UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SEP 19 1979

The USNRC Office of Nuclear Reactor Regulation has developed draft Emergency Action Level Guidelines to improve the emergency preparedness capabilities around operating nuclear power plants. The enclosed draft guidelines for interim use, published as NUREG-0610, establishes four classes of Emergency Action Levels replacing the classes in Regulatory Guide 1.101. The new classes are Notification of Unusal Event, Alert, Site Emergency, and General Emergency.

Public comments on these draft guidelines are solicited. All comments sent to:

Secretary of the Commission
U. S. Nuclear Regulatory Commission
Washington, DC 20555
Attention: Docketing and Service Branch

and received by December 1, 1979, will be considered by the Commission.

Sincerely,

Harold R. Denton

Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Enclosure:
As Stated

1329 017

dupe
7910170151

NUREG-0610

U.S. NUCLEAR REGULATORY COMMISSION

DRAFT EMERGENCY ACTION LEVEL GUIDELINES FOR NUCLEAR POWER PLANTS

September 1979

OFFICE OF NUCLEAR REACTOR REGULATION
U.S. NUCLEAR REGULATORY COMMISSION

For interim use and comment - 9/14/79

BASIS FOR EMERGENCY ACTION LEVELS FOR NUCLEAR POWER FACILITIES

This document is provided for interim use during the initial phases of the NRC effort to promptly improve emergency preparedness at operating nuclear power plants. Changes to the document can be expected as experience is gained in its use and public comments are received. Further, the Commission has initiated a rulemaking procedure, now scheduled for completion in January 1980 in the area of Emergency Planning and Preparedness. Additional requirements are to be expected when rulemaking is completed and some modifications to this document may be necessary.

Four classes of Emergency Action Levels are established which replace the classes in Regulatory Guide 1.101, each with associated examples of initiating conditions. The classes are:

Notification of Unusual Event

Alert

Site Emergency

General Emergency

The rationale for the notification and alert classes is to provide early and prompt notification of minor events which could lead to more serious consequences given operator error or equipment failure or which might be indicative of more serious conditions which are not yet fully realized. A gradation is provided to assure fuller response preparations for more serious indicators. The site emergency class reflects conditions where some significant releases are likely or are occurring but where a core melt situation is not indicated based on current information. In this situation full mobilization of emergency personnel in the near site environs is indicated as well as dispatch of monitoring teams and associated communications. The general emergency class involves actual or imminent substantial core degradation or melting with the potential for loss of containment. The immediate action for this class is sheltering (staying inside) rather than evacuation until an assessment can be made that (1) an evacuation is indicated and (2) an evacuation, if indicated, can be completed prior to significant release and transport of radioactive material to the affected areas.

The example initiating conditions listed after the immediate actions for each class are to form the basis for establishment by each licensee of the specific plant instrumentation readings which, if exceeded, will initiate the emergency class.

1329 019

Some background information on release potential and expected frequencies for the various classes is provided in this material. Note that there is a wide band of uncertainty associated with the frequency estimates. The release potential given reflects the amount that could be released over a long time period or under favorable meteorological conditions without exceeding the exposure criteria of a more severe class. Release of these amounts in a short time period under unfavorable meteorological dispersion conditions might trigger the criteria of a more severe class.

1329 020

Class	Licensee Actions	State and/or Local Offsite Authority Actions
Notification of unusual event Class Description Unusual events are in process or have occurred which indicate a potential degradation of the level of safety of the plant. Purpose Purpose of offsite notification is to (1) assure that the first step in any response later found to be necessary has been carried out, (2) provide current information on unusual events, and (3) provide a periodic unscheduled test of the offsite communication link. Release Potential No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs. Expected Frequency Once or twice per year per unit.	1. Promptly inform State and/or local offsite authorities of nature of unusual condition as soon as discovered 2. Augment on-shift resources 3. Assess and respond 4. Close out with verbal summary to offsite authorities; followed by written summary within 24 hours or 5. Escalate to a more severe class	1. Provide fire or security assistance if requested 2. Standby until verbal closeout or 3. Escalate to a more severe class

EXAMPLE INITIATING CONDITIONS: NOTIFICATION OF UNUSUAL EVENT

1. ECCS initiated

2. Radiological effluent technical specification limits exceeded

3. Fuel damage indication. Examples:

   a. High offgas at BWR air ejector monitor (greater than 500,000 µci/sec; corresponding to 16 isotopes decayed to 30 minutes; or an increase of 100,000 µci/sec within a 30 minute time period)
   b. High coolant activity sample (e.g., exceeding coolant technical specifications for iodine spike)

   c. Failed fuel monitor (PWR) indicates increase greater than 0.1% equivalent fuel failures within 30 minutes.

