

**ACTION**

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

JUN 13 1985

To Gillespie  
from Minogue  
(still looking at)  
rest Shirley  
6/13/85  
Done 6/17/85

MEMORANDUM TO: Distribution

FROM: Frank P. Gillespie, Director  
Division of Risk Analysis and Operations  
Office of Nuclear Regulatory Research

SUBJECT: OFFICE REVIEW OF STAFF POSITION RELATING TO COMPLICATING  
EFFECTS OF EARTHQUAKES ON EMERGENCY PLANNING

On June 27, 1985, the Subcommittee on Energy Conservation and Power (E. J. Markey) will hold an oversight hearing relating to the NRC's handling of the possible complicating effects of earthquakes on emergency planning for Diablo Canyon.

Based on EDO directions received at a June 11, 1985 meeting, the staff work on the subject Commission paper has been accelerated. We have been directed to send the paper to the EDO by June 24. The enclosed paper is the staff's best effort to date and describes three alternatives (1) adopt the proposed rule as a final rule (2) withdraw the proposed rule and leave the issue open for adjudication on a case-by-case basis or (3) issue a final rule which clarifies the original intent of the Commission which might state that emergency response plans shall include an assessment of the complicating effects of severe low frequency natural phenomena that could be expected during the lifetime of the plant (e.g., an earthquake up to the SSE). The staff and the ACRS are presently favoring the last alternative.

It is therefore requested that, by COB Monday, June 17, 1985, you provide input to the paper, as well as your agreement or disagreement with the position presented. Office comments will then be consolidated, retyped and resubmitted to you by June 21 and then submitted to EDO on June 24, 1985. Mike Jamgochian, 443-7615 will be coordinating all office comments.

*Frank P. Gillespie*

Frank P. Gillespie, Director  
Division of Risk Analysis and Operations  
Office of Nuclear Regulatory Research

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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 THE CONTEXT OF EMERGENCY PREPAREDNESS

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 earthquakes in emergency planning.

Category: This paper covers a major policy matter.

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. In the Matter of 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. In the Matter of Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2), CLI-84-12, 20 NRC \_\_\_\_\_ (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

Contact:  
Mike Jamgochian, RES  
443-7615

warrant the amendment of the regulations to specifically consider those impacts." Slip Opinion at 9. 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.

Discussion:

On December 21, 1984, the Commission published a proposed rule change to 10 CFR Part 50 that relates to Emergency Planning and Preparedness at Production and Utilization Facilities (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 incorporate in them the interpretation in the Commission San Onofre and Diablo Canyon rulings.

When the proposed rule was published in the Federal Register (49 FR 49640, dated December 21, 1984), it permitted a 30-day comment period. This was then extended until February 27, 1985 (see 50 FR 3797, dated January 28, 1985).

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

1. Adoption of the proposed rule change which would explicitly incorporate 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.

To date, 61 comment letters have been received. Twenty five (25) letters favored the promulgation of the proposed rule. The majority of these letters were from utilities, consulting firms representing utilities, 2 private citizens and the Department of Energy.

Thirty-four (34) letters were received which were against promulgation of the proposed rule, many of which, voicing strong displeasure, shock or disbelief as to the direction that the Commission was leaning in the proposed rule change. The majority of these letters were from private citizens, intervention groups and environmental groups. Approximately \_\_\_\_\_ of these letters were in the signed petition form with approximately \_\_\_\_\_ signatures per letter.

Additional input was also received from the following foreign countries, all of which stated that the potential complicating effects of earthquakes was not specifically considered in their nuclear power reactor emergency planning: Japan, France, Sweden, Germany and Taiwan. None of the commentors specifically took a position with the second alternative which would leave the issue open for adjudication on a case-by-case basis.

All of the commentors that favored promulgation of the proposed rule into a final rule essentially agreed with the rationale that the Commission used in the Federal Register Notice and provided little amplification or additional conceptual logic which would further support the proposed rule change. Nonetheless, those commentors that were against the proposed rule change provided the Commission with argument that questioned the validity of the rationale in the Federal Register Notice and focused on additional issues that are addressed in the proposed Federal Register Notice (Enclosure 1) of this rulemaking package.

X

X

Alternatives:

After careful review of both the San Onofre and Diablo Canyon decisions involving the complicating effects of earthquakes on emergency planning, as well as all public comment letters resulting from the proposed rule change that was published in the Federal Register on December 21, 1984, the staff perceives that there exists 5 fundamental alternative approaches which the Commission may wish to consider:

Alternative 1. Adoption of the proposed rule into a final rule--"neither emergency response plans nor evacuation time analysis need consider the impacts of earthquakes."

