Attachment 8B

Supplementary Peer Review Report Unit 2

NTTF 2.3 SEISMIC PEER REVIEW SUPPLEMENTARY REPORT CATAWBA NUCLEAR STATION UNIT 2

Prepared for:

Duke Energy Carolinas, LLC

Prepared by: Stone & Webster, Inc. and ARES Corporation

December 2, 2013

QA CATEGORY III

Peer Reviewer: Paul D. Baughman, P.E. ARES Corporation	12/02/2013 Date		
Peer Reviewer: George Bushnell, P.E. Stone and Webster, Inc. (A CB&I Company)	12/02/2013 Date	ARES Approval: C.M. Conselman Project Manager	12/02/2013 Date
Peer Reviewer: Robert Keiser, P.E. Duke Energy	12/02/2013 Date	CB&I Approval: Anthony F. Fazio Project Manager	12/02/2013 Date

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Appendices

Acronyms

ARES	ARES Corporation
AWC	Area Walk-By Checklist
CAP	Corrective Action Program
CB&I	CB&I Company
CNS	Catawba Nuclear Station
Duke Energy	Duke Energy Carolinas, LLC
EPRI	Electric Power Research Institute
IPEEE	Individual Plant Examination of External Events
NRC	U.S. Nuclear Regulatory Commission
NTTF	Near-Term Task Force
PIP	Problem Investigation Process
SQUG	Seismic Qualification Utility Group
SSC	Structure, System and Component
SWC	Seismic Walkdown Checklist
SWE	Seismic Walkdown Engineer
SWEL	Seismic Walkdown Equipment List

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 Carolinas, LLC (Duke Energy) contracted with the Stone and Webster, Inc., a CB&I Company (CB&I) / ARES Corporation (ARES) Team to perform the NTTF 2.3 peer review at the Catawba Nuclear Station (CNS). A peer review of the NTTF 2.3 seismic walkdowns of Units 1 and 2 was conducted in September 2012 and documented in CB&I /ARES Technical Report 1457690303-R-M-00003, *NTTF 2.3 Seismic Peer Review Report, Catawba Nuclear Station Units 1 and 2*. At that time, some items had not been walked down due to being inaccessible during plant operation. Walkdowns of the Unit 1 inaccessible items were deferred to the Unit 1 1EOC20 refueling outage scheduled for November 2012. Walkdowns of the Unit 2 inaccessible items were deferred to the Unit 2 2EOC19 refueling outage scheduled for September 2013. This report documents the supplementary peer review performed at Unit 2 in November 2013. The supplementary peer review covered the walkdown of inaccessible items at Unit 2 performed by Duke Energy during the Unit 2 refueling outage. The supplementary peer review of the Unit 1 inaccessible items, which were walked down in November 2012, is documented in CB&I /ARES Technical Report 1457690303-R-M-00004, *NTTF 2.3 Seismic Peer Review Supplementary Report, Catawba Nuclear Station Unit 1*.

2.0 SCOPE

The scope of this supplementary effort was to perform the NTTF 2.3 Seismic Peer Review of the walkdown of the inaccessible items at CNS Unit 2, 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 for Unit 2 to be delivered to the NRC in January 2014.

3.0 METHODOLOGY

The CB&I/ARES methodology conforms to the guidance in Section 6 of EPRI 1025286. The Peer Review Team consisted of four individuals, three of whom have seismic engineering experience as it applies to nuclear power plants. The fourth individual has plant operations experience. The three individuals with seismic engineering experience participated in the peer review of each of the activities. The Peer Review Team for the supplementary peer review consisted of the same three seismic engineering individuals that performed the September 2012 peer review.

The peer review process for the Seismic Walkdown Equipment List (SWEL) development and seismic walkdowns was documented in CB&I / ARES Technical Report 1457690303-R-M-00003. Since the SWEL did not change from the time of the September 2012 peer review, it was not part of the supplementary peer review.

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 CB&I / ARES Technical Report 1457690303-R-M-00003 were not considered necessary since the Duke Energy seismic walkdown engineers (SWEs) were 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 licensing basis reviews 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 Catawba Design Engineering for licensing review.

4.0 PERSONNEL

The CNS Peer Review Team for the supplemental 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 CNS and is familiar with the CNS 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., CB&I Power Group. 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 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 Seismic Capability Engineer 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 CB&I / ARES Technical Report 1457690303-R-M-00003. Since the SWEL did not change from September 2012 no further peer review was required.

6.0 SEISMIC WALKDOWNS AND AREA WALK-BYS

The inaccessible equipment items and areas to be walked down were listed in Appendix C of CB&I / ARES Technical Report 1457690303-R-M-00002, *Seismic Walkdown Report for Duke Energy's Catawba Nuclear Station Unit 2*. 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.

