UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO EMERGENCY ACTION LEVEL REVISIONS

COMMONWEALTH EDISON GENERATING STATION EMERGENCY PLAN FOR

BRAIDWOOD NUCLEAR POWER STATION, UNITS 1 AND 2

COMMONWEALTH EDISON COMPANY

DOCKET NOS. STN 50-456 AND STN 50-457

1.0 INTRODUCTION

By letter dated September 1, 1993, as supplemented by letters dated October 1, 1993, November 30, 1993, December 17, December 21, and December 23, 1993, Commonwealth Edison Company (the licensee) proposed changes to the Commonwealth Edison Generating Station Emergency Plan (GSEP) Braidwood Station Annex. Specifically, Revision BRW-93-01 to the Braidwood Station Annex incorporated revised emergency action levels (EALs) based upon NUMARC/NESP-007, Revision 2, January 1992, "Methodology for Development of Emergency Action Levels." The NRC has endorsed NUMARC/NESP-007 as an acceptable method by which licensees may develop site-specific emergency classification schemes.

2.0 EVALUATION

The EAL changes associated with Revision BRW-93-01 to the Braidwood Station Annex were reviewed against the requirements in 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. In accordance with Subsection IV.B. of Appendix E, the proposed EALs have been discussed with and agreed upon by the licensee and the State of Illinois, and have been agreed upon by the local county governmental authorities.

Subsection 47(b)(4) to 10 CFR Part 50 specifies that onsite emergency plans must meet the following standard: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee...."

Appendix E, Subsection IV.C. specifies that "Emergency action levels (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 pressure in containment and the response of the Emergency Core Cooling System) for notification of offsite agencies shall be described.... The emergency classes defined shall include: (1) notification of unusual event, (2) alert, (3) site area emergency, and (4) general emergency."

The staff, in Revision 3 to Regulatory Guide 1.101, "Emergency Planning and Preparedness for Nuclear Power Reactors," endorsed NUMARC/NESP-007, Revision 2, "Methodology for Development of Emergency Action Levels," as an

acceptable method for licensees to meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. The staff relied upon the guidance in NUMARC/NESP-007 as the basis for its review of Braidwood's EAL changes.

The licensee has divided the emergency class initiating conditions (ICs) into three matrices. The first matrix provides symptom- and event-based ICs that are defined for power operations, hot standby and hot shutdown. The second matrix incorporates the fission product barrier ICs. The third matrix provides symptom- and event-based ICs that are defined for cold shutdown and refueling. The first and third matrices are divided into four recognition categories: (1) Abnormal Radiological Conditions/Abnormal Radiological Effluent Releases, (2) Fission Product Barrier Degradation, (3) System Malfunctions, and (4) Hazards and Other Conditions. The second matrix contains EALs for loss and potential loss of each of the three fission product barriers.

A majority of the proposed EALs under these ICs conform closely to the guidance; however, several of the licensee's proposed changes depart from the example EALs in NUMARC/NESP-007. Review of these departures is discussed below:

1. Table 4 in NUMARC/NESP-007, "PWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," provides an example EAL for judgement of the Emergency Director to declare the loss or potential loss of any barrier. The licensee omitted this example EAL in its fission product barrier matrix and, instead, incorporated all Emergency Director discretionary classifications into its classification scheme under ICs in the first and third matrices. To address fission product barriers, licensee training emphasizes discretionary ICs as "big picture" concerns that include all symptom-, event-, and barrier-based plant conditions. The licensee's departure from the guidance is acceptable.

2. Table 4 in NUMARC/NESP-007, "PWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," contains an example EAL for core exit thermocouple readings (greater than site-specific value), to indicate the loss of the fuel clad fission product barrier and an EAL for core exit thermocouple readings (greater than site-specific value), to indicate the potential loss of the fuel clad fission product barrier. The licensee did not provide EALs matching these example EALs. The licensee has provided an EAL, "Core Cooling Critical Safety Function - Red," (which uses the core exit thermocouple reading greater than 1200°F as an input), for the loss of the fuel clad fission product barrier and an EAL, "Core Cooling Critical Safety Function - Orange (which uses the core exit thermocouple reading greater than 708°F as an input), for the potential loss of the fuel clad fission product barrier. The Core Cooling Critical Safety Function - Red path occurs when the core exit thermocouple reading is greater than 1200°F. Therefore, there is a one-to-one relationship between the EAL based on core exit thermocouple and the EAL based upon Core Cooling Critical Safety Function - Red. There is not a

one-to-one relationship between the Core Cooling Critical Safety Function - Orange path and the core exit thermocouple reading above 708°F. The Core Cooling Critical Safety Function - Orange path occurs when the core exit thermocouple reading is greater than 708°F in conjunction with a loss of subcooling. Since the core exit thermocouple reading greater than 708°F is, by itself, indication of the potential loss of fuel clad barrier, it should be included as a separate EAL. In a letter dated December 23, 1993, the licensee committed to include a separate EAL for core exit thermocouple reading greater than 708°F within 90 days of the date of the letter. The staff finds this to be acceptable. Until the permanent change is made the licensee departure from the guidance is acceptable for this interim period because other indications of the potential loss of the fuel clad barrier, i.e., Core Cooling Critical Safety Function - Orange and Heat Sink Critical Safety Function - Red, are already included in the licensee's EAL scheme.