- Pro: 1. Provides for no litigation.
- 2. Is consistent with what other countries are doing.
- 3. Is consistent with the Commission's San Onofre and Diablo Canyon decision.

- Con: 1. Provokes outrage by the public because it is perceived that the Commission is attempting to "void" or "write-off" earthquakes.

*Walter Langford*

2. PRA analyses have indicated that earthquakes are among dominate causes of core melt accidents, it has been considered by some commentors irrational to not consider the effects of these same earthquakes on emergency response.

Alternative 2. 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. Provides for no litigation.
  2. The modified wording does not arbitrarily focus on earthquakes.
  3. The modified wording gives the perception that reasonable plans for coping with severe natural phenomena are already in place.

Con: 1. The public may <sup>perceive</sup> realize that we are doing nothing as a result of their <sup>wrong word</sup> input, other than modifying words.

Alternative 3. 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:

- Con:
1. Unnecessarily prolongs the licensing process.
  2. The litigation has no bounds--i.e., strength of bridges and roads may be litigated.

Alternative 4. Promulgate a final rule which might state that "State earthquake preparedness planning shall take into account all nuclear power plants within its boundaries. In so doing, the Commission finds that this would provide reasonable assurance that adequate protective measures can and will be taken."

- Pro:
1. Blends the nuclear power plant in with other industries.
  2. Provides comparable protection to the public relative to other industries throughout the State.
  3. May not require the State to establish additional preparedness around a nuclear power reactor.

- Con:
1. Because each State's ability to deal with earthquakes is different, the generic finding of reasonable assurance may be inappropriate to make.
  2. The State's earthquake preparedness program would be open to litigation and possibly would be open to litigation and may cause more delay in the licensing process.

Alternative 5: Promulgate a final rule which clarified the original intent of the Commission and might state that emergency response plans shall assure that the following decisionmaking preplanning capabilities exist relative to the complicating impacts of severe, low frequency natural phenomena that could be expected during the life of the plant. The intensity of the event shall be no greater than the design basis for that event.

1. Ability to transport necessary personnel to the plant to cope with degraded modes of plant operation.
2. Ability to communicate to the offsite authorities any plant damage.
3. Ability to obtain damage estimates to the plant. This information should be available to factor into the decision-making process, including recommendations to offsite authorities for protective actions after severe, low frequency natural phenomena.
4. Offsite authorities should consider decisionmaking preplanning that takes into account various degrees and locations of damage to the plant environs.

- Pro:
1. Limits litigation.
  2. This would be a clarification rule change, thus the Commission would not be seen as changing its decisions.
  3. This is a compromise position between not requiring consideration of earthquakes and requiring consideration.
  4. This includes all natural phenomena.
  5. This consideration has already been done at San Onofre and Diablo Canyon.
  6. This assessment is not that difficult or expensive to accomplish.

- Con:
1. May permit some litigation of the adequacy of assessment performed.

2. May open litigation at operating reactors.

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 a final rule be promulgated that would embrace the concepts of Alternative 5. This final rule would:

1. Clarify and articulate the Commission original concept of specifying what flexibility is required in emergency plans in order 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. Assure the capability to transport necessary personnel to the plant to cope with the degraded modes of plant operation.
3. Assure the capability to communicate to the offsite authorities any plant damage.
4. Assure the capability to obtain plant damage estimates.
5. Assure that offsite authorities consider decisionmaking preplanning that takes into account various degrees and locations of offsite damage resulting from severe, low frequency natural phenomena.

This staff recommendation would specifically not require:

1. Evacuation time estimates that consider the complicating effects of severe, low frequency natural phenomena.
2. That roads, bridges, buildings and other structures be reinforced to withstand the effects of severe, low frequency natural phenomena.

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. Based on this interaction, FEMA has concurred in staff recommended source of action.

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Cost Estimate:

The staff anticipates no significant cost impact on licensees, or State and local governments as a result of promulgation of this final rule change.

Recommendations:

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week*

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 (Enclosure 2).
  - (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 is attached as Enclosure 3.

Sunshine Act: Recommend consideration at an open meeting.

Scheduling: For early considerations.

William J. Dircks  
Executive Director for Operations

Enclosures:

Federal Register Notice of Final  
Rule Change to 10 CFR, Part 50,  
Appendix E  
Regulatory Analysis  
Draft Congressional Letter  
ACRS Letter dated August 11, 1983  
FEMA Final Regulation; 44 CFR 350  
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Appendix E which is identical to  
the published proposed rule change.  
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tent with FEMA regulation 44 CFR 350.

