

Enclosure 1

**Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor
Topical Report, KP-TR-007-NP-A**

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B	Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor Topical Report, KP-TR-007-NP-A, Revision 3 (Non-Proprietary)

SECTION A



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

November 12, 2021

Mr. Peter Hastings
Vice President, Regulatory Affairs
and Quality
Kairos Power LLC
707 W Tower Ave
Alameda, CA 94501

SUBJECT: KAIROS POWER, LLC - SAFETY EVALUATION FOR KAIROS POWER, LLC
TOPICAL REPORT KP-TR-007-NP, "QUALITY ASSURANCE PROGRAM FOR
THE KAIROS POWER FLUORIDE SALT-COOLED HIGH TEMPERATURE
REACTOR," REVISION 3 (EPID NO: L-2020-TOP-0030/CAC NO. 000431)

Dear Mr. Hastings:

By letter dated May 15, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20136A414), Kairos Power, LLC (Kairos) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review its topical report (TR) KP-TR-007-NP "Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor," Revision 0. This TR addresses power-reactor quality assurance requirements to support license applications for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor. As part of its review the NRC staff sent three sets of preliminary clarification questions to Kairos on September 18, 2020, October 29, 2020, and January 15, 2021 (ADAMS Accession Nos. ML20273A292, ML20311A231, and ML21025A053, respectively). By letter dated March 8, 2021 (ADAMS Accession No. ML21071A081), Kairos provided Revision 1 of KP-TR-007-NP, which contained changes as a result of the NRC staff's preliminary clarification questions, which were discussed in public meetings held on October 7, 2020; November 19, 2020; and February 5, 2021 (ADAMS Accession Nos. ML21130A627, ML21073A003, and ML21292A273, respectively). In response to clarifications requested by the NRC staff during teleconferences held with Kairos on April 6, 2021 and April 21, 2021, Kairos submitted Revision 2 (ADAMS Accession No. ML21105A517) and Revision 3 (ADAMS Accession No. ML21117A046) of KP-TR-007-NP by letters dated April 15, 2021 and April 26, 2021, respectively. An additional clarification question was sent to Kairos on July 7, 2021 (ADAMS Accession No. ML21189A308), and discussed in a public meeting held on July 14, 2021 (ADAMS Accession No. ML21306A342).

The NRC staff's final safety evaluation (SE) for KP-TR-007-NP, "Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor," Revision 3, is enclosed. The NRC staff provided Kairos a draft of the SE for the purpose of identifying proprietary information on October 7, 2021 (ADAMS Accession No. ML21278A416). On October 11, 2021 (ADAMS Accession No. ML21306A123), Kairos confirmed that the SE does not include proprietary information.

The NRC staff requests that Kairos publish an accepted version of this TR within 3 months of receipt of this letter. The accepted version shall incorporate this letter and the enclosed SE

after the title page. The accepted version shall include an "-A" (designating accepted) following the TR identification symbol.

If you have any questions, please contact Samuel Cuadrado at samuel.cuadradojesus@nrc.gov.

Sincerely,



Signed by Kennedy, William
on 11/12/21

William Kennedy, Acting Chief
Advanced Reactor Licensing Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Project No. 99902069

Enclosure:
SE

SUBJECT: KAIROS POWER, LLC - SAFETY EVALUATION FOR KAIROS POWER LLC
TOPICAL REPORT KP-TR-007-NP, "QUALITY ASSURANCE PROGRAM FOR
THE KAIROS POWER FLUORIDE SALT-COOLED HIGH TEMPERATURE
REACTOR," REVISION 3 (EPID NO: L-2020-TOP-0030/CAC NO. 000431)
DATED: NOVEMBER 12, 2021

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**UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001**

SAFETY EVALUATION BY

THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING KAIROS POWER LLC TOPICAL REPORT

