UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 24, 2018

Mr. Charles Eldredge
Quality Assurance Manager
Schulz Electric Company
30 Gando Drive
New Haven, CT 06513

SUBJECT: SCHULZ ELECTRIC COMPANY'S NUCLEAR REGULATORY COMMISSION INSPECTION REPORT NO. 99901269/2018-201 AND NOTICE OF NONCONFORMANCE

Dear Mr. Eldredge:

On April 9-13, 2018, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at Schulz Electric Company's (SEC's) facilities in New Haven, CT. The purpose of this limited-scope routine inspection was to assess SEC's compliance with provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and selected portions of Appendix B, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

This technically-focused inspection specifically evaluated SEC's implementation of the quality activities associated with the rewinding, repair, and supply of safety-related motors to the U.S. nuclear industry. The enclosed report presents the results of the inspection. This NRC inspection report does not constitute NRC endorsement of SEC's overall quality assurance (QA) program.

During this inspection, the NRC inspection team found the implementation of your QA program did not meet certain regulatory requirements imposed on you by your customers or NRC licensees. Specifically, the NRC inspection team determined that SEC was not fully implementing its QA program in the areas of design control and control of purchase material, equipment, and services. The specific findings and references to the pertinent requirements are identified in the enclosures to this letter. In response to the enclosed notice of nonconformance (NON), SEC should document the results of the extent of condition review for these findings and determine if there are any effects on other safety-related components.

Please provide a written statement or explanation within 30 days of this letter in accordance with the instructions specified in the enclosed NON. We will consider extending the response time if you show good cause for us to do so.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," the NRC will make available electronically for public inspection a copy of this letter, its enclosure, and your response through the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System, which is accessible at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response

should not include any personal privacy, proprietary, or Safeguards Information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material be withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information would create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Sincerely,

/RA/

Terry W. Jackson, Chief
Quality Assurance Vendor Inspection Branch-1
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 99901269

Enclosures:
1. Notice of Nonconformance
2. Inspection Report No. 99901269/2018-201
   and Attachment

SUBJECT: SCHULZ ELECTRIC COMPANY'S NUCLEAR REGULATORY COMMISSION INSPECTION REPORT NO. 99901269/2018-201 AND NOTICE OF NONCONFORMANCE Dated: May 24, 2018

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DATE	05/16/18	05/14/18	05/23/18
OFC	NRO/DCIP	NRO/DCIP	NRO/DCIP
NAME	JBurke*	JJacobson	TJackson
DATE	05/24/18	05/22/18	05/24/18

OFFICIAL RECORD COPY

NOTICE OF NONCONFORMANCE

Schulz Electric Company
30 Gando Drive
New Haven, CT 06513

Docket No. 99901269

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at Schulz Electric Company's (SEC's) facility in New Haven, CT, from April 9-13, 2018, SEC did not conduct certain activities in accordance with NRC requirements that were contractually imposed upon them by NRC licensees:

A. Criterion III of Appendix B to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Design Control," states in part that, "Measures shall also be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions for the structures, systems and components."

   Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50, states, in part, that "Measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. These measures shall include provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor or subcontractor, inspection at the contractor or subcontractor source, and examination of products upon delivery."

   SEC Technical Evaluation #725 "Three Phase Fractional and Integral HP Squirrel-Cage Induction Motors NEMA Frame Size 680 or IEC Frame Size 400 and Smaller Continuous and Intermittent Duties," identifies the motor shaft material as a critical characteristic that must be verified when the end use of the motor will be in a seismic environment, harsh environment, side-loaded application, or the shaft has a specific material requirement.

   Contrary to the above, as of April 13, 2018, SEC failed to ensure the suitability of certain parts used in the manufacture of safety-related motors. Specifically, SEC failed to establish and implement an acceptable method to verify by direct inspection, commercial-grade survey, source surveillance, or other acceptable methods, the material composition of shafts used in AC motors provided by a commercial supplier.

   This issue has been identified as Nonconformance 99901269/2018-201-01.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Chief, Quality Assurance Vendor Inspection Branch-1 Vendor Branch, Division of Construction Inspection and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each noncompliance: (1) the reason for the noncompliance or, if contested, the basis for disputing the noncompliance; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken to avoid further noncompliance; and (4) the date when the corrective action will be completed. Where good cause is shown, the NRC will consider extending the response time.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System, which is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html, to the extent possible, it should not include any personal privacy, proprietary, or Safeguards Information (SGI) so that the NRC can make it available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material be withheld, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information would create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Dated this 24th day of May 2018.