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 assure that decisionmaking preplanning capabilities exist ~~local governments to assess the~~ relative to 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 than those established by the August 1980 emergency planning requirements ( FR ) but will provide clarification as to the Commission's original intent on the San Onofre and Diablo Canyon full power licensing decision.

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

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

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*transporting people to the site = decision making*

W



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NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

JUN 13 1985

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- Pro:
1. Provides for no litigation.
  2. Is consistent with what other countries are doing.
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- Con:
1. Provokes outrage by the public because it is perceived that the Commission is attempting to "void" or "write-off" earthquakes.

2. PRA analyses have indicated that earthquakes are among dominate causes of core melt accidents, it has been considered by some commentors irrational to not consider the effects of these same earthquakes on emergency response.

Alternative 2. 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."

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1. The public may realize that we are doing nothing as a result of their input, other than modifying words.

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1. Unnecessarily prolongs the licensing process.
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Alternative 4. Promulgate a final rule which might state that "State earthquake preparedness planning shall take into account all nuclear power plants within its boundaries. In so doing, the Commission finds that this would provide reasonable assurance that adequate protective measures can and will be taken."

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1. Blends the nuclear power plant in with other industries.
  2. Provides comparable protection to the public relative to other industries throughout the State.
  3. May not require the State to establish additional preparedness around a nuclear power reactor.

- Con:
1. Because each State's ability to deal with earthquakes is different, the generic finding of reasonable assurance may be inappropriate to make.
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1. May permit some litigation of the adequacy of assessment performed.

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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 a final rule be promulgated that would embrace the concepts of Alternative 5.** This final rule would:



1. Clarify and articulate the Commission original concept of **specifying what flexibility is required in emergency plans in order 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. **Assure the capability to transport necessary personnel to the plant to cope with the degraded modes of plant operation.**
3. Assure the capability to **communicate to the offsite authorities any plant damage.**
4. Assure the capability to **obtain plant damage estimates.**
5. **Assure that offsite authorities consider decisionmaking preplanning that takes into account various degrees and locations of offsite damage resulting from severe, low frequency natural phenomena.**

This staff recommendation would specifically not require:

1. Evacuation time estimates that consider the complicating effects of severe, low frequency natural phenomena.
2. That roads, bridges, buildings and other structures be reinforced to withstand the effects of severe, low frequency natural phenomena.

**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. Based on this interaction, FEMA has concurred in staff recommended **C**ource of action.

Cost Estimate: The staff anticipates no significant cost impact on licensees, or State and local governments as a result of promulgation of this final rule change.

- 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 (Enclosure 2).
    - (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 is attached as Enclosure 3.

Sunshine Act: Recommend consideration at an open meeting.

Scheduling: For early considerations.

William J. Dircks  
Executive Director for Operations

Enclosures:

Federal Register Notice of Final  
Rule Change to 10 CFR, Part 50,  
Appendix E  
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Federal Register Notice of a Proposed  
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tent with FEMA regulation 44 CFR 350.

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 assure that decisionmaking preplanning capabilities exist ~~local governments to assess the relative to 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 than those established by the August 1980 emergency planning requirements ( FR ) but will provide clarification as to the Commission's original intent on the San Onofre and Diablo Canyon full power licensing decision.

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

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

SUPPLEMENTARY INFORMATION: On December 21, 1984, the Commission published a proposed rule change to 10 CFR Part 50 that relates to Emergency Planning and Preparedness at Production and Utilities Facilities (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 incorporate in them the interpretation in the Commission San Onofre and Diablo Canyon rulings.

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. In the Matter of 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 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. In the Matter of Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2), CLI-84-12, 20 NRC \_\_\_\_\_ (August 10, 1984), petition for review in San Luis Obispo Mothers for Peace v. NRC (D.C. Cir. No. 84-1410). 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. 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." Slip Opinion at 9.

When the proposed rule was published in the Federal Register (49 FR 49640, dated December 21, 1984), it permitted a 30-day comment period, this was then extended until February 27, 1985 (see 50 FR 3797, dated January 28, 1985).

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

1. Adoption of the proposed rule change which would explicitly incorporate 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.

To date, 61 comment letters have been received. Twenty five (25) letters favored the promulgation of the proposed rule. The majority of these letters were from utilities, consulting firms representing utilities, 2 private citizens and the Department of Energy.

