



RULEMAKING ISSUE (Affirmation)

August 21, 1985

SECY-85-283

For: The Commissioners

From: William J. Dircks
Executive Director for Operations

Subject: FINAL AMENDMENTS TO 10 CFR PART 50, APPENDIX E; CONSIDERATION OF EARTHQUAKES IN EMERGENCY PLANNING

Purpose: To obtain Commission approval for publication in the Federal Register of a final amendment to the regulations that would require limited consideration of the complicating effects of severe, low frequency natural phenomena, which would include earthquakes, in emergency planning.

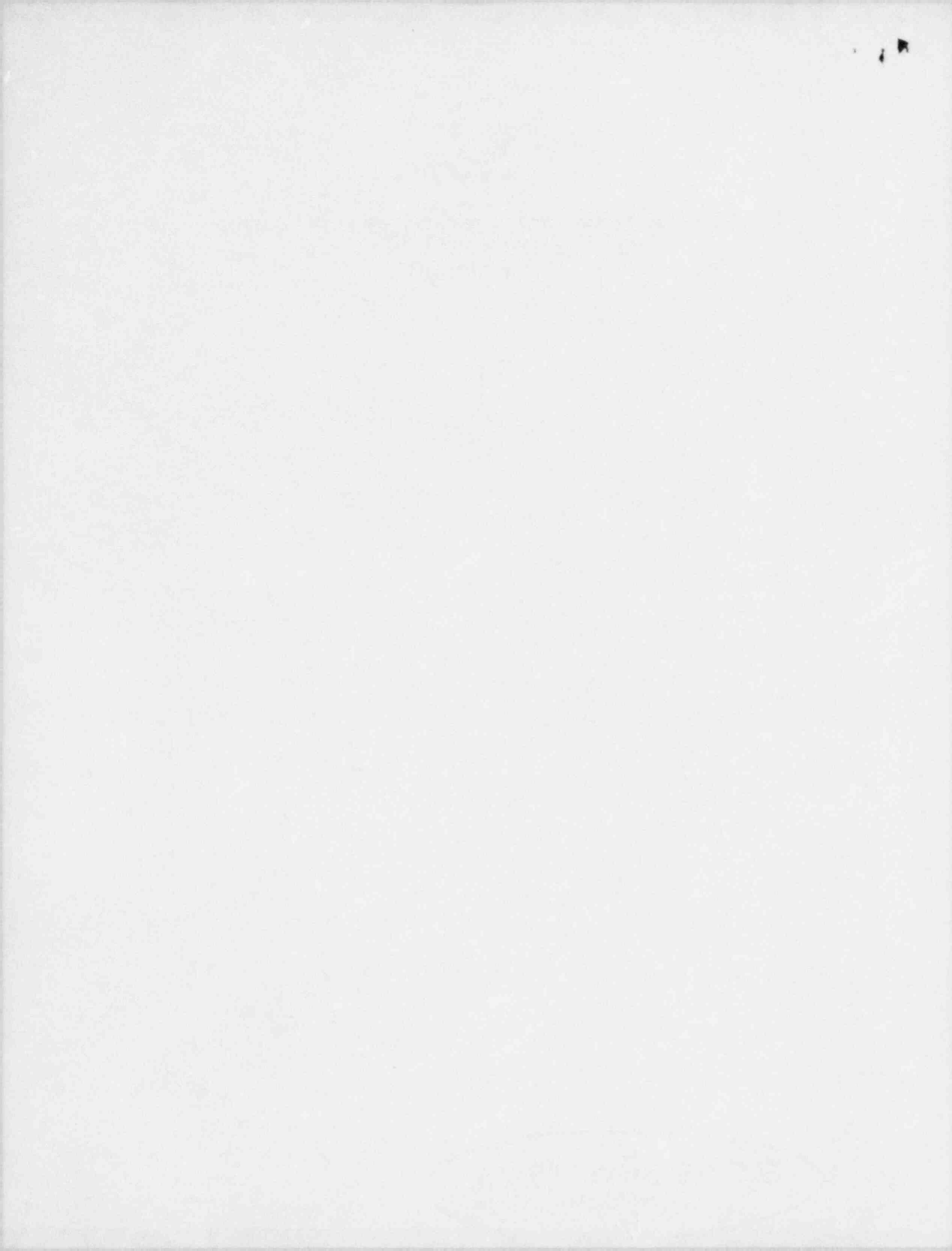
Category: This paper covers a major policy matter.

Summary: In the San Onofre and Diablo Canyon proceedings the Commission ruled that its regulations do not require the consideration of the potential complicating effects of earthquake on emergency planning. The Commission also asked the staff to initiate rule-making to determine on a generic basis whether the regulations should be changed to require such consideration. A proposed rule was published on December 21, 1984. After evaluating all public comments on the proposed rule, past operating reactor and emergency preparedness experience and the ACRS comments, the staff recommends that a final regulation be promulgated which will:

1. Clarify and articulate the Commission's original premise that emergency plans have inherent flexibility to assure that there exists ... "reasonable assurance that appropriate protective actions can and will be taken..." to mitigate (not eliminate) the consequences of a radiological accident.
2. Require the ability to transport necessary personnel to the plant after the event in order to augment the original staff as necessary to cope with degraded modes of plant operation.

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3. Require the ability by the licensee to assess damage to the plant and to translate this information into realistic projections of the expected or actual radiation hazard offsite, and be able to communicate this information to offsite authorities, so that this information will be available as a factor in the decisionmaking process, including recommendations for protective actions after severe, low-frequency, natural phenomena.
4. Recommend that offsite emergency plans should include consideration of alternative actions which could be taken if there were damage to the plant environs. This should be limited to knowing alternate routes of travel as well as establishing criteria for determining whether to shelter, relocate or to evacuate.

This staff recommendation would specifically not require:

1. Evacuation time estimates that consider the complicating effects of severe, low frequency natural phenomena. This is not being recommended because a natural phenomena beyond the design basis would cause such unpredictable disruption and devastation that the time estimates would probably be meaningless and in fact may be misleading.
2. That roads, bridges, buildings and other structures be reinforced to withstand the effects of severe, low frequency natural phenomena.
3. A detailed, extensive study considering the complicating effects of earthquakes or other natural phenomena on offsite emergency response capabilities. The staff specifically considers that the "TERA" study completed for Diablo Canyon is well beyond the scope and intent of this rulemaking.

Background:

On December 8, 1981, the Commission ruled in a then pending adjudication that its emergency planning regulations do not require consideration of potential earthquake effects on emergency plans for nuclear power reactors. Southern California Edison Company, et al. (San Onofre Nuclear Generating Station, Units 2 and 3), CLI-81-33, 14 NRC 1091 (1981). In so ruling the Commission stated:

The Commission will consider on a generic basis whether regulations should be changed to address the potential impacts of a severe earthquake on emergency planning. For the interim, the proximate occurrence of an accidental radiological release and an earthquake that could disrupt normal emergency planning appears sufficiently unlikely that consideration in individual licensing proceedings pending generic consideration of the matter is not warranted. 14 NRC at 1092.

The Commission affirmed this position in the Diablo Canyon proceeding. Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2), CLI-84-12, 20 NRC 249 (August 10, 1984). In this decision the Commission stated that it would initiate rulemaking "to address whether the potential for seismic impacts on emergency planning is a significant enough concern for large portions of the nation to warrant the amendment of the regulations to specifically consider those impacts." 20 NRC at 254. The focus of this rulemaking is to "obtain additional information to determine whether, in spite of current indications to the contrary, cost-effective reductions in overall risk may be obtained by the explicit consideration of severe earthquakes in emergency response planning." Id. at 254-255.

Discussion:

On December 21, 1984, the Commission published a proposed amendment to portions of 10 CFR Part 50 relating to earthquakes and emergency planning (49 FR 49640). The proposed rule stated that neither emergency response plans nor evacuation time analyses need consider the impact of earthquakes which cause or occur proximate in time with an accidental release of radioactive material from a nuclear power reactor. These amendments to 10 CFR 50.47 and 10 CFR Part 50 Appendix E proposed to explicitly adopt by rule the Commission's interpretation of its existing rules in the Commission San Onofre and Diablo Canyon decisions.

In the proposed rule, the Commission requested that commentors address the merits of three possible alternatives:

1. Adoption of the proposed rule explicitly incorporating the Commission interpretation in San Onofre and Diablo Canyon, not to consider the impacts of earthquakes in emergency planning.
2. Leaving the issue open for adjudication on a case-by-case basis; or
3. Requiring by rule that emergency plans specifically address the impacts of earthquakes.

The Commission was also considering whether to include in this rulemaking tornadoes and other low-frequency natural events.

The proposed rule permitted a 30-day comment period. This period was extended until February 27, 1985. To date, 61 comment letters have been received. Twenty-five letters favored the promulgation of the proposed rule. The majority of these letters were from utilities and consulting firms representing utilities. Two favorable comments were received from private citizens and one from the Department of Energy.

Thirty-four letters opposed promulgation of the proposed rule, many of which voiced strong displeasure, shock or disbelief regarding the wording of the proposed rule. The majority of these letters were from private citizens, intervenor groups and public interest groups. Nine of these letters were in signed petition form with approximately 94 signatures in total.

Further, in a letter to the Chairman, dated June 20, 1985, the ACRS stated that "we...see no technical reason for the exclusion of earthquakes from the natural phenomena considered in offsite emergency planning for nuclear power plants. However, we believe that only limited consideration...is appropriate." Additional input was obtained from the nuclear regulatory authority representatives in Japan, France, Sweden, Germany and Taiwan, all of which stated that the potential complicating effects of earthquakes were not specifically considered in their nuclear power reactor emergency planning.

No commentor took a position on the second alternative, i.e., leaving the issue open for adjudication on a case-by-case basis.

All of the commentors favoring promulgation of the proposed rule simply stated their agreement with the rationale offered by the Commission, and provided little additional detailed information supporting the proposed rule. Commentors opposing the proposed rule questioned the validity of the Commission's rationale and raised a number of points which have been addressed by the staff in developing the proposed final rule. (Enclosure 1)

Alternatives:

After review of the San Onofre and Diablo Canyon decisions and evaluation of issues raised by the public comments, the staff offers for Commission consideration three alternative approaches:

Alternative 1. Adoption of the proposed rule into a final rule with minor but important word changes, for example, "no additional emergency preparedness measures need be established to account for severe, low frequency natural phenomena than is already required in 10 CFR 50.47 and Appendix E."

- Pro:
1. Narrows litigation of the issue in individual licensing cases.
 2. Does not arbitrarily focus on earthquakes.
 3. Makes explicit the Commission's position that reasonable plans for coping with severe natural phenomena are already in place.