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NEW REACTORS
DIVISION OF CONSTRUCTION INSPECTION AND OPERATIONAL PROGRAMS
VENDOR INSPECTION REPORT

Docket No.:	99901269
Report No.:	99901269/2018-201
Vendor:	Schulz Electric Company 30 Gando Drive New Haven, CT 06513
Vendor Contact:	Mr. Charles Eldredge Quality Assurance Manager Schulz Electric Company 30 Gando Drive New Haven, CT 06513 Email: eldredge@schulzelectric.com Phone: 203-859-7413
Nuclear Industry Activity:	Schulz Electric Company provides repair and rewind services, as well as, new safety-related and environmentally qualified electric motors.
Inspection Dates:	April 9-13, 2018
Inspectors:	Jeffrey Jacobson, NRO/DCIP/QVIB-1, Team Leader Jermaine Heath, NRO/DCIP/QVIB-1 Aaron Armstrong, NRO/DCIP/QVIB-1 Thomas Herrity, NRO/DCIP/QVIB-2
Approved by:	Terry W. Jackson, Chief Quality Assurance Vendor Inspection Branch-1 Division of Construction Inspection and Operational Programs Office of New Reactors

EXECUTIVE SUMMARY

Schulz Electric Company
99901269/2018-201

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a vendor inspection at Schulz Electric Company's (SEC's) facility in New Haven, CT, to verify that it had implemented an adequate quality assurance (QA) program that complies with the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities." In addition, the NRC inspection also verified that SEC implemented a program under 10 CFR Part 21, "Reporting of Defects and Noncompliance."

This technically-focused inspection specifically evaluated SEC's implementation of quality activities associated with the rewind, repair, and supply of safety-related and environmentally qualified motors to the U.S. nuclear industry. The inspection team focused its review on SEC's implementation of processes for commercial-grade dedication, design control, testing, corrective action, and notifications under 10 CFR Part 21.

In the area of commercial-grade dedication and supplier oversight, the NRC inspection team identified Nonconformance 99901269/2018-201-01 in association with SEC's failure to implement the regulatory requirements of Criterion III, "Design Control" and Criterion VII, "Control of Purchased Material, Equipment, and Services" of Appendix B to 10 CFR Part 50. Nonconformance 99901269/2018-201-01 cites SEC for failing to ensure the suitability of certain parts used in the manufacture of safety-related motors. Specifically, SEC failed to establish and implement an acceptable method to verify by direct inspection, commercial-grade survey, source surveillance, or other acceptable methods, the material composition of shafts used in AC (alternating current) motors provided by a commercial supplier.

In the area of design control, the inspectors focused on how SEC controlled materials being utilized in the repair and rewind of safety-related motors and how SEC maintained the qualification basis of the materials. The inspectors concluded that qualification reports reviewed provided an acceptable basis for the qualification of the form-wound motor insulation system being utilized by SEC. The inspectors concluded that SEC's implementation of their policy and procedures satisfy the regulatory requirements set forth in Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

In the area of corrective actions and 10 CFR Part 21, the NRC inspectors concluded that SEC is implementing its policies and procedures consistent with the regulatory requirements of Criterion XVI, "Corrective Action" of Appendix B to 10 CFR Part 50, and with 10 CFR Part 21. No findings of significance were identified.

In the area of test control, the inspectors concluded that SEC is implementing their policy and procedures consistent with the regulatory requirements set forth in Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

REPORT DETAILS

1. Commercial-Grade Dedication and Supplier Oversight

   a. Inspection Scope

   The NRC inspection team reviewed SEC's policies and procedures that govern the implementation of its commercial-grade dedication (CGD) and supplier oversight programs to verify compliance with the requirements of Criterion III, "Design Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50.

   The NRC inspection team selected a sample of items and services that were dedicated by SEC for use in safety-related applications to verify compliance with the applicable technical and regulatory requirements. Specifically, the NRC inspection team evaluated SEC's technical evaluations to verify that the evaluations appropriately identified and verified the critical characteristics and technical attributes necessary to provide reasonable assurance that components being dedicated would perform their intended safety function. The NRC inspection team also evaluated the criteria for the selection of critical characteristics, the basis for the selection of any sampling plans, and the selection and implementation of verification methods to verify effective implementation of SEC's commercial-grade dedication process. The NRC inspection team also reviewed a sample of external audits and purchase orders (POs) issued to commercial suppliers to verify compliance with the applicable regulatory and technical requirements.

   b. Observations and Findings

   The NRC inspection team reviewed a sample of ten dedication packages for safety-related AC motors and associated critical motor components such as magnet wire, bearings, insulated lamination, and gasket material. The dedication packages contained Technical Evaluations that identified the items critical characteristics, acceptance methods for verification, receipt inspection instructions, and other identifying information necessary to procure the items. SEC's dedicates components in accordance with QAP 3, "Evaluation of CGI for Safety Related Applications."