3. Table 4 in NUMARC/NESP-007, "PWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," contains an example EAL for reactor vessel water level (less than site-specific value), to indicate the potential loss of the fuel clad fission product barrier. The site-specific value used in this EAL should correlate to the top of active fuel. The Braidwood station does not have a level indication system which can indicate level at the top of active fuel and therefore the licensee has not included an EAL corresponding to this NUMARC EAL for the potential loss of fuel clad. The core exit thermocouples are an indicator of the reactor vessel water level and the ability to maintain fuel cooling. The licensee has included an EAL, "Core Cooling Critical Safety Function - Orange" (which uses the core exit thermocouple reading as an input), as an indication of the potential loss of the fuel clad barrier. The licensee's departure from the guidance is acceptable.

4. NUMARC/NESP-007 IC AA1 establishes a threshold of 200 times technical specification limits (or ODCM limits) for effluent release for declaration of an Alert. The licensee has selected a value of 10 times the ODCM limit as its threshold for the Alert. The State of Illinois requested the licensee to remove the joint frequency distribution for wind direction when determining the effluent monitor values to ensure that conservative values were developed for the Site Area and General Emergency thresholds. However, when the joint frequency was factored out, worst case meteorological conditions resulted in Site Area Emergency thresholds less than the NUMARC/NESP-007 Alert threshold of 200 times ODCM limits. Therefore, the licensee reduced the Alert threshold to 10 times ODCM limits to allow for clear event escalation from Unusual Event to Alert to Site Area Emergency. Although this value is considerably less than the threshold recommended in NUMARC/NESP-007, the threshold is sufficiently high to indicate a substantial degradation in the level of safety of the plant and, therefore, is an acceptable departure from the guidance.

5. NUMARC/NESP-007 IC AA2 includes example EALs for low water level in the reactor refueling cavity, spent fuel pool, and fuel transfer canal that will result in irradiated fuel uncovering. The licensee did not include

site-specific EALs corresponding to these example EALs due to the lack of local and remote level indicators for these areas. The licensee has specified EALs based on radiation monitor readings to indicate fuel uncovery in these areas. The licensee's departure from the guidance is acceptable.

6. NUMARC/NESP-007 IC SS3, "Loss of All Vital DC Power," provides for a 15-minute time limit on the threshold value in the associated EAL to preclude declaration on momentary or transient losses. The licensee did not include the 15-minute time criteria in its site-specific EAL for this example IC. The licensee stated that due to the configuration of the vital DC power system, no credible event would lead to a momentary loss of all vital DC power. Therefore, the licensee did not include the 15-minute criteria. This is an acceptable departure based upon site-specific considerations.

3.0 CONCLUSION

Review of the proposed EAL changes in Revision BRW-93-01 of the Braidwood Station Annex to Commonwealth Edison's GSEP concludes that, with the exception of the departures previously identified and accepted, the revised EALs are consistent with the guidance in NUMARC/NESP-007 and, therefore, meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50.

Principal Contributor: J. O'Brien

Date: December 29, 1993

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO EMERGENCY ACTION LEVEL REVISIONS

COMMONWEALTH EDISON GENERATING STATION EMERGENCY PLAN FOR

BYRON NUCLEAR POWER STATION, UNITS 1 AND 2

COMMONWEALTH EDISON COMPANY

DOCKET NOS. STN 50-454 AND STN 50-455

1.0 INTRODUCTION

By letter dated September 1, 1993, as supplemented by letters dated October 1, 1993, November 30, 1993, December 17, December 21, and December 23, 1993, Commonwealth Edison Company (the licensee) proposed changes to the Commonwealth Edison Generating Station Emergency Plan (GSEP) Byron Station Annex. Specifically, Revision BYR-93-01 to the Byron Station Annex incorporated revised emergency action levels (EALs) based upon NUMARC/NESP-007, Revision 2, January 1992, "Methodology for Development of Emergency Action Levels." The NRC has endorsed NUMARC/NESP-007 as an acceptable method by which licensees may develop site-specific emergency classification schemes.

2.0 EVALUATION

The EAL changes associated with Revision BYR-93-01 to the Byron Station Annex were reviewed against the requirements in 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. In accordance with Subsection IV.B. of Appendix E, the proposed EALs have been discussed with and agreed upon by the licensee and the State of Illinois, and have been agreed upon by the local county governmental authorities.

Subsection 47(b)(4) to 10 CFR Part 50 specifies that onsite emergency plans must meet the following standard: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee...."

Appendix E, Subsection IV.C. specifies that "Emergency action levels (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 pressure in containment and the response of the Emergency Core Cooling System) for notification of offsite agencies shall be described.... The emergency classes defined shall include: (1) notification of unusual event, (2) alert, (3) site area emergency, and (4) general emergency."

The staff, in Revision 3 to Regulatory Guide 1.101, "Emergency Planning and Preparedness for Nuclear Power Reactors," endorsed NUMARC/NESP-007, Revision 2, "Methodology for Development of Emergency Action Levels," as an

acceptable method for licensees to meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. The staff relied upon the guidance in NUMARC/NESP-007 as the basis for its review of Byron's EAL changes.

The licensee has divided the emergency class initiating conditions (ICs) into three matrices. The first matrix provides symptom- and event-based ICs that are defined for power operations, hot standby and hot shutdown. The second matrix incorporates the fission product barrier ICs. The third matrix provides symptom- and event-based ICs that are defined for cold shutdown and refueling. The first and third matrices are divided into four recognition categories: (1) Abnormal Radiological Conditions/Abnormal Radiological Effluent Releases, (2) Fission Product Barrier Degradation, (3) System Malfunctions, and (4) Hazards and Other Conditions. The second matrix contains EALs for loss and potential loss of each of the three fission product barriers.