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 CB&I / ARES Technical Report 1457690303-R-M-00002, the percentage for CNS Unit 2 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 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 Peer Review Team reviewed the qualifications of the Duke Energy engineers performing the walkdowns and verified that they meet the requirements for a SWE in EPRI 1025286. The Peer Review

Team also conducted interviews with the engineers to confirm that they had a good understanding of the guidance in EPRI 1025286.

The individuals interviewed were:

- T. R. Leitch – Duke Energy, Senior Walkdown Team Member
- T. K. Hege – Duke Energy, Walkdown Team Member

Interviews of walkdown personnel were jointly performed by the Duke Energy, ARES, and CB&I members of the Peer Review Team. Personnel were interviewed to assess their working synergy as well as individual capabilities/knowledge. All were verified to have attended the EPRI NTTF 2.3 Seismic Walkdown Training Course. 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. Team member qualifications are included in the Duke Energy walkdown report.

The September 2012 peer review included review of in-process Area Walkdown Checklists (AWCs) and Seismic Walkdown Checklists (SWCs). Group meetings were held with the SWEs to address the peer review comments. The Duke Energy personnel who performed walkdowns of the inaccessible items attended these meetings.

The Peer Review Team reviewed 100% of the final SWCs and AWCs for 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 18 SWCs and 14 AWCs reviewed.

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

The Peer Review Team has reviewed the Duke Energy walkdown report (Duke Energy Calculation CNC-1206.03-00-0203, *Fukushima Near-Term Task Force (NTTF) Recommendation 2.3: NRC Submittal Report for Seismic Walk-downs*, Attachment 7B, "Inaccessible Seismic Walkdown Summary Report and Checklists.") The report describes the walkdowns and summarizes the results. The report contains all of the information required by the EPRI guidance.

7.0 LICENSING BASIS REVIEWS

All potentially adverse conditions require a licensing basis review in accordance with the EPRI guidance. For CNS, the licensing basis reviews were performed by Duke Energy Design Engineering personnel. Messrs. Thomas Leitch and Travis Hege performed the licensing basis reviews. They were assisted by Mr. Robert Pryce. These individuals meet the personnel requirements in EPRI 1025286.

The walkdown of the inaccessible items identified five potentially adverse seismic conditions. As with the accessible items, each potentially adverse condition identified by the walkdown team was entered

into the CAP via the Problem Investigation Process (PIP) to enable tracking to closure. The Duke Energy Licensing Basis Reviewers stated that the licensing basis reviews were documented in the PIPs associated with the potentially adverse conditions and no conditions were found to violate the CNS seismic licensing basis.

The potentially adverse seismic conditions identified by the walkdown of the inaccessible items are listed in Appendix B of the Duke Energy walkdown report. The peer reviewers verified that all of the potentially adverse seismic conditions listed in Appendix B of the walkdown report had licensing basis reviews documented in the referenced PIP. The Peer Review Team reviewed the licensing basis evaluations for all of the potentially adverse seismic conditions and concluded that they were conducted in accordance with the EPRI guidance

The peer reviewers also reviewed the updated licensing basis reviews for Unit 2 items with licensing basis review comments provided to Duke Energy during the September peer review. The Peer Review Team concluded that the comments were acceptably resolved.

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

All of the potentially adverse seismic conditions identified by the seismic walkdown of the inaccessible items were entered in the CAP for further evaluation. The Peer Review Team review of the seismic walkdowns determined that the identifications of potentially adverse seismic conditions were conservatively made. Thus, the decision to enter all of them into the CAP was likewise conservative.

The licensing basis reviews determined that none of the potentially adverse seismic conditions violated the CNS licensing basis. Therefore, it was not necessary to perform any extent of condition evaluations.

The licensing basis evaluations of the potentially adverse seismic conditions identified enhancements, which were determined to improve the seismic condition of the plant. Work orders were assigned for implementation of the enhancements.

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

9.0 SUBMITTAL REPORT

The Peer Review Team reviewed a draft of the final submittal report for CNS Unit 2 provided by Mr. Travis Hege on November 19, 2013. The report contained the required sections and discussions. Comments on the submittal report were provided to Messrs. Leitch and Hege. The Peer Review Team reviewed the updated draft and concluded that the comments were satisfactorily resolved.

The Peer Review Team concludes that the final submittal report is in accordance with the EPRI guidance.

10.0 CONCLUSIONS

The conclusion of the supplemental peer review for CNS Unit 2 is that the CNS NTTF 2.3 seismic walkdown for the inaccessible items has been conducted in accordance with the guidance in EPRI 1025286. Comments made during the September 2012 peer review have been addressed satisfactorily.

