


Attachment 7

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|  Stone & Webster, Inc. TECHNICAL REPORT | JO No.: | 1457690202 |
| | Doc. No.: | 1457690202-R-M-00005-0 |
| | Revision: | 0 |
| | Client: | Duke Energy, Oconee Unit: 1 |
| | Location: | South Carolina, USA |

NTTF 2.3 SEISMIC PEER REVIEW SUPPLEMENTARY REPORT OCONEE NUCLEAR STATION UNIT 1



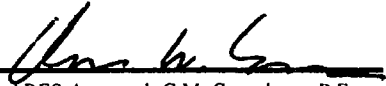
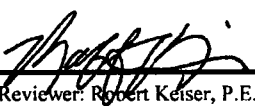
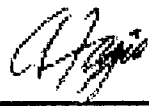
Prepared for:

Duke Energy Carolinas, LLC

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May 15, 2013

QA CATEGORY III

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|---|-------------------|---|-------------------|
|  Peer Reviewer: Paul D. Baughman, P.E. ARES Corporation | 5/15/2013 Date | | |
|  Peer Reviewer: George Bushnell, P.E. Stone & Webster, Inc. (A CB&I Company) | 5/15/2013 Date |  ARES Approval: C.M. Conselman, P.E., Project Manager | 5/15/2013 Date |
|  Peer Reviewer: Robert Keiser, P.E. Duke Energy | 5/15/2013 Date |  Stone & Webster, Inc. (A CB&I Company) Approval: Anthony F. Fazio Project Manager | 5/15/2013 Date |

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Revision Description

| Rev. | Reason for Revision | Change Description | Affected Pages (Page/Sec./Para.) | Date |
|-------------|----------------------------|---------------------------|---|-------------|
| 0 | Original Issue | N/A | N/A | 5/15/2013 |
| | | | | |
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Acronyms

| | |
|-------|---|
| ARES | ARES Corporation |
| AWC | Area Walk-By Checklist |
| CAP | Corrective Action Program |
| EPRI | Electric Power Research Institute |
| IPEEE | Individual Plant Examination of External Events |
| NRC | U.S. Nuclear Regulatory Commission |
| NTTF | Near-Term Task Force |
| ONS | Oconee Nuclear Station |
| PIP | Problem Investigation Process |
| SCE | Seismic Capability Engineer |
| SQUG | Seismic Qualification Utility Group |
| SSC | Structure, System and Component |
| SWC | Seismic Walkdown Checklist |
| SWE | Seismic Walkdown Engineer |
| SWEL | Seismic Walkdown Equipment List |
| SWI | Stone & Webster, Inc., a CB&I Company |



1.0 INTRODUCTION

Electric Power Research Institute (EPRI) Report 1025286, *Seismic Walkdown Guidance for Resolution of Fukushima Near-Term Task Force Recommendation 2.3: Seismic*, was issued in June 2012. This document provides guidance and procedures to perform seismic walkdowns as required by the U.S. Nuclear Regulatory Commission's (NRC's) 50.54(f) letter regarding Near-Term Task Force (NTTF) Recommendation 2.3: Seismic. The EPRI guidance covers selection of personnel; selection of a sample of structures, systems, and components (SSCs) that represent diversity of component types and ensures inclusion of components from critical systems/functions; conduct of the walkdowns; evaluation of potentially adverse conditions against the plant seismic licensing basis; peer review; Individual Plant Examination of External Events (IPEEE) vulnerabilities; and reporting requirements. It was intended that all U.S. nuclear power plants utilize this guidance document in meeting the requirements of the NRC 50.54(f) letter.

Duke Energy contracted with Stone & Webster, Inc., a CB&I Company (SWI) / ARES Corporation (ARES) Team to perform the NTTF 2.3 peer review at the Oconee Nuclear Station (ONS). A peer review of the NTTF 2.3 seismic walkdowns of Units 1, 2 and 3 was conducted in September 2012 and documented in SWI/ARES Technical Report 1457690202-R-M-0004, *NTTF 2.3 Seismic Peer Review Report, Oconee Nuclear Station Units 1, 2 and 3*. There were no outstanding comments from the peer review that required Duke Energy Action. At that time, some items in Unit 1 had not been walked down due to being inaccessible during plant operation. Walkdown of the Unit 1 inaccessible items was deferred to the Unit 1 refueling outage scheduled for the spring of 2013.