KP-TR-007-NP, "QUALITY ASSURANCE PROGRAM FOR THE KAIROS POWER FLUORIDE

SALT-COOLED HIGH TEMPERATURE REACTOR," REVISION 3

FOR A STANDARD DESIGN APPROVAL, A DESIGN CERTIFICATION,

AN EARLY SITE PERMIT, A LIMITED WORK AUTHORIZATION, A CONSTRUCTION PERMIT

AN OPERATING LICENSE, AND/OR A COMBINED LICENSE FOR THE KAIROS POWER

FLUORIDE SALT-COOLED HIGH TEMPERATURE REACTOR

EPID NO. L-2020-TOP-0030

1.0 INTRODUCTION

By letter dated May 15, 2020 (Reference 1), Kairos Power LLC (Kairos) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review KP-TR-007-NP Topical Report (TR) "Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor." This TR addresses power-reactor quality assurance requirements to support license applications for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor (KP-FHR). The Kairos Quality Assurance Program description (QAPD) was submitted in accordance with the guidance of NUREG-0800, "Standard Review Plan [SRP] for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Section 17.5, "Quality Assurance Program Description - Design Certification, Early Site Permit and New License Applicant," Revision 1, dated August 2015 (Reference 2). As part of its review the NRC staff sent 3 sets of preliminary clarification questions to Kairos on September 18, 2020, October 29, 2020, and January 15, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML20273A292, ML20311A231, and ML21025A053, respectively). By letter dated March 8, 2021 (Reference 3), Kairos provided Revision 1 of TR KP-TR-007-NP (Reference 4), which contains changes as a result of the NRC staff's preliminary clarification questions, which were discussed in public meetings held on October 7, 2020; November 19, 2020; and February 5, 2021 (ADAMS Accession Nos. ML21130A627, ML21073A003, and ML21292A273 respectively). In response to clarifications requested by the NRC staff during teleconferences held with Kairos on April 6, 2021 and April 21, 2021, Kairos submitted Revision 2 (Reference 5) and Revision 3 (Reference 6) of KP-TR-007-NP by letters dated April 15, 2021 (Reference 7), and April 26, 2021, respectively (Reference 8). An additional clarification question was sent to

Enclosure

Kairos on July 7, 2021 (ADAMS Accession No. ML21189A308) and discussed in a public meeting held on July 14, 2021 (ADAMS Accession No. ML21306A342).

Kairos' QAPD TR, KP-TR-007-NP, addresses design, construction, and operations phase activities, including those in support of a Standard Design Approval (SDA), a Design Certification (DC), an Early Site Permit (ESP), a Limited Work Authorization (LWA), a Construction Permit (CP), an Operating License (OL), and/or a Combined License (COL) for the KP-FHR. The QAPD is based on the applicable portions of both 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," and the American Society of Mechanical Engineers (ASME) NQA 1-2015, "Quality Assurance Program Requirements for Nuclear Facility Applications," (Reference 9), as endorsed by NRC Regulatory Guide (RG) 1.28, "Quality Assurance Program Criteria (Design and Construction)," Revision 5 (Reference 10).

2.0 REGULATORY EVALUATION

Appendix B to 10 CFR Part 50 sets forth regulatory requirements related to quality assurance programs (QAPs). Appendix B to 10 CFR Part 50 establishes quality assurance (QA) requirements for the design, fabrication, construction, and testing of structures, systems, and components (SSCs) for the facility and for managerial and administrative controls to be used to assure safe operation. The pertinent requirements of Appendix B to 10 CFR Part 50 apply to all activities affecting the safety-related functions of those SSCs and include designing, purchasing, fabricating, handling, shipping, storing, cleaning, erecting, installing, inspecting, testing, operating, maintaining, repairing, refueling, and modifying SSCs.

Regulations in 10 CFR 50.10, "License required; limited work authorization," establish the technical information requirements for LWA applications. Regulations in 10 CFR 50.10(d)(3)(i) require that LWA applications contain a description of the activities requested to be performed; a safety analysis report (SAR) as required by 10 CFR 50.34, "Contents of applications; technical information," 10 CFR 52.17, "Contents of applications; technical information," or 10 CFR 52.79, "Contents of applications; technical information in final safety analysis report," as applicable; and the design and construction information otherwise required by the Commission's rules and regulations, but limited to those portions of the facility that are within the scope of the LWA.

Regulations in 10 CFR 50.34 establish the technical requirements for CP and OL applications. Regulations in 10 CFR 50.34(a)(7) require that CP applications provide a description of the QAP to be applied to the design, fabrication, construction, and testing of the SSCs of the facility. Further, 10 CFR 50.34(a)(7) requires that the description of the QAP include a discussion of how the applicable requirements of Appendix B to 10 CFR Part 50 will be satisfied. Finally, 10 CFR 50.34(b)(6)(ii) requires that the OL application contain information on the managerial and administrative controls to be used to assure safe operation consistent with the requirements of Appendix B to 10 CFR Part 50 and a discussion of how such requirements will be satisfied.