A majority of the proposed EALs under these ICs conform closely to the guidance; however, several of the licensee's proposed changes depart from the example EALs in NUMARC/NESP-007. Review of these departures is discussed below:

1. Table 4 in NUMARC/NESP-007, "PWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," provides an example EAL for judgement of the Emergency Director to declare the loss or potential loss of any barrier. The licensee omitted this example EAL in its fission product barrier matrix and, instead, incorporated all Emergency Director discretionary classifications into its classification scheme under ICs in the first and third matrices. To address fission product barriers, licensee training emphasizes discretionary ICs as "big picture" concerns that include all symptom-, event-, and barrier-based plant conditions. The licensee's departure from the guidance is acceptable.

2. Table 4 in NUMARC/NESP-007, "PWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," contains an example EAL for core exit thermocouple readings (greater than site-specific value), to indicate the loss of the fuel clad fission product barrier and an EAL for core exit thermocouple readings (greater than site-specific value), to indicate the potential loss of the fuel clad fission product barrier. The licensee did not provide EALs matching these example EALs. The licensee has provided an EAL, "Core Cooling Critical Safety Function - Red," (which uses the core exit thermocouple reading greater than 1200°F as an input), for the loss of the fuel clad fission product barrier and an EAL, "Core Cooling Critical Safety Function - Orange (which uses the core exit thermocouple reading greater than 708°F as an input), for the potential loss of the fuel clad fission product barrier. The Core Cooling Critical Safety Function - Red path occurs when the core exit thermocouple reading is greater than 1200°F and, therefore, there is a one-to-one relationship between the EAL based on core exit thermocouple and the EAL based upon Core Cooling Critical Safety Function - Red. There is not a

one-to-one relationship between the Core Cooling Critical Safety Function - Orange path and the core exit thermocouple reading above 708°F. The Core Cooling Critical Safety Function - Orange path occurs when the core exit thermocouple reading is greater than 708°F in conjunction with a loss of subcooling. Since the core exit thermocouple reading greater than 708°F is, by itself, indication of the potential loss of fuel clad barrier, it should be included as a separate EAL. In a letter dated December 23, 1993, the licensee committed to include a separate EAL for core exit thermocouple reading greater than 708°F within 90 days of the date of the letter. The staff finds this to be acceptable. Until the permanent change is made, the licensee departure from the guidance is acceptable for this interim period because other indications of the potential loss of the fuel clad barrier, i.e., Core Cooling Critical Safety Function - Orange and Heat Sink Critical Safety Function - Red, are already included in the licensee's EAL scheme.

3. Table 4 in NUMARC/NESP-007, "PWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," contains an example EAL for reactor vessel water level (less than site-specific value), to indicate the potential loss of the fuel clad fission product barrier. The site-specific value used in this EAL should correlate to the top of active fuel. The Byron station does not have a level indication system which can indicate level at the top of active fuel and therefore the licensee has not included an EAL corresponding to this NUMARC EAL for the potential loss of fuel clad. The core exit thermocouples are an indicator of the reactor vessel water level and the ability to maintain fuel cooling. The licensee has included an EAL, "Core Cooling Critical Safety Function - Orange" (which uses the core exit thermocouple reading as an input), as an indication of the potential loss of the fuel clad barrier. The licensee's departure from the guidance is acceptable.

4. NUMARC/NESP-007 IC AA1 establishes a threshold of 200 times technical specification limits (or ODCM limits) for effluent release for declaration of an Alert. The licensee has selected a value of 10 times the ODCM limit as its threshold for the Alert. The State of Illinois requested the licensee to remove the joint frequency distribution for wind direction when determining the effluent monitor values to ensure that conservative values were developed for the Site Area and General Emergency thresholds. However, when the joint frequency was factored out, worst case meteorological conditions resulted in Site Area Emergency thresholds less than the NUMARC/NESP-007 Alert threshold of 200 times ODCM limits. Therefore, the licensee reduced the Alert threshold to 10 times ODCM limits to allow for clear event escalation from Unusual Event to Alert to Site Area Emergency. Although this value is considerably less than the threshold recommended in NUMARC/NESP-007, the threshold is sufficiently high to indicate a substantial degradation in the level of safety of the plant and, therefore, is an acceptable departure from the guidance.

5. NUMARC/NESP-007 IC AA2 includes example EALs for low water level in the reactor refueling cavity, spent fuel pool, and fuel transfer canal that will result in irradiated fuel uncovering. The licensee did not include

site-specific EALs corresponding to these example EALs due to the lack of local and remote level indicators for these areas. The licensee has specified EALs based on radiation monitor readings to indicate fuel uncovery in these areas. The licensee's departure from the guidance is acceptable.

6. NUMARC/NESP-007 IC SS3, "Loss of All Vital DC Power," provides for a 15-minute time limit on the threshold value in the associated EAL to preclude declaration on momentary or transient losses. The licensee did not include the 15-minute time criteria in its site-specific EAL for this example IC. The licensee stated that due to the configuration of the vital DC power system, no credible event would lead to a momentary loss of all vital DC power. Therefore, the licensee did not include the 15-minute criteria. This is an acceptable departure based upon site-specific considerations.

3.0 CONCLUSION

Review of the proposed EAL changes in Revision BYR-93-01 of the Byron Station Annex to Commonwealth Edison's GSEP concludes that, with the exception of the departures previously identified and accepted, the revised EALs are consistent with the guidance in NUMARC/NESP-007 and, therefore, meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50.