This report documents the supplementary peer review performed in May 2013. The supplementary peer review covered the walkdown of inaccessible items at Unit 1 performed by Duke Energy during the Unit 1 refueling outage. Walkdowns of inaccessible items for Units 2 and 3 are scheduled for outages in 2014.

2.0 SCOPE

The scope of this supplementary effort was to perform the NTTF 2.3 Seismic Peer Review of the inaccessible items at ONS Unit 1, in accordance with the guidelines in Section 6, *Peer Review*, of EPRI 1025286. It is intended that the information contained herein will be utilized by Duke Energy as part of its overall NTTF 2.3 final submittal report to be delivered to the NRC by July 1, 2013.

3.0 METHODOLOGY

The SWI/ARES methodology conforms to the guidance in Section 6 of EPRI 1025286. The Peer Review Team consisted of three individuals, all of whom have seismic engineering experience as it applies to nuclear power plants. These individuals participated in the peer review of each of the activities. The Peer Review Team for the supplementary peer review consisted of the same individuals that performed the September 2012 peer review.

The peer review process for the Seismic Walkdown Equipment List (SWEL) development and the seismic walkdowns was documented in SWI/ARES Technical Report 1457690202-R-M-00004, *NTTF*



2.3 Seismic Peer Review Report, Oconee Nuclear Station Units 1, 2 and 3. The SWEL did not change from the time of the September 2012 peer review, other than some equipment substitutions due to accessibility. The Peer Review Team reviewed these substitutions.

The peer review process for the seismic walkdowns and walk-bys of the inaccessible items consisted of conducting a final review of the completed documentation. The other, in-process, steps in the review methodology described in SWI/ARES Technical Report 1457690202-R-M-00004 were not considered necessary since the Duke Energy seismic walkdown team leader was included in the September 2012 peer review of in-process activities.

The peer review process for the licensing basis evaluations and the decisions for entering potentially adverse conditions into the Corrective Action Program (CAP) consisted of reviewing all of the decisions on potentially adverse seismic conditions resulting from the walkdown of the inaccessible items. The peer review process for the submittal report consisted of reviewing the draft submittal revision prepared by Oconee Design Engineering for licensing review.

4.0 PERSONNEL

The ONS Peer Review Team for the supplementary peer review consisted of the following individuals. As noted above, these are the same individuals who performed the September 2012 peer review.

- **Paul Baughman, P.E.,** ARES Corporation, Team Leader. Mr. Baughman is a licensed structural engineer with over 40 years of experience in seismic engineering for nuclear power stations. Mr. Baughman is a subject matter expert and trainer for the Seismic Qualification Utility Group (SQUG). Mr. Baughman has performed seismic assessment activities for ONS and is familiar with the ONS seismic licensing basis. Mr. Baughman has performed many seismic margin assessments and seismic probabilistic risk assessments, and is familiar with systems modeling and development of safe shutdown equipment lists.
- **George Bushnell, P.E.,** Stone & Webster, Inc. Mr. Bushnell is a licensed mechanical engineer with over 40 years of experience in engineering qualification of electrical and mechanical equipment for nuclear power stations. Mr. Bushnell is a qualified SQUG Seismic Capability Engineer (SCE) and company specialist for design and qualification of ASME III components.
- **Robert Keiser, P.E.,** Duke Energy. Mr. Keiser is a licensed professional engineer in North and South Carolina with over 20 years of experience in the seismic qualification of electrical equipment for Duke Energy's McGuire, Catawba, and Oconee Nuclear Stations. Mr. Keiser received training as a SQUG SCE and was involved with the SQUG effort at Oconee and the IPEEE efforts at all three stations.