Regulations in 10 CFR 50.34(f)(3)(ii) and (iii) specify additional design and construction QA requirements for DC, SDA, and COL applications related to the list of SSCs subject to QA requirements, independence of the QA organization, QA and quality control (QC) implementation at construction sites, establishing criteria for QA programmatic requirements, the role of QA personnel in quality-related procedures and in design and analysis activities, qualification of QA and QC personnel and sizing of QA staff, and procedures for maintaining "as-built" documentation.

Regulations in 10 CFR 52.17 establish the technical information requirements for ESP applications. Section 52.17(a)(1)(xi) requires that ESP applications provide a description of the QAP applied to site-related activities for the future design, fabrication, construction, and testing of the SSCs of a facility or facilities that may be constructed on the site, including a discussion of how the applicable requirements of Appendix B to 10 CFR Part 50 will be satisfied

Regulations in 10 CFR 52.47, "Contents of applications; technical information," establish the technical information requirements for DC applications. Section 10 CFR 52.47(a)(19) requires that DC applications provide a description of the QAP applied to the design of the SSCs of the facility. Further, 10 CFR 52.47(a)(19) requires that the description of the QAP include a discussion of how the applicable requirements of Appendix B to 10 CFR Part 50 have been satisfied.

Regulations in 10 CFR 52.79 establish the technical information requirements for COL applications. Section 52.79(a)(25) requires that COL applications provide a description of the QAP applied to the design, and to be applied to the fabrication, construction, and testing of the SSCs of the facility. Further, 10 CFR 52.79(a)(25) requires that the description of the QAP include a discussion of how the applicable requirements of Appendix B to 10 CFR Part 50 have been and will be satisfied, and also include a discussion of how the QAP will be implemented. Finally, 10 CFR 52.79(a)(27) requires that the application contain information on the managerial and administrative controls to be used to assure safe operation consistent with the requirements of Appendix B to 10 CFR Part 50 and a discussion of how such requirements will be satisfied.

Regulations in 10 CFR 52.137, "Contents of applications; technical information," establish the technical information requirements for SDA applications. Regulations in 10 CFR 52.137(a)(19) require that SDA applications provide a description of the QAP applied to the design of the SSCs of the facility. Further, 10 CFR 52.137(a)(19) requires that the description of the QAP include a discussion of how the applicable requirements of Appendix B to 10 CFR Part 50 have been satisfied.

3.0 EVALUATION

In evaluating the adequacy of Kairos' QAPD, the NRC staff utilized the guidance contained in Section 17.5 of the SRP, which provides guidance to the NRC staff for the review of a QAPD for DC, ESP, COL, CP, and OL applicants. Section 17.5 of the SRP is based on Appendix B to 10 CFR Part 50 and describes regulatory and industry guidance determined to be acceptable methods for meeting the requirements of Appendix B to 10 CFR Part 50. Section 17.5 of the SRP does not specifically address SDAs and LWAs. However, the requirements of Appendix B to 10 CFR Part 50 that would be applied to a COL encompass the quality-related activities for an SDA or an LWA. The ASME standard NQA-1-2015 Edition, upon which Kairos' QAPD is based, is endorsed (with certain exceptions and clarifications) by the NRC in RG 1.28, Revision 5, as providing an adequate basis for complying with 10 CFR Part 50, Appendix B.

3.1 Quality Assurance Program Overview

Topical report KP-TR-007-NP, Revision 3, provides for the control of Kairos' activities affecting the quality and performance of safety-related SSCs and select non-safety-related SSCs to the design, construction, and operations phase activities, including those in support of an SDA, a DC, an ESP, an LWA, a CP, an OL, and/or a COL for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor (KP-FHR).

