September 13, 2017

Mr. Steven Waisanen, President
Konecranes Nuclear Equipment & Services, LLC
5300 S. Emmer Dr.
New Berlin, WI 53151

SUBJECT: KONECRANES NUCLEAR EQUIPMENT & SERVICES LLC'S NUCLEAR REGULATORY COMMISSION INSPECTION REPORT NO. 99901451/2017-201, AND NOTICE OF NONCONFORMANCE

Dear Mr. Waisanen:

On August 7-10, 2017, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Konecranes Nuclear Equipment & Services, LLC's facility (hereafter referred to as KNES) facility in New Berlin, WI. The purpose of this routine inspection was to assess KNES'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 KNES's implementation of the quality activities associated with the design, fabrication, and testing of the containment building polar crane for Palo Verde Nuclear Generating Stations Units 1, 2 and 3. The enclosed report presents the results of the inspection. This NRC inspection report does not constitute NRC endorsement of KNES's overall quality assurance (QA) program.

During this inspection, the NRC inspection team found that 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 KNES was not fully implementing its QA program in the areas of design control and of control of purchased equipment, materials, 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), KNES 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 (if applicable), 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/

John P. Burke, Chief
Quality Assurance Vendor Inspection Branch-2
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 99901451

Enclosures:
1. Notice of Nonconformance
2. Inspection Report No. 99901451/2017-201
   and Attachment

SUBJECT: KONECRANES NUCLEAR EQUIPMENT & SERVICES LLC'S NUCLEAR REGULATORY COMMISSION INSPECTION REPORT NO. 99901451/2017-201, AND NOTICE OF NONCONFORMANCE

Dated: September 13, 2017

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DATE	09/08/2017	09/08/2017	09/11/2017	09/08/2017
OFFICE	NRR/DSS	RIII/DRS	NRO/DCIP	NRO/DCIP
NAME	SJones	EFernández*	SSmith	JBurke
DATE	09/11/2017	09/08/2017	09/11/2017	09/13/2017

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NOTICE OF NONCONFORMANCE

Konecranes Nuclear Equipment and Services, LLC
5300 S. Emmer Dr.
New Berlin, WI 53151

Docket No. 99901451
Report No. 2017-201

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at Konecranes Nuclear Equipment and Services, LLC's (hereafter referred to as KNES) facility in New Berlin, WI, from August 7, 2017, through August 10, 2017, KNES did not conduct certain activities in accordance with NRC requirements that were contractually imposed upon KNES by NRC licensees:

A. Criterion III, "Design Control," 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," states, in part, that "Measures shall 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 of structures, systems and components. The design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program."

   Section 2.0, "Description," of Arizona Public Service (APS) Technical Specification No. 13-CN-0390, "Technical Requirements for Upgrading the Containment Building Polar Crane to Single Failure Proof," Revision 0, dated February 16, 2017, states, in part, that the "crane upgrade will be performed in accordance with the Single Failure Proof (SFP) regulatory guidance as outlined in NUREG-0612 ["Control of Heavy Loads at Nuclear Power Plants, July 1980], NUREG-0554 ["Single-Failure-Proof Cranes for Nuclear Power Plants," May 1979], and NOG-1["Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)," 2004 Edition]." In addition, Section 7.4, "Mechanical Requirements," states, in part, that "Mechanical crane elements, including drives, shafts, axles, bearings, gears, hooks, sheave pins, blocks, wire rope, drum sheaves, couplings, and brakes shall be in full compliance with this specification, ANSI B30.2 ["Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)"], NOG-1 and CMAA ["Crane Manufacturers Association of America, Inc.] # 70 ["Specifications for Top Running Bridge & Gantry Type Multiple Girder Electric Overhead Travelling Cranes]."

   Subsection 5427.1, "Type I Cranes," of the American Society of Mechanical Engineers (ASME) NOG-1-2004, states, in part, that "Sheaves shall be of steel and provided with antifriction or sleeve bearings."

   Section 5473, "Working Stresses," of ASME NOG-1-2004, states, in part, that "The maximum working stresses in Class I crane machinery components shall not exceed the maximum allowable stresses […], unless otherwise specified by the purchaser. The maximum working loads shall include dead loads, maximum live loads, and acceleration and deceleration forces that result from normal operation of the crane. The maximum calculated working stresses shall include both service and stress concentration factors."

Contrary to the above, as of August 10, 2017, KNES failed to verify the adequacy of the design and suitability of application of materials that are essential to the safety-related function of the main hoist lower blocks and the drum sheaves. Specifically, KNES failed to design and manufacture the main hoist lower blocks and the drum sheaves in accordance with the requirements of ASME NOG-1, 2004. The NRC inspection determined that KNES manufactured the drum sheaves from a proprietary polymer material instead of steel as required by Subsection 5427.1 of ASME NOG-1, 2004 Edition. In addition, the NRC inspection team determined that KNES failed to demonstrate that the main hoist lower blocks and the polymer drum sheaves did not exceed the maximum allowable stress values as specified in Section 5473 of ASME NOG-1, 2004 Edition. The main hoist lower block structure retains the drum sheave pin that bears the load from the drum sheaves and the drum sheaves retain the hoist rope. Failure of multiple drum sheaves or failure to retain the drum sheave pin due to overload would prevent the crane from holding the load.

This issue has been identified as Nonconformance 99901451/2017-201-01.

B. 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. The effectiveness of the control of quality by contractors and subcontractors shall be assessed by the applicant or designee at intervals consistent with the importance, complexity, and quality of the product or services."

Section 3.3, "Nuclear Quality System," of KNES's NQM states, in part, that "Where suppliers have a quality system conforming to 10CFR50 Appendix B or ASME NQA-1, they shall be qualified by on-site audit to verify the requirements are met."

Contrary to the above, as of August 10, 2017, KNES failed to assess the effectiveness of the control of quality by contractors. Specifically, KNES failed to perform an implementation audit of Lincoln Electric's quality assurance (QA) program to assure that purchased safety-related weld filler material met the quality requirements of Appendix B to 10 CFR Part 50. The weld filler material procured from Lincoln Electric was used in the weldment of the main and auxiliary hoist drums. The main and auxiliary hoist systems, of which the drums are a part of, are responsible for stopping and holding the load following a seismic event or any credible single failure affecting the load path.

This issue has been identified as Nonconformance 99901451/2017-201-02.

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-2, 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 and the results achieved; (3) the corrective steps that will be 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 the 13th day of September 2017.

