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Facility Name: Duane Arnold Energy Center

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

From May 11 through May 15, 1992, staff of the Nuclear Regulatory Commission's (NRC's) Vendor Inspection Branch (VIB) and the Region III office inspected Iowa Electric Light and Power (IELP) Company's activities related to the procurement and dedication of commercial grade items (CGIs) used in safety-related applications at the Duane Arnold Energy Center (DAEC). The inspection team reviewed IELP's procurement and dedication program to assess the licensee's compliance with the quality assurance (QA) requirements of Appendix B to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50 Appendix B).

On August 24, 1990, the NRC staff forwarded to the Commission SECY-90-304, "NUMARC Initiatives on Procurement," in which the staff reported the status of the Nuclear Management and Resources Council's (NUMARC's) initiatives on general procurement practices. Procurement initiatives as described in NUMARC 90-13, "Nuclear Procurement Program Improvements," October 1990, recommended that licensees assess their procurement programs and take specific action to strengthen inadequate programs. The initiative on the dedication of CGIs, which was to be accomplished by January 1, 1990, stated that licensee programs should meet the intent of the guidance provided in the Electric Power Research Institute (EPRI) Final Report NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)," June 1988. The staff also stated in SECY-90-304 that it would conduct assessments at selected sites to review the licensees' implementation of improved procurement and commercial grade dedication programs, assess improvements made in the areas covered by the NUMARC initiatives, and report the results of those assessments to the Commission. From February through July 1991, the VIB conducted eight assessments of selected licensees to determine the current status of activities to improve the procurement program related to industry initiatives and NRC requirements. On September 16, 1991, the NRC staff forwarded to the Commission SECY-91-291, "Status of NRC's Procurement Assessments and Resumption of Programmatic Inspection Activity," in which the staff reported on the results of its assessments and noted that it was resuming inspection and enforcement activities.

The NRC conducted this inspection, the fourth of the headquarters pilot inspections in this area, to review IELP's procurement and dedication programs and their implementation since January 1, 1990, (the effective date of the NUMARC initiative on dedication of CGIs). The staff focused its inspection on a review of procedures and representative records including approximately 30 procurement and dedication packages for mechanical and electrical items classified as safety-related by DAEC; interviews with IELP staff; and observations of IELP's activities. The inspection team's findings were discussed with IELP's representatives and senior management at the exit meeting held on May 15, 1992. The inspection team identified several strengths in IELP's procurement program and its implementation. A major program strength was IELP's policy of procuring safety-related spare and replacement items from original equipment manufacturers (OEMs) with approved Appendix B QA programs when available. This policy reduces the number of items that need to be purchased commercial grade and dedicated for use in

safety-related applications. Another program strength identified was IELP's receipt inspection and testing capabilities for performing material verification which are performed by independent quality control inspectors qualified to American National Standards Institute Standard N45.2.6.

The inspection team also identified some weaknesses in the generic procurement program and in IELP's implementation. These weaknesses contributed to the specific findings described in Section 3 of the report. Examples of these findings included DAEC's practice of not evaluating the material of certain CGIs. Instead, DAEC relied upon a functional or performance test (e.g., proof load, hydrostatic test) to demonstrate that the item would perform its intended safety function (e.g., maintain pressure integrity). Such tests may not be sufficient to demonstrate that the item is suitable to perform its safety function under the full range of design-basis conditions or to demonstrate reliability for the time between inspections or tests. The team also found that in certain applications valve and pump parts were being generically classified as nonsafety-related despite their potential for performing safety-related functions.

Other findings identified by the inspection team concerned the use of sampling to demonstrate suitability of certain CGIs, including greases, lubricants, and oils used in safety-related and environmental qualification applications. In general, the DAEC sampling plan was based on a MIL-STD-105D approach which assumes lot or batch control and reasonably homogeneous batches. However, the documentation reviewed during the inspection did not support how DAEC had determined such supplier controls on product consistency for CGIs purchased. Additionally, in the case of lubricants, traceability to the OEM was also not demonstrated. The inspection team also identified several concerns related to the conduct and application of commercial grade surveys and with the calibration and use of a spectrographic analyzer during the dedication process. It should be noted that the inspection team selected for review equipment from DAEC's safety-related component list and made no further attempts to assess individual component contribution to the system's safety-related function.

1 INTRODUCTION

During this headquarters pilot inspection, the Nuclear Regulatory Commission (NRC) inspection team from the Vendor Inspection Branch (VIB) of the Division of Reactor Inspection and Licensee Performance of the Office of Nuclear Reactor Regulation reviewed the Iowa Electric Light and Power (IELP) Company's program and its implementation for the procurement of commercial grade items (CGIs) used in safety-related applications in the Duane Arnold Energy Center (DAEC). The team also reviewed the IELP program and its implementation at DAEC for determination or verification of suitability of those CGIs for their intended or approved safety-related applications, a process referred to as "dedication."

Part 21 of Title 10 of the Code of Federal Regulations (10 CFR Part 21) defines dedication as the point at which an item or service becomes a "basic component," essentially, an item or service with a safety-related function. However, 10 CFR Part 21 also defines CGIs (Section 21.3(a)(4)(a-1)), as distinguished from items procured as basic components. The regulation then allows the procurement of items that are to become basic components, but that meet its definition of CGIs, without invoking 10 CFR Part 21 in the procurement documents.

When CGIs are procured for safety-related service, their procurement and dedication constitute activities affecting quality and, therefore, these activities must be controlled in accordance with the quality assurance (QA) requirements of Appendix B, "Quality Assurance Requirements for Nuclear Power Plants," to 10 CFR Part 50 (Appendix B). In particular, Criterion III, "Design Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B are most pertinent to procurement and dedication of CGIs; therefore, the inspectors reviewed the IELP program governing these activities and the implementation of that program at DAEC for compliance with these (primarily) and other applicable Appendix B criteria, as well as with the requirements of 10 CFR Part 21.