- Con: 1. Significant public concerns may appear to be dismissed without due consideration.
2. Can be perceived as inconsistent with the Commission's approach to severe accidents and the concept of defense in depth.

Alternative 2. Leaving the issue open for adjudication on a case-by-case basis; accomplished by withdrawing the proposed rule or by requiring consideration of earthquakes.

Pro: Permits consideration of special plant or site factors.

- Con: 1. The litigation itself would have no bounds--e.g., strength of bridges and roads may be litigated.
2. Prolong the licensing process through adjudication.

Alternative 3: Promulgate a final rule which incorporates justification previously used by the Commission and states that emergency response plans shall assure that the following capabilities exist relative to the complicating impacts of severe, low frequency natural phenomena characteristic of the site. In addressing the following capabilities the licensee shall assume that the severe natural phenomena has disrupted normal communication and road networks.

1. Ability to transport necessary personnel to the plant after the event in order to augment the original staff as necessary to cope with degraded modes of plant operation.
2. Ability by the licensee to assess damage to the plant and to translate this information into projections of the expected or actual radiation hazard offsite, and be able to communicate this information to offsite authorities, so that this information will be available as a factor in the decision-making process, including recommendations for protective actions after severe, low-frequency, natural phenomena.

In considering the complicating impacts of severe, low frequency natural phenomena, State and local governments should identify, in their emergency plans, alternate routes of travel and methods for determining whether to shelter or evacuate.

- Pro: 1. Such a rule would lend greater specificity to the Commission's original premise that emergency plans are sufficiently flexible to accommodate a spectrum of events, including the potential complicating impacts of severe, low frequency natural phenomena.

2. Defines scope of issues open to litigation.
3. Includes all natural phenomena rather than focusing arbitrarily on earthquakes.
4. This is consistent with the Commission's action in other areas dealing with possible accidents with low predicted return frequencies.

- Con:
1. Permit litigation in those areas covered in the rule. This may extend the licensing process.
 2. May open litigation at operating reactors (through 10 CFR 2.206).

Having considered all of the above, as well as all comments received, past operating reactor and emergency preparedness experiences and the ACRS comments, the staff recommends that Alternative 3 be adopted. In reaching this recommendation the staff has given consideration to the following arguments.

Commenters raised the following issues concerning earthquakes and emergency preparedness:

- o Limited or no record exists concerning the flexibility of emergency plans to support the proposed rule; therefore, the Commission cannot make a generic finding that effects of earthquakes on emergency planning are always resolved by the general flexibility of emergency plans (see Issue 1, Enclosure 1),
- o Current emergency plans take into consideration plant accidents whose probability are in the range of $10E(-4)$ to $10E(-5)$. These plans should consider the complicating effects of severe, natural phenomena (2 to 4 times the SSE) whose return frequency is in the same range (see issue 3, Enclosure 1),
- o Defects in seismic design and quality assurance in construction can undermine the seismic strength of plant systems and structures (see Issue 6 in Enclosure 1), and
- o There is limited existing information on the contribution of seismic events to overall core melt frequency (see Issues 5 and 12, Enclosure 1) in that only a few PRAs assess seismic risks and the treatment entails many uncertainties.

Additionally the Emergency Action Level scheme addressed in NUREG-0654 recommends that an emergency be declared in the event that a "Natural phenomenon is being experienced..." at the plant.

As the intensity of the natural phenomenon increases so does the classification of the emergency. Many licensees have incorporated these recommendations into their emergency plans. Based on these emergency plans, licensee actions when the plant experiences a natural phenomenon beyond the design basis would include "augmenting resources by activating the on-site Technical Support Center, on-site operational support center and the near-site Emergency Operations Facility"; and "Dedicating an individual for plant status updates to offsite authorities..."; and "Providing meteorological and dose estimates to offsite authorities...". These presently required licensee actions taken in conjunction with responsibilities of the State and local governmental authorities during an emergency, lead the staff to conclude that the elements in the proposed final regulation are logical and warranted.

In addition, the staff conducted a review of emergency exercises at nuclear power plants and licensee response to potential accidents as well as an analysis of 20 actual, non-nuclear, evacuations for which information was readily available (see Issue 1, Enclosure 1 and Enclosure 2). This review demonstrated the validity of the Commission's belief that emergency plans do have sufficient flexibility to assure that protective actions can and will be taken to mitigate the consequences of a wide spectrum and combination of accidents. Thus, this information provides substantial support for the position that no additional emergency preparedness measures need be established to account for severe natural phenomena.

In addition, the Federal Emergency Management Agency (FEMA), which is responsible for reviewing and assuring effective offsite emergency preparedness and response has several programs in place or underway to assure that an integrated capability exists for protecting the public health and safety in the event of an emergency. These programs (see Issue 11) include: The Radiological Emergency Preparedness (REP) program and the Earthquake Hazard Reduction program. When completed, the Earthquake Hazard Radiation Program will provide the basis for adequate Federal, State and local government response to protect the public in the very unlikely event of a coincident major earthquake and radiological emergency. The Radiological Emergency Preparedness program presently assures an integrated capability exists for State and local governments, together with utilities, to implement protective measures in the event of an emergency. FEMA programs are carried out in a manner that the integration of common functions such as communication, alert and notification, protective actions and decisionmaking is addressed, while recognizing unique management requirements such as radiological measurements.

Considering all of the above it can be argued that the inherent flexibility in the plans outweighs the uncertainties concerning the expected frequency of occurrence of severe reactor accidents resulting from or occurring proximate to severe low frequency

natural phenomena (e.g., earthquakes, tornadoes) which have the potential for complicating the emergency response to these accidents. However, on balance, considering the points raised by many of the public comments and in view of the Emergency Action Level logic along with the potential magnitude of the uncertainties identified, the staff has decided that a more conservative approach is appropriate and recommend amending the regulations to explicitly require some limited consideration of the complicating effects of severe, low frequency natural phenomena on emergency planning. This will provide added assurance that adequate protective actions can and will be taken in the event of a radiological emergency complicated by the effects of such natural phenomena. The staff recommendation that only limited consideration be given is based on 3 things:

- (1) inherent flexibility and demonstrated effectiveness of off-site plans and preparations (local, State FEMA, etc.) to handle severe low frequency natural phenomena.
- (2) residual risk from such phenomena complicating a nuclear emergency are small.
- (3) devastation from the phenomena itself and other associated complications (e.g., release of chemicals, fires, rupturing of dams) will likely far exceed the incremental impact of the complicating effect of the natural phenomena on a nuclear emergency.

This final rule would:

1. Clarify and articulate the Commission's original premise that emergency plans have inherent flexibility to assure that there exist reasonable assurance that appropriate protective actions can and will be taken to mitigate (not eliminate) the consequences of a radiological accident.
2. Require the ability to transport necessary personnel to the plant after the event in order to augment the original staff as necessary to cope with degraded modes of plant operation.
3. Require the ability by the licensee to assess damage to the plant and to translate this information into projections of the expected or actual radiation hazard offsite, and be able to communicate this information to offsite authorities, so that this information will be available as a factor in the decisionmaking process, including recommendations for protective actions after severe, low-frequency, natural phenomena.
4. Recommend that in considering the complicating impacts of severe, low frequency natural phenomena, State and local governments should identify, in their emergency plans,

alternate routes of travel and methods for determining whether to shelter or evacuate.

This staff recommendation would specifically not require:

1. Evacuation time estimates that consider the complicating effects of severe, low frequency natural phenomena. This is not being recommended because a natural phenomena beyond the design basis would cause such unpredictable patterns of disruption and devastation that the time estimates would probably be meaningless and in fact may be misleading.
2. That roads, bridges, buildings and other structures be reinforced to withstand the effects of severe, low frequency natural phenomena.
3. A detailed, extensive study considering the complicating effects of earthquakes or other natural phenomena on offsite emergency response capabilities. For example, the staff specifically considers that the "TERA" study completed for Diablo Canyon is well beyond the scope and intent of what would be required by this rulemaking.

FEMA Coordination: Because FEMA is directly involved in the evaluation of offsite emergency preparedness and would be affected by the promulgation of these amendments, the NRC staff has kept the FEMA staff advised on the development of this paper. FEMA concurs with this paper, with the caveat that at least 6 months of additional time is needed to further define and promulgate guidance for use of State and local governments in their efforts to comply with the language of the final rule change dealing with identifying alternate evacuation routes and methods for determining whether to shelter or evacuate. As a result we are requiring that compliance be completed within 18 months of the effective date of the rule and that the site specific schedule of compliance be subject to negotiation between the licensee, State and local governments, FEMA and the NRC.

Cost Estimate: The staff anticipates that promulgation of this final rule change which limits consideration of the complicating effects of severe natural phenomena will have minimal cost impact on licensees, or State and local governments. This is because (1) the considerations are limited and (2) offsite authorities already have an extensive program for dealing with an entire spectrum of natural and man-made emergencies.

Recommendations:

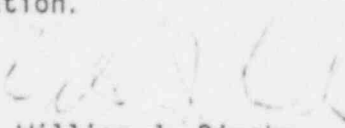
1. Approve for publication in the Federal Register a notice of final rulemaking (Enclosure 1) to 10 CFR Part 50, Appendix E to be effective 30 days after publication.

2. Note:

- (a) That appropriate Congressional committees will be notified of the rule change.
- (b) That the ACRS is being informed of the rule change.
- (c) That, pursuant to 10 CFR § 51.5(d)(3) of the Commission's regulations, an environmental impact statement, negative declaration, or environmental impact appraisal need not be prepared in connection with the subject final rule change because there is no substantive or significant environmental impact.
- (d) That, pursuant to the Regulatory Flexibility Act of 1980, the Federal Register Notice contains a statement that the Commission certifies that this final rule will not have a significant economic impact on a substantial number of small entities, and a copy of this certification will be forwarded to the Chief Counsel for Advocacy, SBA, by the Division of Rules and Records, ADB.
- (e) That the Federal Register Notice contains a statement that, pursuant to the Paperwork Reduction Act of 1980, the NRC has made a determination that the rule change does not impose new recordkeeping, information collection, or reporting requirements.
- (f) That the Federal Register Notice will be sent by TIDC, ADM, to affected applicants, licensees, and persons that commented on the proposed rule.
- (g) That a public announcement of the final rule change will be made.
- (h) That the staff recommends this Commission paper be placed in the PDR.
- (i) That a Regulatory Analysis has been performed.

Sunshine Act: Recommend consideration at an open meeting.

Scheduling: For early consideration.