3.1.1 Organization

Kairos' QAPD follows the guidance of SRP Section 17.5, Subsection II.A for providing an organizational description that includes an organizational structure, functional responsibilities, levels of authority, and interfaces for establishing, executing, and verifying the implementation of Kairos' QAP. For the organizations performing quality assurance functions, the Kairos' QAPD establishes organizations with sufficient authority and organizational freedom to identify quality problems; to initiate, recommend, or provide solutions; and to verify implementation of solutions. Kairos' QAPD also provides an organizational structure where persons and organizations performing quality assurance functions report to a higher management level to maintain the required authority and organizational freedom, including sufficient independence from cost and schedule, when opposed to safety, considerations. Kairos' QAPD satisfies 10 CFR 50.34(f)(3)(iii)(F) by providing during design, that Safety Assurance and Quality Management is responsible to size the Quality Assurance staff commensurate with the duties and responsibilities assigned. During construction and operations, this responsibility transitions to the Site Executive. In addition, responsibility and authority for planning, establishing, and implementing an effective overall QAP are clearly described and defined, including identifying the position responsible for directing and managing Kairos' QAP during the design, construction, and operational phases. Kairos' QAPD provides the authority and responsibility to stop work in progress not being done in accordance with approved procedures or where safety of personnel or SSC integrity may be jeopardized.

Kairos' QAPD satisfies 10 CFR 50.34(f)(3)(iii)(A) by providing that independence be maintained between the organization(s) performing the checking (quality assurance and control) functions and the organizations performing the functions.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 1, "Organization," without further clarifications or exceptions. The NRC staff determined that Kairos' organization controls as described above comply with the requirements of Criterion I, "Organization," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.2 Quality Assurance Program

Kairos' QAPD follows the guidance of SRP Section 17.5, Subsection II.B for establishing the necessary measures to implement a QAP to ensure that the design, construction, and operation of the KP-FHR is in accordance with governing regulations. The QAP applies to those quality-related activities that involve the functions of SSCs associated with the design, construction, and operational phases (including SDA, DC, ESP, LWA, CP, OL, and/or COL activities) of the KP-FHR. The QAP also applies to the fuel characterization, and to the managerial and administrative controls to be used to ensure that the KP-FHR complies with the applicable regulatory requirements. Examples of ESP, CP/OL, or COL program safety-related activities include, but are not limited to, site-specific engineering related to safety-related SSCs, site geotechnical investigations, site engineering analysis, seismic analysis, and meteorological analysis.

A list or system used to identify which SSCs and activities to which the Kairos' QAPD applies is maintained. Kairos may delegate all or part of the activities for which it is responsible to others; however, Kairos retains overall responsibility for QAP program effectiveness. Kairos' QAPD provides measures to assess the adequacy of the QAP to ensure its effective implementation at least once each year or at least once during the life of the activity, whichever is shorter. In addition, Kairos' QAPD applies a grace period of 90 days to activities that must be performed on

a periodic basis. The grace period does not allow the "clock" for a particular activity to be reset forward and therefore the next assessment would need to be performed within a year of the original due date. However, the "clock" for an activity is reset backwards by performing the activity early, meaning that the next assessment would be due within a year of the date of the last completed assessment.

Kairos' QAPD follows the guidance of SRP Section 17.5, paragraphs II.S and II.T, and satisfies 10 CFR 50.34(f)(3)(iii)(E) by providing the necessary measures to establish and maintain formal indoctrination and training programs for personnel performing, verifying, or maintaining activities within the scope of the QAP to ensure that suitable proficiency is achieved and maintained. Kairos' QAPD provides the minimum training requirements for all personnel responsible for implementation of Kairos' QAP.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 2, "Quality Assurance Program," with the following three clarifications and exceptions.

1. For Section 302, "Inspection and Test," Kairos commits to the use of NQA-1-2015, Subpart 3.1-2.3 guidance.

The NRC staff evaluated this proposed clarification and determined that the guidance in Subpart 3.1-2.3 can be used to meet the requirements of Appendix B to 10 CFR Part 50 and is equivalent to the guidance in SRP Section 17.5, paragraph II.T.5. Therefore, the NRC staff finds the use of Subpart 3.1-2.3 of NQA-1-2015 for qualification of inspection and test personnel acceptable.

2. Kairos follows Section 301, "Nondestructive Examination (NDE)," for qualification of nondestructive examination personnel, except that Kairos will follow the applicable standard cited in the version(s) of Section III and Section XI of the ASME Boiler and Pressure Vessel (B&PV) Code approved by the NRC for use at Kairos' sites for the scope of activities governed by these cited standards.

The regulations in 10 CFR 50.55a, "Codes and Standards," endorses versions of ASME B&PV Code Sections III and XI for activities within the scope of these sections. Therefore, the NRC staff finds the alternative proposed for the use of Sections III and XI of the ASME B&PV Code for qualification of nondestructive examination personnel to be acceptable.