The NRC has provided further guidance to the requirements of Appendix B as they pertain to the procurement and dedication of CGIs in NRC Generic Letter (GL) 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products," on March 21, 1989, and GL 91-05, "Licensee Commercial-Grade Procurement and Dedication Programs," on April 9, 1991. Therefore, the IELP CGI procurement and dedication program and its implementation also were evaluated for consistency with the guidance and NRC staff positions promulgated in these GLs.

Finally, with respect to procurement in general, including procurement and dedication of CGIs, IELP has committed to various industry standards and other publications (as endorsed or conditionally endorsed by NRC regulatory guides, NUREGs, and GLs); as stated in the IELP QA program description as contained in or referenced in the IELP Updated Final Safety Analysis Report for DAEC, and as expressed for the industry by the Nuclear Management and Resources Council (NUMARC) in the NUMARC initiative on the dedication of CGIs as part of NUMARC 90-13, "Nuclear Procurement Program Improvements."

2 COMMERCIAL GRADE DEDICATION PROGRAM REVIEW

2.1 Procedures Review

The IELP program for procurement and dedication of CGIs for safety-related applications at DAEC is described and prescribed by a hierarchy of procedural documentation, beginning at the IELP Nuclear Generation Division (NGD) level of IELP with the NGD procedures. Subordinate to these are the three principal groups of procedures used by the organizations at DAEC that share primary responsibility for the various aspects of CGI procurement and dedication. Overall guidance is provided in the first of these groups of procedures, the NGDP 100-series procedures of the IELP NGD. The procedures generally describe the pertinent IELP policies and procedures governing DAEC procurement and dedication activities. Detailed guidance in various procurement-related subjects is provided in the Engineering Department Manual 1200-series procedures, the QA implementing procedures (QAP 1100-series), the DAEC Administrative Manual, the DAEC Procurement Manual (PM 1400-series) procedures, and lower tier instructions and other directives.

The inspection team's review of the DAEC dedication program procedures identified some concerns. The definition of critical characteristics in paragraph 3.6 of DAEC Procedure 1204.14, "Dedication and Upgrade of Commercial Grade Items," Revision 3, April 10, 1992, was not consistent with the working definition in Paragraph 6.2.14 and was not consistent with the guidance contained in GL 91-05.

Guidance on determining safety functions and failure modes was considered weak, but it improved in Revision 3 of 1204.14. Nevertheless, the procedures of the Engineering Department Manual governing the plant component safety classification Q-200 data sheet lacked guidance on documenting the technical basis for the classification, safety function, or credible failure mode determination; nor was there a provision on the Q-200 data sheet for such information. If the CGI application happened to have a plant component identifier or "tag" number, a Q-200 data sheet would be provided, but not a Classification of Subcomponents/Materials (CSM) evaluation. The procedure concerning the technical evaluation of replacement items called for performing this evaluation when the CGI part number has changed and for other situations in which the replacement CGI is considered not to be identical, but it was not clear from the engineering procedures how like-for-like (identical) determinations, i.e., concluding that the replacement CGI is identical, were to be done. The section of Quality Assurance Procedure (QAP) 1116.5 on commercial grade supplier surveys distinguished between critical characteristics for design (CCDs) and critical characteristics for acceptance (CCAs) as in Electric Power Research Institute (EPRI) NP-6406 (NCIG-11). In addition, in this procedure, IELP identified a subset of CCDs called "critical characteristics of the manufacturing process" (CCMs). This was a useful distinction, particularly for the commercial grade survey, source inspection, or source surveillance processes. However, this distinction was not reflected in engineering procedures. In addition, the CCA definition in Paragraph 3.1.3 of QAP 1116.5 as written (i.e., attributes providing reasonable assurance that the item received is the item specified) was not consistent with the guidance contained in GL 91-05; although, this was tempered somewhat by the requirement

in Paragraph 5.5 of QAP 1116.5 to include CCDs, CCMs, and CCAs in the survey plan checklist.

A strength was identified in the commercial grade survey procedure in that it contained the GL 89-02 restrictions on commercial grade surveys and also some additional guidance on handling the situation in which a distributor is involved. Another programmatic strength was identified in IELP's use of QA Form 1104.4-6a, "Checklist for Evaluating Third Party Audit Reports," which also covered commercial grade surveys, to ensure applicability of the audit or survey to the same part being procured or dedicated (or both) for DAEC as well as to DAECs application requirements, including addressing critical characteristics identified for the DAEC dedication.

Another strength identified by the inspection team was DAEC's policy to procure safety-related spare and replacement items from original equipment manufacturers (OEMs) with approved Appendix B QA programs, as stated in DAEC Procedure 1204.14.

The QAPs for source inspections and surveillance called for Engineering approval of plans and required that results be sent to Engineering, but it was not clear from engineering procedures if or when these results would be reviewed for technical adequacy. This would be particularly necessary when the results are not clearly satisfactory or unsatisfactory.

In order to assess the effectiveness of the implementation of IELP's commercial grade survey (and source verification) program in support of dedication, the team reviewed a number of completed survey and source inspection reports associated with some of the individual dedication packages reviewed. Surveys and source inspections evaluated are discussed in Section 3 of this report, in conjunction with the discussion of the associated individual dedication package.