5.0 SELECTION OF THE SSCs INCLUDED ON THE SWEL

Peer review of the SWEL is described in SWI/ARES Technical Report 1457690202-R-M-00004. During the Unit 1 walkdown of inaccessible items, three equipment items could not be walked down due to personnel access restrictions (radiation and safety). Three different items were substituted. The



substitutions are described in Section 4 of the Duke Energy revised submittal report. It is stated that the substitutions do not affect the sample considerations described in Section 3 of the submittal report. The Peer Review Team reviewed each of the substitutions and agreed with the conclusion that the substitutions did not affect the sample considerations.

Duke Energy did not update the Unit 1 SWEL to reflect these substitutions. Since the sample considerations are still as described in the submittal report and the substitutions are also described, the Peer Review Team concurred that it was not necessary to update the SWEL.

6.0 SEISMIC WALKDOWNS AND AREA WALK-BYS

The inaccessible equipment items and areas to be walked down were listed in Appendix C of SWI/ARES Technical Report 1457690202-R-M-00001, *Seismic Walkdown Report for Duke Energy's Oconee Nuclear Station Unit 1*. The walkdowns consist of two parts: equipment-specific seismic walkdowns and area walk-bys. The specific instructions for each part are delineated in EPRI 1025286. The walkdowns were performed by Duke Energy. The walkdowns were documented on Area Walk-By Checklists (AWCs) and Seismic Walkdown Checklists (SWCs), and are included in Attachment 7 of the revised submittal report.

Seismic walkdowns of specific items focused on identifying adverse anchorage conditions, adverse seismic interactions, and other adverse seismic conditions that could challenge the seismic adequacy of a SWEL item.

Anchorage was examined for degraded, nonconforming or unanalyzed conditions. This included visual inspection of the anchorage and verification of anchorage condition. The visual inspections looked for bent, broken, missing or loose hardware; corrosion that is more than mild surface oxidation; visible cracks in the concrete near anchors; and other potentially adverse seismic conditions. This did not apply to line-mounted items.

Anchorage configuration was verified to be consistent with the existing plant documentation for a portion of the equipment with anchorage. The anchorage configuration verification must be done for at least 50% of the non-line-mounted SWEL items. As noted in SWI/ARES Technical Report 1457690202-R-M-00001, the percentage for Unit 1 exceeds the EPRI 1025286 requirement.

The area adjacent to and surrounding the SWEL item was inspected for nearby SSCs that could be seismic interaction hazards due to proximity, failure, and falling, or insufficient flexibility of attached lines and cables. Detailed guidance on seismic spatial interactions is given in Appendix D of EPRI 1025286.

The SWEL item was also examined to see if there were any other potentially adverse seismic conditions besides anchorage and seismic interaction. These could include other degraded conditions, loose or missing subcomponent fasteners, unusual large or heavy subcomponents, doors or panels not latched or fastened, or any other condition which might be seismically adverse. Where possible, cabinets and enclosures were opened for examination of internals.



Area walk-bys consisted of examining the general area surrounding the specific SWEL items for potentially adverse seismic conditions. The area examined included either the entire room enclosing the SWEL item or at least 35 feet in any direction. The examination looked for degraded anchorage conditions of equipment in the area; significantly degraded equipment; poorly supported cable/conduit raceways, HVAC ducting, or piping; and unsecured temporary equipment that could cause seismic interactions (seismic housekeeping concerns). The area walk-by included looking for potential seismic interactions from flooding, spray, or fire. These potential seismic interactions are described in Section 4 of EPRI 1025286.

The Duke Energy engineers who performed the walkdowns of the inaccessible items were:

- **Russell Childs** – Duke Energy, Walkdown Team Lead
- **Adam Johnson** – Duke Energy, Walkdown Team Member

Mr. Childs participated in the previous NTTF 2.3 seismic walkdowns. Mr. Johnson did not participate in the previous NTTF 2.3 seismic walkdowns. The Peer Review Team reviewed their qualifications and verified that they meet the Seismic Walkdown Engineer (SWE) requirements in EPRI 1025286. Both attended the SQUG Seismic Walkdown Screening and Seismic Evaluation Training Course (for Seismic Capability Engineers). Their qualifications are included in the revised Duke Energy submittal report.