3. Section 401, "Inspection and Test Personnel," item (g), on records of qualification, provides that the date of certification expiration be included on the qualification record. Kairos considers the certification expiration date to be the date from the certification or recertification date plus the certification interval time and its inclusion on the qualification record is optional.

The NRC staff evaluated this exception and determined that the date of certification establishes the expiration date, when combined with the certification interval. The certification interval is normally a function of a code or standard and is identified in the organization's procedure; therefore, because having both dates on the form is redundant, the NRC staff determined the exception to be acceptable.

The NRC staff determined that Kairos' QAP controls, as described above, comply with the requirements of Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.3 Design Control

Kairos' QAPD follows the guidance of SRP Section 17.5, Subsection II.C, for establishing the necessary measures to control the design, design changes, and temporary modifications of items that are subject to the provisions of the QAP. The Kairos design process includes provisions to control design inputs, outputs, changes, interfaces, records, and organizational interfaces within Kairos and with its suppliers. These provisions ensure that design inputs (e.g., design bases and the performance, regulatory, quality, and quality verification requirements) are correctly translated into design outputs (such as analyses, specifications, drawings, procedures, and instructions). In addition, Kairos' QAPD satisfies 10 CFR 50.34(f)(3)(iii)(H) by providing for design documents to be reviewed by individuals knowledgeable in QA to ensure that the documents contain the necessary QA requirements.

Kairos' QAPD provides for design verification to ensure that items, computer programs, and activities subject to the provisions of the QAP are suitable for their intended application, consistent with their effect on safety. Design changes are subjected to these controls, which include verification measures commensurate with those applied to original plant design. Design verifications are performed by competent individuals or groups other than those who performed the original design, but who may be from the same organization. The extent of the design verification required is a function of the importance to safety of the item or computer program under consideration, the complexity of the design, the degree of standardization, the state-of-the-art, and the similarity with previously proven designs. Verification methods may include, but are not limited to, design reviews, alternative calculations, and qualification testing.

The Kairos QAP governs the development, procurement, testing, maintenance, control, and use of computer applications and digital equipment software when used in safety-related applications and designated non-safety-related applications. Pre-verified computer programs are controlled using a software configuration management process. Kairos and its suppliers are responsible for developing, approving, and issuing procedures, as necessary, to control the use of such computer application and digital equipment software. Procedures require that the application software be assigned a proper quality classification and that the associated quality requirements be consistent with this classification.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 3, "Design Control," Subpart 2.7, "Quality Assurance Requirements for Computer Software for Nuclear Facility Applications," Subpart 2.14, "Quality Assurance Requirements for Commercial-Grade Items and Services," and Subpart 2.20, "Quality Assurance Requirements for Subsurface Investigations for Nuclear Facilities," without further clarifications or exceptions. The NRC staff determined that Kairos' design controls as described above comply with the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.4 Procurement Document Control

Kairos' QAPD follows the guidance of SRP Section 17.5, Subsection II.D, for establishing the necessary administrative controls and processes to ensure that applicable regulatory, technical, and QAP requirements are included or referenced in procurement documents. The applicable technical, regulatory, administrative, quality, and reporting requirements (e.g., specifications,

codes, standards, tests, inspections, special processes, and 10 CFR Part 21, "Reporting of Defects and Noncompliance") are invoked for the procurement of items and services. In addition, Kairos QAPD states that procurement documents require suppliers to have a documented QAP that meets the applicable requirements of Appendix B to 10 CFR Part 50, as necessary based on the procurement scope or, alternatively, allows the supplier to work under Kairos' approved QAP.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 4, "Procurement Document Control," with the following three clarifications and exceptions:

1. Section 100, "General," of Requirement 4 requires that suppliers have a QAP consistent with applicable requirements. For services performed by a supplier, Kairos' procurement documents may allow the supplier to work under Kairos' QAP, including implementing procedures, in lieu of the supplier having its own QAP.

The NRC staff evaluated this proposed exception and determined that it provides adequate control for establishing and executing the responsibilities for the QAP. In addition, Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50, requires suppliers to have a QAP consistent with the regulations. Therefore, the NRC staff determined that the exception is acceptable.

