TENNESSEE VALLEY AUTHORITY

1101 Market Street, Chattanooga, Tennessee 37402

CNL-22-064

June 9, 2022

10 CFR 50.90
10 CFR 50, Appendix E

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Browns Ferry Nuclear Plant, Units 1, 2, and 3
Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68
NRC Docket Nos. 50-259, 50-260, 50-296, and 72-052

Sequoyah Nuclear Plant, Units 1 and 2
Renewed Facility Operating License Nos. DPR-77 and DPR-79
NRC Docket Nos. 50-327, 50-328, and 72-034

Watts Bar Nuclear Plant, Units 1 and 2
Facility Operating License Nos. NPF-90 and NPF-96
NRC Docket Nos. 50-390, 50-391, and 72-1048

Subject: **Response to Request for Additional Information Regarding Tennessee Valley Authority License Amendment Request to Revise Emergency Plan Implementing Procedure Regarding Seismic Event Emergency Action Level Change (EPID L-2022-LLA-0021)**

References:
1. TVA Letter to NRC, CNL-21-067, "Tennessee Valley Authority License Amendment Request to Revise Emergency Plan Implementing Procedure Regarding Seismic Event Emergency Action Level Change," dated January 27, 2022 (ML22027A835)
2. NRC Electronic Mail to TVA, "Request for Additional Information Related to TVA's Request to Revised the TVA Plants' Radiological Emergency Plans (EPID L-2022-LLA-0021)," dated May 12, 2022 (ML22144A100)

In Reference 1, Tennessee Valley Authority (TVA) submitted a request for an amendment to Renewed Facility Operating Licenses DPR-33, DPR-52, and DPR-68 for the Browns Ferry Nuclear Plant, Units 1, 2, and 3; Renewed Facility Operating Licenses DPR-77 and DPR-79 for the Sequoyah Nuclear Plant, Units 1 and 2; and Facility Operating Licenses NPF-90 and

NPF-96 for the Watts Bar Nuclear Plant, Units 1 and 2. The proposed change involved revising the TVA Radiological Emergency Plan for the affected facilities to adopt the Nuclear Energy Institute (NEI) revised Notification of Unusual Event Emergency Action Level (EAL) scheme for seismic events based on NEI 99-01, Revision 6, "Development of Emergency Action Levels for Non-Passive Reactors." Specifically, the proposed change would make an exception in Initiating Condition HU2, EAL to provide an additional method to declare this event.

In Reference 2, the Nuclear Regulatory Commission (NRC) issued a request for additional information (RAI) and requested that TVA respond by June 11, 2022. Enclosure 1 to this letter provides the response to the RAI. Enclosures 2, 3, and 4 provide updates to the proposed EAL changes for each site that supersede those contained in Reference 1.

This letter does not change the no significant hazards consideration or the environmental considerations contained in Reference 1. Additionally, in accordance with Title 10 of the *Code of Federal Regulations* 50.91(b)(1), TVA is sending a copy of this letter and enclosure to the Alabama Department of Public Health and Tennessee Department of Environment and Conservation.

There are no new regulatory commitments contained in this letter. If you have any questions regarding this submittal, please contact Stuart L. Rymer, Senior Manager, Fleet Licensing, at slrymer@tva.gov.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 9th day of June 2022.

Respectfully,

James Barstow

Digitally signed by Rearden, Pamela S
Date: 2022.06.09 12:40:41 -04'00'

James Barstow
Vice President, Nuclear Regulatory Affairs & Support Services

Enclosures:

1. Response to NRC Request for Additional Information
2. Revised Emergency Action Level Scheme for Browns Ferry Nuclear Plant
3. Revised Emergency Action Level Scheme for Sequoyah Nuclear Plant
4. Revised Emergency Action Level Scheme for Watts Bar Nuclear Plant

cc: See Page 3

cc (with Enclosures):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant
NRC Senior Resident Inspector - Sequoyah Nuclear Plant
NRC Senior Resident Inspector - Watts Bar Nuclear Plant
NRC Project Manager - Browns Ferry Nuclear Plant
NRC Project Manager - Sequoyah Nuclear Plant
NRC Project Manager - Watts Bar Nuclear Plant
State Health Officer, Alabama State Department of Public Health
Director, Division of Radiological Health – Tennessee State Department of Environment and Conservation