William J. Dircks
Executive Director for Operations

Enclosures:

- 1. Federal Register Notice of Final Rule
Change to 10 CFR, Part 50, Appendix E
- 2. Listing of Public Evacuations
- 3. Regulatory Analysis for Final Rulemaking

Commissioners' comments should be provided directly to the Office of the Secretary by c.o.b. Friday, September 13, 1985.

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT Friday, September 6, 1985, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

This paper is tentatively scheduled for affirmation at an Open Meeting during the Week of September 16, 1985. Please refer to the appropriate Weekly Commission Schedule, when published, for a specific date and time.

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ENCLOSURE 1

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

Emergency Planning and Preparedness

AGENCY: Nuclear Regulatory Commission.

ACTION: Final rule.

SUMMARY: The Commission is amending its regulations in 10 CFR Part 50 in order to require limited consideration of the complicating impacts of severe, low frequency, natural phenomena on emergency preparedness. The Commission anticipates that this final regulation will not have significant impact on emergency preparedness requirements established by the August 1980 emergency planning requirements (45 FR 55402) but will provide clarification of the premise (that emergency plans have inherent flexibility) which is an underlying factor in the Commission's San Onofre and Diablo Canyon decisions.

EFFECTIVE DATE: [Insert 30 days after publication in the Federal Register.]

FOR FURTHER INFORMATION CONTACT: Michael T. Jamgochian, Division of Risk Analysis and Operations, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555, Telephone (301)443-7615.

IMPLEMENTATION: Compliance with this regulation shall be completed within 18 months of the effective date. The site specific schedule of compliance will be subject to negotiation between the licensee, State and local governments, FEMA and the NRC.

SUPPLEMENTARY INFORMATION: On December 21, 1984, the Commission published a proposed amendment to portions of 10 CFR Part 50 relating to earthquakes and emergency planning (49 FR 49640). The proposed rule states that neither emergency response plans nor evacuation time analyses need consider the impact of earthquakes which cause an occur proximate in time with an accidental release of radioactive material from a nuclear power reactor. These amendments to 10 CFR 50.47 and 10 CFR Part 50, Appendix E proposed to explicitly adopt by rule the Commission's interpretation of its existing rules in the Commission's San Onofre and Diablo Canyon decisions.

On December 8, 1981, the Commission ruled in a then pending adjudication that its emergency planning regulations do not require consideration of potential earthquake effects on emergency plans for nuclear power reactors. Southern California Edison Company, et al. (San Onofre Nuclear Generating Station, Units 2 and 3), CLI-81-33, 14 NRC 1091 (1981). In so ruling the Commission stated:

The Commission will consider on a generic basis whether regulations should be changed to address the potential impacts of a severe earthquake on emergency planning. For the interim, the proximate occurrence of an accidental radiological release and an earthquake that could disrupt normal emergency planning

appears sufficiently unlikely that consideration in individual licensing proceedings pending generic consideration of the matter is not warranted. 14 NRC at 1092.

The Commission recently affirmed this position in the Diablo Canyon proceeding. Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2), CLI-84-12, 20 NRC 249 (August 10, 1984), San Luis Obispo Mothers for Peace v. NRC, 751 F.2d 1287, (D.C. Cir. 1984); vacated in part and rehearing en banc granted, 760 F.2d 1320 (1985). In its decision the Commission stated that it would initiate rulemaking "to address whether the potential for seismic impacts on emergency planning is a significant enough concern for large portions of the nation to warrant the amendment of the regulations to specifically consider those impacts. The chief focus of the rulemaking was to obtain additional information to determine whether, in spite of current indications to the contrary, cost-effective reductions in overall risk may be obtained by the explicit consideration of severe earthquakes in emergency response planning." Id. at 254-255.

The proposed rule permitted a 30-day comment period. This period was extended until February 27, 1985 (see 50 FR 3797, dated January 28, 1985).

In the proposed rule, the Commission requested that commenters address the merits of three possible alternative:

1. Adoption of the proposed rule explicitly incorporating the Commission interpretation in San Onofre and Diablo Canyon,

not to consider the impacts of earthquakes in emergency planning.

2. Leaving the issue open for adjudication on a case-by-case basis; or
3. Requiring by rule that emergency plans specifically address the impacts of earthquakes.

The Commission was also considering whether to include in this rule-making tornadoes and other low-frequency natural events.

Sixty-one comment letters have been received. Twenty-five letters favored the promulgation of the proposed rule. The majority of these letters were from utilities, and consulting firms representing utilities. Two favorable comments were received from private citizens and one from the Department of Energy.

Thirty-four letters opposed promulgation of the proposed rule, many of which voiced strong displeasure, shock or disbelief regarding the Commission's favored alternative. The majority of these letters were from private citizens, intervenor groups and environmental groups. Nine of these letters were in signed petition form with approximately 94 signatures in total.

Further, in a letter to the NRC Chairman, dated June 20, 1985, the ACRS stated that "we...see no technical reason for the exclusion of earthquakes from the natural phenomena considered in offsite emergency planning for nuclear power plants. However, we believe that only limited consideration...is appropriate." Additional input was obtained from the nuclear regulatory authority representatives in Japan, France, Sweden, Germany and Taiwan, all of which stated that the potential complicating effects of earthquakes

was not specifically considered in their nuclear power reactor emergency planning.

No commentators or foreign countries took a position on the alternative to leave the issue open for adjudication on a case-by-case basis.

All of the commentators favoring promulgation of the proposed rule simply stated their agreement with the rationale offered by the Commission, and provided little additional detailed information supporting the proposed rule change. Commentators opposing the proposed rule questioned the validity of the Commission's rationale and raised a number of points which have been considered by the Commission in developing the final regulation.

A compilation of these issues with an accompanying Commission response follows:

Issue 1. There exist limited or no record concerning the flexibility of emergency plans to support the proposed rule, therefore, the Commission cannot make a generic finding that effects of earthquakes on emergency planning are always resolved by the general flexibility of emergency plans.

Commission Response:

In June of 1979, the Commission began a formal reconsideration of the role of emergency planning in ensuring the continued protection of the public health and safety in areas around nuclear power facilities. The Commission determined that it must have assurance that proper means and procedures will be in place to assess the course of an accident and its potential severity, that NRC and other appropriate authorities and

the public will be notified promptly, and that adequate protective actions in response to actual or anticipated conditions can and will be taken.

On August 19, 1980, the Commission published its final rule on emergency planning. In developing the final rule the Commission established 16 planning standards (See 10 CFR 50.47(b)) as the basic and fundamental standards which must be met by both onsite and offsite emergency response plans for nuclear power facilities. The planning standards are addressed by specific evaluation criteria in NUREG-0654; FEMA-REP-1, Rev. 1. To ensure that adequate plans exist and are maintained, the NRC reviews and evaluates the licensee's onsite emergency plans against the regulatory requirements of 10 CFR 50.47 and 10 CFR Part 50, Appendix E; and the guidance criteria in NUREG-0654/FEMA-REP-1, Rev. 1. In a parallel manner, the Federal Emergency management Agency (FEMA) reviews and evaluates the state and local offsite plans against the criteria in NUREG-0654 and provides the NRC with its finding and determinations. Both agencies continue to review and evaluate changes to the respective plans and the results of drills and exercises, and ensure that necessary corrections are made based on those evaluations.

One of the major items that the Commission addressed in the development of the final rule was that no single accident scenario should form the basis for emergency planning. The Commission noted that, instead, emergency planning should consider a wide spectrum of potential accidents. Thus, while the NRC's requirements are intended to cover radiological accidents at the licensee's facility, the emergency plans developed to meet the requirements of the NRC's regulations can and have been used to respond to both radiological and non-radiological types of actual events. The general flexibility of these emergency plans has been demonstrated by

response to a wide spectrum of simulated accident conditions during emergency exercises, and by the actual response by licensees and offsite authorities to actual and potential events.

The emergency planning and preparedness framework which is set forth in the emergency plans reflects the integration of a number of key elements including: preestablished division of responsibilities and authorities; preestablished management controls; provisions for timely and informed decisionmaking; coordination of response organizations; adequate primary and backup communications systems; adequate assessment capabilities; adequate notification capabilities; written procedures to guide emergency response personnel; and training for emergency response personnel. These key elements are basic and essential to the response to any type of an emergency (i.e., radiological, non-radiological, onsite, offsite). Emergency planning and preparedness also results in a heightened awareness by emergency workers of the complex nature of emergency response. It fosters expertise within emergency organizations due to their increased understanding not only of individual response tasks, but also of how the separate tasks combine to form diverse response capabilities. Further, the emergency planning and preparedness process is a dynamic process incorporating improvements based on experience gained through plan implementation and as a result of exercises, drills and actual events.

A measure of the flexibility of emergency plans is the range of diverse emergency conditions which are used to exercise the provisions of the plan and the capability of the response personnel and equipment. An integral part of the emergency planning and preparedness process is the use of exercises and drills to test equipment and procedures and to give emergency workers an opportunity to demonstrate their individual skills

and to develop the team work necessary to respond to a wide variety of potential accident conditions. Since August 1980, more than 200 emergency exercises have been conducted in the U.S. related to nuclear power plants. A review of 135 of the more recent exercises shows that 36 exercises had natural disasters as events which either started the exercise; contributed directly to simulated damage to plant safety systems/equipment; or contributed directly to other events which complicated the simulated degradation of the plant. These natural disasters included: earthquakes (10); tornados (5); lightning strikes (6 with one offsite fire); bomb threats (4, one with two simulated explosions); and plane crashes (5). In the other 12 exercises, ammonia spills, ice storms, thunderstorms, truck crashes, hurricanes, high winds, hail, and fires were used as events which complicated the exercise scenario. While the NRC has issued no specific guidance to licensees or applicants on the use of these and other non-mechanistic events in exercises or drills, the staff, nonetheless, encourages such innovative exercises to fulfill the regulatory requirements that full scale exercises test as much of the licensee, State, and local emergency plans as is reasonably achievable without mandatory public participation.