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

Docket No.:	99901451
Report No.:	99901451/2017-201
Vendor:	Konecranes Nuclear Equipment and Services, LLC 5300 S. Emmer Dr. New Berlin, WI 53151
Vendor Contact:	Mr. Thomas McCann Quality Assurance Manager Email: Thomas.mccann@konecranes.com Phone: 1-262-821-4064
Nuclear Industry Activity:	Konecranes Nuclear Equipment and Services LLC, located at 5300 South Emmer Drive, New Berlin, WI 53151, provides new, replacement, or refurbished material handling equipment; cask cranes; cask transporters; fuel handling cranes; polar cranes; and turbine hall cranes, for the nuclear industry.
Inspection Dates:	August 7-10, 2017

Inspectors:		
Yamir Diaz-Castillo	NRO/DCIP/QVIB-2	Team Leader
John P. Burke	NRO/DCIP/QVIB-2	Branch Chief
Ilka T. Berrios	NRO/DCIP/QVIB-2	
Ramón Gascot-Lozada	NRO/DCIP/QVIB-2	
Aaron Armstrong	NRO/DCIP/QVIB-1	
Steve Jones	NRR/DSS/SBPB	
Gordon Curran	NRR/DSS/SPSB	Observer
Edison Fernández	RIII/DRS/CSB	

Approved by:	John P. Burke, Chief Quality Assurance Vendor Inspection Branch-2 Division of Construction Inspection and Operational Programs Office of New Reactors

EXECUTIVE SUMMARY

Konecranes Nuclear Equipment and Services, LLC
99901451/2017-201

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a vendor inspection at the Konecranes Nuclear Equipment and Services, LLC's (hereafter referred to as KNES) facility in New Berlin, WI, 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 KNES implemented a program under 10 CFR Part 21, "Reporting of Defects and Noncompliance." This was the second NRC inspection at the KNES facility.

This technically-focused inspection specifically evaluated KNES's implementation of quality activities associated with the design, fabrication, and testing of the upgrade for the containment building polar crane for Palo Verde Nuclear Generating Stations (PNVGS) Units 1, 2 and 3.

In order to satisfy the conditions assumed in a screening performed under the requirements of 10 CFR 50.59, "Changes, Tests, and Experiments," Arizona Public Service (APS) specified that the supplier of the cranes shall meet or exceed the required elements of a number of codes, standards, documents, and regulations, including the following:

- NUREG-0554, "Single-Failure-Proof Cranes for Nuclear Power Plants," May 1979 Edition
- NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," July 1980 Edition
- American Society of Mechanical Engineers (ASME) NOG-1, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)", 2004 Edition
- American Welding Society (AWS) D1.1, "Structural Welding Code – Steel," 2010 Edition

Specific activities observed by the NRC inspection team included:

- Dry run of portions of the Factory Acceptance Test for the PVNGS Unit 1 containment building polar crane which included testing of the manual horizontal movement of the polar crane trolley along the rails and emergency lowering of the rated load.

In addition to observing these activities, the NRC inspection team verified that measuring and test equipment (M&TE) was properly identified, marked, calibrated, and used within its calibrated range.

These regulations served as the bases for the NRC inspection:

- Appendix B to 10 CFR Part 50
- 10 CFR Part 21

During the course of this inspection, the NRC inspection team implemented Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors," dated January 27, 2017, IP 43004, "Inspection of Commercial-Grade Dedication Programs," dated January 27, 2017, and IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated February 13, 2012.

With the exception of the notice of nonconformances described below, the NRC inspection team concluded that KNES's QA policies and procedures comply with the applicable requirements of Appendix B to 10 CFR Part 50 and 10 CFR Part 21, and that KNES's personnel are implementing these policies and procedures effectively. The results of this inspection are summarized below.

Design Control

The NRC inspection team issued Nonconformance 99901451/2017-201-01 in association with KNES's failure to implement the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Nonconformance 99901451/2017-201-01 cites KNES for failing to adequately review the suitability of application of materials, parts and equipment that are essential to the safety-related functions of structures, systems and components and failed to verify the adequacy of the design by the use of alternate or simplified calculational methods. Specifically, KNES failed to design and manufacture the main hoist lower blocks and the drum sheaves in accordance with the requirements of ASME NOG-1, 2004 Edition. The NRC inspection determined that KNES manufactured the drum sheaves from a proprietary polymer material instead of steel as required by Subsection 5427.1 of ASME NOG-1, 2004 Edition. In addition, the NRC inspection team determined that KNES failed to demonstrate that the main hoist lower blocks and the polymer drum sheaves did not exceed the maximum allowable stress values as specified in Section 5473 of ASME NOG-1, 2004 Edition.

Supplier Oversight and Internal Audits

The NRC inspection team issued Nonconformance 99901451/2017-201-02 in association with KNES's failure to implement the regulatory requirements of Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. Nonconformance 99901451/2017-201-02 cites KNES for failing to assess the effectiveness of the control of quality by contractors. Specifically, KNES failed to perform an implementation audit of Lincoln Electric's quality assurance program to assure that purchased safety-related weld filler material met the quality requirements of Appendix B to 10 CFR Part 50.

Other Inspection Areas

The NRC inspection team determined that KNES is implementing its programs for training ad qualification, 10 CFR Part 21, commercial-grade dedication, procurement document control, control of special processes, test control, control of M&TE, nonconforming material, parts, or components, corrective action, and internal audits in accordance with the applicable regulatory requirements of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed and activities observed, the NRC inspection team also determined that KNES is adequately implementing its policies and procedures associated with these programs. No findings of significance were identified.

REPORT DETAILS

1. Design Control

   a. Inspection Scope

   The NRC inspection team reviewed Konecranes Nuclear Equipment and Services, LLC's (hereafter referred to as KNES) policies and implementing procedures that govern the design control program to verify compliance with the requirements of Criterion III, "Design Control," 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." Through its specification for upgrading of the Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3 containment building polar cranes to single failure proof designs, the licensee, Arizona Public Service (APS), specified that critical load bearing components of the cranes would be classified as Quality Related (Q) and Seismic Category I. In order to satisfy the conditions assumed in a screening performed under the requirements of 10 CFR 50.59, "Changes, Tests, and Experiments," APS specified that the supplier of the cranes shall meet or exceed the required elements of a number of codes, standards, documents, and regulations, including the following:

   - NUREG-0554, "Single-Failure-Proof Cranes for Nuclear Power Plants," May 1979 Edition
   - NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," July 1980 Edition
   - American Society of Mechanical Engineers (ASME) NOG-1, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)", 2004 Edition
   - American Welding Society (AWS) D1.1, "Structural Welding Code – Steel," 2010 Edition

   The NRC inspection team reviewed the seismic evaluation of the upgraded crane with respect to the treatment of the existing polar crane bridge and how its design was incorporated in to the seismic analysis. Guidelines for modifications of existing cranes were included in Appendix C, "Modifications of Existing Cranes," to NUREG-0612, and the NRC inspection team focused on elements related to the bridge performance, including the material properties of the bridge, post-weld heat treatment of bridge welds, and the capability to stop and hold the load during a seismic event equal to the safe shutdown earthquake for the facility. The NRC inspection team reviewed KNES Calculation No. 36676-21, "NUREG-0612 Appendix C Compliance Matrix," Revision 0; and Calculation No. 36676-51, "APS Bridge Seismic Analysis with Single Failure Proof Trolley," Revision 2. The NRC inspection team determined that KNES specified a minimum operating temperature for the crane, which ensured acceptable material properties during use, consistent with the NUREG-0612 guidelines. The KNES engineering staff also produced records indicating that the original construction of the crane bridge was consistent with appropriate crane construction standards and provided for post-weld heat treatment. In addition, the NRC inspection team reviewed the seismic

calculations from the original crane manufacturer, design details developed through walk-downs of the bridge, and the seismic calculation evaluating the bridge response under the single failure proof loading conditions specified in ASME NOG-1, 2004 Edition. The NRC inspection team interviewed KNES structural engineering staff members and reviewed the three-dimensional computer model of the bridge used as a design input to the seismic analysis performed using the ANSYS finite-element analysis program to verify the adequacy of design inputs.