Principal Contributor: J. O'Brien

Date: December 29, 1993

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NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO EMERGENCY ACTION LEVEL REVISIONS

COMMONWEALTH EDISON GENERATING STATIONS EMERGENCY PLAN FOR

DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3

COMMONWEALTH EDISON COMPANY

DOCKET NOS. 50-237 AND 249

1.0 INTRODUCTION

By letter dated September 1, 1993, as supplemented by letters dated October 1, 1993, November 30, 1993, December 17, December 21, and December 23, 1993, Commonwealth Edison Company (the licensee) proposed changes to the Commonwealth Edison Generating Station Emergency Plan (GSEP) Dresden Station Annex. Specifically, Revision DRE-93-03 to the Dresden Station Annex incorporated revised emergency action levels (EALs) based upon NUMARC/NESP-007, Revision 2, January 1992, "Methodology for Development of Emergency Action Levels." The NRC has endorsed NUMARC/NESP-007 as an acceptable method by which licensees may develop site-specific emergency classification schemes.

2.0 EVALUATION

The EAL changes associated with Revision DRE-93-03 to the Dresden Station Annex were reviewed against the requirements in 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. In accordance with Subsection IV.B. of Appendix E, the proposed EALs have been discussed with and agreed upon by the licensee and the State of Illinois, and have been agreed upon by the local county governmental authorities.

Subsection 47(b)(4) to 10 CFR Part 50 specifies that onsite emergency plans must meet the following standard: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee...."

Appendix E, Subsection IV.C. specifies that "Emergency action levels (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 pressure in containment and the response of the Emergency Core Cooling System) for notification of offsite agencies shall be described.... The emergency classes defined shall include: (1) notification of unusual event, (2) alert, (3) site area emergency, and (4) general emergency."

The staff, in Revision 3 to Regulatory Guide 1.101, "Emergency Planning and Preparedness for Nuclear Power Reactors," endorsed NUMARC/NESP-007, Revision 2, "Methodology for Development of Emergency Action Levels," as an

acceptable method for licensees to meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. The staff relied upon the guidance in NUMARC/NESP-007 as the basis for its review of Dresden's EAL changes.

The licensee has divided the emergency class initiating conditions (ICs) into three matrices. The first matrix provides symptom- and event-based ICs that are defined for power operations, hot standby and hot shutdown. The second matrix incorporates the fission product barrier ICs. The third matrix provides symptom- and event-based ICs that are defined for cold shutdown and refueling. The first and third matrices are divided into four recognition categories: (1) Abnormal Radiological Conditions/Abnormal Radiological Effluent Releases, (2) Fission Product Barrier Degradation, (3) System Malfunctions, and (4) Hazards and Other Conditions. The second matrix contains EALs for loss and potential loss of each of the three fission product barriers.

A majority of the proposed EALs under these ICs conform closely to the guidance; however, several of the licensee's proposed changes depart from the example EALs in NUMARC/NESP-007. Review of these departures is discussed below:

1. Table 3 in NUMARC/NESP-007, "BWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," provides an example EAL for judgement of the Emergency Director to declare the loss or potential loss of any barrier. The licensee omitted this example EAL in its fission product barrier matrix and, instead, incorporated all Emergency Director discretionary classifications into its classification scheme under ICs in the first and third matrices. To address fission product barriers, licensee training emphasizes discretionary ICs as "big picture" concerns that include all symptom-, event-, and barrier-based plant conditions. The licensee's departure from the guidance is acceptable.

2. NUMARC/NESP-007 IC AA1 establishes a threshold of 200 times technical specification limits (or ODCM limits) for effluent release for declaration of an Alert. The licensee has selected a value of 10 times the ODCM limit as its threshold for the Alert. The State of Illinois requested the licensee to remove the joint frequency distribution for wind direction when determining the effluent monitor values to ensure that conservative values were developed for the Site Area and General Emergency thresholds. However, when the joint frequency was factored out, worst case meteorological conditions resulted in Site Area Emergency thresholds less than the NUMARC/NESP-007 Alert threshold of 200 times ODCM limits. Therefore, the licensee reduced the Alert threshold to 10 times ODCM limits to allow for clear event escalation from Unusual Event to Alert to Site Area Emergency. Although this value is considerably less than the threshold recommended in NUMARC/NESP-007, the threshold is sufficiently high to indicate a substantial degradation in the level of safety of the plant and, therefore, is an acceptable departure from the guidance.

3. NUMARC/NESP-007 IC SU5, "RCS Leakage," defines the Unusual Event threshold as:

   The following conditions exist:

   a. Unidentified or pressure boundary leakage greater than 10 gpm.

   OR

   b. Identified leakage greater than 25 gpm.

   The licensee's technical specifications define reactor coolant system (RCS) leakage limits in terms of unidentified or total (unidentified and identified) leakage. Thus, the licensee developed a site-specific EAL for RCS leakage in terms of unidentified and total leakage. The site-specific values are consistent with the NUMARC/NESP-007 values and are an acceptable departure.

4. NUMARC/NESP-007 IC SS4 defines an initiating condition for a complete loss of function needed to achieve or maintain hot shutdown. For BWRs, however, technical specifications define hot shutdown as placement of the reactor mode switch in the "Shutdown" position and do not consider RCS temperature. To meet the intent of IC SS4, the licensee developed a site-specific EAL which addressed loss of cooling capability during hot shutdown. The EAL threshold value is:

   Inability to maintain Torus Bulk Temperature below the Heat Capacity Limit of DEOP-0200-01.

   The threshold is indicative of a loss of available heat sink to reject decay and sensible heat in a shutdown condition. The EAL defines an event where a major function needed for the protection of the public (heat sink) has failed and thus warrants the declaration of a Site Area Emergency. The staff finds the licensee's approach acceptable in meeting the intent of NUMARC/NESP-007.