A further measure of the flexibility of existing emergency plans is demonstrated by the ability of emergency response organizations to use these emergency plans to accommodate a wide spectrum of events, including events not specifically within the planning basis. The Commission's regulations require, in part, that licensees develop emergency classification schemes, with associated initiating conditions, to enable operators to quickly and accurately assess the potential severity of, and the appropriate response to, a given emergency. These emergency classification

schemes include consideration of natural phenomena (e.g., earthquakes, floods, tornados, and hurricanes) and other hazards (e.g., aircraft crashes, train derailments, explosions, and toxic fumes). The Commission's regulations also require that licensees notify the NRC when the emergency plan is activated. Actual events have occurred which have caused the activation of emergency response plans around U.S. nuclear power plant sites. Between August 1982 and March 1985, the NRC's Incident Response Center recorded 29 notifications by licensees of activation of their emergency plans due to natural events including: seismic events (2), tornadoes (5), hot weather (1), cold weather (3), hurricanes (2), lightning strikes (4), offsite fires (2), flooding (2), high winds (1), and severe storms (2). In most cases, the licensee's decision to activate its emergency plans due to these natural events was based on the potential for, and not actual damage at the site. However, there were cases where the natural events did result in minor onsite impacts such as loss of offsite power for short periods of time, temporary loss of commercial telephone systems and loss of public alert siren systems. In addition to natural events, mechanical problems at nuclear power plants have resulted in almost 600 activations of the licensee's emergency plans. Most of these activations were due to situations which resulted in emergency classifications of a "Notification of Unusual Event," the lowest emergency classification.

Additionally, 20 actual, non-nuclear evacuations for which information was readily available have been individually reviewed. This review focused on the number of persons being evacuated, the amount of time that the evacuation took, the number of injuries resulting from the evacuation, the cause of the evacuation and the common emergency planning elements that existed which enabled the evacuation to be conducted successfully.

This analysis clearly showed that the most important elements common to all of the evacuations (even those conducted without emergency plans) were good communications and good emergency organizations. With these two elements in place, many persons were effectively evacuated for a wide spectrum of natural and man-made hazards.

In light of the overall adequacy determinations on the emergency plans with respect to regulatory requirements and guidance, the results of exercises and drills, and the response to actual or potential adverse conditions, the Commission concludes that there does exist an adequate record to demonstrate that an emergency planning and preparedness framework exists around nuclear power plants that reflects inherent flexibility for responding to a sufficiently wide range of plant and offsite conditions.

Issue 2. The proposed rule violates the NRC's emergency planning principle of planning for accidents ranging from design basis accidents to core-melt accidents, with the capacity to reduce the consequences of even the most severe accidents.

Commission Response:

In the joint FEMA/NRC document entitled "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants (NUREG-0654, FEMA-REP-1, Rev. 1), the Commission's philosophy of assuring both a broad and flexible preparedness in response to a wide spectrum of events is articulated. In this Commission document it is stated at pp. 6, 7: "No single specific accident sequence should be isolated as the one for which to plan because each

accident could have different consequences, both in nature and degree. Further, the range of possible selection for a planning basis is very large, starting with a zero point of requiring no planning at all because significant offsite radiological accident consequences are unlikely to occur, to planning for the worst possible accident, regardless of its extremely low likelihood. The NRC/EPA Task Force did not attempt to define a single accident sequence or even a limited number of sequences. Rather, it identified the bounds of the parameters for which planning is recommended...." The Commission finds that the promulgated amendment is totally consistent with the emergency planning principles and philosophy outlined in NUREG-0654, FEMA-REP-1, Rev. 1).

Issue 3. Emergency planning must include the complicating effects of earthquakes up to and beyond Safe Shutdown Earthquake levels.

Commission Response:

The magnitude of the SSE and the adequacy of a plant's design to meet the SSE are reviewed by NRC and may be challenged in adjudicatory proceedings, but, once settled, should not be reconsidered in reviewing or adjudicating emergency planning issues. Consistent with the Commission's regulations, if a larger earthquake were considered appropriate to provide reasonable assurance that a nuclear power plant can be constructed and operated at a given site without undue risk to the health and safety of the public, a larger SSE would be established. Nevertheless, the basis for emergency planning is not constrained by the design basis for a plant and emergency planning efforts recognize the possibility that events considered beyond the design basis can occur. This rule change is

designed to further assure that the complicating effects of low probability natural events including earthquakes below and above the SSE, are adequately addressed in emergency planning.

Issue 4. The Commission's fundamental obligation is to determine whether "adequate protective measures can and will be taken in the event of a radiological emergency." 10 CFR § 50.47(a). If circumstances prevent the NRC from finding that emergency plans can provide that assurance, it must deny the license.

Commission Response:

The Commission agrees that if the NRC cannot make the finding that "...there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency" to mitigate the consequences of an accident, the operating license must be denied. It is the objective of the NRC emergency preparedness regulations to reduce the risk to the public health and safety by planning in advance how to respond to nuclear power plant accidents.

The NRC would not license a plant if the radiological risk posed by possible accidents were not very small - even in the absence of emergency preparedness. Nevertheless, the NRC has chosen to require emergency preparedness as another level of "defense-in-depth," the principle that a variety of independent and diverse level of protection should be afforded the public from the hazard of radiation exposure. The NRC believes that reasonable efforts to anticipate and plan for public protective actions in the vicinity of a commercial nuclear plant can substantially reduce,

though not eliminate, the already small offsite radiological risk, and is, therefore, a prudent requirement.

Issue 5. Inasmuch as seismic PRA analysis has indicated that earthquakes are among dominant causes of core melt accidents, it is irrational to ignore the effects that these same earthquakes can have on emergency response.

Commission Response:

Past seismic probabilistic risk analysis (PRA) studies have indicated that very large earthquakes (2 to 4 times SSE) may be among the important or dominant contributors to the probability of core-melt accidents or public risk. However, these PRA studies (including the NRC sponsored Seismic Safety Margins Research Program (SSMRP) which calculated the seismic risk at the Zion Nuclear Power Plant) found that the risk of a core-melt accident is caused only by very improbable earthquakes with ground motions (in terms of peak ground acceleration) several times the already severe design basis ground motions. In addition, the failure levels used in seismic PRA studies for structures, components and equipment are based, in general, on very conservative assumptions. For example, many equipment failure levels were based on military data, expert judgement and upper bound qualification tests (i.e., beyond proof test) and do not reflect the true capacity to sustain vibratory motion beyond the design levels. In this context failure relates to loss of functional operability and not necessarily a catastrophic occurrence such as a collapse. It is expected that when more realistic failure levels

are used the significance of the earthquake threat will diminish. NRC efforts are currently underway to better define the needed failure data to provide more realistic inputs to seismic PRA studies. It should be noted that most of the current seismic PRAs, with their generally conservative bias, have not shown unacceptably high core-melt probabilities. For example, the PRA for the Zion plant shows a core melt frequency of 5.6×10^{-6} per year due to the seismic hazard compared to a core melt frequency of about 4×10^{-5} per year due to all internally initiated accidents. Issue 12 discusses this matter in further detail.

With these studies in mind, the Commission never intended to give the perception that it was "ignoring" the complicating effects of earthquakes on emergency response. The final rule is to clarify and articulate the Commission's original premise that emergency plans have inherent flexibility to assure that there exists reasonable assurance that appropriate protective actions can and will be taken to mitigate the consequences of a radiological accident.

Issue 6. Defects in seismic design and quality assurance in construction have consistently undermined the seismic strength of plant systems and structures. It is thus irrational for the NRC to write off earthquakes as an emergency planning issue at the same time it is exhibiting growing concern regarding the effects of earthquakes on nuclear power plant site.

Commission Response

As a result of indications that earthquakes used for the design basis of eastern U.S. nuclear power plants may be understated, the NRC has underway an effort to define the seismic margins in operating plants. Preliminary results, based on evaluation of about 12 published and unpublished

PRAs (including the NRC sponsored Seismic Safety Margins Research Program), demonstrate that eastern U.S. plants, in general, can sustain earthquake levels up to at least 0.3g peak ground acceleration compared to safe shutdown earthquakes (SSE) ranging from 0.10 to 0.25g peak ground acceleration. These relatively high margins reflect an ability to accommodate moderate design and construction errors. In addition, the NRC is sponsoring research (Seismic Category I Structures Program) to determine the ability of concrete shear wall structures to sustain earthquake loads beyond their design basis. Results to date indicate that shear walls generally can sustain at least three to four times the SSE. The NRC has also recently completed the Mechanical Load Combinations research program showing that the probability of an earthquake causing a complete rupture of the primary coolant piping of pressurized water reactors (PWR) is extremely small (about 10^{-6} per reactor year due to heavy component support failure under earthquake conditions and 10^{-12} per reactor year due to fatigue crack growth). The results of this research have led the Commission to issue for public comment a proposed change to 10 CFR 50 Appendix A, General Design Criterion 4 that will permit the removal of pipe whip restraints for the primary coolant piping in PWRs (a similar effort is being performed for BWRs). Recent work by the Seismic Qualification Utility Group (SQUG), based on actual behavior of industrial facilities and their equipment in large earthquakes, leads to the conclusion that more margin against earthquakes larger than the SSE exists than was previously thought.

Earthquakes simultaneously affect all plant safety systems and tend to "search out" design, construction and maintenance errors which could degrade plant safety. However, since the PRAs and margins analyses

performed to date indicate that nuclear power plants are capable of sustaining earthquakes much larger than their design basis, only gross design and construction errors are of concern. It is reasonable to assume that gross design and construction errors would be detected and rectified as a result of normal inspections, preoperational tests and normal operational transients. For example, in our research on the probability of a pipe ruptures in primary coolant loops, sensitivity studies have shown that only very unlikely design and construction errors may substantially change the seismic risk.

Issue 7. The use of unreliable seismic design bases is flawed and therefore its use as a basis for rulemaking is inappropriate.

Commission Response:

The safe shutdown earthquake, or SSE, for a nuclear plant is based upon an evaluation of the maximum earthquake potential for the specific site. The SSE is that earthquake which produces the maximum vibratory ground motion for which certain structures, systems, and components must be designed and constructed to remain functional. All structures, systems and components necessary to achieve a safe shutdown are seismically qualified for the SSE and are expected, with high confidence, to function to bring the plant to a safe shutdown.

While uncertainties do exist in estimating the behavior of structures, systems and components subjected to seismic effects, these uncertainties are explicitly treated in the design process through the use of conservatism. In addition, as was pointed out in the response to Issue 6, NRC research on seismic design margins has shown, based on published and

unpublished PRAs, as well as other NRC research mentioned above, that nuclear plants in the eastern U.S. are, in general, capable of withstanding earthquakes larger than their design basis. These conclusions are based on a very conservative approach that assigns failure levels for components, equipment and structures based on a high confidence of low probability of failure. This conservatism accounts for the uncertainties in response behavior and ability to perform the required safety function. Nonetheless, the final rule focuses on consideration of severe, low frequency natural phenomena and is not limited by the design bases for such phenomena.

Issue 8. Even if a reactor is designed to withstand earthquakes of a certain magnitude, an earthquake can indirectly lead to an accident by causing operator error. Thus, operators may react to the trauma of an earthquake and the distraction of fluctuating instruments by making mistakes that lead to serious accidents.