Enclosure 1

Response to NRC Request for Additional Information

Enclosure 1

Response to NRC Request for Additional Information

Introduction

By application dated January 27, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22027A835), the Tennessee Valley Authority (TVA) requested U.S. Nuclear Regulatory Commission (NRC) approval of changes to the Browns Ferry Nuclear Plant, Units 1, 2, and 3; the Sequoyah Nuclear Plant, Units 1 and 2; and the Watts Bar Nuclear Plant, Units 1 and 2, Radiological Emergency Plans pursuant to Section 50.54(q) of Title 10 of the Code of Federal Regulations (10 CFR).

The following request for additional information (RAI) is needed to facilitate the NRC staff's technical review.

RAI 1

Regulatory Basis:

- *Section 50.47(b) establishes the planning standards that the onsite and offsite emergency response plans must meet for NRC staff to make a finding that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. Planning Standard (4) of this section requires that onsite and offsite emergency response plans meet the following standard:*

  > *A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee, and State and local response plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures.*

- *Associated guidance in NUREG-0654/FEMP-REP-1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants: Final Report," Revision 2 (ADAMS Accession No. ML19347D139), Section II.D, Evaluation Criterion D.1 states that a standard emergency classification and action level scheme is established and maintained.*

- *Nuclear Energy Institute (NEI) document NEI 99-01, Revision 6, "Development of Emergency Action Levels for Non-Passive Reactors" (ADAMS Accession No. ML12326A805), provides NRC-endorsed guidance that can be used to develop a standard emergency classification and action level scheme. NEI 99-01, Revision 6 states:*

  > *Initiating conditions, emergency action levels, operating mode applicability and note statements and formatting consider human factors and are user-friendly.*

Issue:

As stated in Section 2.1, "Reason for the Proposed Change," of the license amendment request (LAR), "revising the HU2 EAL [emergency action level] would ensure that the SM [shift manager]/SED [site emergency director] will make a timely determination by placing a 15-minute clock on the ability to gain additional information through the addition of a Note. Furthermore, having an additional method of event declaration may prevent avoidable notifications of unusual events by giving operators more flexibility in determination." However, based on a review of the LAR, it appears that TVA is providing an additional HU2 threshold value, which would require an unusual event declaration if EAL 2.b is not able to be confirmed within 15 minutes, that the shift manager must confirm the occurrence of a seismic event in a manner that may require information provided in the proposed EAL #2 Basis discussion. Although TVA appears to be providing similar information as that provided by NEI 99-01, Revision 6, the proposed HU2 does not appear to consider human factors, nor does it appear to be user-friendly.

Request:

Provide a justification that supports a deviation from the guidance provided by NEI 99-01, Revision 6. This justification should specifically explain why the HU2.b threshold value, a note related to that threshold value, and the HU2.b basis discussion may all need to be referenced to support an accurate assessment for a seismic event.

TVA Response

The threshold values provided in Emergency Action Level (EAL) 2.b were obtained from each site's abnormal operating procedure or instruction (AOP/AOI) for earthquakes. These values provide clear guidance to the operators as to when to declare a seismic event when indication is not available or is inaccurate. These are values with which they are familiar and are included in the accredited licensed operator training program. As part of the TVA license amendment request validation process, the Operations staff from each site concurred with the changes. This demonstrates that the additional note, threshold values, and basis discussion support an accurate assessment for a seismic event, and that the deviation from the guidance provided by NEI 99-01, Revision 6, is justified.

TVA has given the human factors aspect additional consideration and determined that it would provide additional benefit to operators to include the Modified Mercalli Intensity (MMI) scale in the EAL basis. This information is already included in each site's respective AOP/AOI. This additional MMI information will assist the operators in making a timely classification. Enclosures 2, 3, and 4 contain updated EAL markups and final typed pages for Browns Ferry Nuclear Plant, Sequoyah Nuclear Plant, and Watts Bar Nuclear Plant, respectively. These enclosures supersede what was provided in Enclosures 2, 3, and 4 of the original application (TVA Letter to NRC, CNL-21-067, ADAMS Accession No. ML22027A835).