   The NRC inspection team identified an issue with SEC's methods for verifying the acceptability of motor shaft materials for AC motors that are dedicated for safety-related use. SEC Technical Evaluation (TE)-725 "Three Phase Fractional and Integral HP Squirrel-Cage Induction Motors NEMA Frame Size 680 or IEC Frame Size 400 and Smaller Continuous and Intermittent Duties," provides the procurement specifications, engineering technical evaluation, tests and inspections, as well as the quantitative and qualitative acceptance criteria necessary to dedicate commercial-grade AC induction motors for use in safety-related applications. TE-725 identifies the motor shaft material as a critical characteristic for seismic qualification that must be verified for acceptance. Section 4.5 of TE 725, "Selection of Critical Characteristics for Acceptance," requires "shaft materials" to be verified when the end use of the motor will be in a seismic environment, harsh environment, side-loaded application, or the shaft has a specific material requirement. The TE did not however, provide specific instructions regarding how the material verification was to be performed.

The NRC inspection team reviewed PO 4500990545 from PSEG's Salem Generating Station, dated September 25, 2017, for a 50 hp AC motor, and PO 4500318687 from Dominion's Surry Power Station, dated June 30, 2017, for a 20 hp AC motor. The NRC inspection team identified during a review of the POs that SEC used unverified information contained on manufacturer's catalog data sheets (for the PSEG PO) and a technical drawing (for the Dominion PO) as the basis for accepting the material used in the manufacture of the commercial AC motor shafts.

Prior to 2016, SEC sent samples of motor shaft materials to a laboratory for material analysis. Beginning in 2016, in lieu of examination by material analysis, it was identified that SEC began accepting shaft material based on vendor catalog data, drawings, and communications with manufacturers. In 2016, SEC made a business decision to begin accepting shaft material based on this information, however, SEC failed to provide an evaluation as to why this programmatic change to its material verification process was acceptable. The NRC inspection team determined that SEC failed to provide objective evidence to support the adequacy of this decision and had not conducted any commercial-grade surveys, source surveillances, or other acceptable material verification methods of the commercial suppliers who provided the AC motors and whose catalog data sheets and/or drawings were being utilized for material verification purposes.

During the inspection, SEC generated Corrective Preventative Action Request (CPAR) 18-08 to document the issue and re-evaluated their process for acceptance of motor shaft material. In the CPAR, SEC determined that they could not take credit for catalog statements concerning shaft material without additional supporting objective evidence or process controls such as could be obtained by a commercial-grade survey of the supplier/manufacturer, establishment of a sampling plan, or analysis of the motor shaft material. The NRC inspection team identified this issue as an example of Nonconformance 99900100/2018-201-01 for SEC's failure to ensure the suitability of certain parts used in the manufacture of safety-related motors. Specifically, SEC failed to establish and implement an acceptable method to verify by direct inspection, commercial-grade survey, source surveillance, or other acceptable methods, the material composition of shafts used in AC motors provided by a commercial supplier.

c. Conclusions

The NRC inspection team issued Nonconformance 99901269/2018-201-01 in association with SEC's failure to implement the regulatory requirements of Criteria III and VII of Appendix B to 10 CFR Part 50. Nonconformance 99901269/2018-201-01 cites SEC for failure to ensure the suitability of certain parts used in the manufacture of safety-related motors. Specifically, SEC failed to implement an acceptable method to verify by direct inspection, commercial-grade survey, source surveillance, or other acceptable methods, the material composition of shafts used in AC motors provided by a commercial supplier.

2. Design Control

a. Scope

Qualification Bases for SEC form wound insulation system

SEC supplies and certifies its environmentally qualified form wound insulation system as part of both new and rewound motors. The inspectors reviewed the qualification bases for this insulation system which is contained in SEC Summary Report #N4446EQFWCD, "Environment Qualification for SEC's Form Wound Continuous Duty Insulation System," Revision 2, dated August 24, 2006. This report references a series of other reports which together make up the documented qualification basis for the insulation system. The insulation system is qualified for outside containment use. The inspectors also reviewed Test Report FT-275-TRP, "Form Wound Insulation System Thermal Testing," Revision 0, dated March 20, 1997, which documented the testing performed by SEC to determine the activation energy of the form wound insulation system. This activation energy was then utilized by SEC to perform thermal aging of the insulation system, as part of the overall qualification program. The activation energy was derived from thermal testing of the complete insulation system to failure, using the methods described in IEEE 275 and 101. Upon receipt of a customer purchase order, SEC also prepares a custom supplemental qualification report which is used to address any issues/materials that are outside the scope of the original qualification testing referenced above.