Commission Response:

The NRC has conducted research to determine if psychological stress induced by an emergency in a nuclear power plant have a significant adverse effect on operator decisionmaking performance. A report entitled, "Operational Decisionmaking and Action Selection Under Psychological Stress in Nuclear Power Plants," NUREG/CR-4040, documented these findings: (1) decisionmaking performance is affected by stress such that fewer correct action selections were made in the affected condition as

compared with the non-stress condition; (2) operators under stress perform better under lower levels of workload; (3) the interactions of conflicting information with operating procedures and level of workload suggest a complex relationship between stress variables and decision-making performance; (4) specific operator personality characteristics were found to be related to enhanced decisionmaking under stress. A number of measures for decreasing the effects of stress on operators were identified in order to assist operators in making correct decisions during and after a severe natural phenomena.

Although it is considered highly unlikely that operator error caused by an earthquake could lead to a reactor accident which would threaten public health and safety, emergency plans are designed to deal with such an accident if it should occur. This rulemaking is designed to provide added assurance that the potential complicating effect of earthquakes will be properly addressed in emergency planning.

Issue 9. Emergency plans are unique, for example, a rural and sparsely populated area may pose fewer evacuation problems, and thus require less flexibility, than an urban and densely populated plant site. Thus, emergency plans cannot be found to possess the same degree of "flexibility" in every case.

Commission Response:

The complexity of the emergency plan is tailored to the needs and characteristics of the site. However, the basic principles underlying the plan, including the inherent flexibility to accommodate the spectrum

of accident conditions which might exist at that site, are common to all emergency plans. For additional discussion on flexibility of emergency plans, please see the Commission response to Issue #1.

Issue 10. Earthquakes are distinct phenomena with the following distinct features:

--Sirens and broadcasting systems could be knocked down and roads could be severely obstructed in an earthquake.

--Although sheltering may be presumed to be available in almost any other type of natural event, it could be rendered useless by an earthquake.

--An earthquake is likely to disrupt the distribution of water, natural gas, and gasoline, thus causing fires and impeding the efforts of firefighters.

--An earthquake is likely to impair or destroy the ability to monitor potential radiation releases and meteorological conditions.

--An earthquake can damage transportation routes by collapse of bridges and overpasses, damage to roads, and landslides.

--An earthquake can cause the collapse of structures (including those housing personnel directing the emergency planning effort, relocation and decontamination facilities, and local agency services) or render sheltering useless due to damage.

--An earthquake is likely to cause a loss of offsite power, with its attendant effect on communications, as well as to potentially render useless other (backup) methods of communication such as radio transmissions.

--An earthquake is likely to cause physical and fright-induced (e.g., heart attack) injuries, thereby overloading medical facilities and ambulance and rescue services.

Commission Response:

The Commission disagrees with the assertion that the effects of earthquakes are significantly different than the effects of other severe low frequency natural phenomena. All of the consequences listed above could also result from other severe, low frequency natural phenomena such as tornadoes, hurricanes, floods, etc. which are already addressed in emergency plans. All of these natural phenomena are similar in that (1) they occur without very much warning (2) they potentially devastate larger areas and (3) they are relatively of short duration. The principal difference between earthquakes and the other low frequency natural phenomena is that the other phenomena tend to be easier to predict and there may be slightly more advance warning for these phenomena.

Issue 11. FEMA's emergency plans do not adequately provide for earthquake response in a radiological emergency.

Commission Response:

The Commission disagrees. FEMA conducts two planning programs, the Radiological Emergency Preparedness (REP) program and the Earthquake Hazard Reduction program that, when completed, tested and exercised for the areas around nuclear power plants, will provide the basis for adequate Federal, State and local governmental response to protect the

public in the very unlikely event of a coincident major earthquake and radiological emergency.

The objective of FEMA's Radiological Emergency Preparedness (REP) program is to assure that an integrated capability exists for State and local governments, together with utilities, to implement protective measures to protect public health and safety in the event of an emergency. FEMA coordinates the activities of 10 Federal agencies in reviewing and evaluating State and local government planning and preparedness around nuclear power plants through its 10 Regional Assistance Committees (RAC's). These evaluations are effected through assessment of emergency plans, and observation and evaluations of exercises designed to test the capabilities of government entities. Also, FEMA has developed and published the Federal Radiological Emergency Response Plan (49 FR 34896) for radiological emergencies including commercial nuclear power plant accidents on September 12, 1984.

FEMA has an active program of earthquake hazard reduction that coordinates Federal preparedness and mitigation activities and provides technical and financial assistance to States and local communities in all segments of emergency management. This includes hazard awareness, assessment, preparedness, mitigation, response, and recovery. The Federal response planning provides for the supplemental help and recovery to State and local governments required to save lives and provide for basic human needs after a major earthquake. FEMA expects to publish the National Plan for Federal Response to a catastrophic earthquake in December 1985. Drafts of the plan serve as an interim operating guide for Federal agencies to use in the event of an earthquake prior to completion of the follow-on regional planning.

FEMA technical and financial assistance to State and local earthquake hazard reduction programs focuses upon preparedness and response planning, and provides for implementation and training exercises. The planning includes such activities as: hazards identification, vulnerability analysis, casualty and property loss estimates, and potential impacts resulting from damage to critical and special facilities (such as nuclear power plants) and lifelines. FEMA estimates that sufficient earthquake response planning (annexes to State and local emergency operation plans) will be in place for the thirteen high-risk, high population areas currently being studied by the year 1996.

Both the earthquake and radiological preparedness programs are carried out in a manner that addresses the integration of common functions such as communication, alert and notification, protective actions and decisionmaking, while recognizing unique management requirements such as radiological measurements. The ultimate goal in both program efforts is to facilitate the development of management and operational capabilities to analyze the need for protective action, make protective action decisions and implement appropriate operations. They are complementary in that the capabilities developed under the radiological program provide the means for coping with the various hazards that might present themselves during a major earthquake.

Issue 12. The Commission should evaluate the contribution of seismic events to overall core melt frequencies.

Commission Response:

An examination of recent probabilistic risk analyses indicates that seismic events have often been estimated to be one of the principal contributors to overall plant risk. Further, these estimates indicate that the significant seismic contributors to core damage or risk have been from earthquakes considerably larger than the safe shutdown earthquake (SSE).

Earthquakes which have accelerations less than the safe shutdown earthquake have not been found to be significant contributors to overall plant risk. The susceptibility of a component or subsystem to seismic damage is measured in terms of its fragility. An example of this is the ceramic insulators in the switchyard. It has been estimated (NUREG/CR-2405) that there is a 50-percent likelihood that they would fail at an acceleration of 0.2 g, leading to a loss of offsite power. However, loss of offsite power alone will not lead to a severe accident. Cooling water can be provided to the core using steam-turbine-driven pumps or by electrical pumps powered by onsite emergency diesel generators. An examination of the fragilities of the components of these emergency systems indicates that their failure likelihood at earthquakes less than the SSE will be governed by random component failures, rather than seismically induced scenarios. Thus, the accident would progress in a manner similar to a transient associated with a loss of offsite power. Since the likelihood of a loss of offsite power at a U.S. plant from all causes is considerably higher than that associated with seismic events less than or equal to the SSE, the contribution of below-SSE earthquakes to overall plant risk is minimal.

In contrast, as seismic intensity increases beyond the SSE, the estimated seismic contribution to risk increases. Large earthquakes would almost always be accompanied by a resultant loss of offsite power. Seismically induced faults in electrical control systems become important as accelerations approach 0.7 g. In addition, the estimated risk associated with severe earthquakes is usually associated with equipment failures resulting from structural collapse or interactions between structures which impose high stresses on piping systems. Absent structural interactions, most components (piping, cable trays, large pumps and compact valves) behave well even in earthquakes significantly above their design conditions. However, this is not universally true and improper location of motor drives or control devices can cause component failures in large earthquakes.

The analyses of seismic risk that have been performed have generally made several potentially conservative assumptions. In most cases, structural degradation has been assumed to disable all components within the damaged structure in order to simplify the analysis. This assumption is clearly extremely conservative, but current analytical techniques permit only a subjective estimate of the degree of conservatism. Thus, a comprehensive estimate of the degree of conservatism introduced must await improvements in analytical techniques.

Another area not usually considered is the ability of the operator to mitigate seismically induced risk. Depending on the types of failures which have occurred, alternate systems may be employed by the operator to ensure core cooling is maintained, or damaged components may be repaired. It is generally assumed that most seismic damage cannot be repaired in a

short period of time. However, some credit has been allowed for restoration of relays which have moved to an unintended state, when they are easily accessible and the misposition can be detected easily from the control room.

Seismically induced accident sequences which take a long time (several hours) to develop provide time for the operator to provide alternate water sources. One hour after plant shutdown, the decay heat level reduces to about 1.5 percent of full power and a 1000 MW(e) reactor can be adequately cooled if a little as 300 gpm of water is provided to the core and allowed to boil. There are many potential sources of water which might be employed for core cooling but the availability depends on the availability of support systems such as AC and DC power. Studies performed to date have not included a comprehensive evaluation of recovery actions following an accident and thus tend to be conservative.

Even in the fastest developing scenarios which have been found risk significant in previous PRAs, core melt does not occur simultaneously with the very large earthquake. Because of the normal heat capacity of material within the reactor vessel and the need to boil whatever water is initially present in the reactor vessel, and considering the additional heat sink available in the steam generators (PWR) or the suppression pool (BWR), at least 30 minutes will elapse between the initial shock and the release of fission products. In most cases, several hours will be available before large releases occur.

Because of the low demand for cooling water flow which the plant requires after shutdown, seismic aftershocks may be less significant than the original shock even if further damage results. Because of the low

heat generation rates involved, a temporary interruption of coolant addition can occur without core damage. However, a detailed examination of the effects of after shocks has not been performed, and a conclusive evaluation of their significance cannot be provided at present.

Issue 13. What is the probability that other natural events (e.g., hurricanes, tornadoes, heavy snow) which are now considered in emergency planning would initiate or occur proximate to an accident resulting in a radionuclide release from a nuclear power plant? How does this compare with earthquakes?

Commission Response:

Only a few probabilistic risk analyses have considered high winds (tornadoes or hurricanes) in the overall risk analysis and the current ability to conduct such analyses is modest. Thus, the results are highly uncertain. The likelihood of severe core damage from high wind speed initiators has been estimated between 4×10^{-5} /year to 1×10^{-8} /year in the studies which have occurred. Obviously, the occurrence of high winds is highly location dependent. Thus this range, which represents the variation in reported results, is not typical of the range expected at any specific site. We are unaware of any PRA study that specifically includes the effects of heavy snowfall. This would normally be treated as one of the causes of a loss of offsite power and not treated separately. External flooding events have been examined in a few PRAs with a resultant estimate of flood-induced severe core damage frequency in the range between 10^{-5} and 10^{-6} per year. Again, these results are highly uncertain because

is the current state of development of the methodology and are highly site specific.