2.2 Parts Classification

The inspection team reviewed DAEC Procedure 1204.15, "Classification of Subcomponents/Materials," Revision 1, November 12, 1991, and discussed the methodology for parts classification with DAEC procurement and QA personnel. The methodology and criteria used to determine safety classification of parts includes identifying and documenting information such as the following in a CSM document:

- subcomponent/material data, such as the model/part number, description, and manufacturer

- parent component data, such as equipment identification, quality evaluation, specific plant application (description and function), and seismic and environmental qualification considerations

- subcomponent/material credible failure modes and effects on plant operation

The inspection team considered the CSM process adequate for classifying subcomponents/materials; however, the team noted that DAEC Procedure 1204.15, Revision 1, does not require the preparation of a CSM if the subcomponent/material is assumed to have the same safety classific-tion as the parent structure, system, or component. DAEC procurement personnel indicated that the intent of Paragraph 6.2.8, of DAEC Procedure 1204.14, Revision 3, was that a CSM would be prepared for each subcomponent/material being dedicated that was not generically classified in accordance with DAEC Engineering Guide DGC-P100, "Design Guide Criteria for the Classification, Procurement and Application of Selected Items," Revision 1, April 10, 1992. Review of Procedure 1204.15, and Paragraph 6.2.8 of DAEC Procedure 1204.14, and discussions with DAEC procurement and QA personnel resulted in an agreement to revise both procedures in order to meet the stated intent.

The inspection team performed a limited review of the following generic classification documents included in Engineering Guideline DGC-P100, Revision 1: ED-002, "O-Rings, Gaskets, Packing, and Thread Sealant," Revision 1, January 24, 1992; ED-004, "Lubricants and Fuel Oils," Revision 1, April 6, 1992; and ED-008, "Pump and Valve Components," Revision 1, January 2, 1992.

After performing a limited review of ED-002 of Engineering Guideline DGC-P100, the inspection team expressed concerns about the omission of certain O-rings, gaskets, and packing in containment isolation valves forming part of the primary containment system. DAEC personnel indicated that ED-002 would be revised to identify such O-rings, gaskets, and packing as being part of the containment boundary if they form part of the local leak rate test boundary.

ED-004 of Engineering Guideline DGC-P100 requires lubricant and fuel oil to be classified as safety-related except that lubricants which do not directly support the equipment's safety function are classified as nonsafety-related. The inspection team considered this to be a reasonable approach for classifying lubricants. Following the inspection team's review of ED-008 of Engineering Guideline DGC-P100, it was determined that in certain applications some pump and valve parts such as disc nut set pins, locking keys, and bearings were generically classified as nonsafety-related but may perform a safety-related function and, as such, would be considered basic components. DAEC indicated that ED-008 would be revised to require that a CSM be prepared to determine the classification of safety-related pump and valve parts, except that pump and valve o-rings, gaskets, and packing should be classified in accordance with ED-002.

2.3 Trending of Suppliers

At the time of the inspection, no formal program for determining trends of problems associated with suppliers had been established at DAEC. Problems identified through either receipt inspection or dedication, which warranted in·iation of a procurement action request, were considered during annual supplier evaluations performed per DAEC Procedure 1104.4, "Supplier Evaluation." Since early 1992, for purposes of determining trends, IELP has been collecting information on all safety-related and nonsafety-related problems identified through receipt inspection. However, IELP had not fully

developed the overall program and software for trending supplier quality. IELP expected to have its trending program in place by August 1, 1992.

2.4 Detection of Fraudulent Material

DAEC has established a program for detecting counterfeit and fraudulent material to ensure that such material is not installed in the plant. DAEC Procedure 1404.2, "Procedures for Receiving Materials, Parts and Components," Revision 3C, April 11, 1992, provides guidance for warehouse storekeepers to use when material is received at the plant. These warehouse employees perform the initial screening of material; discussions with them indicated that they were knowledgeable about what to check for. Checklists describing typically misrepresented items, and methods used to counterfeit them, are posted in the receiving area for the workers' reference.

DAEC Procedure 1105.1, "Acceptance of Material, Items, Services, and Components," Revision 8, April 1, 1992, gives detailed guidance to the QC inspectors who perform the receipt inspections on all safety-related and dedicated parts. This procedure contains the DAEC Receiving Inspection Instruction Checklist (QA Form 1105.1-1A) which includes a generic checklist designed specifically to help the QC inspectors detect counterfeit and fraudulent material. In addition to this generic checklist, DAEC also has detailed checklists for detecting counterfeit valves, fasteners, and circuit breakers.

The QC inspectors who were interviewed during the inspection appeared experienced and very knowledgeable about the methods used to detect counterfeit and fraudulent material. DAEC's policy is to rotate QC inspectors throughout the plant so that they gain experience in different areas. This helps the inspectors understand where and how the parts they are inspecting at receiving will be used, enabling them to more easily detect anomalies in new parts. In addition, all the personnel involved in the receipt of parts at the plant, including warehouse storekeepers, QC inspectors, and QA engineers who write the receiving inspection instructions, have attended training sessions given by outside contractors on the detection of counterfeit and fraudulent material.

2.5 Receipt Inspection

The NRC inspectors identified a strength in DAEC's procurement and dedication program in that DAEC utilizes a Spectrotest-F spectrographic analyzer (SA) to analyze the chemistry (including carbon content) of CGIs and basic components to verify receipt of the specified material. Additionally, all tests and inspections are performed by independent QC inspectors qualified to American National Standards Institute (ANSI) Standard N45.2.6.

During the inspection of the DAEC receiving inspection area, a three-way manifold valve was being tested (Dedication Package D92-028) using the SA. Chapter 11, "Inspection and Testing," Revision 5, of the IELP QA Manual gives requirements for the control of measuring and test equipment (M&TE).