11.0 REFERENCES

CB&I / ARES Technical Report 1457690303-R-M-00002, *Seismic Walkdown Report for Duke Energy's Catawba Nuclear Station Unit 2*, Revision 2, November 14, 2012.

CB&I / ARES Technical Report 1457690303-R-M-00003, *NTTF 2.3 Seismic Peer Review Report, Catawba Nuclear Station Units 1 and 2*, Revision 0, November 18, 2012.

CB&I / ARES Technical Report 1457690303-R-M-00004, *NTTF 2.3 Seismic Peer Review Supplementary Report, Catawba Nuclear Station Unit 1*, Revision 0, March 14, 2013.

Duke Energy Calculation CNC-1206.03-00-0203, *Fukushima Near-Term Task Force (NTTF) Recommendation 2.3: NRC Submittal Report for Seismic Walk-downs*, Revision 3, DRAFT, November 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-Tern Task Force Review of Insights from the Fukushima Dai-ichi Accident," Enclosure 2.3, "Recommendation 2.3: Seismic," dated March 12, 2012.

APPENDIX A

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

Walkdown Team Members:

T. K. Hege, Duke Energy T. R. Leitch, Duke Energy

Summary of Peer Review of Final SWCs and AWCs for Inaccessible Items

EDB ID	Equipment Class	50% Anchorage	Non 50% Anchorage	Line Mounted	Overall Status	Team	Comments
2NV52A	7	–	X	X	Y	Hege/ Leitch	• No adverse condition noted • No documents referenced • No photos provided
CV2 EL 557	–	–	–	–	Y	Hege/ Leitch	Area Walkdown (Deg 066 Rad 40): 1. WD centered around VALVE 2NV52A 2. No adverse conditions noted 3. No photos included
2NI439B	8	–	X	X	Y	Hege/ Leitch	• No adverse condition noted • No documents referenced • No photos provided
CV2 EL 578	–	–	–	–	Y	Hege/ Leitch	Area Walkdown (Deg 140 Rad 47 Rm BCLA): 1. WD centered around Valve 2NI439B 2. No adverse conditions noted 3. No photo included
2ND2A	8	–	X	X	Y	Hege/ Leitch	• No adverse seismic related condition noted • Damaged cable flex armor noted: no functional challenge • No documents referenced • Photo provided
CV2 EL 567	–	–	–	–	Y	Hege/ Leitch	Area Walkdown (Deg 176 Rad 50 Rm FANR): 1. WD centered around Valve 2ND2A 2. No seismically adverse conditions noted 3. Loose cable in tray and minor corrosion noted 4. Photos included
2 ND1B	0	–	X	X	Y	Hege/ Leitch	• No adverse seismic related condition noted • No documents referenced • No photo provided

Summary of Peer Review of Final SWCs and AWCs for Inaccessible Items

EDB ID	Equipment Class	50% Anchorage	Non 50% Anchorage	Line Mounted	Overall Status	Team	Comments
CV2 EL 572	–	–	–	–	Y	Hege/ Leitch	Area Walkdown (Deg 170 Rad 33) 1. WD centered around valve 2ND1B 2. No seismically adverse conditions noted 3. Temporary shielding in place for outage, damaged cable connection noted 4. Photos provided
2NC34A	8	–	X	X	Y	Hege/ Leitch	• No adverse condition noted • No documents referenced • No photos provided
CV2 El 635	–	–	–	–	Y	Hege/ Leitch	Area Walkdown (Deg 105 Rad 38): 1. WD centered around Valve 2NC34A, 2NC32B, 2NC36B 2. No adverse conditions noted 3. No photo included
2NC32B	8	–	X	X	Y	Hege/ Leitch	• No adverse condition noted • No documents referenced • No photos provided
2NC36B	8	–	X	X	Y	Hege/ Leitch	• No adverse condition noted • Potential physical interference noted: justified acceptable based on at-temperature configuration and observed ruggedness of component • No documents referenced • Photo provided
2NV865A	8	–	X	X	Y	Hege/ Leitch	• SWEL 2 component • No adverse condition noted • No documents referenced • No photos provided
AN2 El 578	–	–	–	–	Y	Hege/ Leitch	Area Walkdown (Deg 266 Rad 61): 1. WD centered around Valve 2NV865A 2. No adverse conditions noted 3. No photo included