The inspectors reviewed the qualification basis for the form wound insulation system as per IEEE 334-1974, "Standard for Type Tests of Continuous Duty Class 1E Motors for Nuclear Power Generating Stations." Among the items verified by the inspectors were that the tested samples were energized and that leakage currents were properly monitored during the accident simulation (outside containment high energy line break).

Control of Qualified Materials and Evaluation of Material Changes

The inspectors reviewed SEC Supplemental Report #SEC17047-N8418, "Environmental Qualification Supplemental Report for Exelon Quad Cities 800 hp Core Spray (CS) Pump Motor, General Electric Model 5K6338XC23A, Serial Number FDJ619019," Revision O, dated February 26, 2018. The inspectors reviewed Quad Cities PO 00620696 to rewind and repair this motor. Included in this report was a discussion of the qualification bases for the upper bearing housing insulator material which was not included as part of the original qualification program. This material performs an important safety-related function as it provides a means for isolating the bearings from the pump housing and prevents circulating currents from passing through the bearings, which could (and in the past have been noted to) result in bearing failures.

The inspectors reviewed SEC Position Paper SEC-PP-01-06, "Schulz Electric Evaluation of using Single Dacron Glass in place of Double Dacron Glass for use in EQ Insulation System N4446EQFWCD," Revision 0, dated February 27, 2014. This document evaluated the acceptability of using a different magnet wire from that which was originally environmentally qualified in the winding of formed wound stator coils. The magnet wire insulation (enamel and glass fiber) provides the primary insulation between adjacent turns within a single stator coil, as well as forming a portion of the insulation system between each turn to ground.

The inspectors reviewed a sample of materials utilized in the production of the form wound coils currently being manufactured to verify the materials were the same as those in the tested and qualified insulation system. The inspectors also verified that the sample coil formettes that were tested and qualified were representative of production units. Since SEC is using the results from this testing to qualify a wide range of motors (both size and operating voltage), the inspectors reviewed the manufacturing controls and procedures put in place to ensure that the tested specimens appropriately enveloped the production units from the perspective of stress to the insulation system. Specifically, the inspectors assessed whether the dielectric strength (per voltage stress levels) of the sample coil formette insulation systems that were manufactured for testing would envelope that of the production motors.

Regarding the supplemental report, the inspectors discussed with SEC the qualification of the bearing insulating material, as SEC had not addressed the potential aging degradation of this material due to its continuous submergence in bearing oil. While SEC does not ship their new or refurbished motors with bearing oil, the bearing insulating material used by SEC needs to be compatible with typical oils utilized in the nuclear industry and as part of the overall qualification of the motors. While the supplemental qualification report addressed radiation and thermal properties of the bearing insulating material, the aging of the material when exposed to oil was not addressed.

During the inspection SEC issued CPAR 18-09 and performed an evaluation which was documented in SEC Position Paper SEC-PP-01-15, “Schulz Electric Evaluation of Grade G-10 Thermoset Laminate When Used as a Bearing Insulator Submerged in Motor Bearing Oil,” dated April 11, 2018. The evaluation was performed to address the stability of the bearing insulating material under oil and concluded that the material would not be affected. The inspectors reviewed the evaluation to determine its sufficiency to address the thermal aging concerns.

Regarding the change in magnet wire, the inspectors identified that SEC position paper SEC-PP-01-06 had not fully evaluated the impact of the decrease in dielectric strength of the new versus the originally qualified wire. The position paper did not address the loss of dielectric strength provided by a single as opposed to a double wrapping of glass fiber insulation. Following discussions with the inspection team, SEC revised the position paper to address the worst case expected loss in dielectric strength. Since the function of the magnet wire’s insulation is primarily to protect against turn-to-turn shorts, it provides only a relatively small component of the total dielectric strength of the insulation system to ground. As such, the inspectors focused their concerns on the relative loss in dielectric strength with respect to the turn-to-turn voltage potential. The inspectors reviewed the revised position paper which included a calculated a loss of a maximum of 135 Volts in dielectric strength between the single and originally qualified double wrapped magnet wire, from an originally stated calculated minimum strength of 2220 volts (approximately 6 percent). The inspectors evaluated SEC’s position that the dielectric strength loss is negligible when compared to the amount of margin maintained between the dielectric strength of the magnet wire and the maximum voltage turn-to-turn potential of only about 50 volts.