4. Abnormal coolant temperature and/or pressure or abnormal fuel temperatures

5. Exceeding either primary/secondary leak rate technical specification or primary system leak rate technical specification

6. Failure of a safety or relief valve to close

7. Loss of offsite power or loss of onsite AC power capability

8. Loss of containment integrity requiring shutdown by technical specifications

9. Loss of engineered safety feature or fire protection system function requiring shutdown by technical specifications (e.g., because of malfunction, personnel error or procedural inadequacy)

10. Fire lasting more than 10 minutes

11. Indications or alarms on process or effluent parameters not functional in control room to an extent requiring plant shutdown or other significant loss of assessment or communication capability (e.g., plant computer, all meteorological instrumentation)

12. Security threat or attempted entry or attempted sabotage

13. Natural phenomenon being experienced or projected beyond usual levels

    a. Any earthquake

    b. 50 year flood or low water, tsunami, hurricane surge, seiche

    c. Any tornado near site

    d. Any hurricane

14. Other hazards being experienced or projected

    a. Aircraft crash on-site or unusual aircraft activity over facility

    b. Train derailment on-site

    c. Near or onsite explosion

    d. Near or onsite toxic or flammable gas release

    e. Turbine failure

15. Other plant conditions exist that warrant increased awareness on the part of State and/or local offsite authorities or require plant shutdown under technical specification requirements or involve other than normal controlled shutdown (e.g., cooldown rate exceeding technical specification limits, pipe cracking found during operation)

16. Transportation of contaminated injured individual from site to offsite hospital

17. Rapid depressurization of PWR secondary side.

Class	Licensee Actions	State and/or Local Offsite Authority Actions
Alert	1. Promptly inform State and/or local authorities of alert status and reason for alert as soon as discovered	1. Provide fire or security assistance if requested
Class Description Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant.	2. Augment resources by activating on-site technical support center, on-site operations center and near-site emergency operations center (EOC)	2. Augment resources by activating near-site EOC and any other primary response centers
Purpose Purpose of offsite alert is to (1) assure that emergency personnel are readily available to respond if situation becomes more serious or to perform confirmatory radiation monitoring if required, (2) provide offsite authorities current status information, and (3) provide possible unscheduled tests of response center activation.	3. Assess and respond 4. Dispatch on-site monitoring teams and associated communications 5. Provide periodic plant status updates to offsite authorities (at least every 15 minutes) 6. Provide periodic meteorological assessments to offsite authorities and, if any releases are occurring, dose estimates for actual releases 7. Close out by verbal summary to offsite authorities followed by written summary within 8 hours or 8. Escalate to a more severe class	3. Alert to standby status key emergency personnel including monitoring teams and associated communications 4. Provide confirmatory offsite radiation monitoring and ingestion pathway dose projections if actual releases substantially exceed technical specification limits 5. Maintain alert status until verbal closeout or 6. Escalate to a more severe class
Release Potential Limited releases of up to 10 curies of I-131 equivalent or up to 10^4 curies of Xe-133 equivalent.		
Expected Frequency Once in 10 to 100 years per unit.		

EXAMPLE INITIATING CONDITIONS: ALERT

1. Severe loss of fuel cladding

   a. High offgas at BWR air ejector monitor (greater than 5 ci/sec; corresponding to 16 isotopes decayed 30 minutes)

   b. Very high coolant activity sample (e.g., 300 µci/cc equivalent of I-131)

   c. Failed fuel monitor (PWR) indicates increase greater than 1% fuel failures within 30 minutes or 5% total fuel failures.

2. Rapid gross failure of one steam generator tube with loss of offsite power

3. Rapid failure of more than 10 steam generator tubes (e.g., several hundred gpm primary to secondary leak rate)

4. Steam line break with significant (e.g., greater than 10 gpm) primary to secondary leak rate or MSIV malfunction

5. Primary coolant leak rate greater than 50 gpm

6. High radiation levels or high airborne contamination which indicate a severe degradation in the control of radioactive materials (e.g., increase of factor of 1000 in direct radiation readings)

7. Loss of offsite power and loss of all onsite AC power

8. Loss of all onsite DC power

9. Coolant pump seizure leading to fuel failure

10. Loss of functions needed for plant cold shutdown

11. Failure of the reactor protection system to initiate and complete a scram which brings the reactor subcritical

12. Fuel damage accident with release of radioactivity to containment or fuel handling building

13. Fire potentially affecting safety systems

14. All alarms (annunciators) lost

15. Radiological effluents greater than 10 times technical specification instantaneous limits (an instantaneous rate which, if continued over 2 hours, would result in about 1 mr at the site boundary under average meteorological conditions)