Weaknesses noted during the review included: no unique M&TE controls assigned to the SA; no prescribed interval or frequency established for the calibration and adjustment of the SA; and no calibration sticker affixed to the SA. Additionally, when the SA was found to be out of calibration during performance of its test, the operator adjusted it using nationally recognized standards; however, no evaluations were being made and documented concerning the validity of previous test results. Also, it was not clear to the inspection team that a records system had been established and maintained for the SA showing the results of the calibration. During the inspection, DAEC QA personnel issued Revision 1 to Procedure 2161.15, "Chemical Analysis of Ferrous and Non-Ferrous Materials With the Spectrotest-F Spectrographic Analyzer," which now provides requirements that implement Chapter 11 of the IELP QA Manual and addresses the weaknesses identified by the inspection team

3 DEDICATION PACKAGE REVIEW FINDINGS

To help the NRC review individual dedications, IELP prepared (at the NRC's request) approximately 30 files of dedication packages compiled from diverse records, but each pertaining to one dedication, as selected by the team from its review of the DAEC dedication file lists. The review packages were organized by discipline into (1) electrical and instrumentation, (2) mechanical, and (3) materials (including lubricants). In addition, IELP provided, as applicable, the associated commercial grade survey report if EPRI Method 2 was used. The team reviewed the available records for the selected dedications; these included receiving reports and receipt inspection reports. The following 12 examples are items that IELP purchased as commercial grade and either installed or made available for installation in safety-related plant applications without performing a fully specified review for suitability of service or in some cases, a design verification (seismic and environmental evaluation). The NRC inspectors did not consider that the findings documented in the examples resulted in the use of CGIs that could cause operability problems, however, they were unable to assure that this was the case. Accordingly, for those identified and similar items, DAEC should review the dedications to assure that all parts are suitable for their intended safety-related applications.

(1) Dedication Package D90-003, Revision 2, May 14, 1991, dedicated a three-quarter-inch, four-and-one-half-pound, cast steel relief valve (model number 3/4 1990C-XDAI), manufactured by Dresser Incorporated, which replaced a three-quarter-inch, seven-eighth-pound, bronze relief valve (PSV7333A), manufactured by Aquatrol, Incorporated, and installed on control building heating, ventilation and air conditioning (HVAC) air system accumulator 1V-5-12. The Q-200 data sheet identified the safety function of the relief valve as forming part of the pressure boundary in a Safety Class 3 system and having only a passive integrity function. System overpressure protection was not listed as a safety function. The critical characteristics identified were configuration, pressure integrity, popping point, and assurance that the valve conformed to American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section VIII. Material of construction was not identified as a critical characteristic. The verification methods for accepting

each critical characteristic were listed as visual inspection, dimensional verification, weighing the valve, pressure testing performed at 88 pounds per square inch gauge (psig) and ASME Code Section VIII stamp verification.

The engineering evaluation for the replacement relief valve did not address the material substitution and its suitability for use in the intended safety-related application. DAEC's position was that a specific material for the relief valve is not required by any design specification; therefore, a replacement relief valve made of bronze, carbon steel, or some other material is acceptable providing it meets the requirements, if any, which are included in the approved specification. DAEC stated that Engineering is not required to reverify the adequacy of the original design during the procurement process. The inspection team noted that Sections 1.3, 5.5, and 10.0 of Specification 7884-M-86, "Technical Specification for HVAC Instrument Air Compressor," Revision 2, March 27, 1975, required, in part, that the supplier of the units and accessories be responsible for their design; the accessories include the air receivers (accumulators) that utilize a relief valve design meeting applicable ASME Code requirements. The manufacturer was also required by Section 10.3 of the specification to submit to DAEC design output documents and data for use in the plant design. The inspection team noted that DAEC had committed to ANSI Standard 18.7-1976, "Administrative Controls and Quality Assurance of the Operational Phase of Nuclear Power Plants," and that Section 5.2.13 of ANSI 18.7 requires, in part, that if the requirements of the original item cannot be determined, an Engineering evaluation shall be conducted and documented to establish the requirements. Additionally, Criterion III of Appendix B requires, in part, that measures be established for the selection and review for suitability of application of materials used in safety-related applications. During the inspection, DAEC generated an office memorandum to justify using cast steel material as a replacement for bronze material.

DAEC's position on not identifying the valve's material as a critical characteristic is that the relief valve's only safety function is to maintain pressure boundary integrity, and that pressure testing is an acceptable method of obtaining assurance that the relief valve will perform its safety function. The inspection team questioned this position since a one-time-only pressure test may provide assurance that the component and system do not leak, but does not provide assurance of the material's strength or corrosion resistance. Material may need to be verified to ensure that the item will perform its intended safety function when subjected to the full range of normal and design-basis operating environments and events.

The Q-200 data sheet did not identify overpressure protection as a safety function. DAEC's position was that the compressor for the HVAC instrument air has start/stop controls (pressure switch) that shut the compressor off when the pressure in the receiver is at approximately 88 psig. Section 5.3.1 of Specification 7884-M-86, Revision 2, originally required that "Pressure control shall be set to start the

compressor at 85 psig and stop at 100 psig. Receiver mounted relief valve shall be set at 125 psig." The inspection team expressed concern that DAEC was taking credit for system overpressure protection using overpressure control devices (i.e., a pressure switch stopping a compressor from functioning) that are not recognized by the ASME Code or by the original design specification. The ASME Code requires the use of in-line pressure-relief devices for overpressure protection. Although not identified on the Q-200 data sheet as a safety function, the valve's overpressure protection capability was verified during the dedication process.

Other concerns identified by the inspection team included: (1) an incorrectly dispositioned procurement action request (S-55728-01, November 20, 1990) that permitted the relief valve to leak at 115 psig, before it could reach its 125 +/-4 psig popping point (Note: the valve was later correctly tested) and (2) during the closeout of the maintenance action request (MAR), the equipment data base for relief valve PSV7333B was incorrectly updated. DAEC System Engineering corrected this data base discrepancy during the inspection. Dedication Package D92-010, Revision 0, February 25, 1992, was another example reviewed during the inspection that resulted in similar concerns.