3.0 CONCLUSION

Review of the proposed EAL changes in Revision DRE-93-03 of the Dresden Station Annex to Commonwealth Edison's GSEP concludes that with the exception of the departures previously identified and accepted, the revised EALs are consistent with the guidance in NUMARC/NESP-007 and, therefore, meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50.

Principal Contributor: S. Boynton

Date: December 29, 1993

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO EMERGENCY ACTION LEVEL REVISIONS

COMMONWEALTH EDISON GENERATING STATIONS EMERGENCY PLAN FOR

LASALLE COUNTY NUCLEAR POWER STATION, UNITS 1 AND 2

COMMONWEALTH EDISON COMPANY

DOCKET NOS. 50-373 AND 50-374

1.0 INTRODUCTION

By letter dated September 1, 1993, as supplemented by letters dated October 1, 1993, and November 30, 1993, December 17, December 21, and December 23, 1993, Commonwealth Edison Company (the licensee) proposed changes to the Commonwealth Edison Generating Station Emergency Plan (GSEP) LaSalle Station Annex. Specifically, Revision LAS-93-02 to the LaSalle Station Annex incorporated revised emergency action levels (EALs) based upon NUMARC/NESP-007, Revision 2, January 1992, "Methodology for Development of Emergency Action Levels." The NRC has endorsed NUMARC/NESP-007 as an acceptable method by which licensees may develop site-specific emergency classification schemes.

2.0 EVALUATION

The EAL changes associated with Revision LAS-93-02 to the LaSalle Station Annex were reviewed against the requirements in 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. In accordance with Subsection IV.B. of Appendix E, the proposed EALs have been discussed with and agreed upon by the licensee and the State of Illinois, and have been agreed upon by the local county governmental authorities.

Subsection 47(b)(4) to 10 CFR Part 50 specifies that onsite emergency plans must meet the following standard: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee...."

Appendix E, Subsection IV.C. specifies that "Emergency action levels (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 pressure in containment and the response of the Emergency Core Cooling System) for notification of offsite agencies shall be described.... The emergency classes defined shall include: (1) notification of unusual event, (2) alert, (3) site area emergency, and (4) general emergency."

The staff, in Revision 3 to Regulatory Guide 1.101, "Emergency Planning and Preparedness for Nuclear Power Reactors," endorsed NUMARC/NESP-007, Revision 2, "Methodology for Development of Emergency Action Levels," as an

acceptable method for licensees to meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. The staff relied upon the guidance in NUMARC/NESP-007 as the basis for its review of LaSalle's EAL changes.

The licensee has divided the emergency class initiating conditions (ICs) into three matrices. The first matrix provides symptom- and event-based ICs that are defined for power operations, hot standby and hot shutdown. The second matrix incorporates the fission product barrier ICs. The third matrix provides symptom- and event-based ICs that are defined for cold shutdown and refueling. The first and third matrices are divided into four recognition categories: (1) Abnormal Radiological Conditions/Abnormal Radiological Effluent Releases, (2) Fission Product Barrier Degradation, (3) System Malfunctions, and (4) Hazards and Other Conditions. The second matrix contains EALs for loss and potential loss of each of the three fission product barriers.

A majority of the proposed EALs under these ICs conform closely to the guidance; however, several of the licensee's proposed changes depart from the example EALs in NUMARC/NESP-007. Review of these departures is discussed below:

1. Table 3 in NUMARC/NESP-007, "BWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," provides an example EAL for judgement of the Emergency Director to declare the loss or potential loss of any barrier. The licensee omitted this example EAL in its fission product barrier matrix and, instead, incorporated all Emergency Director discretionary classifications into its classification scheme under ICs in the first and third matrices. To address fission product barriers, licensee training emphasizes discretionary ICs as "big picture" concerns that include all symptom-, event-, and barrier-based plant conditions. The licensee's departure from the guidance is acceptable.

2. NUMARC/NESP-007 IC AA1 establishes a threshold of 200 times technical specification limits (or ODCM limits) for effluent release for declaration of an Alert. The licensee has selected a value of 10 times the ODCM limit as its threshold for the Alert. The State of Illinois requested the licensee to remove the joint frequency distribution for wind direction when determining the effluent monitor values to ensure that conservative values were developed for the Site Area and General Emergency thresholds. However, when the joint frequency was factored out, worst case meteorological conditions resulted in Site Area Emergency thresholds less than the NUMARC/NESP-007 Alert threshold of 200 times ODCM limits. Therefore, the licensee reduced the Alert threshold to 10 times ODCM limits to allow for clear event escalation from Unusual Event to Alert to Site Area Emergency. Although this value is considerably less than the threshold recommended in NUMARC/NESP-007, the threshold is sufficiently high to indicate a substantial degradation in the level of safety of the plant and, therefore, is an acceptable departure from the guidance.

3. NUMARC/NESP-007 IC SU5, "RCS Leakage," defines the Unusual Event threshold as:

   The following conditions exist:

   a. Unidentified or pressure boundary leakage greater than 10 gpm.

   OR

   b. Identified leakage greater than 25 gpm.

   The licensee's technical specifications define reactor coolant system (RCS) leakage limits in terms of unidentified or total (unidentified and identified) leakage. Thus, the licensee developed a site-specific EAL for RCS leakage in terms of unidentified and total leakage. The site-specific values are consistent with the NUMARC/NESP-007 values and are an acceptable departure.