b. Findings and Observations

No findings of significance were identified.

c. Conclusions

The inspectors concluded that the qualification reports and subsequent technical evaluations reviewed provided an acceptable basis for the qualification of the form wound motor insulation system being utilized by SEC. The inspectors concluded that SEC's implementation of their policy and procedures for design control regarding the repair and supply of safety-related motors satisfies the regulatory requirements set forth in Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

3. Corrective Action and 10 CFR Part 21

a. Inspection Scope

SEC documents any conditions adverse to quality in accordance with their QA Procedure Manual Section 16, "Corrective and Preventive Action Request;" and their Shop Instruction 102, "Identifying and Reporting Under 10CFR21."

Corrective/Preventive Action Requests (CPARs) are generated for each deficiency whether observed by an employee, or reported by a customer. Status is tracked on the Corrective and Preventative Action Status Log, SEC form QAP-16-2. The QA Manager assigns the investigation to an employee based on the details of the reported condition. Items considered during the assignment process include the technical knowledge needed and independence from the event. The QA Manager conducts an evaluation using the 10 CFR Part 21 Potential Defect Checklist to determine if 10 CFR Part 21 reporting is required.

Material non-conformances are reported and recorded with a Nonconformance Report Form, which documents the details of the deficiency and the investigation conducted. This is a part of the CPAR process. The NRC inspection team reviewed a sample of CPARs, the Part 21 Evaluations and the Nonconformance Reports from the past 8 years. The inspectors reviewed a sample of nonconformances from 2016 through the present. NRC inspectors reviewed a sampling of technical evaluations of potential Part 21s that were determined by SEC not to be reportable defects. The attachment to this report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspectors concluded that SEC is implementing its policies and procedures that govern corrective actions and Part 21 consistent with the regulatory requirements of Criterion XVI, "Corrective Action" of Appendix B to 10 CFR Part 50, and with 10 CFR Part 21. No findings of significance were identified.

4. Test Control

a. Inspection Scope

The inspection team reviewed SEC's policies and implementing procedures that govern the implementation of its test control program to verify compliance with the regulatory requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. SEC's process for implementing test control activities is governed by Quality assurance Procedure (QAP) No. 11, "Test Control," Revision 11, dated September 8, 2017. QAP 11 identifies the planning and execution of testing of safety-related motor work necessary to ensure that the work conforms to the specified requirements. The procedure identifies the responsibilities, prerequisites, additional quality testing requirements, acceptance testing, and in-process testing and final testing requirements for use by personnel during testing activities.

The inspection team witnessed and reviewed electrical testing activities and verified testing procedures were correctly implemented. The inspection team observed mechanical and electrical testing for "Commercial Grade Item Technical Evaluation -710," Revision 6, dated January 3, 2018, for magnetic wire ordered on PO #435069, dated March 28, 2018. In addition, the inspection team witnessed Shop Instruction (SI) 909, "No-Load Operation Testing Electrical Motors and Generators," for PO #500611238 and reviewed the testing data to ensure that data obtained met the requirements and acceptance limits contained in the applicable PO.

In addition, the inspection team witnessed multiple SIs related to PO #02376159," NextEra Energy Seabrook, LLC 600 hp @ 885 rpm SWPM Rewind." Specifically, the inspectors witnessed SI 902, "High Potential Testing," SI 901, "Polarization Index of (PI) Test," SI 900, "Insulation Resistance (Megger) Test," SI 903, "Measuring Coil Winding Resistance," SI 907, "Single Phase Balance Test," and reviewed the electrical testing data from these tests to ensure the data obtained met the requirements and acceptance limits contained in the SI and PO.

The NRC inspection team verified that the inspection results, including deviations, were properly documented and the testing data obtained met the requirements and acceptance limits contained in the applicable POs. The inspectors reviewed test equipment used by SEC personnel for the work observed and verified the equipment used in the SIs and POs was appropriate for the task and within calibration.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The inspectors concluded that SEC's implementation of their policy and procedures for test control regarding the safety-related motors activates satisfy the regulatory requirements set forth in Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Attachment

1. Entrance and Exit Meetings

On April 9, 2018, the NRC inspection team discussed the scope of the inspection with Bill Newell, Nuclear Operations Manager and other members of SEC's management and technical staff. On April 13, 2018, the NRC inspection team presented the inspection results and observations during an exit meeting with Richard Chrzanowski, General Manager, TPS NE, and other members of SEC's management and technical staff. The attachment to this report lists the attendees of the entrance and exit meetings, as well as those individuals whom the NRC inspection team interviewed.