The results of recent PRAs indicate that the estimated contribution of seismic events to plant risk is of the same order as that from flooding and high winds at certain sites. This is highly site specific, however, and is not applicable at all sites. In areas where the frequency of high winds or flooding is relatively low, the seismic risk contribution will dominate.

Conclusion: Having considered all of the above, as well as all comments received, past operating reactor and emergency preparedness experiences, and the ACRS comments, the Commission has determined that a final rule be promulgated that would:

1. Clarify and articulate the Commission's original premise that emergency plans have inherent flexibility to assure that there exists "...reasonable assurance that appropriate protective actions can and will be taken..." to mitigate (not eliminate) the consequences of a radiological accident.
2. Require the ability to transport necessary personnel to the plant after the event in order to augment the original staff as necessary to cope with degraded modes of plant operation.
3. Require the ability by the licensee to assess damage to the plant and to translate this information into projections of the expected or actual radiation hazard offsite, and be able to communicate this information to offsite authorities, so that this information will be available

as a factor in the decisionmaking process, including recommendations for protective actions after severe, low-frequency, natural phenomena.

4. Recommend that in considering the complicating impacts of severe, low frequency natural phenomena, State and local governments should identify, in their emergency plans, alternate routes of travel and methods for determining whether to shelter or evacuate.

In reaching this decision, the Commission has weighed all of the above issues raised by the commentors. Additionally the Emergency Action Level scheme addressed in NUREG-0654 specifies that an emergency be declared in the event that a "Natural phenomenon is being experienced..." at the plant. As the intensity of the natural phenomenon increases so does the classification of the emergency. A few of the required licensee actions when the plant experiences a natural phenomenon beyond the design basis would be to "augment resources by activating the on-site Technical Support Center, on-site operational support center and the near-site Emergency Operations Facility"; and to "Dedicate an individual for plant status updates to offsite authorities..."; and to "Provide meteorological and dose estimates to offsite authorities...". These presently required licensee actions, taken in conjunction with responsibilities of the State and local governmental authorities during an emergency, lead the Commission to conclude that the elements in the proposed final regulation are logical and warranted.

In addition, the Commission conducted a review of emergency exercises at nuclear power plants and licensee response to potential accidents as well as an analysis of 20 actual, non-nuclear evacuations for which information was readily available (see Issue 1). This review demonstrated the validity of the Commission's belief that emergency plans do have sufficient flexibility to assure that protective actions can and

will be taken to mitigate the consequences of a wide spectrum and combination of accidents. Thus, this information taken in conjunction with the FEMA programs addressed in the Commission's response to Issue 11, provides substantial support for the position that no additional emergency preparedness measures need be established to account for severe natural phenomena.

Considering all of the above, it can be argued that the inherent flexibility in emergency plans outweighs the uncertainties concerning the expected frequency of occurrence of severe reactor accidents resulting from or occurring proximate to severe low frequency natural phenomena (e.g., earthquakes, tornadoes) which have the potential for complicating the emergency response to these accidents. However, on balance, considering the points raised by many of the public commentators and in view of the Emergency Action Level logic along with the potential magnitude of the uncertainties identified the Commission has decided that a more conservative approach is appropriate and amend its regulations to explicitly require some limited consideration of the complicating effects of severe, low frequency natural phenomena on emergency planning. This will provide added assurance that adequate protective actions can and will be taken in the event of a radiological emergency complicated by the effects of such natural phenomena. The staff recommendation that only limited consideration be given is based on three things:

- (1) inherent flexibility and demonstrated effectiveness of offsite plans and preparations (local, State FEMA, etc.) to handle severe low frequency natural phenomena.

(2) residual risks from such phenomena complicating a nuclear emergency are small.

(3) devastation from the phenomena itself and other associated complications (e.g., release of chemicals, fires, rupturing of dams) will likely far exceed the incremental impact of the complicating effect of the natural phenomena on a nuclear emergency.

In spite of this the staff felt it necessary to specifically assure that provisions were in place to:

(1) transport necessary personnel to the plant after the event in order to augment the original staff as necessary to cope with degraded modes of plant operation,

(2) be able to provide needed information concerning the status of the plant to offsite authorities so that these authorities would be able to take the status of the plant into account in formulating and carrying out emergency measures following the natural phenomena, and

(3) that offsite plans should include consideration of alternative actions which could be taken if there were damage to the plant environs.

This final rule would specifically not require:

1. Evacuation time estimates that consider the complicating effects of severe, low frequency natural phenomena. This is not being recommended because a natural phenomenon beyond the design basis would cause such unpredictable patterns of disruption and devastation that the time estimates may be misleading.

2. That roads, bridges, buildings and other structures be reinforced to withstand the effects of severe, low frequency natural phenomena.

3. A detailed, extensive study considering the complicating effects of earthquakes or other natural phenomena on offsite emergency response capabilities. For example, the Commission specifically considers that the "TERA" study completed for Diablo Canyon is well beyond the scope and intent of what would be required by this rulemaking.

Likewise, the Commission's intentions relative to each item in the rule are as follows:

Item 1. Ability to transport necessary personnel to the plant after the event in order to augment the original staff as necessary to cope with degraded modes of plant operation including emergencies.

This item means that a licensee's emergency plan must contain adequate consideration of the necessity of having at the plant or getting to the plant, adequate personnel to cope with the plant operations under adverse conditions. Thus, the plans must consider alternate methods for getting selected personnel to the plant if a severe, low frequency natural phenomenon, occurs and disrupts the normal transportation routes to the site.

The licensee's onshift operating crew is adequate to safely operate the plant and to initially respond to emergencies. However, operating crews and other plant personnel must be relieved after a reasonable time or special support skills may be required. Thus, this item requires the licensee to perform adequate planning (transportation arrangements) to ensure that they can get relief personnel and other necessary personnel

to the plant in 12 to 24 hours after the start of the phenomenon. For those phenomena which are amenable to prediction (i.e., hurricanes, severe ice and snow storms, and floods) the licensee should consider contingency measures such as maintaining more than one operating shift on station if the phenomenon is anticipated.

This item does not mean that the staffing goals of Table B-1 of NUREG-0654 must be met in the event of an emergency at the plant and the simultaneous occurrence of unpredicted severe, low frequency natural phenomena which impede normal transportation routes.

Item 2. Ability by the licensee to assess damage to the plant and to translate this information into projections of the expected or actual radiation hazard offsite, and be able to communicate this information to offsite authorities, so that this information will be available as a factor in the decisionmaking process, including recommendations for protective actions after severe, low-frequency, natural phenomena.

This item relates to the information available for transmission by the licensee (i.e., estimates of onsite damage) to the offsite authorities and the inclusion of such information by the licensee into the decisionmaking process for (1) developing recommendations to offsite authorities of protective actions, and (2) determining appropriate actions by the licensee to respond to the event and its impacts on plant operations, if any.

The existing regulations require that the licensee's emergency plans contain provisions for the gathering of information concerning damage sustained by the plant as a result of any accident, including the occurrence of severe, low frequency natural phenomena. This information would

be used by the licensee in its decisionmaking process regarding plant operations and protective action recommendations for the public. The implementation of this item recognizes the existence of the current diverse communications means (i.e., radios, direct link dedicated telephones, microwave telephone links and standard commercial telephone links) already in a place at nuclear power plants to communicate that information offsite. These systems are expected to be adequate to fulfill the provisions of this requirement.

This item does not mean that equipment used to transmit information within the plant or from the plant to offsite authorities must meet any special seismic or environmental qualifications above those for which the equipment is presently designed. However, the licensee should assure that adequate communications are available (e.g., mobile radios) to transmit information between the licensee and local offsite authorities in order to discuss public protective actions, after a severe, low frequency natural phenomenon.

Item 3. In considering the complicating impacts of severe, low frequency natural phenomena, State and local governments should identify, in their emergency plans, alternate routes of travel and methods for determining whether to shelter or evacuate.

This item means that State and local offsite emergency response plans must contain adequate provision to assure that information regarding the damage sustained to the areas surrounding a plant, and the adverse impact of that damage to offsite responses to a radiological emergency at the plant, are (1) transmitted by the offsite authorities to the licensee and (2) appropriately considered by the licensee and offsite authorities in their decisionmaking. Guidance for offsite authorities on the use of

alternate evacuation routes and the balancing of public protective actions (i.e., evacuation, sheltering, relocation) should be included in the offsite plans.

Because FEMA is directly involved in the evaluation of offsite emergency preparedness exercises and is affected by the promulgation of these amendments, the NRC consulted extensively with FEMA during the development of this rule and as a result FEMA has concurred in the rule change.

FINDING OF NO SIGNIFICANT ENVIRONMENT IMPACT

The Commission has determined under the National Environmental Policy Act of 1969, as amended, and the Commission's regulations in Subpart A of 10 CFR Part 51, that this rule, is not a major Federal action significantly affecting the quality of the human environment and therefore an environmental impact statement is not required. See 10 CFR 50.22(a)(1). Moreover, the Commission has determined, pursuant to 10 CFR 51.32, that the final rule has no significantly environmental impact. This determination has been made because the Commission cannot identify any impact on the human environment associated with limited consideration of the complicating effects of severe, low frequencies natural phenomena on emergency preparedness.

The alternative approaches that were considered in this rulemaking proceedings were:

1. Not to consider the complicating effects of earthquakes on emergency plans or evacuation time estimates.
2. Not to require additional emergency preparedness measures to cope with the complicating effects of earthquakes.

3. Leave the complicating effects of earthquakes on emergency planning open to consideration on a case-by-case basis.
4. Requiring that State Earthquake Preparedness take into account all nuclear power plants within their boundaries.
5. Promulgate a rule change which would require the full assessment of the complicating effects of severe, low frequency natural phenomena on emergency planning.

PAPERWORK REDUCTION ACT STATEMENT

The final rule contains no information collection requirements and therefore is not subject to the requirements of the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.).

REGULATORY ANALYSIS

The Commission has prepared a regulatory analysis of this regulation. The analysis examines the costs and benefits of the rule as considered by the Commission. A copy of the regulatory analysis is available for inspection and copying, for a fee, at the NRC Public Document Room, 1717 H Street NW., Washington, DC. Single copies of the analysis may be obtained from Michael T. Jamgochian, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555, Telephone (301)443-7615.