(2) Dedication Package D90-005, Revision 0, February 14, 1990, dedicated four 1-inch, socket-welded, 600-pound, stainless steel, conventional, port-gate valves manufactured by Velan Valve, Incorporated. The valves were originally purchased as nonsafety-related in 1988 and were dedicated as basic components for use in the emergency diesel generator air start system. The Q-200 data sheet for these four drain valves (V32-0065, -0069, -0073, and -0077) indicated that their safety function is forming part of the air start system pressure boundary and that their draining function is nonsafety-related. The critical characteristics identified were shell, seat, and backseat leakage; body, bonnet, and gate material; and configuration. The verification methods for accepting each critical characteristic were listed as reviewing leak test reports sent with the original purchase order (PO); reviewing certified material test reports (CMTRs) supplied by the manufacturer to ensure the material conforms to the American Society for Testing and Materials (ASTM); and verifying configuration and system identification.

DAEC used a third-party audit conducted by the Nuclear Suppliers Quality Assurance Committee (NSQAC) at the Velan Valve facility in Williston, Vermont, on May 27-29, 1987 (NSQAC Audit 87-18) as the basis for accepting the documentation supplied by Velan. However, the 1988 purchase order (PO S42548) was issued to Velan's Montreal, Quebec, facility. The CMTRs and certificate of conformance (CoC) issued for the material and testing appeared to have been generated by the Quebec facility. Therefore, the use of the audit or survey of the Vermont facility as a basis for accepting documentation and items from Quebec is not consistent with the guidance contained in EPRI NP-5652, or in NRC GL 89-02. Additionally, a review of the NSQAC audit revealed that the majority of the activities addressed in the audit were related to

Velan's ASME Code Section III quality program with very little documentation supporting the review of its commercial quality program.

DAEC gave the inspection team documentation supplied by Velan that addressed the traceability of the installed valves. Each of the four valves had raised cast markings indicating F-316, A-BF, and had a dye-stamped mark of Velan 600. The inspection team reviewed the receiving inspection report and documentation supplied by Velan and determined that the heat code for the valve bodies listed on the CoC was A-BF and that the CMTRs supporting the CoC indicated the correct material for the valve body, bonnet, and gate material. However, it is noted that the CoCs and valve marking were produced in accordance with a QA program not reviewed or audited by the licensee.

(3) Dedication Package D90-016, Revision 0, May 16, 1990, with attached revision control sheets through Revision 6, May 20, 1991, dedicated safety-related louver spare parts such as stainless steel pinions, wing and jam gaskets, rivets, nuts, and bearings. The Q-200 data sheets listed several plant dampers (equipment identification numbers D07514A, B, C) in which these parts could be used and identified their safety function as positioning the ventilation dampers. The critical characteristics identified were part number, configuration, materials of construction, and dimensions. The verification methods for accepting each critical characteristic consisted of a visual inspection, a review of the CoC, identification of part number, and verification of the material specification. For the pinion, an independent chemical analysis of the material (ASTM A351, Type 304, CF8) was required to be performed on a sample basis in accordance with MIL-STD-105C, along with a random dimensional check.

The dedication package incorporated the performance of a commercial grade survey in order to ensure that items were designed, procured, and controlled sufficiently to warrant acceptance following a standard receipt inspection along with a review of the supplier's, Construction Specialties, Incorporated (CSI), CoC. The six attached revision sheets for D90-016 limited the use of the survey of CSI by requiring that DAEC perform dimensional checks on a sample basis of all louver parts and that a chemical analysis of the pinions also be performed on a sample basis. The dedication package permitted the use of CSI's CoC as the basis of accepting the materials of construction for all of the louver parts except the pinion, even though the survey stated, in part, that "Certification documents are supplied by the vendors upon request from CSI. CSI prepares its CoC based on these vendor documents. CSI does not verify the correctness of certification documents with regard to material." Therefore the use and validity of the CoC from CSI, as the basis for accepting these materials is not considered consistent with the specifications of Section 10.2, "Certificate of Conformance," of ANSI N45.2.13-1976, "Quality Assurance Requirements for the Control of Procurement of Items and Services at Nuclear Power Plants."

DAEC analyzed the chemistry of the pinions and checked dimensions on the louver parts by randomly sampling these items in lot sizes required by

MIL-STD-105D. However, there was no documented basis to support the vendor's lot or batch control process, nor was it evident how the supplier controlled product consistency for the purpose of determining lot homogeneity. The inspection team also discussed with DAEC procurement personnel the use of sampling, based on statistical methods, when purchasing bulk or commodity items from organizations that do not maintain Appendix B QA programs. DAEC gave the inspection team documentation that indicated all louver parts, dedicated as basic components and available for safety-related service, had been installed in nonsafety-related applications.

(4) Dedication Package D92-019, Revision 1, February 7, 1992, dedicated non-rotating, non-lubricated, one-quarter-inch-diameter wire rope (19X7 classification) for the auxiliary hoist used for various purposes, including refueling. The critical characteristics identified were part number, configuration, dimensions, and material strength. The verification methods for accepting each critical characteristic consisted of a visual inspection to verify configuration, length (105 feet), and diameter, and a source surveillance to verify breaking strengtn of the cable.

Section 4.6.6.5.3 of General Electric Specification 21A9246, "General Requirements for Refueling Platform," Revision 1, January 13, 1970, required that the cable be unlubricated stainless steel; however, material was not identified as a critical characteristic. The inspection team considered material (stainless steel) to be important for this application because of the potentially corrosive environment. The source inspection confirmed the breaking strength of the cable as 5550 pounds. However, a carbon steel cable of the same diameter and configuration has a breaking strength of 5540 pounds (exceeding the breaking strength of stainless steel which is 5400 pounds); therefore, breaking strength alone does not assure that the cable was made of stainless steel. The source inspection report indicated that the CoC, generated by Wire Rope Corporation of America, was reviewed and that the material supplied was stainless steel. The report did not indicate that the supplier and tester of the cable (Yale Hoist) performed any independent overchecks to support the validity of the CoC, as specified by Section 10.2 of ANSI N45.2.13-1976.