4. NUMARC/NESP-007 IC SS4 defines an initiating condition for a complete loss of function needed to achieve or maintain hot shutdown. For BWRs, however, technical specifications define hot shutdown as placement of the reactor mode switch in the "Shutdown" position and do not consider RCS temperature. To meet the intent of IC SS4, the licensee developed a site-specific EAL which addressed loss of cooling capability during hot shutdown. The EAL threshold value is:

   Inability to maintain Suppression Pool Temperature below the Heat Capacity Limit Curve of LGA-03.

   The threshold is indicative of a loss of available heat sink to reject decay and sensible heat in a shutdown condition. The EAL defines an event where a major function needed for the protection of the public (heat sink) has failed and thus warrants the declaration of a Site Area Emergency. The staff finds the licensee's approach acceptable in meeting the intent of NUMARC/NESP-007.

5. NUMARC/NESP-007 IC SS3, "Loss of All Vital DC Power," provides for a 15-minute time limit on the threshold value in the associated EAL to preclude declaration on momentary or transient losses. The licensee did not include the 15-minute time criteria in its site-specific EAL for this example IC. The licensee stated that due to the configuration of the vital DC power system, no credible event would lead to a momentary loss of all vital DC power. Therefore, the licensee did not include the 15-minute criteria. This is an acceptable departure based upon site-specific considerations.

3.0 CONCLUSION

Based on a review of the proposed EAL changes in Revision LAS-93-02 of the LaSalle Station Annex to Commonwealth Edison's GSEP, the staff concludes that, with the exception of the departures previously identified and accepted, the

revised EALs are consistent with the guidance in NUMARC/NESP-007 and, therefore, meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50.

Principal Contributor: S. Boynton

Date: December 29, 1993

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO EMERGENCY ACTION LEVEL REVISIONS

COMMONWEALTH EDISON GENERATING STATIONS EMERGENCY PLAN FOR

QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2

COMMONWEALTH EDISON COMPANY

AND

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

DOCKET NOS. 50-254 AND 50-265

1.0 INTRODUCTION

By letter dated September 1, 1993, as supplemented by letters dated October 1, 1993, November 30, 1993, December 17, December 21, and December 23, 1993, Commonwealth Edison Company (the licensee) proposed changes to the Commonwealth Edison Generating Station Emergency Plan (GSEP) Quad Cities Station Annex. Specifically, Revision QCA-93-01 to the Quad Cities Station Annex incorporated revised emergency action levels (EALs) based upon NUMARC/NESP-007, Revision 2, January 1992, "Methodology for Development of Emergency Action Levels." The NRC has endorsed NUMARC/NESP-007 as an acceptable method by which licensees may develop site-specific emergency classification schemes.

2.0 EVALUATION

The EAL changes associated with Revision QCA-93-01 to the Quad Cities Station Annex were reviewed against the requirements in 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. In accordance with Subsection IV.B. of Appendix E, the proposed EALs have been discussed with and agreed upon by the licensee and the State of Illinois, and have been agreed upon by the local county governmental authorities.

Subsection 47(b)(4) to 10 CFR Part 50 specifies that onsite emergency plans must meet the following standard: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee...."

Appendix E, Subsection IV.C. specifies that "Emergency action levels (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 pressure in containment and the response of the Emergency Core Cooling System) for notification of offsite agencies shall be described.... The emergency

classes defined shall include: (1) notification of unusual event, (2) alert, (3) site area emergency, and (4) general emergency."

The staff, in Revision 3 to Regulatory Guide 1.101, "Emergency Planning and Preparedness for Nuclear Power Reactors," endorsed NUMARC/NESP-007, Revision 2, "Methodology for Development of Emergency Action Levels," as an acceptable method for licensees to meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. The staff relied upon the guidance in NUMARC/NESP-007 as the basis for its review of Quad Cities's EAL changes.

The licensee has divided the emergency class initiating conditions (ICs) into three matrices. The first matrix provides symptom- and event-based ICs that are defined for power operations, hot standby and hot shutdown. The second matrix incorporates the fission product barrier ICs. The third matrix provides symptom- and event-based ICs that are defined for cold shutdown and refueling. The first and third matrices are divided into four recognition categories: (1) Abnormal Radiological Conditions/Abnormal Radiological Effluent Releases, (2) Fission Product Barrier Degradation, (3) System Malfunctions, and (4) Hazards and Other Conditions. The second matrix contains EALs for loss and potential loss of each of the three fission product barriers.

A majority of the proposed EALs under these ICs conform closely to the guidance; however, several of the licensee's proposed changes depart from the example EALs in NUMARC/NESP-007. Review of these departures is discussed below:

1. Table 3 in NUMARC/NESP-007, "BWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," provides an example EAL for judgement of the Emergency Director to declare the loss or potential loss of any barrier. The licensee omitted this example EAL in its fission product barrier matrix and, instead, incorporated all Emergency Director discretionary classifications into its classification scheme under ICs in the first and third matrices. To address fission product barriers, licensee training emphasizes discretionary ICs as "big picture" concerns that include all symptom-, event-, and barrier-based plant conditions. The licensee's departure from the guidance is acceptable.

2. NUMARC/NESP-007 IC AA1 establishes a threshold of 200 times technical specification limits (or ODCM limits) for effluent release for declaration of an Alert. The licensee has selected a value of 10 times the ODCM limit as its threshold for the Alert. The State of Illinois requested the licensee to remove the joint frequency distribution for wind direction when determining the effluent monitor values to ensure that conservative values were developed for the Site Area and General Emergency thresholds. However, when the joint frequency was factored out, worst case meteorological conditions resulted in Site Area Emergency thresholds less than the NUMARC/NESP-007 Alert threshold of 200 times ODCM limits. Therefore, the licensee reduced the Alert threshold to 10 times ODCM limits

to allow for clear event escalation from Unusual Event to Alert to Site Area Emergency. Although this value is considerably less than the threshold recommended in NUMARC/NESP-007, the threshold is sufficiently high to indicate a substantial degradation in the level of safety of the plant and, therefore, is an acceptable departure from the guidance.