2. Entrance/Exit Meeting Attendees

Name	Title	Affiliation	Entrance	Exit
Richard Chrzanowski	General Manager	SEC		X
James Dean	EQ Seismic Engineer	Consultant to SEC	X	X
Bill Eldridge	QA Manager	SEC	X	X
Robert Russak	QA Engineer	SEC	X	X
Bill Newell	Nuclear Operations Manager	SEC	X	X
Dovcal Jimenez	Controller Supply Chain Manager	SEC	X	
Dominic Cleveland	Operations Manager	SEC	X	
Jeffrey Jacobson	Team Leader	NRC	X	X
Jermaine Heath	Inspector	NRC	X	X
Thomas Herrity	Inspector	NRC	X	X
Aaron Armstrong	Inspector	NRC	X	X

3. Inspection Procedures Used

Inspection Procedure (IP) 36100, “Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance,” dated February 13, 2012

IP 43002, “Routine Inspections of Nuclear Vendors,” dated January 27, 2017

IP 43004, “Inspection of Commercial-Grade Dedication Programs,” dated January 27, 2017

4. List of Items Opened, Closed, and Discussed

Item Number	Status	Type	Description
99901269/2018-201-01	Open	NON	Criterion III and VII

5. Documents Reviewed

Standards

- IEEE 275-1992, “Recommended Practice for Thermal Evaluation of Insulation Systems for Alternating-Current Electric Machinery Employing Form-Wound Pre-Insulated Stator Coils for Machines Rated 6900 Volts and Below.”
- IEEE 101-1987, “Guide for the Statistical Analysis of Thermal Life Test Data.”
- IEEE 334-1974, “Standard for Type Tests of Continuous Duty Class 1E Motors for Nuclear Power Generating Stations.”

Test Reports

- Wyle Test Report #45925-1, “Schulz Electric Company Motor Insulation Systems,” Revision A, dated February 2, 1999
- Test Report FT-275-TRP, “Form Wound Insulation System Thermal Testing,” Revision 0, dated March 20, 1997
- Schulz summary EQ report #N4446EQFWCD, “Environment Qualification for Schulz Electric Company’s Form Wound Continuous Duty Insulation System,” Revision 2, dated August 24, 2006
- Schulz EQ report #SEC17047-N8418, “Environmental Qualification Supplemental Report or Exelon Quad Cities 800 HP Core Spray (CS) Pump Motor, General Electric Model 5K6338XC23A, Serial Number FDJ619019, Revision O, dated February 26, 2018
- Seismic Analysis and Qualification Report No. SEC17036-N8465, Revision 0 for 50 HP, 1175 RPM, 324/6 T Frame Motor, WEG Model No. 050185T3Q1E326T-W22, dated September 25, 2017
- Seismic Analysis and Qualification Report No. SEC17036-N8132, Revision 0, for 20 HP Motor, Frame 256TC, 3600 RPM, Toshiba Model No. XD-10003D33, dated June 30, 2017
- Report No. SEC16010-N7963, Rev.0, Seismic Analysis and Qualification Report of 100 HP Motor, Frame 444/5TS, 1185 RPM, dated May 5, 2016

- Report No. SEC17036N8465, Seismic Analysis and Qualification Report of 50 HP, 1775 RPM, 24/6 T Frame Motor, dated September 25, 2017