Thirty-four (34) letters were received which were against promulgation of the proposed rule, many of which, voicing strong displeasure, shock or disbelief as to the direction that the Commission was leaning in the proposed rule change. The majority of these letters were from private citizens, intervention groups and environmental groups. Approximately \_\_\_\_\_ of these letters were in the signed petition form with approximately \_\_\_\_\_ signatures per letter.

Additional input was also received from the following foreign countries, all of which stated that the potential complicating effects of earthquakes was not specifically considered in their nuclear power reactor emergency planning: Japan, France, Sweden, Germany and Taiwan. None of the commentators specifically took a position with the alternative to leave the issue open for adjudication on a case-by-case basis.

All of the commentators that favored promulgation of the proposed rule into a final rule essentially agreed with the rationale that the Commission used in the Federal Register Notice and provided little amplification or additional conceptual logic which would further support the proposed rule change. Nonetheless, those commentators that were

against the proposed rule change provided the Commission with arguments that questioned the validity of the rationale in the Federal Register Notice and focused on additional issues that will be addressed in this Federal Register Notice.

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

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

Commission Response : To Be Provided

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 : To Be Provided

Issue 3. Emergency planning should focus on accident consequences and accident initiators not just the consequences of potential accidents.

Commission Response : To Be Provided

Issue 4. Like all other safety systems, seismically qualified equipment must also be assumed to fail for purposes of emergency planning.

Commission Response : To Be Provided

Issue 5. Emergency Planning must include the complicating effects of earthquakes up to and beyond SSE 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 controverted in adjudicatory proceedings, but, once settled, should not be reconsidered in reviewing or adjudicating emergency planning issues. If a larger earthquake were considered feasible, then a larger SSE would have been established. If an earthquake smaller than an SSE were considered to be capable of damaging a plant's safety systems, then the plant's design would have been corrected. Thus, emergency plans need not take into account earthquakes larger or smaller than an SSE. Nevertheless, the basis for emergency planning is not constrained by the design basis for a plant, and emergency planning effort recognize the possibility that events considered beyond the design basis can occur. A spectrum of potential consequences independent of the particular causes are analyzed in reaching decisions on emergency planning.

ing provisions, and the planning basis does not depend upon the particular scenario which may lead to significant offsite releases of radioactivity.

Issue 6. 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 (not eliminate) the consequences of an accident, the operating license must be denied. Various governmental authorities, consultants, and members of the public have argued that an emergency plan cannot be developed that would eliminate public health risk from all of the possible reactor accidents even in conjunction with severe, low frequency natural phenomena. However, since complete elimination of all risk is not even theoretically possible, it is not the intent of the NRC's emergency preparedness regulations to ensure that no one in the public would receive a dose in excess of the EPA protective action guidelines (PAGs) for any accidental release, regardless of timing or severity. Based on experience, the NRC has noted that there are many uncertainties associated with potential accidents and that emergency preparedness is not a panacea for eliminating all risk to the public.

The objective of the NRC emergency preparedness regulations is 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 principal 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 is not essential requirement.

### Commission Response

Issue 7. 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 PRA analyses have indicated that earthquakes are a **major contributor** to core melt accidents. However, recent evidence suggests that these PRA investigations embodied pessimistic estimates of structural and component failure levels, and that when more realistic failure levels are used, the significance of the earthquake threat diminishes. This appears to be true even when aging and degradation effects are considered. Moreover, the above cited studies found that

only very improbable earthquakes with motions several times the very severe design basis motions could cause serious accidents. Major earthquakes have to date not caused distress to nuclear power plants either in the United States or elsewhere. NRC efforts are currently underway to better defined needed inputs to seismic PRA studies which in the past were based on conservative subjective judgments. It is noted that even the earth seismic PRAs, with their suspected conservative bias, has not yielded unacceptably high core melt probabilities.

It is the staff's position that early seismic PRA were not sufficiently validated for licensing decisionmaking, and that such validation must be expedited. Preliminary finding from ongoing work point toward excessive conservatism being introduced in the estimated failure levels used in the early work.

With these studies in mind, the Commission nonetheless never intended to give the preception that we were "ignoring" the complicating effects of earthquakes on emergency response. Therefore, the enclosed final rule is to clarify and particulate the Commission's original intend of specifying what flexibility is required in emergency plans in order 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.