Enclosure 2

Revised Emergency Action Level Scheme for Browns Ferry Nuclear Plant

Attachments:

1. BFN Emergency Action Level Proposed Change (Markup Copy)
2. BFN Emergency Action Level Proposed Change (Final Typed)

HU2

ECL: Unusual Event

Initiating Condition: Seismic event greater than OBE levels.

Operating Mode Applicability: All

Emergency Action Levels:

Note: For emergency classification, if EAL 2.b is not able to be confirmed, then the occurrence of a seismic event is confirmed in a manner deemed appropriate by the Shift Manager or Site Emergency Director in **< 15 mins** of the event.

(1) Seismic event greater than Operating Basis Earthquake (OBE) as indicated by:

- Unit 1 Control Room Panel 1-XA-55-22C Window 6, 1/2 SSE RESPONSE SPECTRUM EXCEEDED

OR

(2) When Seismic Monitoring Equipment is not available:

a. Control Room personnel feel an actual or potential seismic event.

AND

b. **ANY** one of the following confirmed in **< 15 mins** of the event:

- Earthquake resulted in Modified Mercalli Intensity (MMI) **Level VI or greater within 5 km (3.1 miles)** from plant.
- Earthquake was magnitude **6.0 (Richter scale) or greater.**
- Earthquake was magnitude **5.0 (Richter scale) or greater** and occurred **within 200 km (124.5 miles)** from plant.

Basis:

This IC addresses a seismic event that results in accelerations at the plant site greater than those specified for an Operating Basis Earthquake (OBE)[1]. An earthquake greater than an OBE but less than a Safe Shutdown Earthquake (SSE)[2] should have no significant impact on safety-related systems, structures, and components; however, some time may be required for the plantstaff to ascertain the actual post-event condition of the plant (for example, performs walk-downs and post-event inspections). Given the time necessary to perform walk-downs and inspections, and fully understand any impacts, this event represents a potential degradation of the level of safety of the plant.

EAL #1 Basis

Event verification with external sources should not be necessary during or following an OBE. Earthquakes of this magnitude should be readily felt by on-site personnel and recognized as a seismic event. The Shift Manager or SED may seek external verification if deemed appropriate; however, the verification action must not preclude a timely emergency declaration.

EAL #2 Basis

EAL 2.b and the accompanying note is included to ensure that a declaration does not result from felt vibrations caused by a non-seismic source (e.g., a dropped load). The Shift Manager or SED may review the MMI scale descriptions below or seek external verification if deemed appropriate (e.g., a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration. This guidance recognizes that it may cause the site to declare an Unusual Event while another site, similarly affected but with readily available OBE indications in the Control Room, may not.

MODIFIED MERCALLI INTENSITY SCALE	
INTENSITY LEVEL	**DESCRIPTION**
I	Not felt except by a very few under especially favorable conditions.
II	Felt by only a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls in homes make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures. Considerable damage in poorly-built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly-built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

References

0-AOI-100-5
1-ARP-9-22C
NEI 99-01 R6 HU2
RG 1.166 Appendix A

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[1]An OBE is vibratory ground motion for which those features of a nuclear power plant necessary for continued operation without undue risk to the health and safety of the public will remain functional.

[2]An SSE is vibratory ground motion for which certain (generally, safety-related) structures, systems, and components must be designed to remain functional.

HU2

ECL: Unusual Event

Initiating Condition: Seismic event greater than OBE levels.

Operating Mode Applicability: All

Emergency Action Levels:

Note: For emergency classification, if EAL 2.b is not able to be confirmed, then the occurrence of a seismic event is confirmed in a manner deemed appropriate by the Shift Manager or Site Emergency Director in **< 15 mins** of the event.

(1) Seismic event greater than Operating Basis Earthquake (OBE) as indicated by:
- Unit 1 Control Room Panel 1-XA-55-22C Window 6, 1/2 SSE RESPONSE SPECTRUM EXCEEDED

OR

(2) When Seismic Monitoring Equipment is not available:

a. Control Room personnel feel an actual or potential seismic event.