16. Ongoing security compromise

17. Severe natural phenomena being experienced or projected

    a. Earthquake greater than OBE levels

    b. Flood, low water, tsunami, hurricane surge, seiche near design levels

    c. Any tornado striking facility

    d. Hurricane winds near design basis level

18. Other hazards being experienced or projected

    a. Aircraft crash on facility

    b. Missile impacts from whatever source on facility

    c. Known explosion damage to facility affecting plant operation

    d. Entry into facility environs of toxic or flammable gases

    e. Turbine failure causing casing penetration

19. Other plant conditions exist that warrant precautionary activation of technical support center and near-site emergency operations center

20. Evacuation of control room anticipated or required with control of shutdown systems established from local stations

Class	Licensee Actions	State and/or Local Offsite Authority Actions
Site Emergency Class Description Events are in process or have occurred which involve actual or likely major failures of plant functions needed for protection of the public. Purpose Purpose of the site emergency warning is to (1) assure that response centers are manned, (2) assure that monitoring teams are dispatched, (3) assure that personnel required for evacuation of near-site areas are at duty stations if situation becomes more serious, (4) provide current information for and consultation with offsite authorities and public, and (5) provide possible unscheduled test of response capabilities in U. S. Release Potential Releases of up to 1000 ci of I-131 equivalent or up to 10^6 ci of Xe-133 equivalent. Expected Frequency Once in one hundred to once in 5000 years per unit.	1. Promptly inform State and/or local offsite authorities of site emergency status and reason for emergency as soon as discovered. 2. Augment resources by activating on-site technical support center, on-site emergency operations center and near-site emergency operations center (EOC) 3. Assess and respond 4. Dispatch on-site and offsite monitoring teams and associated communications 5. Provide a dedicated individual for plant status updates to offsite authorities and periodic press briefings (perhaps joint with offsite authorities) 6. Make senior technical and management staff onsite available for consultation with NRC and State on a periodic basis 7. Provide meteorological and dose estimates to offsite authorities for actual releases via a dedicated individual or automated data transmission 8. Provide release and dose projections based on available plant condition information and foreseeable contingencies 9. Close out or recommend reduction in emergency class by briefing of offsite authorities at EOC and by phone followed by written summary within 8 hours or 10. Escalate to general emergency class	1. Provide any assistance requested 2. Activate immediate public notification of emergency status and provide public periodic updates 3. Augment resources by activating near-site EOC and any other primary response centers 4. Dispatch key emergency personnel including monitoring teams and associated communications 5. Alert to standby status other emergency personnel (e.g., those needed for evacuation) and dispatch personnel to near-site duty stations 6. Provide offsite monitoring results to licensee and others and jointly assess them 7. Continuously assess information from licensee and offsite monitoring with regard to changes to protective actions already initiated for public and mobilizing evacuation resources 8. Recommend placing milk animals within 2 miles on stored feed and assess need to extend distance 9. Provide press briefings, perhaps with licensee 10. Maintain site emergency status until closeout or reduction of emergency class or 11. Escalate to general emergency class

EXAMPLE INITIATING CONDITIONS: SITE EMERGENCY

1. Known loss of coolant accident greater than makeup pump capacity

2. Degraded core with possible loss of coolable geometry (indicators should include instrumentation to detect inadequate core cooling, coolant activity and/or containment radioactivity levels)

3. Rapid failure of more than 10 steam generator tubes with loss of offsite power

4. BWR steam line break outside containment without isolation

5. PWR steam line break with greater than 50 gpm primary to secondary leakage and indication of fuel damage

6. Loss of offsite power and loss of onsite AC power for more than 15 minutes

7. Loss of all vital onsite DC power for more than 15 minutes

8. Loss of functions needed for plant hot shutdown

9. Major damage to spent fuel in containment or fuel handling building (e.g., large object damages fuel or water loss below fuel level)

10. Fire affecting safety systems

11. All alarms (annunciators) lost for more than 15 minutes and plant is not in cold shutdown or plant transient initiated while all alarms lost

12. a. Effluent monitors detect levels corresponding to greater than 50 mr/hr for 1/2 hour or greater than 500 mr/hr W.B. for two minutes (or five times these levels to the thyroid) at the site boundary for adverse meteorology

    b. These dose rates are projected based on other plant parameters (e.g., radiation level in containment with leak rate appropriate for existing containment pressure) or are measured in the environs