REGULATORY FLEXIBILITY CERTIFICATION

In accordance with the Regulatory Flexibility Act of 1980, 5 U.S.C. § 605(b), the Commission hereby certifies that this final rule will not,

if promulgated, have a significant economic impact on a substantial number of small entities. The final rule clarifies certain elements and findings necessary for the issuance of an operating license for a nuclear power plant licensed pursuant to Section 103 and 104b of the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2133, 2134b. The electric utility companies which own and operate nuclear power plants are dominant in their service areas and do not fall within the definition of a small business found in Section 3 of the Small Business Act, 15 U.S.C. 632, or within the Small Business Size Standards set forth in 13 CFR Part 121. Accordingly, there is no significant economic impact on a substantial number of small entities under the Regulatory Flexibility Act of 1980.

LIST OF SUBJECTS IN 10 CFR PART 50

Part 50 - Antitrust, Classified information, Fire prevention, Incorporation by reference, Intergovernmental relations, Nuclear power plants and reactors, Penalty, Radiation protection, Reactor siting criteria, Reporting and recordkeeping requirements.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and Section 552 and 553 of Title 5 of the United States Code, notice is hereby given that the following amendments to Title 10, Chapter I, Code of Federal Regulations, Part 50 is published as a document subject to codification.

PART 50 - DOMESTIC LICENSING OF PRODUCTION
AND UTILIZATION FACILITIES

1. The authority citation for Part 50 continues to read as follows:
AUTHORITY: Sections 103, 104, 161, 182, 183, 186, 189, 68 Stat. 936, 937, 948, 953, 954, 955, 956, as amended, sec. 234, 83 Stat. 1244, as amended (42 U.S.C. 2133, 2134, 2201, 2232, 2233, 2236, 2239, 2282); secs. 201, 202, 206, 88 Stat. 1242, 1244, 1246, as amended (42 U.S.C. 5841, 5842, 5846), unless otherwise noted.

Section 50.7 also issued under Pub. L 95-601, sec. 10, 92 Stat. 2951 (42 U.S.C. 5851). Sections 50.57(d), 50.58, 50.91, and 50.92 also issued under Pub. L. 97-415, 96 Stat. 2071, 2073 (42 U.S.C. 2133, 2239). Section 50.78 also issued under sec. 122, 68 Stat. 939 (42 U.S.C. 2152). Sections 50.80-50.81 also issued under sec. 184, 68 Stat. 954, as amended (42 U.S.C. 2234). Sections 50.100-50.102 also issued under sec. 186, 68 Stat. 955 (42 U.S.C. 2236).

For the purposes of Sec. 223, 68 Stat. 958, as amended (42 U.S.C. 2273), §§ 50.10(a), (b), and (c), 50.44, 50.46, 50.48, and 50.80(a) are issued under 161b, 68 Stat. 948, as amended (42 U.S.C. 2201(b)); §§ 50.10(b) and (c) and 50.54 are issued under sec. 161i, 68 Stat. 949, as amended (42 U.S.C. 2201(i)); and §§ 50.55(e), 50.59(b), 50.70, 50.71, 50.72, 50.73, and 50.78 are issued under sec. 161o, 68 Stat. 950, as amended (42 U.S.C. 2201(o)).

In Appendix E, Section IV "Content of Emergency Plans" is revised to read as follows:

IV. Content of Emergency Plans

The applicant's emergency plans shall contain, but not necessarily be limited to, information needed to demonstrate compliance with the elements set forth below, i.e., organization for coping with radiation emergencies, assessment action, activation of emergency organization, notification procedures, emergency facilities and equipment, training, maintaining emergency preparedness, and recovery. In addition, the emergency response plans submitted by an applicant for a nuclear power reactor operating license shall contain information needed to demonstrate compliance with the standards described in § 50.47(b), and they will be evaluated against those standards. The nuclear power reactor operating license applicant shall also provide an analysis of the time required to evacuate and for taking other protective actions for various sectors and distances within the plume exposure pathway EPZ for transient and permanent populations.

*The nuclear power reactor operating licensee and applicant emergency response plans shall assure that the following capabilities exist relative to the complicating impacts of severe, low frequency natural phenomena characteristic of the site. In addressing the following capabilities the licensee shall assume that the severe natural phenomenon has disrupted normal communication and road networks.

1. Ability to transport necessary personnel to the plant after the event in order to augment the original staff as necessary to cope with degraded modes of plant operation.

*This rule change is typed in comparative text in order to assist review.

2. Ability by the licensee to assess damage to the plant and to translate this information into projections of the expected or actual radiation hazard offsite, and be able to communicate this information to offsite authorities, so that this information will be available as a factor in the decisionmaking process, including recommendations for protective actions after severe, low-frequency, natural phenomena.

In considering the complicating impacts of severe, low frequency, natural phenomena, State and local governments should identify, in their emergency plans, alternate routes of travel and methods for determining whether to shelter or evacuate.

* * * * *

Dated at _____ this ____ day of _____, 1985.

For the Nuclear Regulatory Commission.

Samuel J. Chilk
Secretary of the Commission

ENCLOSURE 2

EVACUATIONS

Location	Date	Cause(s)	Emer- gency Plan	Number of People Evac.	Time	Inju- ries	Deaths	Distance (up to)	Comments
Decatur, Ill	7/19/74	Tank car explosion and fire	No	30,000	3 hrs	None	None	15 miles	rapid communication
Madison County, Idaho	6/6/76	Teton Dam broke	No	7,000	30 mins	None	None	30 miles	well organized; good communications
Freemont Co., Idaho	6/6/76	Teton Dam broke	No	2,800	1-1-1/2 hrs	None	None	5 miles	6 deaths - refused to leave
Jackson, Miss and Jackson County	4/15/79	Flood of Pearl River	Yes	6,500	12-18 hrs	None	1	2.3 miles	Well prepared but meet resistance from residents
Wichita Falls, TX	5/5/79	Tornado	Yes	100,000 sheltered	N/A	None	None	N/A	Organized system of communications
Mobile, Ala and 2 coasted counties	1979	Hurricane	Yes	100,000	within 17 hrs	None	None	300 miles	Prepared in advance; ability to communicate
Phoenix, AR	2/17/80	Flooding	Yes	20,000	6 hrs	None	None	3 miles	Advance preparation and ability to communicate
Port Jarvis, NY	2/12/81	Flooding of the Delaware River	Yes	3,000	2 hrs	None	1	1 mile	Death involved a retarded youth who became confused success due to organiza- tion and communication
South San Fran., CA	8/22/81	Toxic gas cloud from chemical plant	No	3,000- 5,000	30 mins	None	None	1/2 mile	People were told to leave area
Marysville, WA	10/6/81	Chlorine gas cloud	Yes	2,000	2 hrs	None	None	4 miles	Occurred after midnight; went door-to-door
Cameron, LA	9/10/82	Hurricane	Yes	3,000	3 hrs	None	None	50 miles	Communication between Federal and State to local parishes
Taft, LA	12/11/82	Chemical plant accident	Yes	17,000	2.5 hrs to 3.5 hrs	None	None	10 miles	Well prepared
Denver, CO	4/3/83	Rail accident, nitric acid spill	Yes	9,000	3.5 hrs	None	None	10 miles	Had prepared for contingencies
Jackson, MISS	5/21/83	Pearl River Flood	Yes	3,100	12-18 hrs	None	None	2.3 miles	Moved to higher ground- well prepared for restart actions
Moncks Cornor, SC	7/7/83	Leak in Pinopolis dam, Lake Moultrie	Yes	3,000	2.5 to 3 hrs	None	None	10 miles	Ability to communicate

EVACUATIONS (Continued)

Location	Date	Cause(s)	Number		Time	Inju- ries	Deaths	Distance (up to)	Comments
			Emer- gency Plan	of People Evac.					
Passaic County, NJ	4/5/84	Flooding	Yes	500	N/A	None	None	3 miles	Organized; moving people for 5 days on and off
Marshville, NC	4/10/84	Train derailment and fire	No	22,000	15 mins	None	None	12 miles	Residential area; good communication
Mt. Vernon, WA	4/23/81	Train derailment	No	1,000	3 hrs	None	None	1.5 mile	Communication
Sedro Wolley, WA	3/20/81	Train derailment	No	1,500	3 hrs	None	None	1 mile	Early morning - went door-to-door
Gulf Coast - 12 Counties	8/10/80	Hurricane	Unav.	400,000	Unav.	None	13	Unav.	Death not due to evacuation; well prepared and drilled

ENCLOSURE 3

Regulatory Analysis for Final Rulemaking
to 10 CFR Part 50 Appendix E;
Emergency Planning and Preparedness for
Production and Utilization Facilities

Statement of the Problem

On December 8, 1981, the Commission ruled in a then pending adjudication that its emergency planning regulations do not require consideration of potential earthquake effects on emergency plans for nuclear power reactors. Southern California Edison Company, et al. (San Onofre Nuclear Generating Station, Units 2 and 3), CLI-81-33, 14 NRC 1091 (1981). In so ruling the Commission stated:

The Commission will consider on a generic basis whether regulations should be changed to address the potential impacts of a severe earthquake on emergency planning. For the interim, the proximate occurrence of an accidental radiological release and an earthquake that could disrupt normal emergency planning appears sufficiently unlikely that consideration in individual licensing proceedings pending generic consideration of the matter is not warranted.
14 NRC at 1092.

The Commission affirmed this position in the Diablo Canyon proceeding. Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2), CLI-84-12, 20 NRC 249 (August 10, 1984). In this decision the Commission stated that it would initiate rulemaking "to address whether the potential for seismic impacts on emergency planning is a significant enough concern for large portions of the nation to warrant the amendment of the regulations to specifically consider those impacts." 20 NRC at 254. The focus of this rulemaking is to "obtain additional information to determine whether, in spite of current indications to the contrary, cost-effective reductions in overall risk may be obtained by the explicit consideration of severe earthquakes in emergency response planning." Id. at 254-255.

Objective

On December 21, 1984, the Commission published a proposed amendment to portions of 10 CFR Part 50 relating to earthquakes and emergency planning (49 FR 49640). The proposed rule stated that neither emergency response plans nor evacuation time analyses need consider the impact of earthquakes which cause or occur proximate in time with an accidental release of radioactive material from a nuclear power reactor. These amendments to 10 CFR 50.47 and 10 CFR Part 50 Appendix E proposed to explicitly adopt by rule the Commission's interpretation of its existing rules in the Commission San Onofre and Diablo Canyon decisions.