AND

b. **ANY** one of the following confirmed in **< 15 mins** of the event:
- Earthquake resulted in Modified Mercalli Intensity (MMI) **Level VI or greater within 5 km (3.1 miles)** from plant.
- Earthquake was magnitude **6.0 (Richter scale) or greater.**
- Earthquake was magnitude **5.0 (Richter scale) or greater** and occurred **within 200 km (124.5 miles)** from plant.

Basis:

This IC addresses a seismic event that results in accelerations at the plant site greater than those specified for an Operating Basis Earthquake (OBE)[1]. An earthquake greater than an OBE but less than a Safe Shutdown Earthquake (SSE)[2] should have no significant impact on safety-related systems, structures, and components; however, some time may be required for the plant staff to ascertain the actual post-event condition of the plant (for example, performs walk-downs and post-event inspections). Given the time necessary to perform walk-downs and inspections, and fully understand any impacts, this event represents a potential degradation of the level of safety of the plant.

EAL #1 Basis

Event verification with external sources should not be necessary during or following an OBE. Earthquakes of this magnitude should be readily felt by on-site personnel and recognized as a seismic event. The Shift Manager or SED may seek external verification if deemed appropriate; however, the verification action must not preclude a timely emergency declaration.

EAL #2 Basis

EAL 2.b and the accompanying note is included to ensure that a declaration does not result from felt vibrations caused by a non-seismic source (e.g., a dropped load). The Shift Manager or SED may review the MMI scale descriptions below or seek external verification if deemed appropriate (e.g., a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration. This guidance recognizes that it may cause the site to declare an Unusual Event while another site, similarly affected but with readily available OBE indications in the Control Room, may not.

MODIFIED MERCALLI INTENSITY SCALE	
INTENSITY LEVEL	**DESCRIPTION**
I	Not felt except by a very few under especially favorable conditions.
II	Felt by only a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls in homes make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures. Considerable damage in poorly-built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly-built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

References

0-AOI-100-5
1-ARP-9-22C
NEI 99-01 R6 HU2
RG 1.166 Appendix A

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[1]An OBE is vibratory ground motion for which those features of a nuclear power plant necessary for continued operation without undue risk to the health and safety of the public will remain functional.

[2]An SSE is vibratory ground motion for which certain (generally, safety-related) structures, systems, and components must be designed to remain functional.

Enclosure 3

Revised Emergency Action Level Scheme for Sequoyah Nuclear Plant

Attachments:

1. SQN Emergency Action Level Proposed Change (Markup Copy)
2. SQN Emergency Action Level Proposed Change (Final Typed)

HU2

ECL: Unusual Event

Initiating Condition: Seismic event greater than OBE levels.

Operating Mode Applicability: All

Emergency Action Levels:

Note: For emergency classification, if EAL 2.b is not able to be confirmed, then the occurrence of a seismic event is confirmed in a manner deemed appropriate by the Shift Manager or Site Emergency Director in **< 15 mins** of the event.

(1) Seismic event greater than Operating Basis Earthquake (OBE) as indicated by Panel 1-XA-55-15B alarm windows E-2 and D-1 activated.

OR

(2) When Seismic Monitoring Equipment is **not** available:

a. Control Room personnel feel an actual or potential seismic event.

AND

b. **ANY** one of the following confirmed in **< 15 mins** of the event:
- Earthquake resulted in Modified Mercalli Intensity (MMI) **Level VI or greater within 5 km (3.1 miles)** from plant.
- Earthquake was magnitude **6.0 (Richter scale) or greater.**
- Earthquake was magnitude **5.0 (Richter scale) or greater** and occurred **within 200 km (124.5 miles)** from plant.

Basis:

This IC addresses a seismic event that results in accelerations at the plant site greater than those specified for an Operating Basis Earthquake (OBE)[1]. An earthquake greater than an OBE but less than a Safe Shutdown Earthquake (SSE)[2] should have no significant impact on safety-related systems, structures, and components; however, some time may be required for the plant staff to ascertain the actual post-event condition of the plant (for example, performs walk-downs and post-event inspections). Given the time necessary to perform walk-downs and inspections, and fully understand any impacts, this event represents a potential degradation of the level of safety of the plant.