The NRC inspection team also evaluated the implementation of the hoist over-speed limit for the main hoist. Section, "Hoist Over-speed Limits (Type I Cranes)," of ASME NOG-1, 2004, states, in part, that "hoists handling a critical load shall have an over-speed limit switch and hook speeds over 115% of the design rated load lowering speed for any critical load shall trip this switch, causing all holding brakes to set without intentional time delay." The NRC inspection team reviewed the electrical circuit drawings and the product information sheet for the over-speed limit switch and discussed the operation of the over-speed limit with the KNES engineering staff. The NRC inspection team verified that the circuit provided for fail-safe actuation to actuate the holding brakes and stop the hoist motor.

In addition, the NRC inspection team evaluated the mechanical design of the reeving system for the main and auxiliary hoists, which APS classified as single failure proof. The NRC inspection team reviewed Calculation No. 36676-01, "Palo Verde Nuclear Generating Station - APS Main Hoist Reeving Calculations," Revision 4, and Calculation No. 36676-26, "APS Aux Hoist Reeving Calculations," Revision 0, and the associated mechanical and weldment drawings. The NRC inspection team interviewed members of the structural engineering staff to verify that applicable technical requirements from ASME NOG-1 were correctly translated into the design of the hoist reeving systems.

Furthermore, the NRC inspection team evaluated the implementation of KNES's design change process. The NRC inspection team reviewed three design changes associated with Calculation No. 36676-01 for the main hoist reeving system. The NRC inspection team verified that the design change process employed controls, including design reviews that implemented design control measures commensurate with those applied to the original design and were approved by the organization that performed the original design.

The NRC inspection team also discussed the design control program with KNES management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

The NRC inspection team identified that certain portions of the main hoist reeving system did not conform to the technical requirements of ASME NOG-1, 2004. The NRC inspection team found that Calculation No. 36676-01 did not include an evaluation of the stresses imposed on the sheaves and the lower outboard portion of the load block structural steel. Although KNES completed a failure modes and effects analysis finding the consequences of a single sheave failure acceptable, because the failure would affect only one of the two reeving systems, failure of more than one sheave could affect both reeving systems and result in an unacceptable failure to hold the load. Although the lower outboard portion of the load block structure was not part of the primary vertical

load path, this structure retained the load block sheave pin in position to hold the sheaves and bore a side load from the sheaves due to the angle of the wire rope acting against the side of the sheaves, particularly with the block in the high position. The sheaves, load block structure, and load block welds were designated as a critical component in accordance with Section 5150, “Critical Items,” and Table 7200-1, “Required Inspections or Tests - Type 1,” of ASME NOG-1, 2004 Edition. Upon further discussions with KNES’s engineering staff, the NRC inspection team determined that no calculations of the sheave stress and stress in the lower outboard portion of the load block under normal load conditions as specified by Section 5473, “Working Stresses,” of ASME NOG-1, 2004, had been completed to demonstrate stresses were within allowable values.

The KNES structural engineering staff prepared informal analyses indicating that the stresses in the load block would be well within allowable values, and the compressive stress on the sheave would be within the published strength of the material. However, the appropriate allowable stress for the polymer sheaves was not established since the material is not addressed in the ASME NOG-1, 2004 Edition standard. Furthermore, the NRC inspection team noted that the sheaves had been manufactured from a synthetic polymer material, contrary to the requirements of Subsection 5427.1, “Type I Cranes,” of Section 5427, “Sheaves,” in ASME-NOG-1 2004 Edition, which states, in part, that the “Sheaves shall be of steel.” In addition, since the sheaves are non-metallic, environmental degradation should also be evaluated for the remaining plant life.

The verification of the suitable design of the main hoist lower blocks and drum sheaves is important to the function of the crane. In order to satisfy the conditions assumed in a screening performed under the requirements of 10 CFR 50.59, APS specified that the supplier of the cranes shall meet or exceed the required elements of a number of codes, standards, documents, and regulations, including ASME NOG-1, 2004 Edition. The NRC inspection team interviewed KNES engineering staff to determine the extent that APS was notified of the use of a polymer material for the hoist reeving system sheaves. The NRC inspection team concluded that, as of August 10, 2017, APS had not clearly accepted a design that incorporated sheaves that did not conform to the criteria of Subsection 5427.1 of ASME NOG-1, 2004 Edition.

The NRC inspection team identified this issue as an example of Nonconformance 99901451/2017-201-01 for KNES’s failure to adequately review the suitability of application of materials, parts and equipment that are essential to the safety-related functions of structures, systems and components and failed to verify the adequacy of the design by the use of alternate or simplified calculational methods. Specifically, KNES failed to design and manufacture the main hoist lower blocks and the drum sheaves in accordance with the requirements of ASME NOG-1, 2004 Edition. The NRC inspection determined that KNES manufactured the drum sheaves from a proprietary polymer material instead of steel as required by Subsection 5427.1 of ASME NOG-1, 2004 Edition. In addition, the NRC inspection team determined that KNES failed to demonstrate that the stress in the main hoist lower blocks and the polymer drum sheaves did not exceed the maximum allowable stress values specified in Section 5473 of ASME NOG-1, 2004 Edition.

KNES initiated corrective/preventive action report (P/CAR) No. 749 to address this issue. KNES should document the results of the extent of condition review for this

Nonconformance and determine the effects on any previously delivered safety-related components.

c. Conclusion

The NRC inspection team issued Nonconformance 99901451/2017-201-01 in association with KNES's failure to implement the regulatory requirements of Criterion III, of Appendix B to 10 CFR Part 50. Nonconformance 99901451/2017-201-01 cites KNES for failing to adequately review the suitability of application of materials, parts and equipment that are essential to the safety-related functions of structures, systems and components and failed to verify the adequacy of the design by the use of alternate or simplified calculational methods. Specifically, KNES failed to design and manufacture the blocks and the drum sheaves in accordance with the requirements of ASME NOG-1, 2004. The NRC inspection determined that KNES manufactured the drum sheaves from a proprietary polymer material instead of steel as required by Subsection 5427.1 of ASME NOG-1, 2004 Edition. In addition, the NRC inspection team determined that KNES failed to demonstrate that the main hoist lower block and the polymer drum sheaves did not exceed the maximum allowable stress values as specified in Section 5473 of ASME NOG-1, 2004 Edition.