3. NUMARC/NESP-007 IC SU5, "RCS Leakage," defines the Unusual Event threshold as:

   The following conditions exist:

   a. Unidentified or pressure boundary leakage greater than 10 gpm.

   OR

   b. Identified leakage greater than 25 gpm.

   The licensee's technical specifications define reactor coolant system (RCS) leakage limits in terms of unidentified or total (unidentified and identified) leakage. Thus, the licensee developed a site-specific EAL for RCS leakage in terms of unidentified and total leakage. The site-specific values are consistent with the NUMARC/NESP-007 values and are an acceptable departure.

4. NUMARC/NESP-007 IC SS4 defines an initiating condition for a complete loss of function needed to achieve or maintain hot shutdown. For BWRs, however, technical specifications define hot shutdown as placement of the reactor mode switch in the "Shutdown" position and do not consider RCS temperature. To meet the intent of IC SS4, the licensee developed a site-specific EAL which addressed loss of cooling capability during hot shutdown. The EAL threshold value is:

   Inability to maintain Torus Bulk Temperature within the Heat Capacity Limit of Detail QGA-D7.

   The threshold is indicative of a loss of available heat sink to reject decay and sensible heat in a shutdown condition. The EAL defines an event where a major function needed for the protection of the public (heat sink) has failed and thus warrants the declaration of a Site Area Emergency. The staff finds the licensee's approach acceptable in meeting the intent of NUMARC/NESP-007.

5. NUMARC/NESP-007 IC SS3, "Loss of All Vital DC Power," provides for a 15-minute time limit on the threshold value in the associated EAL to preclude declaration on momentary or transient losses. The licensee did not include the 15-minute time criteria in its site-specific EAL for this example IC. The licensee stated that due to the configuration of the vital DC power system, no credible event would lead to a momentary loss of all vital DC power. Therefore, the licensee chose to omit the 15-minute criteria. This is an acceptable departure based upon site-specific considerations.

3.0 CONCLUSION

Based on a review of the proposed EAL changes in Revision QCA-93-01 of the Quad Cities Station Annex to Commonwealth Edison's GSEP, the staff concludes that with the exception of the departures previously identified and accepted, the revised EALs are consistent with the guidance in NUMARC/NESP-007 and, therefore, meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50.

Principal Contributor: S. Boynton

Date: December 29, 1993

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO EMERGENCY ACTION LEVEL REVISIONS

COMMONWEALTH EDISON GENERATING STATIONS EMERGENCY PLAN FOR

ZION NUCLEAR POWER STATION, UNITS 1 AND 2

COMMONWEALTH EDISON COMPANY

DOCKET NOS. 50-295 AND 50-304

1.0 INTRODUCTION

By letter dated September 1, 1993, as supplemented by letters dated October 1, 1993, November 30, 1993, December 17, December 21, and December 23, 1993, Commonwealth Edison Company (the licensee) proposed changes to the Commonwealth Edison Generating Station Emergency Plan (GSEP) Zion Station Annex. Specifically, Revision ZIN-93-01 to the Zion Station Annex incorporated revised emergency action levels (EALs) based upon NUMARC/NESP-007, Revision 2, January 1992, "Methodology for Development of Emergency Action Levels." The NRC has endorsed NUMARC/NESP-007 as an acceptable method by which licensees may develop site-specific emergency classification schemes.

2.0 EVALUATION

The EAL changes associated with Revision ZIN-93-01 to the Zion Station Annex were reviewed against the requirements in 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. In accordance with Subsection IV.B. of Appendix E, the proposed EALs have been discussed with and agreed upon by the licensee and the State of Illinois, and have been agreed upon by the local county governmental authorities.

Subsection 47(b)(4) to 10 CFR Part 50 specifies that onsite emergency plans must meet the following standard: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee...."

Appendix E, Subsection IV.C. specifies that "Emergency action levels (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 pressure in containment and the response of the Emergency Core Cooling System) for notification of offsite agencies shall be described.... The emergency classes defined shall include: (1) notification of unusual event, (2) alert, (3) site area emergency, and (4) general emergency."

The staff, in Revision 3 to Regulatory Guide 1.101, "Emergency Planning and Preparedness for Nuclear Power Reactors," endorsed NUMARC/NESP-007, Revision 2, "Methodology for Development of Emergency Action Levels," as an

acceptable method for licensees to meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50. The staff relied upon the guidance in NUMARC/NESP-007 as the basis for its review of Zion's EAL changes.

The licensee has divided the emergency class initiating conditions (ICs) into three matrices. The first matrix provides symptom- and event-based ICs that are defined for power operations, hot standby and hot shutdown. The second matrix incorporates the fission product barrier ICs. The third matrix provides symptom- and event-based ICs that are defined for cold shutdown and refueling. The first and third matrices are divided into four recognition categories: (1) Abnormal Radiological Conditions/Abnormal Radiological Effluent Releases, (2) Fission Product Barrier Degradation, (3) System Malfunctions, and (4) Hazards and Other Conditions. The second matrix contains EALs for loss and potential loss of each of the three fission product barriers.