Purchase Orders

- PO 500611238, “APS- Palo Verde Nuclear Station 7.5 HP @ 3510,” Revision 0, dated May 18, 2017
- PO 02370621, “Florida Power & Light - St. Lucie 400 HP 2P Unit 2 HPSI Rewind,” dated October 23, 2017
- PO 587704,” Exelon - Quad Cities Station 400 lb.- ft. @ 3350 rpm MOV Motor”
- PO N_PO-000002673, “ATC Nuclear 30 HP 4P 286T - SR Testing”
- PO 02376159, “NextEra Energy Seabrook, LLC 600 HP @ 885 rpm SWPM Rewind,” dated March 26, 2018
- PO 90 085542, “Exelon - Peach Bottom Station 7.5 HP @ 1170 rpm GE Motor,” dated September 1,2016
- PO 486094, “Exelon - Quad Cities Station 600 HP 2P vert. RHR Motor,” July 13, 2017
- PO 4500990545, “PSEG Nuclear LLC –Salem 50 HP 4P WEG Dedicate” dated September 22, 2017
- PO 435069, “Rectangular Magnet Wire,” dated March 28, 2018
- Exelon Purchase Order 00620696 to SEC, dated July 27, 2017 for refurbishment of an environmentally qualified 800 HP, 4000 Volt vertical motor for a core spray pump.
- PO 4500318687 for 20 HP AC Induction Motor, dated June 30, 2017
- PO 4500990545 for 50 HP AC Induction Motor, dated September 22, 2017
- PO 00635407 for 100KW Motor Generator Set, dated September 9, 2016
- PO 433606 for Magnet Wire, dated March 15, 2018
- PO 434742, Lab analysis for magnet wire sample, dated March 23, 2017
- PO 10507983, Gearbox, Revision 1, dated July 31, 2017
- PO 433128, Insulated Electrical Steel Laminations, dated February 23, 2018
- PO 752212, Roller bearings, dated August 2013
- PO 435213, ¼” Nitrile Gasket Material, dated April 10, 2018
- PO 00593006, Seismic Analysis for 1 HP AC Motor, dated March 16, 2017

Procedures and Work instructions

- Schulz Electric’s Quality Assurance Manual, Revision 11, dated August 23, 2017
- QAP 11, “Test Control,” Revision 11, dated September 8, 2017
- Commercial Grade item Technical Evaluation – 710 for Magnetic Wire, PO 435069, Revision 6, dated January 3 2013
- Shop instruction (SI) 900, “Insulation Resistance (Megger) Test,” Revision 6, dated June 11, 2010
- SI 901, “Polarization Index of (PI) Test,” Revision 8, dated May 16, 2014
- SI 902, “High potential testing,” Revision 9, dated June 15, 2010
- SI 903, “Measuring Coil Winding Resistance,” Revision 3, dated May 22, 2008
- SI 907, “Single Phase Balance Test,” Revision 3, dated May 22, 2008
- SI 909, “No-Load Operation testing Electrical Motors and Generators,” Revision 7, dated April 4, 2018
- SI 602, “Vacuum Pressure Impregnation of Windings,” Revision 11, dated April 3, 2017
- SI 603, “Baking / Curing Electrical Windings,” Revision 11, dated March 20, 2017

- SI 613, “Winding Safety Related/Harsh Environment Form Wound Stators,” Revision 6, dated December 1, 2017
- SI 108A, “Capturing Motor Data for Seismic Qualification, Revision 0, dated June 8, 2016
- SI 109, Sampling Procedure for Commercial Grade Dedications, Revision 5, dated December 2, 2016
- SI 101, Receiving Motors and Generators, Rev. 8, May 3, 2016
- SI 102, Identifying and Reporting under 10CFR Part 21, Rev. 12, May 2, 2016
- SI 103, Personnel Training, Rev 10, Oct, 14, 2009
- SI 200, Disassembly, Inspection, and Testing (of Motors and Generators), Rev. 12, August 4, 2016
- SI 900, Insulation Resistance (Megger) Test, Rev 6, June 11, 2010
- Motors NEMA Frame Size 680 or IEC Frame Size 400 and Smaller Continuous and Intermittent Duties, Revision 10, dated May 30, 2017

M&TE

- Calibration of Vibration meter ID# SEC 2115, dated June 2, 2018
- Calibration of AMP meter, ID # SEC 3732, dated June 12, 2018
- Calibration of AMP meter, ID # SEC 3498, dated June 28, 2018
- Calibration of Volt meter, ID # SEC 3862, dated August 31, 2018
- Calibration of RPM meter, ID # SEC 3867, dated September 2, 2018
- Calibration of Temperature meter, ID # SEC 3511, dated May 2, 2018
- Calibration of DLRO tester, ID # SEC 3783, dated September 26, 2018
- Calibration of High Pot tester, ID # SEC 3156, dated August 2, 2018
- Calibration of PI tester, ID # SEC 3609, dated August 2, 2018
- Calibration of Thermal Camera, ID # SEC 3865, dated November 16, 2018
- Calibration of Micro Set, ID# SEC 3208-1, dated June 28, 2018
- Calibration of Dielectric tester, ID# SEC 3196, dated April 20, 2018
- Calibration of High Pot tester ID# SEC 3618, dated September 26, 2018