2. Supplier Oversight and Internal Audits

a. Inspection Scope

The NRC inspection team reviewed KNES's policies and implementing procedures that govern the implementation of its oversight of contracted activities and internal audit programs to verify compliance with the requirements of Criterion IV, "Procurement Document Control," Criterion VII, "Control of Purchased Material, Equipment, and Services," and Criterion XVIII, "Internal Audits," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed KNES's Approved Vendors List, and a sample of purchase orders (POs), external and internal audits, and receipt inspection records to verify compliance with the applicable regulatory and technical requirements. The NRC inspection team also reviewed the disposition of audit findings for adequacy and timeliness.

The NRC inspection team verified that for the sample of POs reviewed, the POs included, as appropriate, the applicable technical and quality requirements. In addition, the NRC inspection team verified that for the sample of receipt inspection records reviewed (e.g., receipt inspection reports, Certificates of Compliance, Certificate of Calibration, and Certified Material Test Reports), these records were (1) reviewed by KNES for compliance with the requirements of the POs, and (2) the records contained the applicable technical and regulatory information.

For the sample of external and internal audits reviewed, the NRC inspection team verified that the audit reports included an audit plan, any findings identified, adequate documented objective evidence of compliance with the applicable requirements, and a review by KNES's responsible management. In addition, the NRC inspection team also verified that the external and internal audits were performed by qualified auditors and in the case of the internal audits, that these audits were performed by personnel not having direct responsibilities in the areas being audited. Furthermore, the NRC inspection team also reviewed a sample of training and qualification records of KNES's lead auditors and

auditors and confirmed that auditing personnel had completed all the required training and had maintained the applicable qualification and certification in accordance with KNES's policies and procedures.

The NRC inspection team also discussed the procurement document control, supplier oversight, and internal audits programs with KNES's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

During the review of the sample of external audits, the NRC inspection team noted that KNES did not perform an implementation audit of Lincoln Electric's quality assurance (QA) program to assure that purchased safety-related weld filler material met the quality requirements of Appendix B to 10 CFR Part 50. KNES procured the safety-related weld filler material used in the weldment of the main and auxiliary hoist drums for the PVNGS Units 1, 2, and 3 containment polar crane from Lincoln Electric. The main and auxiliary hoist systems, of which the drums are a part of, are responsible for stopping and holding the load following a seismic event or any credible single failure affecting the load path. KNES relied on the fact that Lincoln Electric has a Quality System Certificate from the American Society of Mechanical Engineers (ASME) as a basis for not performing any audits of Lincoln Electric's QA program.

In Information Notice No. 86-21, "Recognition of American Society of Mechanical Engineers Accreditation Program for N Stamp Holders", dated March 31, 1986, the NRC staff stated that the NRC recognizes the ASME Accreditation Program and associated certificates of authorization as evidence that the holder of the certificate of authorization has a documented QA program that meets the requirements of Appendix B to 10 CFR Part 50. However, recognition of the ASME Accreditation Program applies only to the programmatic aspects of the QA programs. Vendors such as KNES are still responsible for ensuring that their suppliers are effectively implementing their approved QA programs.

The NRC inspection team identified this issue as an example of Nonconformance 99901451/2017-201-02 for KNES's failure to perform an implementation audit of Lincoln Electric's QA program to assure that purchased safety-related weld filler material met the quality requirements of Appendix B to 10 CFR Part 50. KNES initiated corrective/preventive action report (P/CAR) No. 747 to address this issue. KNES should document the results of the extent of condition review for this Nonconformance and determine the effects on any previously delivered safety-related components.

c. Conclusion

The NRC inspection team issued Nonconformance 99901451/2017-201-02 in association with KNES's failure to implement the regulatory requirements of Criterion VII, of Appendix B to 10 CFR Part 50. Nonconformance 99901451/2017-201-02 cites KNES for failing to assess the effectiveness of the control of quality by contractors. Specifically, KNES failed to perform an implementation audit of Lincoln Electric's QA program to assure that purchased safety-related weld filler material met the quality requirements of Appendix B to 10 CFR Part 50.

3. Commercial-Grade Dedication

a. Inspection Scope

The NRC inspection team reviewed KNES's policies and implementing procedures that govern the commercial-grade dedication program to verify their compliance with the regulatory requirements of Criterion III, Criterion IV, and Criterion VII, of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed KNES's program for the dedication of commercial-grade items for use in safety-related applications. Specifically, the NRC inspection team reviewed the commercial-grade dedication packages for the following items and services: main hook and nut assembly, auxiliary hook and nut assembly, wire rope, sheave pins, load equalizing trunnion pins, calibration, machining, heat treating, and welding and fabrication. Within these packages, the NRC inspection team reviewed the commercial-grade dedication plans which included technical evaluations, checklists, and inspection reports. In addition, the NRC inspection team reviewed the POs and commercial-grade surveys of the commercial vendors on KNES's Approved Supplier's List (ASL) responsible for the supply of the components and services described above. The NRC inspection team verified that the technical evaluations in the commercial-grade dedication plans appropriately identified the critical characteristics and technical attributes necessary to provide reasonable assurance that the services would perform their intended safety function, and the acceptance methods used to verify that the acceptance criteria of the critical characteristics were met.

The NRC inspection team also evaluated KNES's process for the commercial-grade dedication of software used in the design of the containment polar cranes. Specifically, the NRC inspection team reviewed the commercial-grade dedication package for ANSYS 17, Solid Works Simulator Revision 2016 SP 5.0, and Math Cad 15 for KNES's stress and strain design and analysis calculations. KNES independently verified the acceptable method of the commercial program calculations by using comparable proven programs and information from technical literature each time the commercially procured computer program is used. The NRC inspection team noted that KNES was using the guidance of the Electric Power Research Institute (EPRI) NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety-Related Applications." The NRC inspection team also discussed with KNES engineering personnel the updated EPRI guidance, Technical Report No. 1025243, "Plant Engineering: Guideline for the Acceptance of Commercial-Grade Design and Analysis Computer Programs Used in Nuclear Safety-Related Applications," Revision 1, dated December 2016, which the NRC endorsed in Regulatory Guide 1.231, "Acceptance of Commercial-Grade Design and Analysis Computer Programs used in Safety-Related Applications for Nuclear Power Plants," dated January 2017.

The NRC inspection team also discussed the commercial-grade dedication program with KNES's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that KNES is implementing its commercial-grade dedication program in accordance with the regulatory requirements of Criterion III, Criterion IV, and Criterion VII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that KNES is adequately implementing its policies and procedures associated with the commercial-grade dedication program. No findings of significance were identified.

4. Manufacturing Control

a. Inspection Scope

The NRC inspection team reviewed KNES's policies and implementing procedures that govern the control of special processes to verify compliance with the regulatory requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50, the requirements of the American Welding Society (AWS) D1.1, "Structural Welding Code - Steel," 2010 Edition, and the American Society for Nondestructive Testing (ASNT) SNT-TC-1A, "Personnel Qualification and Certification in Nondestructive Testing."