(5) Dedication Package D91-013, February 13, 1991, dedicated a three-eighth-inch Whitey needle valve which replaced an identical valve installed in the plant. The safety function of the valve was maintaining system pressure boundary. The function of the valve was isolating pressure switch PS4556 which provides reactor vessel pressure input to the low-pressure coolant injection loop select logic. The critical characteristics listed were: part number, dimensions as specified in the catalog, and performance of a hydrostatic test. The verification methods for accepting each critical characteristic consisted of a standard receiving inspection and a hydrostatic test performed by DAEC's instrumentation and control laboratory. The NRC inspection team identified that the hydrostatic test was only performed with the valve in the open position; therefore, there was no assurance that the valve

would be capable of performing its intended safety function when the valve was closed and being used to isolate the pressure switch. The valve also required testing in the closed position to ensure that the valve would be capable of maintaining system design pressure.

(6) Dedication Package D90-105, Revision 0, December 12, 1990, dedicated from warehouse stock several one-eighth-inch by one-half-inch Woodruff keys to be used in various models of Fisher control valves. The critical characteristics identified by DAEC included part number and dimensions (these were to be verified by standard receipt inspection) and chemical analysis (performed by Mobile Metal Analysis (MMA) Laboratories, Huntington Beach, California; an Appendix B qualified laboratory). The chemical analysis verified that the two keys supplied to MMA for destructive testing met the material requirements of ASTM A29 (1035) steel. No documentation was available to support lot homogeneity of the eight keys since they were purchased from Fisher Controls as commercial grade; therefore, testing two keys had no direct correlation to the remaining keys. DAEC installed one key in control valve CV 4301 (isolation valve for standby gas treatment torus exhaust) and the NRC inspector verified the remaining five keys in warehouse stock. No keys were issued for installation under Revision 1 or 2 of the dedication package. Other applications of these control valves, according to the Q-200 data sheet, included standby gas treatment torus and drywell exhaust. The keys are manufactured to commercial standards (ANSI B17.2) and are used as anti-rotation devices; as such, they must maintain their structural integrity. DAEC did not establish if Fisher had a program in place to control lot or batch homogeneity.

(7) Dedication Package D90-021 dedicated a spare Woodward model 8901-037 booster servomotor for the Woodward model EGB-10C governors (tag numbers 1G021/GOV and 1G031/GOV) used on DAEC's emergency diesel generator (EDG) engines (1G021/ENG and 1G031/ENG). The item was purchased for potential use in an upcoming outage under IELP PO S55870 (Revision 0) issued to the Fairbanks-Morse Engine Division (FMED) of Colt Industries on May 17, 1990. The purchase order identified the item by IELP stock code (P118563), the Colt-FMED part number (16200525), and the Woodward part number (8901-037), and was required to be tagged with the IELP purchase order number and Colt-FMED part number as a minimum.

The Q-200 data sheet for the booster servomotor's parent component, the governor, listed hydraulic fluid pressure boundary as being a safety function of the governor as well as diesel engine speed control. However, the safety functions (as given in D90-021) of the booster servomotor (which forms part of that pressure boundary) did not include its being a hydraulic fluid (governor oil) pressure boundary (boosted to 250 psig nominal during start), nor a pressure boundary for the starting air system (also nominally 250 psig).

The critical characteristics identified by DAEC consisted of part number, seal integrity, mounting dimensions, and spring servo travel. These were to be verified by Woodward under a separate PO for IELP using Woodward Test Procedure TSP 344. The package indicated that spring

servo travel was an indirect functional performance requirement related to the response of a special test device used by Woodward as part of Woodward's Test Procedure TSP 344. However, it was not documented in the package how IELP had determined that spring servo travel (of a specified amount, but within no specified time) would ensure that the 8901-037 booster servomotor would pressurize the EGB-10C governor upon its pressurization by starting air (at DAEC's minimum allowable pressure) so that the governor would open DAEC's engine fuel racks the required amount and within the required time to ensure engine startup within the technical specification limit (10 seconds). It was also not documented how the performance of Test Procedure TSP 344 would ensure that the booster would release its pressurization of the governor and allow its own oil pump to take over at the required engine speed or upon the removal of starting air to prevent overshoot, or worse, overspeed shutdown of the engine.

According to the dedication instructions, the critical characteristics of seal integrity and spring servo travel were to be verified by means of a source inspection. The objectives of the source inspection were discussed in detail in Design Engineering Memorandum NG-90-1736. The memorandum's source inspection requirements included witnessing Woodward's performance of TSP 344 and verifying no oil leakage from the vent hole and no air bubbles in the effluent oil, but did not mention "no excessive air leakage" from the vent hole (per Step 7 of TSP 344). The source inspector was supposed to verify traceability of the booster by tracking number (PO number) and part number to the manufacturer and to test results. However, IELP produced a memorandum from the source inspector that explained that he had marked the booster with his own special marks to preserve traceability since the unit had no serial number and the source inspection plan failed to require recording the tracking number. The NRC inspector examined the unit and observed the marks as described in the memorandum, indicating that it was the same unit described by the source inspector, but the test and repair records for the unit still did not reflect this means of identification. The completed test record consisted of a filled out page 4 of TSP 344, Revision 0, October 9, 1990. Step 1 indicated that the unit was to be tested with SAE 10W40 oil, but it was not stated in the dedication package whether the unit will use the same oil when installed on a DAEC EDG. Finally, Step 5 of TSP 344 called for setting the supply air pressure between 100 and 300 psig and the recorded pressure was 124 psig. However, the DAEC starting air pressure is nominally 250 psig. Therefore, while the unit did move the spring return servo 1.1 inches (at least 1.0 was required), at a pressure lower than installed, the test did not verify lack of oil or air leakage (i.e., seal integrity) at the pressure to which the unit would be at least nominally exposed when installed.