Non-conformances

- SEC-QA-18-01, Damaged Coil/Endturn, 2/1/18
- SEC-QA-18-02, Damaged Fan 2/26/18
- SEC-QA-18-04, Damaged DE Bearing Cartridge, 3/6/18
- SEC-QA-18-05, Stator Frame Endbell Mounting Holes 3/9/18
- SEC-QA-18-07, VFIR 17.4, 17.5 and 17.20, (welding and brazing before procedure approved) 3/27/18
- SEC-QA-18-08, Shaft, 3/20/18
- SEC-QA-18-03, Motors M&TE used on, 3/26/18
- SEC-QA-18-06, Drive end shaft extension and bearing cap fit shaft condition, 3/10/18
- SEC-QA-18-09, Small “chuck” marks on shaft 3/23/18
- SEC-QA-17-01, Motor leads to short, 2/14/17
- SEC-QA-16-01, Various motors Endbell coating, 1/5/16

Quality Assurance Procedures (QAP)

- QAP 15, Control of Nonconforming Items
- QAP 15A, Use of Commercial Grade Items While Awaiting Dedication for Safety Related Use
- QAP 16, Corrective and Preventative Action
- QAP-3, Evaluation of CGI for Safety Related Applications, Revision 16, dated November 16, 2017

CPARs

- 18-01, Incorrect welding procedure followed, 1/8/18
- 18-02, Purchase Order revision applied to incorrect PO,1/15/18
- 18-03, Delivery rigger metal sling found in bell housing, incorrectly blamed on Schulz, 2/1/18
- 18-04, cartridge flange broken during removal, 2/12/18
- 18-05, Failure to follow procedure, core replacement procedure, 3/1/18
- 18-06, Damage to shaft during balancing, 3/12/18
- 18-07, leads (may have been) incorrectly hooked up during test, smoke and noise, 4/2/18
- 17-01, in correct restack weld during core assembly, 2/16/17
- 17-02, using fan to cool core before procedure allowed, 2/17/17
- 16-12, incorrect lead wire crimped to motor, 7/18/16 (reported by customer)
- 16-14, Leads improperly spaced causing insulation failure, 8/24/16
- 16-09, “Rush job” Motor wired incorrectly (typo not caught or questioned), 5/9/16

Commercial-grade surveys

- PGD-1, commercial grade survey, dated November 20, 2015
- KATO-1, commercial grade survey, dated May 16, 2014
- NIAC commercial grade survey 22058 report, dated February 13, 2018
- Schulz commercial grade survey of Kencoil Inc., KEN-2, dated November 11, 2016.

Technical Evaluations

- Technical Evaluation 710, Magnet Wire, Revision 6, dated January 3, 2018
- Technical Evaluation 725, Three Phase Fractional and Integral HP Squirrel-Cage Induction
- Technical Evaluation, Lubricating Grease, Revision 3, dated January 10, 2010
- Technical Evaluation 804, Philadelphia Gear Brand Gear Boxes, Revision 1, dated December 2016
- Technical Evaluation 731, Insulated Electrical Steel Laminations, Revision 2, dated April 9, 2012

Other

- Lab No. 131337, material analysis for metal shavings, dated July 23, 2013
- Lab No. 122022, material analysis for metal shavings, dated October 1, 2012
- NDT Qualification records for Paul Pini, dated June 3, 2016 Mathew Torla, dated June 22, 2017 and John Wilonski, and June 3, 2016
- Position paper SEC-PP-01-13, “Schulz Electric Evaluation of the Requirement to Perform Shaft Material Analysis during Dedication of New Motors,” Revision 0, dated April 11, 2018
- SEC Position Paper SEC-PP-01-15, “Schulz Electric Evaluation of Grade G-10 Thermoset Laminate When Used as a Bearing Insulator Submerged in Motor Bearing Oil,” dated 4/11/2018
- Job File N-5566 (Wolff Creek ESW motor re-wind) 2011-2012

6. List of Abbreviations Used

A	Ampere
AC	alternating current
CAR	corrective action request
CAP	corrective action program
CFR	Code of Federal Regulations
CGD	commercial grade dedication
CGI	commercial grade item
CPAR	corrective preventative action request
hp	horse power
NON	Notice of Nonconformance
NRC	Nuclear Regulatory Commission
PO	purchase order
QA	quality assurance
QAP	quality assurance procedure
RG	regulatory guide
SEC	Schulz Electric Company
SI	shop instruction
V	Volt
VAC	Volts AC