February 28, 1983

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Docket Nos: 50-329
and 50-330

Mr. J. W. Cook
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Dear Mr. Cook:

Subject: Staff Comments on Emergency Action Levels

The NRC staff has reviewed the Emergency Action Levels (EALs) contained within Section 4 of Revision 1 to the Radiological Emergency Response Plan for Midland Plant, Units 1 and 2. We find that several of the proposed EALs require modification or supplementation as identified by enclosure 1.

In order that we may continue our review of the Midland emergency preparedness program, please provide your response to enclosure 1 within 30 days of receipt of this letter. Should you be unable to meet this schedule or require clarification of those comments, contact our licensing project manager.

The reporting and/or recordkeeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

/S/

Elinor G. Adensam, Chief
Licensing Branch No. 4
Division of Licensing

Enclosure:
As stated

cc: See next page

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COMMENTS ON MIDLAND 1/2 EMERGENCY ACTION LEVELS

The emergency plans for nuclear power reactors are required by 10 CFR 50.47(b) to have a standard emergency classification and action level scheme, the bases of which include facility system and effluent paramenters. As specified in 10 CFR 50, Appendix E, Section IV and NUREG-0654/FEMA-REP-1, Revision 1, emergency action levels (EALs) are observable and measureable indicators of plant status and are based not only on onsite and offsite radiation monitoring information but also on readings from a number of sensors that indicate a potential emergency, such as containment pressure and the response of safety injection systems.

The Midland 1/2 EALs are presented in Section 4 of the Radiological Emergency Response Plan, Revision 1. A review of these EALs indicates that in general more emphasis should be placed on using indicators of plant condition (core, containment, and engineered safety features) to initiate predetermined protective action recommendations for severe core damage events.

Most of the initiating conditions of NUREG-0654 and all of the postulated accidents of the FSAR were covered. Many of the EAL sets are acceptable; those requiring rework are discussed below. For convenience, the initiating conditions are given in Attachment A.

Notification of Unusual Event (NUE)

Initiating Conditions 4 (abnormal coolant temperature and/or pressure or abnormal fuel temperatures), 8 (loss of containment integrity), 11 (alarms not functional), 13b (low and high water) and 13d (hurricane or high winds) were not addressed.

Initiating Condition 3: (fuel damage indication). An EAL based upon high coolant activity is needed.

Initiating Condition 5: (exceeding technical specification leak rates). The relevant primary and primary-to-secondary leaks rates should be listed.

Initiating Condition 6: (failure of a safety or relief valve to close). Too many confirmatory symptoms of a leak are required. This could cause misdiagnosis because of instrumentation failure, etc. The requirement that the RCS pressure approaches the pressure of the affected OTSG (page 4-29) would seem to exclude partially open valves. The suggestions in NUREG-0818 should be considered.

Initiating Condition 9: (loss of ESF or fire protection system). The relevant systems should be listed.

Initiating Condition 10: (fire lasting more than 10 minutes). The licensee's version of the initiating ocndition and corresponding EAL is nonconservative in that it requires the fire to be severe enough to result in a reduction in power output or a change in operational mode. Any onsite fire lasting more than 10 minutes is cause for declaring a NUE.

Initiating Condition 14a: (aircraft). An EAL for unusual aircraft activity over the facility is needed.

Initiating Condition 14c: (near or onsite explosion). The licensee's version of this initiating condition is nonconservative in that a reduction in power output or a change in operational mode is required. Any near or onsite explosion is cause for declaring a NUE.

Initiating Condition 14e: (turbine rotating component failure causing rapid plant shutdown). The licensee's version of the initiating condition is nonconservative because it requires penetration of the turbine casing. It appears that the licensee is attempting to substitute initiating condition Alert-18e for NUE-14e). The suggestions in NUREG-0818 should be considered.

Alert

Initiating Condition 1: (severe loss of fuel cladding). The requirement that a RCS coolant sample be taken is nonconservative unless the results can be obtained within 15 minutes.

Initiating Condition 2: (rapid gross failure of one steam generator tube with loss of offsite power). The licensee requires too many confirmatory indications. The suggestions in NUREG-0818 should be considered in developing an acceptable EAL set.

Initiating Condition 3: (rapid failure of steam generator tubes). The licensee's version of the initiating condition (number 15 on page 4-30) addresses only those leaks that are within the capabilities of two HPI pumps. Larger leaks are not addressed. The suggestions of NUREG-0818 considered in preparing an acceptable EAL set.