2. Sections 300, "Procurement Document Review," and 400, "Procurement Document Changes," of Requirement 4, require the review of technical and QAP requirements of procurement documents prior to award of a contract and for procurement document changes. Kairos may satisfy this requirement through the review of the procurement specification when the specification contains the technical and QA requirements of the procurement.

The NRC staff evaluated this proposed clarification and determined that it provides adequate QA review of procurement documents before awarding the contract and after any change to the contract. Therefore, the NRC staff determined that the clarification is acceptable.

3. Sections 202, "Technical Requirements," and 203, "Quality Assurance Program Requirements," of Requirement 4, require that the technical and quality requirements be specified in the procurement documents. As a clarification, procurement documents for commercial-grade items that will be procured by Kairos for use as safety-related items shall contain technical and quality requirements such that the procured item can be appropriately dedicated in accordance with Kairos' QAP, Part II, Section 7, "Control of Purchased Material, Equipment, and Services."

The NRC staff evaluated this proposed clarification and determined that is consistent with NRC staff guidance provided in Generic Letter (GL) 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marked Products," dated March 21, 1989 (ADAMS Accession No. ML031140060), and GL 91-05, "Licensee Commercial-Grade Procurement and Dedication Programs," dated April 9, 1991 (ADAMS Accession No. ML031140508), as delineated in SRP Section 17.5, paragraphs II.V.1.d and II.V.1.e.

The NRC staff determined that Kairos' procurement document controls as described above comply with the requirements of Criterion IV of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.5 Instructions, Procedures, and Drawings

Kairos' QAPD follows the guidance of SRP Section 17.5, Subsection II.E, for establishing the necessary measures and governing procedures to ensure that activities affecting quality are prescribed by and performed in accordance with instructions, procedures, or drawings of a type appropriate to the circumstances and which, where applicable, include quantitative or qualitative acceptance criteria to implement the QAP as described in Kairos' QAP TR.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 5, "Instructions, Procedures, and Drawings," without further clarifications or exceptions. The NRC staff determined that Kairos controls for instructions, procedures, and drawings, as described above, comply with the requirements of Criterion V, "Instructions, Procedures, and Drawings," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.6 Document Control

Kairos' QAPD follows the guidance of SRP Section 17.5, Subsection II.F, for establishing the necessary measures and governing procedures to control the preparation, issuance, and revision of documents that specify quality requirements or prescribe how activities affecting quality, including organizational interfaces, are controlled. Kairos' QAPD satisfies 10 CFR 50.34(f)(3)(iii)(G) by providing that the types of documents to be controlled include as-built drawings. Kairos' QAPD provides measures to ensure that documents, including revisions or changes (other than those defined in implementing procedures as minor changes), are reviewed and approved by the same organization that performed the original review and approval unless other organizations are specifically designated. Kairos maintains a list of all controlled documents, identifying the current approved revision or date, so personnel can determine the appropriate document for use. Kairos' QAPD satisfies 10 CFR 50.34(f)(3)(iii)(C) by providing that during the ESP or construction phase, procedures for design, construction, and installation are also reviewed by the organization responsible for quality verification to ensure quality assurance measures have been appropriately applied.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 6, "Document Control," without further clarifications or exceptions. The NRC staff determined that Kairos' document controls as described above comply with the requirements of Criterion VI, "Document Control," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.7 Control of Purchased Material, Equipment, and Services

Kairos' QAPD follows the guidance of SRP Section 17.5, Subsection II.G, for establishing the necessary measures and governing procedures to control the procurement of items and services to ensure conformance with specified requirements. These measures provide for the evaluation of prospective suppliers and selection of qualified suppliers only, evaluation of objective evidence of on-going acceptable quality furnished by the supplier, source verification and inspection, audit, and examination of items or services.

Kairos' QAPD establishes and implements measures to assess the quality of purchased items and services, whether purchased directly or through contractors, at intervals and to a depth consistent with the items or service's importance to safety, complexity, quantity, and the frequency of procurement. In addition, Kairos' QAPD provides for auditing and evaluating suppliers to ensure that qualified suppliers continue to provide acceptable products and services.

Kairos' QAPD provides for using source verification, receipt inspection, pre- and post-installation tests, certificates of conformance, and review of documentation (e.g., Certified Material Test Reports/Certificates) for accepting purchased items and services. In addition, controls are implemented for the selection, determination of suitability for intended use (critical characteristics), evaluation, receipt, and acceptance of commercial-grade services or items to ensure they will perform satisfactorily in-service in safety-related applications.