The Peer Review Team interviewed the Duke Energy engineers to assess their working synergy as well as individual capabilities and knowledge. Discussion provided positive indication that the walkdown personnel had adequate experience and training to perform walkdown and walk-by activities in compliance with the EPRI Seismic Walkdown Guidance. They displayed knowledge of the primary objectives of the walkdowns, appropriate levels of dialog between themselves to reach common agreement without excessive discussion, and adequate objectivity in identification of significant discrepancies between as-designed and as-found conditions.

The September 2012 peer review included review of in-process AWCs and SWCs. Group meetings were held with the SWEs to address the peer review comments. Mr. Childs attended those meetings.

The Peer Review Team concluded that the walkdown personnel had adequate experience and training to perform walkdown and walk-by activities in compliance with the EPRI Seismic Walkdown Guidance.

The Peer Review Team reviewed 100% of the final SWCs and AWCs of the inaccessible items. This is more than the 10% sample that the EPRI guidance requires. The review is summarized in Appendix A of this report. The table in Appendix A lists the 22 SWCs and 12 AWCs reviewed.

The Peer Review Team concluded that the walkdowns of the inaccessible items were conducted in accordance with the EPRI guidance.



7.0 LICENSING BASIS REVIEWS

All potentially adverse conditions require a licensing basis review in accordance with the EPRI guidance. For the ONS Unit 1 inaccessible items, no potentially adverse seismic conditions were identified. Therefore, there were no licensing basis reviews.

Although not considered potentially adverse seismic conditions, two conditions – a temporary electrical cable support specification non-compliance and an editorial error on a drawing – were identified for further action. These were entered into the CAP via the Problem Investigation Process (PIP) to enable tracking to closure. The items were entered into two PIPs: O-13-04143 and O-13-03357. The Peer Review Team reviewed the PIPs and agreed that neither condition was a potentially adverse seismic condition.

8.0 DECISIONS ON ENTERING POTENTIALLY ADVERSE SEISMIC CONDITIONS INTO THE CAP PROCESS

As noted above, there were no potentially adverse seismic conditions identified for the Unit 1 inaccessible items. However, two items that were not potentially adverse seismic conditions were entered into the CAP via PIP for further action. Since there were no potentially adverse seismic conditions, it was not necessary to perform extent of condition evaluations.

The Peer Review Team concludes that the decisions on entering potentially adverse conditions into the CAP process were in accordance with the EPRI guidance.

9.0 SUBMITTAL REPORT

The Peer Review Team reviewed a draft of the revised submittal report for ONS Unit 1 provided by Mr. Childs on April 30, 2013. The report contains the required sections and discussions. The Peer Review Team had no technical comments on the draft revised submittal report. The Peer Review Team concludes that the revised submittal report is in accordance with the EPRI guidance.

10.0 CONCLUSIONS

The conclusion of the supplemental peer review is that the ONS NTTF 2.3 seismic walkdown for the Unit 1 inaccessible items has been conducted in accordance with the guidance in EPRI 1025286. There were no unresolved comments from the September 2012 peer review.

11.0 REFERENCES

Duke Energy, *Fukushima Near-Term Task Force (NTTF) Recommendation 2.3: NRC Submittal Report for Seismic Walkdowns, Oconee Unit 1*, Revision 1, DRAFT, April 30, 2013.

EPRI 1025286, *Seismic Walkdown Guidance for Resolution of Fukushima Near-Term Task Force Recommendation 2.3: Seismic*, June 2012, Electric Power Research Institute, Palo Alto, CA.



Letter, E. Leeds and M. Johnson (NRC) to All Power Reactor Licensees et al., "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," Enclosure 2.3, "Recommendation 2.3: Seismic," dated March 12, 2012.

