, it may be possible to follow the logic in EPFAQ 2013-004 and arrive at a conclusion that an RPSA is occurring for the unlikely condition where offsite dose exceeds EPA PAGs at the site boundary, but no other evidence of a loss or potential loss of the fuel clad barrier exists, much less an advanced core damage condition such as 20% clad failure. This scenario does not appear to meet the intent of an RPSA because it does not match the Supplement 3 Note 1 condition described in part as “...during a GE with core damage...”

In addition to clarifying the guidance relating to the element of the guidance relating to offsite does at the site boundary, it may be helpful to clearly state that an RPSA describes a reactor core event that does not start from a cold shutdown condition or originate from the spent fuel pool.

### Question

Can EPFAQ 2013-004 be revised to remove ambiguity related to the start of the “in about an hour” period for element 3.b for a significant radiological release or eliminate the potential for misinterpretation of this element?

### **PROPOSED SOLUTION:**

- Provide a start time for the “...in about an hour...” period that relates to the severe core damage element of an RPSA
- Clearly state that an RPSA does not apply when an accident starts from a cold shutdown condition
- Clearly state that an RPSA does not apply to spent fuel pool events

The modified FAQ information would then read as follows:

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“A rapidly progressing severe accident may be defined as:

NOTE: A rapidly progressing severe accident does not apply to events originating from cold shutdown modes or from the spent fuel pool.

1. This protective action recommendation is the first after a General Emergency has been declared  
AND
2. There is loss of the containment barrier per the Emergency Action Levels  
AND
3. EITHER of the following:
  - a. Greater than or equal to Containment High Range Area Radiation Monitor Potential Loss EAL Threshold (20% Clad Damage)  
OR
  - b. A significant radiological release (greater than PAGs at boundary) in about an hour from the time severe accident management procedure (BWR)/guideline (PWR) entry conditions have been met – excluding spent fuel pool-related entry conditions

As noted in Supplement 3, if these conditions cannot be determined, the Emergency Director should assume they are not taking place...”

### **NRC Response:**

The NRC staff reviewed NUREG-0654, Revision 1, Supplement 3 (NUREG-0654, Supplement 3) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML113010596) and NUREG/CR-6953, Vol. 3, SAND2010-2806P (NUREG-6953) (ADAMS Accession No. ML102380087) and determined that EPFAQ 2019-03 proposes to modify EPFAQ 2013-04 in a fashion that is not consistent with the intent of the EPFAQ 2013-04, Question 1. A further discussion in support of this rejection is as follows:

Although a rapidly progressing severe accident (RPSA) is not specifically defined in NUREG-0654, Supplement 3, adequate information is provided to clearly identify the key characteristics of a RPSA.

As indicated on the “Protective Action Strategy Development Tool” on page A-2 of NUREG-0654, Supplement 3, the protective action strategy will be implemented for RPSAs after the declaration of a General Emergency. Note 1, which specifically applies to a rapidly progressing severe accident, states:

A rapidly progressing severe incident is a General Emergency (GE) with rapid loss of containment integrity (emergency action levels indicate containment barrier loss) and loss of ability to cool the core. This path is used for scenarios in which containment integrity can be determined as bypassed or immediately lost during a GE with core damage. If this scenario cannot be immediately confirmed, assume it is not taking place and answer “no” to this decision block.

Note 9, includes a background note for a Rapidly Progressing Scenario further states:

The rapidly progressing incident is more severe than other GEs, and different protective actions are appropriate for all sites.

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Section 2.7, "Strategy for Rapidly Progressing Scenarios," of NUREG-0654, Supplement 3, states:

The emergency preparedness planning basis includes rapidly progressing scenarios that have a significant radioactive release in about 1 hour. . . .

Considering that Section 2.7 of NUREG-0654, Supplement 3, provides a generic protective action strategy for rapidly progressing severe incidents, it is reasonable to conclude that the timing of the radioactive release should be relative to the implementation of the protective action strategy. Additionally, the event of concern is a General Emergency with core damage and a loss containment integrity.