A majority of the proposed EALs under these ICs conform closely to the guidance; however, several of the licensee's proposed changes depart from the example EALs in NUMARC/NESP-007. Review of these departures is discussed below:

1. Table 4 in NUMARC/NESP-007, "PWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," provides an example EAL for judgement of the Emergency Director to declare the loss or potential loss of any barrier. The licensee omitted this example EAL in its fission product barrier matrix and, instead, incorporated all Emergency Director discretionary classifications into its classification scheme under ICs in the first and third matrices. To address fission product barriers, licensee training emphasizes discretionary ICs as "big picture" concerns that include all symptom-, event-, and barrier-based plant conditions. The licensee's departure from the guidance is acceptable.

2. Table 4 in NUMARC/NESP-007, "PWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," contains an example EAL for core exit thermocouple readings (greater than site-specific value), to indicate the loss of the fuel clad fission product barrier and an EAL for core exit thermocouple readings (greater than site-specific value), to indicate the potential loss of the fuel clad fission product barrier. The licensee did not provide EALs matching these example EALs. The licensee has provided an EAL, "Core Cooling Critical Safety Function - Red," (which uses the core exit thermocouple reading greater than 1200°F as an input), for the loss of the fuel clad fission product barrier and an EAL, "Core Cooling Critical Safety Function - Orange (which uses the core exit thermocouple reading greater than 708°F as an input), for the potential loss of the fuel clad fission product barrier. The Core Cooling Critical Safety Function - Red path occurs when the core exit thermocouple reading is greater than 1200°F. Therefore, there is a one-to-one relationship between the EAL based on core exit thermocouple and the EAL based upon Core Cooling Critical Safety Function - Red. There is not a

one-to-one relationship between the Core Cooling Critical Safety Function - Orange path and the core exit thermocouple reading above 708°F. The Core Cooling Critical Safety Function - Orange path occurs when the core exit thermocouple reading is greater than 708°F in conjunction with a loss of subcooling. Since the core exit thermocouple reading greater than 708°F is, by itself, indication of the potential loss of fuel clad barrier, it should be included as a separate EAL. In a letter dated December 23, 1993, the licensee committed to include a separate EAL for core exit thermocouple reading greater than 708°F within 90 days of the date of the letter. The staff finds this to be acceptable. Until the permanent change is made, the licensee departure from the guidance is acceptable for this interim period because other indications of the potential loss of the fuel clad barrier, i.e., Core Cooling Critical Safety Function - Orange and Heat Sink Critical Safety Function - Red, are already included in the licensee's EAL scheme.

3. Table 4 in NUMARC/NESP-007, "PWR EMERGENCY ACTION LEVEL FISSION PRODUCT BARRIER REFERENCE TABLE THRESHOLDS FOR LOSS OR POTENTIAL LOSS OF BARRIERS," contains an example EAL for reactor vessel water level (less than site-specific value), to indicate the potential loss of the fuel clad fission product barrier. The site-specific value used in this EAL should correlate to the top of active fuel. The Zion station does not have a level indication system which can distinctly indicate level at the top of active fuel and therefore the licensee has not included an EAL corresponding to this NUMARC EAL for the potential loss of fuel clad. The core exit thermocouples are an indicator of the reactor vessel water level and the ability to maintain fuel cooling. The licensee has included an EAL, "Core Cooling Critical Safety Function - Orange" (which uses the core exit thermocouple reading as an input), as an indication of the potential loss of the fuel clad barrier. The licensee's departure from the guidance is acceptable.

4. NUMARC/NESP-007 IC AA1 establishes a threshold of 200 times technical specification limits (or ODCM limits) for effluent release for declaration of an Alert. The licensee has selected a value of 10 times the ODCM limit as its threshold for the Alert. The State of Illinois requested the licensee to remove the joint frequency distribution for wind direction when determining the effluent monitor values to ensure that conservative values were developed for the Site Area and General Emergency thresholds. However, when the joint frequency was factored out, worst case meteorological conditions resulted in Site Area Emergency thresholds less than the NUMARC/NESP-007 Alert threshold of 200 times ODCM limits. Therefore, the licensee reduced the Alert threshold to 10 times ODCM limits to allow for clear event escalation from Unusual Event to Alert to Site Area Emergency. Although this value is considerably less than the threshold recommended in NUMARC/NESP-007, the threshold is sufficiently high to indicate a substantial degradation in the level of safety of the plant and, therefore, is an acceptable departure from the guidance.

5. NUMARC/NESP-007 IC AA2 includes example EALs for low water level in the reactor refueling cavity, spent fuel pool, and fuel transfer canal that

will result in irradiated fuel uncovering. The licensee did not include site-specific EALs corresponding to these example EALs due to the lack of local and remote level indicators for these areas. The licensee has specified EALs based on radiation monitor readings to indicate fuel uncovery in these areas. The licensee's departure from the guidance is acceptable.

6. NUMARC/NESP-007 IC SS3, "Loss of All Vital DC Power," provides for a 15-minute time limit on the threshold value in the associated EAL to preclude declaration on momentary or transient losses. The licensee did not include the 15-minute time criteria in its site-specific EAL for this example IC. The licensee stated that due to the configuration of the vital DC power system, no credible event would lead to a momentary loss of all vital DC power. Therefore, the licensee did not include the 15-minute criteria. This is an acceptable departure based upon site-specific considerations.

3.0 CONCLUSION

Review of the proposed EAL changes in Revision ZIN-93-01 of the Zion Station Annex to Commonwealth Edison's GSEP concludes that with the exception of the departures previously identified and accepted, the revised EALs are consistent with the guidance in NUMARC/NESP-007 and, therefore, meet the requirements of 10 CFR 50.47(b)(4) and Appendix E to 10 CFR Part 50.

Principal Contributor: J. O'Brien

Date: December 29, 1993