EAL #1 Basis

Event verification with external sources should not be necessary during or following an OBE. Earthquakes of this magnitude should be readily felt by on-site personnel and recognized as a seismic event. The Shift Manager or SED may seek external verification if deemed appropriate (for example, a call to the NATIONAL EARTHQUAKE CENTER, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration.

EAL #2 Basis

EAL 2.b and the accompanying note is included to ensure that a declaration does not result from felt vibrations caused by a non-seismic source (e.g., a dropped load). The Shift Manager or SED may review the MMI scale descriptions below or seek external verification if deemed appropriate (e.g., a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration. This guidance recognizes that it may cause the site to declare an Unusual Event while another site, similarly affected but with readily available OBE indications in the Control Room, may not.

MODIFIED MERCALLI INTENSITY SCALE	
INTENSITY LEVEL	**DESCRIPTION**
I	Not felt except by a very few under especially favorable conditions.
II	Felt by only a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Stationary cars may rock slightly. Vibrations similar to the passing of a truck.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls in homes make cracking sound. Sensation like heavy truck striking building. Stationary cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Slight damage (to homes).
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures. Considerable damage in poorly-built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly-built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

References
1-AR-M15-B
AOP-N.05, Earthquake
NEI 99-01 R6 HU2
RG 1.166 Appendix A

[1]An OBE is vibratory ground motion for which those features of a nuclear power plant necessary for continued operation without undue risk to the health and safety of the public will remain functional.

[2]An SSE is vibratory ground motion for which certain (generally, safety-related) structures, systems, and components must be designed to remain functional.

HU2

ECL: Unusual Event

Initiating Condition: Seismic event greater than OBE levels.

Operating Mode Applicability: All

Emergency Action Levels:

Note: For emergency classification, if EAL 2.b is not able to be confirmed, then the occurrence of a seismic event is confirmed in a manner deemed appropriate by the Shift Manager or Site Emergency Director in **< 15 mins** of the event.

(1) Seismic event greater than Operating Basis Earthquake (OBE) as indicated by Panel 1-XA-55-15B alarm windows E-2 and D-1 activated.

OR

(2) When Seismic Monitoring Equipment is **not** available:

a. Control Room personnel feel an actual or potential seismic event.

AND

b. **ANY** one of the following confirmed in **< 15 mins** of the event:
- Earthquake resulted in Modified Mercalli Intensity (MMI) **Level VI or greater within 5 km (3.1 miles)** from plant.
- Earthquake was magnitude **6.0 (Richter scale) or greater.**
- Earthquake was magnitude **5.0 (Richter scale) or greater** and occurred **within 200 km (124.5 miles)** from plant.

Basis:

This IC addresses a seismic event that results in accelerations at the plant site greater than those specified for an Operating Basis Earthquake (OBE)[1]. An earthquake greater than an OBE but less than a Safe Shutdown Earthquake (SSE)[2] should have no significant impact on safety-related systems, structures, and components; however, some time may be required for the plant staff to ascertain the actual post-event condition of the plant (for example, performs walk-downs and post-event inspections). Given the time necessary to perform walk-downs and inspections, and fully understand any impacts, this event represents a potential degradation of the level of safety of the plant.

EAL #1 Basis

Event verification with external sources should not be necessary during or following an OBE. Earthquakes of this magnitude should be readily felt by on-site personnel and recognized as a seismic event. The Shift Manager or SED may seek external verification if deemed appropriate (for example, a call to the NATIONAL EARTHQUAKE CENTER, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration.

EAL #2 Basis

EAL 2.b and the accompanying note is included to ensure that a declaration does not result from felt vibrations caused by a non-seismic source (e.g., a dropped load). The Shift Manager or SED may review the MMI scale descriptions below or seek external verification if deemed appropriate (e.g., a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration. This guidance recognizes that it may cause the site to declare an Unusual Event while another site, similarly affected but with readily available OBE indications in the Control Room, may not.