Section 2.3, "Scenario Development," of NUREG-6953 provides 6 scenarios that were used to define bounding conditions for analysis. All scenarios began at time zero which represented the time at which plant operators became aware that a General Emergency condition exists. NUREG-6953 further states, "it is likely that operators would be aware of precursor events that create the protentional for a rapidly progressing accident before this hypothetical T=0 and would make a notification to local authorities."

Based on the above, the NRC staff concludes that the time at which plant operators become aware that a General Emergency condition exist is a reasonable RPSA start time. The NRC staff further concludes that that a RPSA would exist if the conditions described in Note 1 of NUREG-0654, Supplement 3, exist, or will likely exist, within approximately one hour of becoming aware of the General Emergency condition.

The Final Response for EPFAQ 2013-004 (ADAMS Accession No. ML14007A652), Question 1, is directly related to the following question:

Can a Rapidly Progressing Severe Accident be defined in terms that are easily identified by the control room staff (e.g., tied to a specific time frame and site's emergency action levels)?

The key elements of the NRC response to EPFAQ 2013-004 are as follows:

- This is the first protective action recommendation after a General Emergency has been declared.
- There is a loss of the containment barriers per the emergency action levels.
- The core is damaged as indicated by either meeting the EAL threshold for clad damage or there is a significant radiological release as indicated by radiation levels indicating that a release in excess of the protective action guidelines would occur within about an hour [considering this is a subsequent step to the declaration of a General Emergency, either this condition would either exist at the time of the General Emergency declaration or would be projected to occur within one hour of the General Emergency declaration.]

The above NRC response provides an answer to Question 1 of EPFAQ 2013-004. This response specifically addresses the utilization of emergency action levels as indication of a damaged core or a significant release of radioactive release concurrent with containment failure and is not intended to alter the guidance in NUREG-0654, Supplement 3. Considering that EPFAQ 2013-004 Question 1 is limited to providing indications that would be readily available to

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the control room staff for a rapidly progressing severe accident/incident as described in NUREG-0654, Supplement 3, the response to EPFAQ 2013-004 should only be used to inform the development of a site-specific protective action strategy in accordance with NUREG-0654, Supplement 3.

EPFAQ 2019-03 proposed the following:

A significant radiological release (greater than PAGs at boundary) in about an hour from the time severe accident management procedure (BWR [boiling water reactor])/guideline (PWR [pressurized water reactor]) entry conditions have been met – excluding spent fuel pool-related entry conditions.

The NRC staff does not agree with this condition. Depending on site-specific emergency plan development, the severe accident management procedure may be implemented to mitigate or prevent core damage from occurring. If the severe accident management procedure is successful, the proposed statement would require implementation of the RPSA strategy based solely on the implementation time of the severe accident mitigation procedure rather than a rapid loss of containment integrity during a general emergency with core damage.

Additionally, EPFAQ 2019-03 proposed the following:

Clearly state that an RPSA does not apply when an accident starts from a cold shutdown condition.

NUREG-0654, Supplement 3, provides guidance based on core damage, containment failure, and time. The initial operating mode is not a provided condition of NUREG-0654, Supplement 3. As such, the NRC staff concludes that the guidance of NUREG-0654, Supplement 3, should be applied whenever a RPSA exists, regardless of the operating mode at the beginning of the event.

In summary, NUREG-0654, Supplement 3, and the response to EPFAQ 2013-004 provide guidance for developing site-specific protective action strategies. Specifically, the “Protective Action Strategy Development Tool” is intended to be used to develop site specific protective action strategies and is not intended to be used as a template that would be inserted into site-specific emergency plans.

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OFFICE	NSIR/DPR/ORLT	NSIR/DPR/RLB: BC	NSIR/DPR/POB: BC	NSIR/DPR:DD
NAME	R. Hoffman	J. Anderson	R. Kahler	C. Johnson
DATE	01/07/20	02/04/20	02/14/20	02/ 06/20

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