KNES performs the design of the polar cranes, which are fabricated and tested at Weldall Manufacturing Inc. (hereafter referred to as Weldall), a commercial sub-supplier of KNES located in Waukesha, Wisconsin. Weldall fabricates the large structural components of the polar cranes while smaller components are shipped directly to Weldall, where they are receipt inspected and prepared for assembly. Weldall's quality activities as part of the fabrication of the polar cranes include the procurement of raw material and weld filler metal, material traceability, welding, machining, and inspection. Any material requiring testing is sent to a KNES approved safety-related laboratory. In addition, fabrication activities are performed to KNES's engineering drawings and procedures. All of these activities were verified by KNES through a commercial-grade survey.

Once the components have been completed for assembly, they are transferred to a KNES leased area within the Weldall facilities and staged for assembly. KNES and Weldall perform the final assembly of the polar crane, and KNES provides oversight and supervision of any activities performed by Weldall as part any assembly activities. A factory acceptance test is then performed by KNES test personnel typically consisting of members of KNES's engineering, quality and production departments following the applicable test procedures developed by KNES.

Subsequently, any non-destructive examination (NDE) required is performed by Team Industrial Services, a safety-related sub-supplier audited and approved by KNES. At the time of the inspection, there were no welding or NDE activities being performed. As such, the NRC inspection reviewed a sample of completed welding records, including shop travelers, weld procedure specifications (WPSs), supporting procedure qualification records (PQRs), and welder qualifications. The NRC inspection team verified that the WPS were qualified in accordance with the applicable requirements of AWS D1.1, 2010 Edition, using the supporting PQRs and KNES procedures. The NRC inspection team also verified that the applicable welding data such as weld material, heat/lot number, WPS, inspection procedures, and final inspection results were adequately

recorded. The welding data was recorded on the associated weld record for each weld joint along with the applicable NDE results.

For NDE activities, the NRC inspection team reviewed a sample of procedures and test records from Team Industrial Services for magnetic particle testing (MT) and ultrasonic testing (UT). The NRC inspection verified that the examinations were performed by qualified personnel and qualified procedures in accordance with the applicable requirements of ASNT SNT-TC-1A. In addition, the NRC inspection team reviewed the MT and UT Levels II and III NDE inspector qualification records and confirmed they were qualified in accordance with the requirements in ASNT SNT-TC-1A.

The NRC inspection team also reviewed the protective coatings program for the PVNGS Units 1, 2, and 3 containment polar crane components and found that the coating specification, "Painting of KNES Products, Document number 36676-02, B22 Painting Specification, APS Palo Verde Nuclear Generating Station," Revision 8, dated January 31, 2017, was prepared in collaboration with APS coating specialists, KNES engineers and other coating industry experts. The NRC inspection team verified that the specification requirements were consistent with commitments and evaluations APS made in responding to Generic Letter 2004-02 "Potential Impact of Debris Blockage on emergency Recirculation During design Basis Accidents at Pressurized-Water Reactors" in a letter to the NRC dated December 18, 2013. The specification required the use of Carboguard 890N, which meets the American Society for Testing and Materials (ASTM) D3911, "Standard Test Method for Evaluating Coatings Used in Light-Water Nuclear Power Plants at Simulated Design Basis Accident (DBA) Conditions."

The coatings used in the containment polar cranes for PVNGS Units 1, 2, and 3 were purchased as safety-related from Carboline Company. The coating application activities were procured from Profile Finishing Systems (PFS) under a commercial contract by KNES. KNES dedicated the coating application process. The NRC inspection team reviewed the commercial-grade survey report of PFS, reviewed the painter qualification records and a sample of the painting application daily reports. The NRC inspection team verified that KNES qualified the PFS coating applicators to meet ASTM D4228-05 (2012), "Standard Test Method for Evaluating Coatings Used in Light-Water Nuclear Power Plants at Simulated Design Basis Accident (DBA) Conditions," under their Appendix B to 10 CFR Part 50 quality assurance program.

The coating quality control inspections were procured from Dixon Engineering, Inc. (here after referred to as Dixon) under a commercial contract by KNES. KNES dedicated the coating inspection process by verifying that the Dixon's coating inspectors were qualified as National Association of Corrosion Engineers' Level III Coating Inspectors. KNES also documented that the Dixon inspectors met ASTM D4537-12, "Standard Guide for Establishing Procedures to Qualify and Certify Personnel Performing Coating and Lining Work Inspection in Nuclear Facilities," which the NRC staff endorsed in Regulatory Guide 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants," Revision 3, dated April 2017. The NRC inspection team also reviewed the certification documentation for the two inspectors and verified that they were accepted by the KNES Director of Nuclear Quality for the time periods that the work was performed.

In addition, the NRC inspection team reviewed a sample of the coating inspection forms for the coating work performed by PFS and inspected by Dixon. The applicators from

PFS and inspectors from Dixon were the personnel certified by KNES for the tasks. The NRC inspection team verified that coating application was documented to be in accordance with the design specification and the applicable technical requirements.

The NRC inspection team also discussed the manufacturing control program with KNES's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observation and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that KNES is implementing its manufacturing control program in accordance with the regulatory requirements of Criterion IX of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that KNES is implementing its policies and procedures associated with the control of special processes program. No findings of significance were identified.

5. Test Control

a. Inspection Scope

The NRC inspection team reviewed KNES's policies and implementing procedures that govern the test control program to verify compliance with the requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50.

The NRC inspection team observed a dry run of portions of the Factory Acceptance Testing (FAT) for the containment building polar crane for PVNGS Unit 1. The test was conducted in accordance with Procedure No.36676-07, "APS Single Failure Proof Trolley and Controls Upgrade Factory Acceptance Test Procedure," Revision 4, dated July 28, 2017. The NRC inspection team observed the conduct of step 10.26, which tested manual horizontal movement of the polar crane trolley along the rails, and step 10.28, which involved emergency lowering of the rated load. The test engineer briefed the members of the test team and conducted the actual emergency lowering process using Procedure No. 36676-16, "Magnetorque Emergency Lowering Procedure Main & Aux Hoist". The test engineer maintained control of the evolution and made notes during the test to improve the program.

The NRC inspection team reviewed the FAT procedure and evaluated a sample of tests for conformance with ASME NOG-1, 2004 Edition. The NRC inspection team verified that the FAT procedure for the normal full load test and testing of the hoist over-speed limit switch circuit satisfied the applicable requirements. Specifically, the NRC inspection team verified that the full load test adequately tested independent operation of the holding brakes and that the hoist over-speed switch circuit adequately tested actuation of the holding brakes. The NRC inspection team also discussed the hoist over-speed circuit test with KNES engineering staff and verified that appropriate measures were in place to return the switch setting to the correct value after completion of the test, which would be performed at a reduced set-point.

The NRC inspection team discussed the test control program with KNES's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that KNES is implementing its test control program in accordance with the regulatory requirements of Criterion XI of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that KNES is implementing its policies and procedures associated with the test control program. No findings of significance were identified.