13. Imminent loss of physical control of the plant

14. Severe natural phenomena being experienced or projected with plant not in cold shutdown

    a. Earthquake greater than SSE levels

    b. Flood, low water, tsunami, hurricane surge, seiche greater than design levels or failure of protection of vital equipment at lower levels

    c. Winds in excess of design levels

1329 028

15. Other hazards being experienced or projected with plant not in cold shutdown

    a. Aircraft crash affecting vital structures by impact or fire

    b. Severe damage to safe shutdown equipment from missiles or explosion

    c. Entry of toxic or flammable gases into vital areas

16. Other plant conditions exist that warrant activation of emergency centers and monitoring teams and a precautionary public notification

17. Evacuation of control room and control of shutdown systems not established from local stations in 15 minutes

Class

General Emergency

Class Description

Events are in process or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity.

Purpose

Purpose of the general emergency warning is to (1) initiate predetermined protective actions for public, (2) provide continuous assessment of information from licensee and offsite measurements, (3) initiate additional measures as indicated by event releas or potential releases, and (4) provide current information for and consultation with offsite authorities and public.

Release Potential

Releases of more than 1000 ci of I-131 equivalent or more than 10^6 ci of Xe-133 equivalent.

Expected Frequency

Less than once in about 5000 years per unit. Life threatening doses offsite (within 10 miles) once in about 100,000 years per unit.

Licensee Actions

1. Promptly inform State and local offsite authorities of general emergency status and reason for emergency as soon as discovered (Parallel notification of State/local)
2. Augment resources by activating on-site technical support center, on-site emergency operations center and near-site emergency operations center (EOC)
3. Assess and respond
4. Dispatch on-site and offsite monitoring teams and associated communications
5. Provide a dedicated individual for plant status updates to offsite authorities and periodic press briefings (perhaps joint with offsite authorities)
6. Make senior technical and management staff onsite available for consultation with NRC and State on a periodic basis.
7. Provide meteorological and dose estimates to offsite authorities for actual releases via a dedicated individual or automated data transmission
8. Provide release and dose projections based on available plant condition information and foreseeable contingencies
9. Close out or recommend reduction of emergency class by briefing of offsite authorities at EOC and by phone followed by written summary within 8 hours

State and/or Local Offsite Authority Actions

1. Provide any assistance requested
2. Activate immediate public notification of emergency status and provide public periodic updates
3. Recommend sheltering for 2 mile radius and 5 miles downwind and assess need to extend distances
4. Augment resources by activating near-site EOC and any other primary response centers
5. Dispatch key emergency personnel including monitoring teams and associated communications
6. Dispatch other emergency personnel to duty stations within 5 mile radius and alert all others to standby status
7. Provide offsite monitoring results to licensee and others and jointly assess these
8. Continuously assess information from licensee and offsite monitoring with regard to changes to protective actions already initiated for public and mobilizing evacuation resources
9. Recommend placing milk animals within 10 miles on stored feed and assess need to extend distance
10. Provide press briefings, perhaps with licensee
11. Consider relocation to alternate EOC if actual dose accumulation in near-site EOC exceeds lower bound of EPA PAGs
12. Maintain general emergency status until closeout or reduction of emergency class

EXAMPLE INITIATING CONDITIONS: GENERAL EMERGENCY

1. a. Effluent monitors detect levels corresponding to 1 rem/hr W.B. or 5 rem/hr thyroid at the site boundary under actual meteorological conditions

   b. These dose rates are projected based on other plant parameters (e.g., radiation levels in containment with leak rate appropriate for existing containment pressure with some confirmation from effluent monitors) or are masured in the environs.

   Note: Consider evacuation only within about 2 miles of the site boundary unless these levels are exceeded by a factor of 10 or projected to continue for 10 hours

2. Loss of 2 of 3 fission product barriers with a potential loss of 3rd barrier, (e.g., loss of core geometry and primary coolant boundary and high potential for loss of containment).

   Note: Consider 2 mile precautionary evacuation. If more than gap activity released, extend this to 5 miles downwind.

3. Loss of physical control of the facility.

   Note: Consider 2 mile precautionary evacuation.

4. Other plant conditions exist, from whatever source, that make release of large amounts of radioactivity in a short time period possible, e.g., any core melt situation. See the specific PWR and BWR sequences.