Issue 8. 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

*this issue is*  
The assertion in ~~Section 2(b)~~ that there is a growing concern about the ability of nuclear power plants to withstand the effects of large earthquakes is, simply, incorrect. If anything, recent work, based on actual behavior of industrial facilities and their equipment in large earthquakes, leads to the conclusion that more margin against earthquakes larger than included in the design basis than was previously thought.

Earthquakes simultaneously affect all plant safety systems and do tend to "search out" design, construction and maintenance errors which could degrade plant safety. In a general way, only very gross errors are of concern since NRC standards and industry codes provide margins against minor to moderate errors. Unfortunately gross errors do occur and are more prevalent than previously believed. Examples are the failure to tie reinforcing steel together in the Trojan control room and using mirror image design drawings at Diablo Canyon. Also, the comments tend to confuse the regulatory issue of a plant not being built in accordance with the commitments in its license application with the safety issue of earthquake resistance of the plant as built. A discrepancy between as-built and as designed does not, of itself, imply significant degradation as seismic resistance. In fact, some of the changes might well enhance seismic resistance. However, the burden of justifying that the as-built plant is adequate resets with the

licensee. One cannot assume, a priori, that resistance is either better or worse.

Issue 9. The use of unreliable seismic design bases is flawed and therefore its use as a basis for rulemaking is inappropriate.

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 introduction of conservatisms in the procedures. The end product tends to reflect an over design against earthquakes, sometimes to the extent that inservice inspection is degraded as is normal plant operation. Current research activities in seismic design of nuclear power plants is directed towards achieving greater realism through the removal of unneeded and undesirable seismic conservatism when it reduces overall plant reliability. Thus, present seismic bases may only be flawed in that they afford an overprotection against infrequently occurring earthquakes, while introducing negative performance aspects for routine operation.

Issue 10. 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 extensive research relative to this issue, the purpose of which was to determine if conditions of psychological stress induced by emergency conditions in a nuclear power plant have a significant adverse effect on operator performance of typical tasks required during plant emergencies. To this end, two technical tasks were undertaken: (1) the technical findings from prior research studies of human performance under stress were reviewed and evaluated, and (2) an experiment was performed with 24 trained reactor operators under varying conditions of psychological stress to measure the effectiveness of their decisionmaking and responses for different reactor operational requirements.

Findings from existing technical literature indicate specific factors important to operator performance under stress. These factors are:

- Perceptual narrowing, which can restrict the operator's understanding of stressful conditions and the subsequent ability to respond appropriately to them;
- Cognitive rigidity, which can restrict the cognitive capacities of operators to analyze, evaluate, and plan alternative courses of action in response to the stressful conditions;
- Changes in the nominal degree of correctness of decisions arrived at by the individual or by the group;
- Reliance on prior training and the mental set such training provides;
- Enhanced role and importance of centralized authority to the operator in responding to the stressful conditions;

- Some distortion of information provided about the stressful conditions and their effects by individuals and by the group;
- Response perseveration, or the tendency to repeat actions which are ineffectual or to make responses which are not appropriate to the stressful conditions.

The experiment involved three stress related variables to assess their effects on operator decisionmaking under stress. Workload (i.e., amount of time to perform), conflicting information (i.e., background noise and voices), and the level of detail in available written procedures were manipulated as three stressors. Decisionmaking performance was evaluated by the correct selection of actions to mitigate twelve emergency scenarios which could result from a seismic event at a pressurized water reactor. Operators responded to each scenario by selecting from a response list of specific actions to be taken immediately, or subsequently, or nonapplicable. Also, certain personality variables of the operators, related to decisionmaking performance under stress were assessed and correlated.

Results from the experiment with reactor operators revealed:

- Operators under stress perform better under lower levels of workload;

- Availability of detailed procedures may supplement operator performance and decisionmaking such that negative effects of psychological stress are reduced;
- Operators selected significantly more actions correctly in the presence of high conflicting information, relative to low conflicting information;
- The interactions of conflicting information with procedures, and conflicting information with workload, suggest a complex relationship between stress variables and decisionmaking performance;
- Specific operator personality characteristics were found to be related to enhance decisionmaking under stress;
- Operators having an internal locus of control (i.e., those who perceived reward as contingent on their behavior) perform better under stress than those having an external locus of control (i.e., those who perceive reward as independent of their behavior);
- Operators who have coped successfully with many past stressful experiences perform better under stress than those who have coped with fewer past stressful situations;

- Operator response to stress may be affected by their general level of anxiety, their degree of emotional exhaustion, feelings of depersonalization, and feelings about personal accomplishments.