6. Control of Measuring and Test Equipment

a. Inspection Scope

The NRC inspection team reviewed KNES policies and implementing procedures that govern the M&TE program to verify compliance with the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50.

For a sample of M&TE, the NRC inspection team determined that the M&TE had the appropriate calibration stickers and current calibration dates, including the calibration due date. The NRC inspection team also verified that the M&TE had been calibrated, adjusted, and maintained at prescribed intervals prior to use. In addition, the calibration records reviewed by the NRC inspection team indicated the as-found or as-left conditions, accuracy required, calibration results, calibration dates, and the due date for recalibration. The NRC inspection team also verified that the selected M&TE was calibrated using procedures traceable to known industry standards.

The NRC inspection team also verified that when M&TE equipment is received from the calibration service supplier and the calibration certificate states that it was found to be out of calibration, the M&TE is removed from use and segregated to prevent further usage until the out of tolerance condition is reviewed and dispositioned by completion of a "Notice of Out of Calibration Condition Report and Evaluation". In addition, KNES performs an evaluation to identify items that have been accepted using this equipment since the last valid calibration date and to perform an extent of condition review.

The NRC inspection team also discussed the M&TE program with KNES's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that KNES is implementing its M&TE program in accordance with the regulatory requirements of Criterion XII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that KNES is implementing its policies and procedures associated with the M&TE program. No findings of significance were identified.

7. Nonconforming Materials, Parts, or Components and Corrective Action

a. Inspection Scope

The NRC inspection team reviewed KNES policies and implementing procedures that govern the control of nonconformances to verify compliance with the requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed a sample of nonconformance reports (NCRs) to verify that KNES: (1) dispositioned the NCR in accordance with the applicable procedures, (2) documented an appropriate technical justification for various dispositions, and (3) took adequate corrective action with regard to the nonconforming items. For NCRs that were dispositioned as use as is, the NRC inspection team confirmed that the technical justifications were documented to verify the acceptability of the nonconforming item.

The NRC inspection team also reviewed a sample of P/CARs to ensure that conditions adverse to quality were promptly identified and corrected. In addition, the NRC inspection team verified that the P/CARs provide: (1) adequate documentation and description of conditions adverse to quality; (2) an appropriate analysis of the cause of these conditions and the corrective actions taken to prevent recurrence; (3) direction for review and approval by the responsible authority; (4) a description of the current status of the corrective actions; and (5) the follow-up actions taken to verify timely and effective implementation of the corrective actions. The NRC inspection team noted that KNES treats all P/CARs as significant conditions adverse to quality and determines the root cause of each P/CAR. In addition, the NRC inspection team verified that KNES's corrective action process provides a link to the 10 CFR Part 21 program.

The NRC inspection team also discussed the nonconforming materials, parts, or components and corrective action programs with KNES's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that KNES is implementing its nonconforming materials, parts, or components and corrective action programs in accordance with the regulatory requirements of Criterion XV and Criterion XVI of Appendix B to

10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that KNES is implementing its policies and procedures associated with the control of nonconforming materials, parts, or components and corrective action. No findings of significance were identified.

8. 10 CFR Part 21 Program

a. Inspection Scope

The NRC inspection team reviewed KNES's policies and implementing procedures that govern KNES's 10 CFR Part 21, "Reporting of Defects and Noncompliance," program to verify compliance with the regulatory requirements. In addition, the NRC inspection team evaluated the 10 CFR Part 21 postings and a sample of KNES's POs for compliance with the requirements of 10 CFR 21.21, "Notification of Failure to Comply or Existence of a Defect and its Evaluation," and 10 CFR 21.31, "Procurement Documents." The NRC inspection team also verified that KNES's nonconformance and corrective action procedures provide a link to the 10 CFR Part 21 program. Furthermore, for the two 10 CFR Part 21 evaluations performed by KNES, the NRC inspection team verified that KNES had effectively implemented the requirements for evaluating deviations and failures to comply. The NRC inspection team verified that the notifications were performed in accordance with the requirements of 10 CFR 21.21, as applicable.

The NRC inspection team also discussed the 10 CFR Part 21 program with KNES's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that KNES is implementing its 10 CFR Part 21 program in accordance with the regulatory requirements of 10 CFR Part 21. Based on the limited sample of documents reviewed, the NRC inspection team also determined that KNES is implementing its policies and procedures associated with the 10 CFR Part 21 program. No findings of significance were identified.

9. Entrance and Exit Meetings

On August 6, 2017, the NRC inspection team discussed the scope of the inspection with Steven Waisanen, KNES President, and other members of KNES's management and technical staff. On August 10, 2017, the NRC inspection team presented the inspection results and observations during an exit meeting with Mr. Waisanen, and other members of KNES'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.

ATTACHMENT

1. ENTRANCE/EXIT MEETING ATTENDEES

Name	Title	Affiliation	Entrance	Exit	Interviewed
Steven Waisanen	Konecranes Nuclear Equipment and Services (KNES) President	KNES	X	X	
Thomas McCann	Global Director - Nuclear Quality	KNES	X	X	X
Joseph A. Yustus	Assistant Chief Engineer	KNES	X	X	X
Keith Wegener	Production Operation Manager	KNES			X
Dr. Pugazhendhi Kanakasabai	Structural Engineering Supervisor	KNES	X	X	X
Jeffrey Borges	Subcontracting Supervisor	KNES			X
Jeremy Gross	Assistant Subcontract Supervisor	KNES			X
Timothy Bies	Electrical Supervisor	KNES			X
Carol L. Arneson	Nuclear Quality Assurance Specialist	KNES	X	X	X
Jeff Fisher	Nuclear Quality Inspector	KNES		X	X
Dan Ford	Structural Project Engineer	KNES			X
Clarke Anderson	Structural Project Engineer	KNES			X
Thong Vang	Test Engineer	KNES			X
Andrew Elliott	Assistant Test Engineer	KNES			X
Joshua Luppest	Quality Engineer	KNES	X	X	X
Dan Wittig	Project Manager	KNES	X	X	X

Name	Title	Affiliation	Entrance	Exit	Interviewed
Scott J. Lenzner	Weldall Quality Manager	KNES			X
Yamir Diaz-Castillo	Inspection Team Leader	NRC	X	X	
John P. Burke	Branch Chief	NRC		X	
Aaron Armstrong	Inspector	NRC	X	X	
Ilka T. Berrios	Inspector	NRC	X	X	
Ramón Gascot-Lozada	Inspector	NRC	X	X	
Steve Jones	Inspector	NRC	X	X	
Edison Fernández	Inspector	NRC	X	X	
Gordon Curran	Observer	NRC	X	X	

2. 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.