SWI/ARES Technical Report 1457690202-R-M-00001-1, *Seismic Walkdown Report for Duke Energy's Oconee Nuclear Station Unit 1*, Revision 1, November 12, 2012.

SWI/ARES Technical Report 1457690202-R-M-00004-0, *NTTF 2.3 Seismic Peer Review Report, Oconee Nuclear Station Units 1, 2 and 3*, Revision 0, November 16, 2012.



APPENDIX A

**SUMMARY OF PEER REVIEW OF
FINAL SWCs AND AWCs FOR INACCESSIBLE ITEMS**



Walkdown Team Members: Russell P. Childs, Duke Energy Adam T. Johnson, Duke Energy

Summary of Peer Review of Final SWCs and AWCs for Inaccessible Item (4 sheets)

| EDB ID | Equipment Class | 50% Anchorage | Non 50% Anchorage | Line Mounted | Overall Status | Team | Comments |
|-----------------------------|-----------------|---------------|-------------------|--------------|----------------|--------------------|--|
| AB40 Unit 1 Aux Bldg | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (Aux Bldg roof, EI 809). 1. Walkdown centered around Main Steam Safety Relief Valves. 2. No adverse condition noted. |
| RB01 Unit 1 Reactor Bldg | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (RB room B, EI 777). 1. Walkdown centered around level transmitter/makeup pump. 2. No adverse condition noted. |
| RB02 Unit 1 Reactor Bldg | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (RB, EI 797). 1. Walkdown centered around level transmitter. 2. No adverse condition noted. |
| RB03 Unit 1 Reactor Bldg | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (RB, EI 817). 1. Walkdown centered around fuse panel. 2. No adverse condition noted. |
| RB04 Unit 1 Reactor Bldg | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (RB, EI 819). 1. Walkdown centered around pressure transmitter. 2. No adverse condition noted. |
| RB05 Unit 1 Reactor Bldg | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (RB room 2F, EI 825). 1. Walkdown centered around pressure transmitter/RBCU fan. 2. No adverse condition noted. |
| RB06 Unit 1 Reactor Bldg | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (RB, EI 844). 1. Walkdown centered around vent isolation valve. 2. No adverse condition noted. |
| RB07 Unit 1 Reactor Bldg | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (RB room B, EI 853). 1. Walkdown centered around pressurizer PORV. 2. No adverse condition noted. |
| RB20 Unit 1 Reactor Bldg | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (RB, EI 797). 1. Walkdown centered around RTD. 2. No adverse condition noted. |



Summary of Peer Review of Final SWCs and AWCs for Inaccessible Item (4 sheets)

| EDB ID | Equipment Class | 50% Anchorage | Non 50% Anchorage | Line Mounted | Overall Status | Team | Comments |
|----------------------|-----------------|---------------|-------------------|--------------|----------------|--------------------|--|
| KEO02 Dam Complex | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (K1 KEO room WP, El 667). 1. Walkdown centered around oil level switch. 2. No adverse condition noted. |
| KEO07 Dam Complex | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (K2 KEO room WP, El 667). 1. Walkdown centered around sump level switch/HP lift pump. 2. No adverse condition noted. |
| KEO10 Dam Complex | - | - | - | - | Y | Childs/ Johnson | Area Walkdown (K2 KEO room MEG, El 683) 1. Walkdown centered around generator cooling isolation valve. 2. Outlier temporary cable restraint geometry noted (PIP O-13-04143), but judged seismically adequate. 3. Photo provided. 4. No adverse condition noted. |
| 1ELLX1X4 | 02 | - | X | - | Y | Childs/ Johnson | No seismically adverse condition noted. Editorial error identified on reference drawing, corrected via PIP O-13-03357. Non-conforming anchorage details justified by existing SQUG evaluations. Documents referenced; photos provided. SQUG modification identified. |
| 1ELLX1X8 | 02 | X | - | - | Y | Childs/ Johnson | No seismically adverse condition noted. Minor concrete cracking assessed as non-significant. Gap at a support point previously justified under SQUG. Documents referenced; photos provided. |
| 1VSAH0011 | 10 | X | - | - | Y | Childs/ Johnson | No seismically adverse condition noted. SQUG and post-IPEEE modifications justify anchorage as-found. Documents referenced; photos provided. |
| 0SYDPLSYDC1 | 14 | X | - | - | Y | Childs/ Johnson | No seismically adverse condition noted. Minor concrete/mortar spillage removed to allow visual access to anchorage. Weld modification previously justified under SQUG. Documents referenced; photos provided. |