Analysis of these findings from the literature and from the operator experiments identified general measures for decreasing the effects of stress. These are: (1) training programs geared to develop operator knowledge, characteristics, and coping mechanisms which will enhance operator performance under stressful conditions; (2) training programs and procedures which are compatible with the response characteristics of operators experiencing stress; and (3) awareness by supervisors, management and operating personnel of operator characteristics which are related to decisionmaking performance under stress. Specific measures that are now being used as a result of this research are:

- Training and drills which establish mental set (i.e., an expectant attitude within the operator) toward the mitigation of an emergency and the reduction of high stress;
- Establishing procedures which optimize individual workload during emergencies while maintaining individual responsibility;
- Effective display presentations of critical information in the control room, with displays designed for a narrowed range of cue utilization by operators during emergencies;

- Ensuring that procedures are compatible with operator reliance on established authority and centralization of authority during emergencies;
- Providing procedures compatible with restrictive cognitive and problem solving processes;
- Providing formal training of operator strategies in broadened problem solving techniques, novel problem solving, and decision reassessment;
- Training in information management, and procedures geared to reduce information distortion and to improve the flow and communication of critical information;
- Frequent drills that will help operators over-learn effective procedures and will allow practice in novel problem solving and decision reassessment. This includes opportunities to exhibit effective coping with such problems as part of the drills (especially if the drills are somewhat stressful) in order to help operators cope with future stressful events;
- Train personnel to view plant conditions and problem solving from a standpoint of internal locus of control (i.e., such that the operator performs because his/her performance is perceived

as effectual and rewarding) in conjunction with the plant management's administrative policies;

- Train shift supervisors and plant managers to be aware of personality factors in their crews which could negatively affect decisionmaking and performance under high stress. Supervisors could use this information to structure the control room personnel into the most effective decision unit possible by deployment of individual responsibility, work assignment, and tailor-made training programs and drills;
- Incorporation of findings relating operator personality characteristics to performance under stress in a career selection guide for prospective operators.

Issue 11. 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 : *To Be Provided*

Issue 12. Earthquakes are distinct phenomena the following distinct features of earthquakes are:

--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, liquefaction of 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 : *To Be Provided*

Issue 13. FEMA's emergency plans do not adequately provide for earthquake response in a radiological emergency.

Commission Response

*The Commission disagrees.*

^ FEMA has an active program of earthquake preparedness which includes hazards and vulnerability analysis, estimates of damage and casualties, planning for Federal response to a major earthquake, and assistance to State and local governments in their earthquake planning and preparedness activities. The Commission and FEMA believe that all of these activities are sufficiently flexible to complement each other in preparing for an event that may require a concurrent response to a major earthquake and a serious accident at a nuclear power plant.

*2 more  
spaces*

→ 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 concept of specifying what flexibility is required in emergency plans in order 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. Assure the capability to transport necessary personnel to the plant to cope with the degraded modes of plant operation.
3. Assure the capability to communicate to the offsite authorities any plant damage.
4. Assure the capability to obtain plant damage estimates.

5. Assure that offsite authorities consider decisionmaking preplanning that takes into account various degrees and locations of offsite damage resulting from severe, low frequency natural phenomena.

This staff recommendation would specifically not require:

1. Evacuation time estimates that consider the complicating effects of severe, low frequency natural phenomena.

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

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 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 decisionmaking preplanning relating to 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. To not 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 clarification rule change which would limit the assessment of the complicating effects of severe, low frequency natural phenomena to certain decisionmaking preplanning capabilities.

#### 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.

\*Likewise, the nuclear power reactor operating licensee and applicant emergency response plans shall assure that the following decisionmaking

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

preplanning capabilities exist relative to the complicating impacts of severe, low frequency natural phenomena that could be expected during the life of the plant. The intensity of the event shall be no greater than the design basis for that event.

1. Ability to transport necessary personnel to the plant to cope with degraded modes of plant operation.
2. Ability to communicate to the offsite authorities any plant damage.
3. Ability to obtain damage estimates to the plant. This information should be available to factor into the decisionmaking process, including recommendations to offsite authorities for protective actions after an earthquake.
4. Offsite authorities shall consider decisionmaking preplanning that takes into account various degrees and locations of damage to the plant environs.

\* \* \* \* \*

Dated at \_\_\_\_\_ this \_\_\_ day of \_\_\_\_\_, 1985.

For the Nuclear Regulatory Commission.

\_\_\_\_\_  
Samuel J. Chilk  
Secretary of the Commission