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Item Number	Status	Type	Description
99901451/2017-201-01	OPENED	NON	Criterion III
99901451/2017-201-02	OPENED	NON	Criterion VII

4. DOCUMENTS REVIEWED

Policies and Procedures

- Konecranes Nuclear Equipment & Services, LLC (KNES) Nuclear Quality Manual (NQM), Revision 35, dated December 2016
- KNES-NOP-1.4.0, “Personnel Certification Procedure Level 2 & Level 3 Nuclear Crane Inspector,” Revision 2, dated June 2011
- KNES-NQM-1.3, “Personnel Indoctrination and training,” 03 dated March 2012
- KNES-NQM-1.4, “Quality Examiner (Inspector) Qualification,” Revision 07 dated March 2012
- KNES-NQM-1.5, “Qualifications of Auditor,” Revision 05 dated February 2015
- KNES-NQM-3.0, “Procurement Control-Purchasing,” Revision 5, dated March 2012
- KNES-NQM-3.1, “Procurement Control-Suppliers,” Revision 5, dated March 2012
- KNES-NQM-3.2, “Subcontracted Services,” Revision 4, dated June 2011
- KNES-NQM-3.3, “Receiving Examination,” Revision 4, dated February 2015
- KNES-NQM-4.0, “Process Control-Inspection and Test Control,” Revision 7, dated February 2015
- KNES-NQM-4.2, “In Process Control-Handling, Storage & Shipment,” Revision 5, dated March 2012
- KNES-NQM-7.0, “Calibration,” Revision 5, dated January 2015
- KNES-NQM-12.0, “Audit and Management Review,” Revision 6, dated December 2016
- KNES Nuclear Operating Procedure (NOP) 2.1.0, “Procedure for Calculations,” Version 7, dated February 2015
- KNES NOP 2.1.1, “Control of Design Activities,” Version 6, dated March 2015
- KNES NOP No. 2.1.2, “Commercial Grade Dedication – Application Procedure,” Revision 5, dated April 2017
- KNES NOP No. 2.1.3, “Procedure for KNES Software Quality Assurance Documentation,” Revision 1, dated February 2015
- KNES NOP No. 3.1.1, “Commercial-Grade Surveys and Source Verification (Surveillance) Activities,” Revision 0, dated March 2015

- KNES NOP No. 5.0.1, “Nuclear Welding Procedure Manual,” Revision 13, dated January 2017

- KNES NOP No. 5.0.3, “Control of Suppliers Performing Fusion Welding, Revision 0, dated July 2015

- KNES Test Procedure No. 36676-07, “APS Single Failure Proof Trolley and Controls Upgrade Factory Acceptance Test Procedure,” Revision 4, dated July 28, 2017

- KNES Test Procedure No. 36676-08, “Main Hook & Nut,” Revision 0, dated August 2011

- KNES Test Procedure No. 36676-16, “Magnetorque Emergency Lowering Procedure Main & Aux Hoist”

- Anderson Laboratories Quality Policy Manual, Revision M, dated February 14, 2014

- Anderson Laboratories procedure No. QM3001C, “Reporting Defect and Deviations per the Requirements of 10 CFR Part 21,” dated December 2, 2015

- TEAM Industrial Services Quality Systems Manual Nuclear Industry Manufacturing and Service No. 33.G.100-S3, Revision 0, dated March 29, 2017

- Team Industrial Services Procedure No. MT.ASTM.1, “Magnetic Particle Dry Examination Method,” Revision 4, dated April 2013

- Team Industrial Services Procedure No. UT.AWS.1, “Ultrasonic Examination of Groove Welds,” Revision 8, dated April 2016

- Team Industrial Services Procedure No. UT.ASTM.1, “Ultrasonic Examination of Steel Forging,” Revision 6, dated May 2015

Design and Commercial-Grade Dedication Records

- Arizona Public Service (APS) Palo Verde Critical List No. 36676-11, Revision 4

- APS Document No. 13-10407-M063-49-4, “Whiting Seismic Stress Calculations - Containment Polar Crane”

- Purchase Specification No. 36676-23, “Palo Verde Polar Crane Compliance Matrix [Purchase Spec],” Revision 0

- Calculation No. 36676-01, , “Palo Verde Nuclear Generating Station – APS Main Hoist Reeving Calculations,” Revision 4

- Calculation No. 36676-26, “APS Aux Hoist Reeving Calculations,” Revision 0

- Calculation No. 36676-21, "NUREG-0612 Appendix C Compliance Matrix,” Revision 0

- Calculation No. 36676-51, “APS Bridge Seismic Analysis with Single Failure Proof Trolley,” Revision 2
- Document No. 36676-03, “Palo Verde Nuclear Generating Station Single Failure Proof Trolley and Controls Upgrade”
- Document No. 36676-04, “Safety Analysis Report for Konecranes SUPERSAFE Single Failure Proof Trolley”
- Document No. 36676-22, “NOG-1 Compliance Matrix”
- Drawing No. U78090, “General Arrangement Polar Crane Bridge, Front and End Views”
- Drawing No. U78091, “General Arrangement Polar Crane Bridge, Plan View”
- Drawing No. U78404, “Structural Truck Equalizing Bogie”
- Drawing Nos. 54217820 and 54217821, “Main Hoist Wire Rope Assembly,” Revision 2
- Drawing No. 54215466, “Main Hoist Bottom Block Assembly,” Revision 5
- Drawing No. 54215477, “Main Hoist Bottom Block Sheave Pin,” Revision 0
- Drawing No. 54220963, “Rope Drum, Main Hoist Drum Weldment,” Revision 3
- Drawing No. 54222274, “Rope Drum, Aux Hoist Drum Weldment,” Revision 2
- Drawing No. 54215718, “SRI-225 Ton SFP Hook,” Revision 1, dated January 2, 2013
- Drawing No. 54215718, “SRI-225 Ton SFP Hook,” Revision 2, dated October 3, 2016
- Drawing No. 54215718, “SRI-225 Ton SFP Hook,” Revision 3, dated July 28, 2016
- Drawing No. 54215717, “Trolley SRI Nut, 225 Ton SFP Hook Nut,” Revision1, dated January 1, 2013
- Drawing No. 54215718, “Trolley SRI Hook and, Main Hoist Hook Assembly,” Revision 2, dated January 1, 2013
- Drawing No. 54215716, “Trolley SRI - Hook and Nut, Aux Hoist Hook Assembly”
- Engineering Release Notices Nos. 17-9236 (Change to Load Cell Pin Specification), 17-9364 (Update to Reflect Minimum Tested Values of Hook Strength), and 17-9259 (Change in Outer Diameter of Load Cell Pin) associated with Calculation No. 36676-01, “Palo Verde Nuclear Generating Station - APS Main Hoist Reeving Calculation”
- Painting Specification No. 36676-02, “APS Palo Verde Nuclear Generating Station,” Revision 8, dated January 31, 2017