Although not addressed as part of the dedication, IELP claimed that the pressure integrity of the unit would be checked (although not necessarily at maximum design pressure) upon startups during preoperational testing of the EDG on which it would be installed.

(8) Dedication Package D90-012 dedicated a General Electric (GE) heater element, part number 47C518675, to be used in the main steam isolation valve leakage control system (tag numbers 1S122A, 1H3713), procured from NSSS-Divesco. The stated safety function of the heaters was to maintain leakage as vapor and to evaporate leakage condensate. No failure modes were identified, but the critical characteristics listed were heated length, overall length, diameter (to be measured during a source inspection (SI) at Divesco), wattage rating and serial number (to be verified visually during the SI), GE master parts list number E32-B001, and GE part number (to be verified visually during receipt inspection). The evaluation addressed seismic and environmental qualification on the basis of establishing that the heater element from Divesco was a like-for-like replacement. Although the stated characteristics were all appropriate attributes for item identification, the NRC inspector was concerned about the omission of verification of functional performance-related attributes for heater elements, such as direct current (dc) resistance, actual heat output, insulation resistance or dielectric strength, and pressure-retention capability (unless in a well). IELP's reply to these concerns was that this procurement was actually of a component originally manufactured as a basic component under an Appendix B QA program and that the dedication process was used merely to reestablish traceability to the original equipment manufacturer. Although this was not an unreasonable approach, it did not take into consideration that this heater element had changed hands several times and had been stored and handled under unknown conditions making independent verification of certain key attributes prudent.

(9) Dedication Package D90-034 dedicated Westinghouse, type FH03 through FH94, overload heaters to be used in various Class 1E (safety-related) motor control centers at DAEC. The safety function of the part was stated as "not to cause the overload relay to trip sooner than desired." The critical characteristics listed were part number and trip time as determined by IELP Procedure GMP-TEST-031 during post-installation testing, but starting, transient, and full-load hold-in capability were not addressed. These unlisted attributes were considered to be essential to the stated safety function. IELP stated that this was an oversight that would be corrected by adding the hold-in test to GMP-TEST-031 in a future revision, but that credit was taken for operational testing that had not resulted in any premature tripping. The DAEC evaluation of overcurrent tripping tests (per GMP-TEST-031) stated that "one pole at a time was tested," but a test circuit diagram in GMP-TEST-031 indicated that three poles would be tested in series. This would not provide conclusive results on each individual heater. GMP-TEST-031 stated that the acceptance criterion was tripping time within +/-15 percent of the time corresponding to the test current on the manufacturer's trip curves. However, the DAEC evaluation of the raw data indicated that the 15-percent tolerance was interpreted to be the accuracy of the measured time values as opposed to the tolerance of the measured trip time with respect to the trip curve. The test results as documented were therefore inconclusive with respect to the stated acceptance criterion. IELP agreed to review the results.

(10) Dedication Package D90-044 dedicated various AMP Corporation crimp-type electrical connectors (insulated and uninsulated) for general purpose safety-related applications. The generic safety function was described as maintaining electrical and mechanical integrity of the circuits in which the connectors were used. Failure modes adverse to safety were not specifically addressed. The stated critical characteristics for the connectors were part number, conductor material, barrel length, inside diameter and wall thickness, insulation material, and insulation thickness. The characteristics of part number and dimensions were to be verified during receipt inspection by visual observation and measurement, and material was supposed to be verified visually and by part number. The conductor material and insulation material were to be certified in a CoC from AMP Corporation and the validity of AMP's certifications was to be determined by a commercial grade survey. Review of the survey report (V-90-85) indicated that it resembled a broad-based, programmatic, Appendix B-type audit. Although there was a survey plan that listed the critical characteristics of metals, insulation, insulation thickness and metal thickness (per AMP drawings), the survey report contained no evidence that all of these parameters were verified. In fact, the report criticized AMP's traceability of materials to documentation of particular composition or properties and recommended that IELP not require conformance to certain material specifications because AMP could not certify to them. It was not clear from the receiving documents that anything more than part number, quantity, and receipt of the vendor CoC was verified.

(11) Dedication Package D90-045 dedicated a heater for the standby liquid control (SLC) tank manufactured by Wellman Thermal Systems. The safety function of the heater was described as maintaining the temperature of the SLC tank pentaborate solution above precipitation temperature. Failure modes or effects were not discussed. The Q-200 data sheet for the heater (tag number 1H3446) gave the safety function simply as "provide heat." The critical characteristics identified were part number, operating voltage, wattage, dimension "B" and rod diameter from vendor drawing 40A109295, and dc resistance. However, the temperature at which the dc resistance was to be taken was not specified, nor was the required resistance. In addition neither insulation dielectric strength nor insulation resistance normally considered critical characteristics for such applications were specified.

In response to the team's concerns, IELP obtained documentation from the vendor stating the expected "cold" dc resistance was 37.2 ohms +/-10%. IELP stated that the heater had met that criterion. With regard to the omission of checking insulation resistance (IR) or dielectric strength, IELP stated "IR prior to installation is a personnel safety characteristic," however this statement was considered invalid because the heater would not be expected to be energized prior to installation since no preinstallation operability bench test was specified. IELP also contended that insulation resistance would be indirectly tested (at nominal service voltage) during post-installation testing, but an operational check of a heater circuit would not necessarily detect the relatively high leakage currents indicative of degraded insulation.