Summary of Peer Review of Final SWCs and AWCs for Inaccessible Items

EDB ID	Equipment Class	50% Anchorage	Non 50% Anchorage	Line Mounted	Overall Status	Team	Comments
2FW8	0	–	X	X	Y	Leitch/ Hege	• SWEL 2 component • No adverse condition noted • No documents referenced • No photos provided
CV2 El 566	–	–	–	–	Y	Leitch/ Hege	Area Walkdown (Deg 244 Rad 47) 1. WD centered around gate valve 2FW8 2. No seismically adverse conditions noted 3. Comments describing/justifying minor condition: temporary shielding in place for outage 4. Photo provided
2FW25	0	–	X	–	Y	Leitch/ Hege	• SWEL 2 component • No adverse condition noted • No documents referenced • No photos provided
CV2 El 564	–	–	–	–	Y	Leitch/ Hege	Area Walkdown (Deg 255 Rad 33 Rm LC) 1. WD centered around drain valve 2FW25 2. No seismically adverse conditions noted 3. No photos provided
2NVPD0042	0	–	X	–	Y	Hege/ Leitch	• SWEL 2 component • No adverse condition noted • Potential physical interference noted: justified acceptable based on configuration of components • Lack of component ID tags noted • No documents referenced • Photos provided
2NVPUSB	5	X	–	–	N	Hege/ Leitch	• SWEL 2 component • Potentially adverse seismic condition items noted. • Anchorage inadequacies noted: loose anchor bolt; geometry not as depicted on drawings • No documents referenced; photos provided • Comments justify adequacy of close clearance/potential interaction condition

Summary of Peer Review of Final SWCs and AWCs for Inaccessible Items

EDB ID	Equipment Class	50% Anchorage	Non 50% Anchorage	Line Mounted	Overall Status	Team	Comments
AN2 El 557	–	–	–	–	Y	Hege/ Leitch	Area Walkdown (Deg 277 Rad 60) 1. WD centered on pump 2NVPUSB, damper 2NVPD0042 2. No seismically adverse condition noted 3. No documents referenced; no photos provided
2CFLT5560	20	–	X	–	Y	Hege/ Leitch	• No adverse condition noted • No documents referenced • No photos provided
AN2 El 569	–	–	–	–	Y	Hege/ Leitch	Area Walkdown (Deg 229 Rad 59) 1. WD centered on 2CFLT5560 DP transmitter 2. No seismically adverse conditions noted 3. No documents referenced; no photos provided
2EMXQ	1	–	X	–	Y	Hege/ Leitch	• No seismically adverse conditions noted • No documents referenced • No photos provided
RN Pump House	–	–	–	–	Y	Hege/ Leitch	Area Walkdown (Pump House El 600) 1. WD centered on MCC 2EMXQ 2. No seismically adverse condition noted 3. No documents referenced; photos provided 4. Discussion provided on resolution of apparent close clearance conditions
2EMXK	1	–	X	–	N	Hege/ Leitch	• Degraded anchorage (concrete spalling) identified • Potentially adverse seismic condition item noted • Documents referenced; photos provided • Background discussion included in form of comments: close clearance condition
2EMXC	1	–	X	–	N	Hege/ Leitch	• Potentially adverse seismic condition items noted: presence of foreign material identified, including loose bolt; contact with adjacent component • Background discussion included in form of comments to resolve apparent close clearance condition

Summary of Peer Review of Final SWCs and AWCs for Inaccessible Items

EDB ID	Equipment Class	50% Anchorage	Non 50% Anchorage	Line Mounted	Overall Status	Team	Comments
AUX El 577	–	–	–	–	Y	Hege/ Leitch	Area Walkdown (U2 Train A Rm 486) 1. WD centered on MCC 2EMXC, 2EMXK 2. No seismically adverse condition noted 3. Documents referenced; photos provided 4. Discussion provided on resolution of apparent close clearance conditions
2DGLSA-1	14	X	–	–	N	Hege/ Leitch	• Potentially adverse seismic condition item noted. Anchorage cannot be verified: conflicting/irretrievable documentation of qualified geometry • Potential seismic interaction with adjacent structures due to presence of foreign materials; proximity of protruding elements of adjacent component • Documents referenced • Photos provided
D2A El 557	–	–	–	–	N	Hege/ Leitch	Area Walkdown (hallway to 2A Diesel Generator room) 1. WD centered on load panel 2DGLSA-1 2. Potentially adverse seismic spatial interaction identified due to protruding element between components 3. Document referenced; photo provided 4. Component specific (2DGLSA-1) anchorage observations repeated
2KF122	0	–	–	X	N	Hege/ Leitch	• SWEL 2 component • Potentially adverse seismic condition item noted • No documents referenced • Housekeeping issue identified regarding adjacent unsecured items • Photos provided
AUX El 610	–	–	–	–	N	Hege/ Leitch	Area Walkdown (aux building room 614) 1. WD centered on gate valve 2KF122 2. Potentially adverse seismic spatial interaction identified due to unsecured components 3. No documents referenced; photo provided in SWC for 2KF122