The overall objective of the proposed rule, was to obtain public input relative to the merits of three possible alternatives:

1. Adoption of the proposed rule explicitly incorporating the Commission interpretation in San Onofre and Diablo Canyon, not to consider the impacts of earthquakes in emergency planning.
2. Leaving the issue open for adjudication on a case-by-case basis; or
3. Requiring by rule that emergency plans specifically address the impacts of earthquakes.

The Commission was also considering whether to include in this rulemaking tornadoes and other low-frequency natural events.

Alternatives

After review of the San Onofre and Diablo Canyon decisions and all public comments, the staff considered three alternative approaches:

Alternative 1. Adoption of the proposed rule into a final rule with minor but important word changes, for example, "no additional emergency preparedness measures need be established to account for severe, low frequency natural phenomena than is already required in 10 CFR 50.47 and Appendix E."

- Pro:
1. Narrows litigation of the issue in individual licensing cases.
 2. Does not arbitrarily focus on earthquakes.
 3. Makes explicit the Commission's position that reasonable plans for coping with severe natural phenomena are already in place.

Con: 1. Significant public concerns may appear to be dismissed without due consideration.

2. Can be perceived as inconsistent with the Commission's approach to severe accidents and the concept of defense in depth.

Alternative 2. Leaving the issue open for adjudication on a case-by-case basis; accomplished by withdrawing the proposed rule or by requiring consideration of earthquakes.

Pro: Permits consideration of special plant or site factors.

Con: 1. The litigation itself would have no bounds--e.g., strength of bridges and roads may be litigated.

2. Prolong the licensing process through adjudication.

Alternative 3: Promulgate a final rule which incorporates justification previously used by the Commission and states that emergency response plans shall assure that the following capabilities exist relative to the complicating impacts of severe, low frequency natural phenomena characteristic of the site. In addressing the following capabilities the licensee shall assume that the severe natural phenomena has disrupted normal communication and road networks.

1. Ability to transport necessary personnel to the plant after the event in order to augment the original staff as necessary to cope with degraded modes of plant operation.

2. Ability by the licensee to assess damage to the plant and to translate this information into projections of the expected or actual radiation hazard offsite, and be able to communicate this information to offsite authorities, so that this information will be available as a factor in the decisionmaking process, including recommendations for protective actions after severe, low-frequency, natural phenomena.

In considering the complicating impacts of severe, low frequency natural phenomena, state and local governments should identify, in their emergency plans, alternate routes of travel and methods for determining whether to shelter or evacuate.

Pro: 1. Such a rule would lend greater specificity to the Commission's original premise that emergency plans are sufficiently flexible to accommodate a spectrum of events, including the potential complicating impacts of severe, low frequency natural phenomena.

2. Defines scope of issues open to litigation.

3. Includes all natural phenomena rather than focusing arbitrarily on earthquakes.

4. This is consistent with the Commission's action in other areas dealing with possible accidents with low predicted return frequencies.

Con: 1. Permits litigation in those areas covered by the rule. This may extend the licensing process.

2. May open litigation at operating reactors (through 10 CFR 2.206).

Consequences

NRC

The staff believes that the limited consideration of severe, low frequency natural phenomena will require the NRC staff to review the licensees' emergency plan amendments. This review might require a one time cost of up to 6 FTE over two years.

Other Government Agencies

The proposed rule change will have an impact on FEMA because the modification to State and local plans will be reviewed with the annual updating of emergency plans.

Industry

The proposed amendment will affect the industry in that licensees will be required to modify their emergency plans in order to account for severe low frequency natural phenomena characteristic of the site and may result in the purchase of additional communications equipment and transportation services to support onsite and offsite response organizations.

Public

The proposed amendment will effect the public only to the extent that it provides added assurance of adequate emergency preparedness at nuclear reactors in the event of a nuclear accident complicated by the effects of a severe, low probability, natural phenomenon.

Impact on Other Requirements

The proposed rule change will require a Guidance Memorandum from FEMA and IE in order to provide guidance to State and local governments on acceptable means for implementing the regulation.

Constraints

No constraints have been identified that affect the implementation of the proposed rule.

Decision Rationale

Having considered all of the above, as well as all comments received, past operating reactor and emergency preparedness experiences and the ACRS comments, the staff recommends that Alternative 3 be adopted. In reaching this recommendation the staff has given consideration to the following arguments.

Commentors raised the following issues concerning earthquakes and emergency preparedness:

- o Limited or no record exists concerning the flexibility of emergency plans to support the proposed rule; therefore, the Commission cannot make a generic finding that effects of earthquakes on emergency planning are always resolved by the general flexibility of emergency plans (see Issue 1, Enclosure 1),
- o Current emergency plans take into consideration plant accidents whose probability are in the range of $10E(-4)$ to $10E(-5)$. These plans should consider the complicating effects of severe, natural phenomena (2 to 4 times the SSE) whose return frequency is in the same range (see issue 3, Enclosure 1),

- o Defects in seismic design and quality assurance in construction can undermine the seismic strength of plant systems and structures (see Issue 6 in Enclosure 1), and
- o There is limited existing information on the contribution of seismic events to overall core melt frequency (see Issues 5 and 12, Enclosure 1) in that only a few PRAs assess seismic risks and the treatment entails many uncertainties.

Additionally the Emergency Action Level scheme addressed in NUREG-0654 specifies that an emergency be declared in the event that a "Natural phenomenon is being experienced..." at the plant. As the intensity of the natural phenomenon increases so does the classification of the emergency. A few of the required licensee actions for the Site Area and General Emergencies when the plant experiences a natural phenomenon beyond the design basis would be to "augment resources by activating the on-site Technical Support Center, on-site operational support center and the near-site Emergency Operations Facility"; and to "Dedicate an individual for plant status updates to offsite authorities..."; and to "Provide meteorological and dose estimates to offsite authorities...". These presently required licensee actions, taken in conjunction with responsibilities of the State and local governmental authorities during an emergency leads the staff to conclude that the elements in the proposed final regulation are logical and warranted.

In addition, the staff conducted a review of emergency exercises at nuclear power plants and licensee response to potential accidents as well as an analysis of 20 actual, non-nuclear, evacuations for which information was readily available (see Issue 1, Enclosure 1 and Enclosure 2). This review demonstrated the validity of the Commission's belief that emergency plans do have sufficient flexibility to assure that protective actions can and will be taken to mitigate the consequences of a wide spectrum and combination of accidents. Thus, this information provides substantial support for the position that no additional emergency preparedness measures need be established to account for severe natural phenomena.

In addition, the Federal Emergency Management Agency (FEMA), which is responsible for reviewing and assuring effective offsite emergency preparedness and response has several programs in place or underway to assure that an integrated capability exists for protecting the public health and safety in the

event of an emergency. These programs (see Issue 11) include: The Radiological Emergency Preparedness (REP) program and the Earthquake Hazard Reduction program. When completed, the Earthquake Hazard Radiation Program will provide the basis for adequate Federal, State and local government response to protect the public in the very unlikely event of a coincident major earthquake and radiological emergency. The Radiological Emergency Preparedness program presently assures an integrated capability exists for State and local governments, together with utilities, to implement protective measures in the event of an emergency. FEMA programs are carried out in a manner that the integration of common functions such as communication, alert and notification, protective actions and decision-making is addressed, while recognizing unique management requirements such as radiological measurements.

Considering all of the above it can be argued that the inherent flexibility in the plans outweighs the uncertainties concerning the expected frequency of occurrence of severe reactor accidents resulting from or occurring proximate to severe low frequency natural phenomena (e.g., earthquakes, tornadoes) which have the potential for complicating the emergency response to these accidents. However, on balance, considering the points raised by many of the public comments and in view of the Emergency Action Level logic along with the potential magnitude of the uncertainties identified, the staff has decided that a more conservative approach is appropriate and recommend amending the regulations to explicitly require some limited consideration of the complicating effects of severe, low frequency natural phenomena on emergency planning. This will provide added assurance that adequate protective actions can and will be taken in the event of a radiological emergency complicated by the effects of such natural phenomena. The staff recommendation that only limited consideration be given is based on 3 things:

- (1) inherent flexibility and demonstrated effectiveness of offsite plans and preparations (local, State FEMA, etc.) to handle severe low frequency natural phenomena.

- (2) residual risk from such phenomena complicating a nuclear emergency are small.

- (3) devastation from the phenomena itself and other associated complications (e.g., release of chemicals, fires, rupturing of dams) will likely far exceed the incremental impact of the complicating effect of the natural phenomena on a nuclear emergency.

In spite of this the staff felt it necessary to specifically assure that provisions were in place to:

(1) transport necessary personnel to the plant after the event in order to augment the original staff as necessary to cope with degraded modes of plant operation,

(2) be able to provide needed information concerning the status of the plant to offsite authorities so that these authorities would be able to take the status of the plant into account in formulating and carrying out emergency measures following the natural phenomena, and

(3) that offsite plans should include consideration of alternative actions which could be taken if there were damage to the plant environs.

This final rule would:

1. Clarify and articulate the Commission's original premise that emergency plans have inherent flexibility to assure that there exist reasonable assurance that appropriate protective actions can and will be taken to mitigate (not eliminate) the consequences of a radiological accident.

2. Require the ability to transport necessary personnel to the plant after the event in order to augment the original staff as necessary to cope with degraded modes of plant operation.

3. Require the ability by the licensee to assess damage to the plant and to translate this information into projections of the expected or actual radiation hazard offsite, and be able to communicate this information to offsite authorities, so that this information will be available as a factor in the decisionmaking process, including recommendations for protective actions after severe, low-frequency, natural phenomena.

4. Recommend that in considering the complicating impacts of severe, low frequency natural phenomena, State and local governments should identify, in their emergency plans, alternate routes of travel and methods for determining whether to shelter or evacuate.

This staff recommendation would specifically not require:

1. Evacuation time estimates that consider the complicating effects of severe, low frequency natural phenomena. This is not being recommended because a natural phenomena beyond the design basis would cause such unpredictable patterns of disruption and devastation that the time estimates would probably be meaningless and in fact may be misleading.

2. That roads, bridges, buildings and other structures be reinforced to withstand the effects of severe, low frequency natural phenomena.

3. A detailed, extensive study considering the complicating effects of earthquakes or other natural phenomena on offsite emergency response capabilities. For example, the staff specifically considers that the "TERA" study completed for Diablo Canyon is well beyond the scope and intent of what would be required by this rulemaking.

Implementation

In order to be responsive to Commission direction, the staff has established the following schedule for publication of the proposed rule change.

Proposed Rule Published in Federal Register - 12/21/84

60-Day Comment Period - 2/85

Final Rule Published in Federal Register - 9/85