Initiating Condition 4: (steam line break with greater than 10 gpm primary-to-secondary leak rate). The licensee's approach is nonconservative in that a 10 gpm primary-to-secondary leak rate prior to the accident is required. Post accident primary-to-secondary leak rates will increase because of the increase in primary-to-secondary pressure and possibly because of tube failures resulting from the increase in pressure difference. An EAL based upon a smaller pre-existing leak rate would be acceptable as a sufficient but not necessary condition. EALs based upon appropriate radiation readings that, if exceeded, will result in the declaration of an Alert should also be used. Care should be taken when selecting radiation monitors for EALs to be sure their readings will be relevant after the accident.

Initiating Condition 9: (coolant pump seizure leading to fuel failure). The requirement for a RCS sample is nonconservative unless the results can be obtained within 15 minutes.

Initiating Condition 10: (complete loss of any function needed for plant cold shutdown). A review of the EAL set for this initiating condition and the EAL set for Site Area Emergency initiating condition 8 (loss of any function required for hot shutdown) indicates that the plant conditions that satisfy the requirements for declaring an Alert also satisfy the requirements for declaration of a Site Area Emergency. Because the EAL sets are complex and plant conditions are the same in both cases, it is possible that an accident could be improperly classified (e.g., an Alert declared instead of a Site Area Emergency) in an emergency involving either one of the initiating conditions. Elimination of duplicate EAL sub sets for each emergency level should be made to rectify this situation. The licensee also requires that a plant parameter (such as RCS hot) cannot be maintained in the normal range for plant conditions. This is nonconservative in that an emergency should be delcared as soon as it is determined that a system required for cold shutdown or for hot shutdown is lost. The recommendations of NUREG-0818 should be considered in developing a simpler acceptable EAL set. In addition, it appears that the EAL for loss of pressurizer auxiliary spray controls (see page 4-50) should also be in the analogous position in the SAE-8 EAL set if EALs for pressurizer problems are appropriate there.

Initiating Condition 15: (radiological effluents). EALs for liquid effluents should be added.

Initiating Condition 16: (security). It is not clear if security procedure STATION 1431.3 is activated before or after penetration into a vital area has occurred. An Alert should be declared any time plant locations outside of the vital areas are penetrated.

Initiating Condition 17b: (low water). An EAL for low water should be added.

Initiating Condition 18c: (known explosion damage to facility affecting plant operation). The licensee's version of the initiating condition is nonconservative in that it requires the explosion to potentially affect a safety system. The suggestions in NUREG-0818 considered for developing an acceptable EAL set.

Site Area Emergency

Initiating Condition 16a: (aircraft crash) was not addressed.

Initiating Condition 1: (LOCA greater than coolant pump capacity). The licensee's initiating conditions are based upon ECCS operation which would not be useful if ECCS failure were to occur. In addition no EAL subset making use of loss of subcooling margin with a concurrent decrease in reactor coolant system pressure is given. The suggestions of NUREG-0818 should be considered in developing an acceptable EAL set.

Initiating Condition 3: (rapid failure of steam generator tubes with loss of offsite power). It would be preferrable to use the reactor parameters upon which the ECCS actuations are based to eliminate the possibility of missing an emergency. If instrumentations exists for determining steam generator tube failure by increased radiation to the secondary system, EAL sets based upon radiation should be considered.

Initiating Condition 5: (PWR steam line break with greater than 50 gpm primary-to-secondary leakage and indication of fuel damage). The primary-to-secondary leak rate EAL is nonconservative because it requires a pre-existing 50 gpm leak rate. The leak rate following a steam line rupture will be higher because of the increased pressure differential across the steam generator tubes and possibly because of additional tube failures caused by the higher pressure differentials. An EAL based upon a preexisting (lower) leak rate would be acceptable as a sufficient but not necessary condition. Care must be taken when selecting radiation monitors for EALs to be sure their readings will be relevant after the accident. Finally the requirement for a confirmatory sample of the RCS coolant is nonconservative as it delays declaring the emergency by more than 15 minutes.

Initiating Condition 8: (loss of any function required for hot shutdown). This EAL set was discussed under Alert Initiating Condition 10.

Initiating Condition 14: (imminent loss of physical control of the plant). The licensee's definition of this initiating condition is not clear. Imminent occupancy of any vital area of the plant is grounds for declaring a Site Emergency; the vital area does not have to be one which contains apparatus for operating the plant.

Initiating Condition 15a: (earthquake). The requirement for verification by the National Earthquake Information Center that a 0.1 g earthquake has occurred is nonconservative. The onplant instrumentation should suffice. Attempting confirmation will delay the declaration of the emergency.

Initiating Condition 15b: (low water). An EAL for low water is required.