Summary of Peer Review of Final SWCs and AWCs for Inaccessible Item (4 sheets)

| EDB ID | Equipment Class | 50% Anchorage | Non 50% Anchorage | Line Mounted | Overall Status | Team | Comments |
|-------------------|-----------------|---------------|-------------------|--------------|----------------|----------------|---|
| K1GBOLS63TB | 18 | - | X | - | Y | Childs/Johnson | No seismically adverse condition noted. Photos provided. |
| K2ELKTN0203 | 14 | X | - | - | Y | Childs/Johnson | No seismically adverse condition noted. Minor oxidation/efflorescence around anchorage assessed as benign. Anchorage details justified under SQUG. Documents referenced; photos provided. |
| K2WLVA0011 | 07 | - | X | - | Y | Childs/Johnson | No seismically adverse condition noted. Discussion provided regarding flexibility of attached lines. Photos provided. |
| K2TSL63SB | 18 | X | - | - | Y | Childs/Johnson | No seismically adverse condition noted. Documents referenced; photos provided. |
| K2HPOPU88HA | 05 | - | X | - | Y | Childs/Johnson | No seismically adverse condition noted. Documents referenced; photos provided. |
| IMSVA0006 | 07 | - | - | X | Y | Childs/Johnson | No seismically adverse condition noted. Photos provided. |
| IMSVA0010 | 07 | - | - | X | Y | Childs/Johnson | No seismically adverse condition noted. |
| 1ELPLPZR1B | 14 | - | X | - | Y | Childs/Johnson | No seismically adverse condition noted. SQUG and post-IPEEE modifications identified. Potential interaction with abandoned cable resolved. Photos provided; documents referenced. |
| 1FDWLT0082 | 18 | X | - | - | Y | Childs/Johnson | No seismically adverse condition noted. Documents referenced. |
| 1HPIPU0005 | 05 | - | X | - | Y | Childs/Johnson | No seismically adverse condition noted. |
| 1RBCAH0020A | 09 | - | X | - | Y | Childs/Johnson | No seismically adverse condition noted. Discussion provided on potential spatial interaction. Photos provided. |
| 1RBCHX000D AUX | 10 | X | - | - | Y | Childs/Johnson | No seismically adverse condition noted. Documents referenced; photos provided. |
| 1RCLT0004P1 | 18 | X | - | - | Y | Childs/Johnson | No seismically adverse condition noted. Documents referenced. |



Summary of Peer Review of Final SWCs and AWCs for Inaccessible Item (4 sheets)

| EDB ID | Equipment Class | 50% Anchorage | Non 50% Anchorage | Line Mounted | Overall Status | Team | Comments |
|------------|-----------------|---------------|-------------------|--------------|----------------|--------------------|---|
| 1RCPT0166P | 18 | X | - | - | Y | Childs/ Johnson | No seismically adverse condition noted. Documents referenced. |
| 1RCPT0226 | 18 | - | X | - | Y | Childs/ Johnson | No seismically adverse condition noted. Post-IPEEE modification identified. Documents referenced. |
| 1RCRD0006A | 19 | - | - | X | Y | Childs/ Johnson | No seismically adverse condition noted. |
| 1RCVA0066 | 08B | - | - | X | Y | Childs/ Johnson | No seismically adverse condition noted. |
| 1RCVA0159 | 08B | - | - | X | Y | Childs/ Johnson | No seismically adverse condition noted. |

Notes:

1. Walkdown observations adequately documented.
2. Appropriate explanatory discussion, references, and/or photographs provided as required.
3. Ample number of photographs provided.