- Technical Evaluation of Commercial Grade Services, Calibration Services for KNES, Revision 2, dated July 11, 2017
- Commercial-grade survey report of Lebus International, dated January 2013
- Commercial-grade survey reports of Bohr Machining, dated August 5, 2010 and October 13, 2016, respectively
- Commercial-grade survey report of Weldall, dated March 13, 2015
- Commercial-grade survey report of Trade-Tech, dated October 8, 2015
- Commercial-grade survey report of Mid-Valley Industries, dated October 13, 2016
- Commercial-grade survey report of ASC Industry, dated Mach 23, 2015
- Commercial-grade survey reports of Irizar Forge, dated October 24, 2011, December 24, 2014, and March 8, 2017, respectively
- NQM-Commercial Grade Dedication (CGD) -Technical Evaluation (TE), "Hook and Nut Supply Service", Revision 0, dated July 2016
- NQM-CGD-TE, "Raw material Supply Service", Revision 1, dated August 2015
- NQM-CGD-TE, "Fabrication and Welding Supply Service", Revision 1, dated August 2014
- NQM-CGD-TE, "Machining Supply Service", Revision 2, dated July 2016
- NQM-CGD-TE, "Raw material Supply Service", Revision 1, dated August 2015
- NQM-CGD-TE, "Machining Supply Service", Revision 2, dated August 2016
- NQM-CGD-TE, "Mechanical Component Supply Service", Revision 0, dated July 2017
- NQM-CGD-TE, "Electrical Component Supply Service", Revision 1, dated July 2017
- NQM-CGD-TE, "Heat Treating Supply Service", Revision 0, dated December 2014
- NQM-CGD-TE, "Electrical Component Supply Service", Revision 1, dated July 2017
- NQM-CGD-TE, "Wire Rope Supply Service", Revision 0, dated December 2014
- NQM-CGD-TE, "Calibration Service", Revision 2, dated July 2017
- Source surveillance report of Lebus International, dated April 2013

- CGD Package for Software - ANSYS 17, Solid Works Simulation 2016 Revision. SP 5.0, and Math Cad 15

- Certificate of Conformance for Weldall Quality Management Systems, dated March 7, 2017

- Quality Survey Report of Profile Finishing Systems, dated March 4, 2016

American Society of Mechanical Engineers (ASME) and Welding Records

- American Society of Mechanical Engineers (ASME) NOG-1, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)," 2004 Edition

Calibration, Heat Treatment, Non-Destructive Examination, Inspection and Test Records

- APS Single Failure Proof Trolley and Controls Upgrade Factory Acceptance Test Procedure No. 36676-07, Revision 4, dated July 28, 2017

- Notice of Out of Calibration Condition Report and Evaluation for tool ID No. KNQA-0030, dated October 31, 2014

- Notice of Out of Calibration Condition Report and Evaluation for tool ID No. KNWH-001, dated October 31, 2014

- Certificate of Conformance for Ultra-Core 712A80-H weld filler material from Q1 lot No. 13582620 from Lincoln Electric

- Certificate of Calibration for an infrared thermometer, dated May 2017

- Certificate of Calibration for a digital caliper, dated May 2017

- Certificate of Calibration for a bore gage, dated May 2017

- Certificate of Calibration for a hardness tester, dated May 2017

- Certificate of Calibration for a micrometer, dated May 2017

Supplier Oversight Records

- KNES Approved Vendor List, dated July 31, 2017

- Purchase order (PO) No. 17144-00 from Weldall Manufacturing Inc., to Precision Metrology Inc., for calibration services, dated August 8, 2017

- PO No. 4500012665 from KNES to Brad Foote Gear Works for several types of gear, dated June 1, 2012

- PO No. 450084077 from KNES to Precision Metrology Inc. for calibration services, dated June 13, 2017

- PO No. 4500849908 from KNES to Precision Metrology Inc. for calibration services, dated June 19, 2017
- PO. No. 4500860813 from KNES to Precision Metrology Inc. for calibration services, dated June 29, 2017
- PO No. 4500027598 from KNES to Weldall Manufacturing Inc., for three trolley frames and three charpy tests, dated December 3, 2012
- PO No. 4500706728 from KNES to Weldall Manufacturing Inc., for six arm auxiliary hoist equalizer weldment, dated January 18, 2017
- PO No. 4500764800 from KNES to Weldall Manufacturing Inc., for six pivoting units, dated March 21, 2017
- PO No. 4500622489 from KNES to Crosby Group for an auxiliary hook and nut, Revision 0, dated October 11, 2016
- PO No. 4500090512 from KNES to Anderson Laboratories for testing of a pinion, dated January 24, 2014
- PO No. 4500074257 from KNES to Trust Manufacturing LLC for two a heavy hex nut and a bolt, dated October 24, 2013
- PO No. 4500801337 from KNES to Scot Forge Company for a forging, dated May 1, 2017
- PO No. 4500758095 from KNES to Team Industrial Services Inc for ultrasonic testing of bottom blocks, dated March 14, 2017
- PO No. 4500642574 from KNES to DuBose National Energy for a hex nut, dated November 2, 2016
- PO No. 4500466537 from KNES to Lincoln Structural for weld filler metal, dated January 4, 2016
- PO No. 4500677557 from KNES to Carboline for Carboline 890N Paint and Carboline Dekta TRAK Device, dated December 12, 2016
- Audit report of Anderson Laboratories, dated July 30, 2012
- Audit report of Anderson Laboratories, dated October 13, 2015
- Audit report of DuBose National Energy, dated October 27, 2016
- Audit report of Lincoln Structural Solutions, dated July 23, 2014
- Audit report of Scot Forge, dated March 3, 2016

- Audit report of TEAM Industrial Services, dated August 5, 2015
- Audit report of The ESAB Group, Inc., dated October 9, 2012
- Audit report of Trust Manufacturing, dated November 29, 2016
- KNES Internal Audit Report NO. 15-02, dated December 2016
- KNES Internal Audit Report No. 16-01, dated January 2017

Nonconformance Reports

200023086, 200046248, 200054828, 200057268, 200057598, 200058777, 200058778, 200058779, 200058820, 200058821, 200059920, 200059324, 200060873, 200060874, 200064942, 200065734, and 200070094

Corrective Action Reports

663, 667, 685, 687, 688, 691, 700, 703, 706, 721, 724 and 734

Corrective Action Requests Opened During the NRC Inspection

742, 743, 744, 746, 747, 748 and 749

Training Records

- Inspector Certifications in accordance with ASTM D4537-12, including accompanying NACE certificate for Tom Van Gemert and Kayla Mulchay, dated November 2016
- Coating Applicator Qualifications of Coatings to Steel Structures in accordance with ASTM D4228-05, dated December 2016
- Ultrasonic testing (UT) Level II Personnel Qualification and Certification for Zachory Branscum
- UT Level III Personnel Qualification and Certification for Tim Mull and Richard F. Doss
- Magnetic Testing (MT) Level II Personnel Qualification and Certification for John R. Petroske, Jacob J. Graycarek, and Bryan Zurawski
- MT Level III Personnel Qualification and Certification for Donald M. Cywinski
- Flux-cored arc welding welder/welding operator qualification for Xiong Nhia, Chang Yang, Yer Xiong, and Choua Xiong