Initiating Condition 16c: (uncontrolled flammable or uncontrolled toxic gases). The EAL for flammable gases is nonconservative because it requires detonation or combustion of the gases. All that is required is lack of access constituting a safety problem. An EAL for toxic gases is needed.

General Emergency

Initiating Condition 4 and 7: (catch-alls) were not addressed. In addition, it was not possible to review initiating condition 5 (sample sequences) since none of the licensee's initiating conditions correspond to those found in NUREG-0654.

Initiating Condition 2: (loss of two out of three fission product barriers). The suggestions of NUREG-0818 should be considered in arriving at acceptable EAL sets.

Initiating Condition 3: (security). It appears that portions of the vital areas from which the plant can be controlled must be occupied. This is non-conservative. Occupancy of any portion of any vital area is grounds for declaring a General Emergency.

ATTACHMENT A

EXAMPLE INITIATING CONDITIONS: NOTIFICATION OF UNUSUAL EVENT

1. Emergency Core Cooling System (ECCS) initiated and discharge to vessel

2. Radiological effluent technical specification limits exceeded

3. Fuel damage indication. Examples:

   a. High offgas at BWR air ejector monitor (greater than 500,000 uci/sec; corresponding to 16 isotopes decayed to 30 minutes; <u>or</u> an increase of 100,000 uci/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 outside of technical specification limits

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

6. Failure of a safety or relief valve in a safety related system to close following reduction of applicable pressure

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 within the plant 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, Safety Parameter Display System, 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 felt in-plant or detected on station seismic instrumentation

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

   c. Any tornado on 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 rotating component failure causing rapid plant shutdown

15. Other plant conditions exist that warrant increased awareness on the part of a plant operating staff or 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.

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 uci/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 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 (PWR) or MSIV malfunction causing leakage (BWR)

5. Primary coolant leak rate greater than 50 gpm

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

7. Loss of offsite power and loss of all onsite AC power (see Site Area Emergency for extended loss)

8. Loss of all onsite DC power (See Site Area Emergency for extended loss)

9. Coolant pump seizure leading to fuel failure

10. Complete loss of any function 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. Most or 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 uncontrolled toxic or flammable gases

    e. Turbine failure causing casing penetration

19. Other plant conditions exist that warrant precautionary activation of technical support center and placing near-site Emergency Operations Facility and other key emergency personnel on standby

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

EXAMPLE INITIATING CONDITIONS: SITE AREA 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 steam generator tubes (several hundred gpm leakage) 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. Complete loss of any function needed for plant hot shutdown

9. Transient requiring operation of shutdown systems with failure to scram (continued power generation but no core damage immediately evident)

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

11. Fire compromising the functions of safety systems

12. Most or all alarms (annunciators) lost and plant transient initiated or in progress

13. 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

    c. EPA Protective Action Guidelines are projected to be exceeded outside the site boundary

14. Imminent loss of physical control of the plant

15. 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. Sustained winds or tornadoes in excess of design levels

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

a. Aircraft crash affecting vital structures by impact or [illegible]e

b. Severe damage to safe shutdown equipment from mis[illegible]r explosion

c. Entry of uncontrolled flammable gases into [illegible]s. Entry of uncontrolled toxic gases into vital areas [illegible]ck of access to the area constitutes a safety problem

17. Other plant conditions exist that warr[illegible]on of emergency centers and monitoring teams or a precautiona[illegible]ion to the public near the site

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

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 measured in the environs

   Note: Consider evacuation only within about 2 miles of the site boundary unless these site boundary levels are exceeded by a factor of 10 or projected to continue for 10 hours or EPA Protective Action Guideline exposure levels are predicted to be exceeded at longer distances

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

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 below.

   Notes: a. For core melt sequences where significant releases from containment 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 (greater than gap activity) are in the containment atmosphere. Recommend sheltering in other parts of the plume exposure Emergency Planning Zone under this circumstance.

   b. For core melt sequences where significant releases from containment 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 core melt 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.

5. Example PWR Sequences

a. Small and large LOCA's with failure of ECCS to perform leading to severe core degradation or melt in from minutes to hours. Ultimate failure of containment likely for melt sequences. (Several hours likely to be available to complete protective actions unless containment is not isolated)

b. 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.

c. Transient requiring operation of shutdown systems with failure to scram which results in core damage or additional failure of core cooling and makeup systems (which could lead to core melt)

d. 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.

e. 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 melt-through with release of gases only for dry containment; quicker and larger releases likely for ice condenser containment for melt sequences. Quicker releases expected for failure of containment isolation system for any PWR.

6. Example BWR Sequences

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

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

c. 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.

d. 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.

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