   Notes: a. For sequences where significant releases are not yet taking place and large amounts of fission products are not yet in the containment atmosphere, consider 2 mile precautionary evacuation. Consider 5 mile downwind evacuation (45° to 90° sector) if large amounts of fission products are in the containment atmosphere. Recommend sheltering in other parts of the plume exposure Emergency Planning Zone under this circumstance.

   b. For sequences where significant releases are not yet taking place and containment failure leading to a direct atmospheric release is likely in the sequence but not imminent and large amounts of fission products in addition to noble gases are in the containment atmosphere, consider precautionary evacuation to 5 miles and 10 mile downwind evacuation (45° to 90° sector).

   c. For sequences where large amounts of fission products other than noble gases are in the containment atmosphere and containment failure is judged imminent, recommend shelter for those areas where evacuation cannot be completed before transport of activity to that location.

d. As release information becomes available adjust these actions in accordance with dose projections, time available to evacuate and estimated evacuation times given current conditions.

1329 032

EXAMPLE PWR SEQUENCES

1. Small and large LOCA's with failure of ECCS to perform leading to severe core degradation or melt. Ultimate failure of containment likely for melt sequences. (Several hours available for response)

2. Transient initiated by loss of feedwater and condensate systems (principal heat removal system) followed by failure of emergency feedwater system for extended period. Core melting possible in several hours. Ultimate failure of containment likely if core melts.

3. Transient requiring operation of shutdown systems with failure to scram. Core damage for some designs. Additional failure of core cooling and makeup systems would lead to core melt.

4. Failure of offsite and onsite power along with total loss of emergency feedwater makeup capability for several hours. Would lead to eventual core melt and likely failure of containment.

5. Small LOCA and initially successful ECCS. Subsequent failure of containment heat removal systems over several hours could lead to core melt and likely failure of containment.

NOTE: Most likely containment failure mode is meltthrough with release of gases only for dry containment; quicker and larger releases likely for ice condenser containments for melt sequences or for failure of containment isolation system for any PWR.

1329 033

EXAMPLE BWR SEQUENCES

1. Transient (e.g., loss of offsite power) plus failure of requisite core shut down systems (e.g., scram or standby liquid control system). Could lead to core melt in several hours with containment failure likely. More severe consequences if pump trip does not function.

2. Small or large LOCA's with failure of ECCS to perform leading to core melt degradation or melt. Loss of containment integrity may be imminent.

3. Small or large LOCA occurs and containment performance is unsuccessful affecting longer term success of the ECCS. Could lead to core degradation or melt in several hours without containment boundary.

4. Shutdown occurs but requisite decay heat removal systems (e.g., RHR) or non-safety systems heat removal means are rendered unavailable. Core degradation or melt could occur in about ten hours with subsequent containment failure.

5. Any major internal or external events (e.g., fires, earthquakes, etc.) which could cause massive common damage to plant systems resulting in any of the above.

NRC FORM 335 (7-77)

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

1. REPORT NUMBER (Assigned by DDC): NUREG-0610

4. TITLE AND SUBTITLE (Add Volume No., if appropriate)

DRAFT EMERGENCY ACTION LEVEL GUIDELINES FOR NUCLEAR POWER PLANTS

2. (Leave blank)

3. RECIPIENT'S ACCESSION NO.

7. AUTHOR(S)

5. DATE REPORT COMPLETED: MONTH September, YEAR 1979

9. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

DATE REPORT ISSUED: MONTH September, YEAR 1979

6. (Leave blank)

8. (Leave blank)

12. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)

Same as 9. above.

10. PROJECT/TASK/WORK UNIT NO.

11. CONTRACT NO.

13. TYPE OF REPORT: Draft guidelines

PERIOD COVERED (Inclusive dates)

15. SUPPLEMENTARY NOTES

14. (Leave blank)

16. ABSTRACT (200 words or less)

The USNRC Office of Nuclear Reactor Regulation has developed draft Emergency Action Level Guidelines to improve the emergency preparedness capabilities around operating nuclear power plants. The included draft guidelines are for interim use and establish four classes of Emergency Action Levels replacing the classes in Regulatory Guide 1.101. The new classes are Notification of Unusual Event, Alert, Site Emergency, and General Emergency.

1729 035

17. KEY WORDS AND DOCUMENT ANALYSIS

17a. DESCRIPTORS

17b. IDENTIFIERS/OPEN-ENDED TERMS

18. AVAILABILITY STATEMENT: Unlimited availability.

19. SECURITY CLASS (This report): Unclassified

21. NO. OF PAGES

20. SECURITY CLASS (This page): Unclassified

22. PRICE: $

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

POSTAGE AND FEES PAID
U.S. NUCLEAR REGULATORY
COMMISSION

U.S. MAIL

1329 036