MODIFIED MERCALLI INTENSITY SCALE	
INTENSITY LEVEL	**DESCRIPTION**
I	Not felt except by a very few under especially favorable conditions.
II	Felt by only a few persons at rest, especially on upper floors of buildings
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Stationary cars may rock slightly. Vibrations similar to the passing of a truck.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls in homes make cracking sound. Sensation like heavy truck striking building. Stationary cars rocked noticeably.
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VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Slight damage (to homes).
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures. Considerable damage in poorly-built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly-built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

References
1-AR-M15-B
AOP-N.05, Earthquake
NEI 99-01 R6 HU2
RG 1.166 Appendix A

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[1]An OBE is vibratory ground motion for which those features of a nuclear power plant necessary for continued operation
without undue risk to the health and safety of the public will remain functional.

[2]An SSE is vibratory ground motion for which certain (generally, safety-related) structures, systems, and components must be designed to remain functional.

Enclosure 4

Revised Emergency Action Level Scheme for Watts Bar Nuclear Plant

Attachments:

1. WBN Emergency Action Level (Markup Copy)
2. WBN Emergency Action Level (Final Typed)

HU2

ECL: Unusual Event

Initiating Condition: Seismic event greater than OBE levels.

Operating Mode Applicability: All

Emergency Action Levels:

Note: For emergency classification, if EAL 2.b is not able to be confirmed, then the occurrence of a seismic event is confirmed in a manner deemed appropriate by the Shift Manager or Site Emergency Director in **< 15 mins** of the event.

(1) Seismic event greater than Operating Basis Earthquake (OBE) as indicated by Alarm Window 166-D, OBE SPECTRA EXCEEDED lit.

OR

(2) When Seismic Monitoring Equipment is **not** available:

a. Control Room personnel feel an actual or potential seismic event.

AND

b. **ANY** one of the following confirmed in **< 15 mins** of the event:
- Earthquake resulted in Modified Mercalli Intensity (MMI) **Level VI or greater within 5 km (3.1 miles)** from plant.
- Earthquake was magnitude **6.0 (Richter scale) or greater.**
- Earthquake was magnitude **5.0 (Richter scale) or greater** and occurred **within 200 km (124.5 miles)** from plant.

Basis:

This IC addresses a seismic event that results in accelerations at the plant site greater than those specified for an Operating Basis Earthquake (OBE)[1]. An earthquake greater than an OBE but less than a Safe Shutdown Earthquake (SSE)[2] should have no significant impact on safety-related systems, structures, and components; however, some time may be required for the plant staff to ascertain the actual post-event condition of the plant (for example, performs walk-downs and post-event inspections). Given the time necessary to perform walk-downs and inspections, and fully understand any impacts, this event represents a potential degradation of the level of safety of the plant.

EAL #1 Basis

Event verification with external sources should not be necessary during or following an OBE. Earthquakes of this magnitude should be readily felt by on-site personnel and recognized as a seismic event. The Shift Manager or SED may seek external verification if deemed appropriate (for example, a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration.

EAL #2 Basis

EAL 2.b and the accompanying note is included to ensure that a declaration does not result from felt vibrations caused by a non-seismic source (e.g., a dropped load). The Shift Manager or SED may review the MMI scale descriptions below or seek external verification if deemed appropriate (e.g., a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration. This guidance recognizes that it may cause the site to declare an Unusual Event while another site, similarly affected but with readily available OBE indications in the Control Room, may not.

MODIFIED MERCALLI INTENSITY SCALE	
INTENSITY LEVEL	**DESCRIPTION**
I	Detected only by sensitive instruments.
II	Felt by few persons at rest, especially on upper floors; delicately suspended objects may swing.
III	Felt noticeably indoors. but not always recognized as earthquake; standing autos rock slightly, vibration like passing truck.
IV	Felt indoors by many, outdoors by few, at night some may awaken: dishes, windows, doors disturbed; autos rock noticeably.
V	Felt by most people; some breakage of dishes. windows, and plaster; disturbance of tall objects.
VI	Felt by all. many frightened and run outdoors; falling plaster and chimneys; damage small.
VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; noticed by drivers of autos.
VIII	Panel walls thrown out of frames; fall of walls, monuments, chimneys; sand and mud ejected; drivers of autos disturbed.
IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken.
X	Most masonry and frame structures destroyed; ground cracked, rails bent, landslides.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

References
0-ARI-166-172
1, 2-AOI-9, Earthquake

NEI 99-01 R6 HU2
RG 1.166 Appendix A

[1]An OBE is vibratory ground motion for which those features of a nuclear power plant necessary for continued operation without undue risk to the health and safety of the public will remain functional.