(12) Dedication Package D90-092, Revision 5, April 10, 1992, dedicated various commercial grade lubricants for use in safety-related equipment, including, for example, MOBIL "Light DTE" oil, EXXON "Nebula EP-0" grease, and MOBILGREASE #28, used in the core spray and residual heat removal pump motors, in safety-related Limitorque motor-operated valves (MOVs), and in Limitorque MOV limit-switch gearboxes, respectively (all environmentally qualified equipment). Visual inspection for such critical characteristics as color, product identification information (e.g., type designations and batch numbers), and container integrity were performed on site; whereas, IELP had been using Herguth Laboratories, an Appendix B, IELP-qualified contractor, to perform lubricant dedication testing of such critical characteristics as viscosity of oils and dropping point and penetration of greases. The team determined that, in general, IELP's dedication methodology for lubricants was acceptable; although, some concerns were identified. The sampling plan for lubricants described in the evaluation, in which traceability to the manufacturer was to be established by lot or batch numbers, was based on a MIL-STD-105D statistical sample, which assumes batch control and reasonably homogeneous batches (a batch being defined as units of product of a single type, grade, class, size, and composition, manufactured under essentially the same conditions, and at essentially the same time). However, it was not clear from the evaluation how IELP had determined what the suppliers' batches or lot controls were, nor was it clear how the suppliers' controls on product consistency were verified for purposes of determining batch homogeneity.

4 PROCUREMENT AND DEDICATION TRAINING

The inspection team reviewed IELP's training activities in support of the process of dedication of CGIs used in safety-related applications performed after January 1, 1990. Until mid-1991, IELP had relied heavily upon contractors to provide engineering support for procurement activities. Since 1991, IELP has developed a Procurement Engineering group of in-house personnel; the group was of comprised four engineers and a group leader. With the exception of the group leader, the engineers had less than one year of experience in the group and had little previous procurement experience. The inspectors noted that the training program for the procurement engineers was not fully implemented. IELP stated that it expects full implementation by September 1, 1992. Past training of the procurement engineers consisted primarily of on-the-job training. Additional training on the EPRI procurement guidelines was given at training seminars held in March 1990 and April 1992.

Since the beginning of 1991, procurement-related topics had been covered during each of the quarterly training sessions provided to the Engineering staff. Among the topics covered were bill of materials, vendor performance-based audits, and the NUMARC comprehensive procurement initiative. An overview of the procurement process is also a part of the general orientation training provided to all new engineers.

Training had also been provided to those most affected by procedure revisions. For example, the procurement engineers received about a half-day of training on the April 1992 revision of the procurement procedures; training consisted of an informal discussion of the changes. Training for the Quality Assurance engineers (QAEs), those engineers who reviewed procurement packages, consisted of a qualification card system that had been in place since the beginning of 1990. Completion of the qualification cards required familiarization with the associated procedures, performance of specific on-the-job activities, completion of specific training courses, discussion of the various topics with the supervisor, and the successful completion of an exam. For those who had previous experience, completion of the qualification cards was waived on a case-by-case basis. Only individuals who had completed the qualification cards for a specific function were authorized to perform that function. As a group, the QAEs had sufficient QA experience but a limited engineering background.

The training given to QC inspectors was also based on a qualification card system. Training had been provided on receipt inspection, CGIs, and detection of fraudulent parts. Interviews with IELP's QC inspectors showed them knowledgeable of the practices to detect fraudulent parts; as a group, they had considerable nuclear and QA experience. In general, the inspection team considered IELP's training activities to be effective.

5 EXIT MEETING

On May 15, 1992, the inspection team conducted an exit meeting with members of the IELP staff and its management at the DAEC site. During the exit meeting, the team summarized the inspection findings and observations. The following individuals were present:

Iowa Electric Light and Power Company

J. Franz, Vice President - Nuclear
M. Flasch, Manager - Engineering
D. Church, QA Supervisor
D. Jantosik, Group Leader, Materials and Supplier Quality
D. Wilson, Plant Superintendent
T. Sims, Nuclear Licensing Specialist
J. Howlett, Group Leader, Procurement Engineering
H. Johnson, Supervisor, Material Management
M. Fairchild, Group Leader, Vendor Programs
K. Peveler, Manager, Corporate QA
W. Rose, Engineer, Nuclear Safety Committee
B. Bernier, Supervisor, Mechanical Engineering
D. Engle, Procurement Engineer
F. Baines, Procurement Engineer
K. Medulan, Procurement Engineer
B. Borek, Procurement Engineer
D. Baumgartner, Procurement Engineer
P. Hansen, Systems Engineer
M. Huting, QC Supervisor
A. Roderick, Supervisor, Testing and Surveillance

R. Aiken, Senior QA Specialist
G. Falta, Senior QA Specialist
J. Zullo, QA Specialist
D. Homes, QA Specialist
L. Jenkins, Senior QA Engineer - Procurement
J. Powers, Senior QA Eng[illegible]eer - Procurement
D. Podlin, QC Engineer
M. Monsef, Senior Civil/Structural Engineer
K. Young, Manager, Nuclear Licensing
P. Bessette, Supervisor, Regulatory Communications
D. Blair, Group Leader, Internal QA Audits
L. Mattes, Management Support
R. Salmon, Staff Engineer
N. Sikka, Supervisor, Electrical Engineering
M. Rader, Instrumentation and Control Maintenance
G. Whittier, System Engineer
J. Gushue, QA Engineer
D. Pint, QA Engineer

Nuclear Regulatory Commission

L. Norrholm, Chief, VIB
F. Jablonski, Section Chief, RIII
R. Pettis, Team Leader, VIB
S. Alexander, EQ and Test Engineer, VIB
L. Campbell, Reactor Engineer, VIB
S. Magruder, Reactor Engineer, VIB
R. Longstaff, Reactor Inspector, RIII
M. Parker, Senior Resident Inspector, DAEC

Other Organizations

W. Hou[illegible]on EPRI
B. Brad[illegible], NUMARC
W. Ford, Consumers Power Company