[2]An SSE is vibratory ground motion for which certain (generally, safety-related) structures, systems, and components must be designed to remain functional.

HU2

ECL: Unusual Event

Initiating Condition: Seismic event greater than OBE levels.

Operating Mode Applicability: All

Emergency Action Levels:

Note: For emergency classification, if EAL 2.b is not able to be confirmed, then the occurrence of a seismic event is confirmed in a manner deemed appropriate by the Shift Manager or Site Emergency Director in **< 15 mins** of the event.

(1) Seismic event greater than Operating Basis Earthquake (OBE) as indicated by Alarm Window 166-D, OBE SPECTRA EXCEEDED lit.

OR

(2) When Seismic Monitoring Equipment is **not** available:

a. Control Room personnel feel an actual or potential seismic event.

AND

b. **ANY** one of the following confirmed in **< 15 mins** of the event:
- Earthquake resulted in Modified Mercalli Intensity (MMI) **Level VI or greater within 5 km (3.1 miles)** from plant.
- Earthquake was magnitude **6.0 (Richter scale) or greater.**
- Earthquake was magnitude **5.0 (Richter scale) or greater** and occurred **within 200 km (124.5 miles)** from plant.

Basis:

This IC addresses a seismic event that results in accelerations at the plant site greater than those specified for an Operating Basis Earthquake (OBE)[1]. An earthquake greater than an OBE but less than a Safe Shutdown Earthquake (SSE)[2] should have no significant impact on safety-related systems, structures, and components; however, some time may be required for the plant staff to ascertain the actual post-event condition of the plant (for example, performs walk-downs and post-event inspections). Given the time necessary to perform walk-downs and inspections, and fully understand any impacts, this event represents a potential degradation of the level of safety of the plant.

EAL #1 Basis

Event verification with external sources should not be necessary during or following an OBE. Earthquakes of this magnitude should be readily felt by on-site personnel and recognized as a seismic event. The Shift Manager or SED may seek external verification if deemed appropriate (for example, a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration.

EAL #2 Basis

EAL 2.b and the accompanying note is included to ensure that a declaration does not result from felt vibrations caused by a non-seismic source (e.g., a dropped load). The Shift Manager or SED may review the MMI scale descriptions below or seek external verification if deemed appropriate (e.g., a call to the USGS, check internet news sources, etc.); however, the verification action must not preclude a timely emergency declaration. This guidance recognizes that it may cause the site to declare an Unusual Event while another site, similarly affected but with readily available OBE indications in the Control Room, may not.

MODIFIED MERCALLI INTENSITY SCALE	
INTENSITY LEVEL	**DESCRIPTION**
I	Detected only by sensitive instruments.
II	Felt by few persons at rest, especially on upper floors; delicately suspended objects may swing.
III	Felt noticeably indoors, but not always recognized as earthquake; standing autos rock slightly, vibration like passing truck.
IV	Felt indoors by many, outdoors by few, at night some may awaken; dishes, windows, doors disturbed; autos rock noticeably.
V	Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects.
VI	Felt by all, many frightened and run outdoors; falling plaster and chimneys; damage small.
VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; noticed by drivers of autos.
VIII	Panel walls thrown out of frames; fall of walls. monuments, chimneys; sand and mud ejected; drivers of autos disturbed.
IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken.
X	Most masonry and frame structures destroyed; ground cracked, rails bent, landslides.

Depending upon the plant mode at the time of the event, escalation of the emergency classification level would be via IC CA6 or SA9.

References
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NEI 99-01 R6 HU2
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