Kairos' QAPD commits to implement the quality standards described in NQA-1-2015, Requirement 7, "Control of Purchased Items and Services," Subpart 2.14, "Quality Assurance Requirements for Commercial Grade Items and Services," and the regulatory positions described in RG 1.28, Revision 5, with the following two clarifications and exceptions:

1. Section 200, "Supplier Evaluation and Selection," of Requirement 7 requires the purchaser to evaluate the supplier's capability to provide items or services in accordance with the requirements of the procurement documents. Kairos considers that 10 CFR Part 50 and 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," licensees, Authorized Nuclear Inspection (ANI) agencies, National Institute of Standards and Technology (NIST), or other State and Federal agencies, which may provide items or services to Kairos' plants, are not required to be evaluated or audited.

The NRC staff acknowledges that 10 CFR Part 50 and 10 CFR Part 52 licensees, ANI agencies, NIST, or other State and Federal agencies work under their own quality programs, and no additional audit or evaluation is required by Kairos. The NRC staff determined that this approach is acceptable for applicants, as these are organizations known to the NRC to have QAPs with the necessary quality and programmatic controls and have proven abilities and disciplines. However, Kairos is still responsible for ensuring that the items and services procured conform to the applicable criteria in Appendix B to 10 CFR Part 50, ASME B&PV Code requirements, and other regulatory requirements and commitments. Kairos is also responsible for ensuring that procured items or services are suitable for the intended application, as well as for documenting the associated evaluation.

The NRC staff evaluated this proposed exception and determined that it provides an appropriate level of quality and safety. Therefore, the NRC staff concluded that this alternative is acceptable.

2. As a clarification to Section 700, "Commercial Grade Items and Services," of Requirement 7, Kairos will implement the guidance from Nuclear Energy Institute (NEI) 14-05A, "Guidelines for the Use of Accreditation in Lieu of Commercial Grade Surveys for Procurement of Laboratory Calibration and Test Services," Revision 1 (Reference 11), for using the International Laboratory Accreditation (ILAC) accreditation process in lieu of performing commercial-grade surveys as part of the commercial-grade dedication process. In an SE dated November 23, 2020 (Reference 12), the NRC staff concluded that NEI 14-05A, Revision 1, provides an acceptable approach for licensees and suppliers of basic components for using the ILAC accreditation process in lieu of performing commercial-grade surveys as part of the commercial-grade dedication process.

The NRC staff evaluated this proposed clarification and determined that it is consistent with the NRC's current regulatory position regarding the acceptability of procuring commercial-grade calibration and testing services from laboratories accredited by ILAC. Therefore, the NRC staff concluded that this alternative is acceptable.

The NRC staff determined that Kairos' controls for purchased material, equipment, and services as described above comply with the requirements of Criterion VII, of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.8 Identification and Control of Materials, Parts, and Components

Kairos' QAPD conforms to SRP Section 17.5, Subsection II.H, for establishing the necessary measures and governing procedures to identify and control items to prevent the use of incorrect or defective items. This includes controls for consumable materials and items with limited shelf life. The identification of items is maintained throughout fabrication, erection, installation, and use so that the item can be traced to its documentation, consistent with the item's effect on safety. Identification locations and methods are selected so as not to affect the function or quality of the item.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 8, "Identification and Control of Items," without further clarifications or exceptions. The NRC staff determined that Kairos' identification and controls for materials, parts, and components as described above comply with the requirements of Criterion VIII, "Identification and Control of Materials, Parts, and Components," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.9 Control of Special Processes

Kairos' QAPD conforms to SRP Section 17.5, Subsection II.I, for establishing the necessary measures and governing procedures to ensure that special processes such as welding, heat treating, and non-destructive examination are controlled. Special processes are accomplished by qualified personnel using qualified procedures and equipment, and in accordance with applicable codes, standards, specifications, criteria, or other special requirements. Special processes are those where the results are highly dependent on the control of the process or the skill of the operator, or both, and for which the specified quality cannot be fully and readily determined by inspection or test of the final product.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 9, "Control of Special Processes," without further clarifications or exceptions. The NRC staff determined that Kairos' control of special processes as described above comply with the requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.10 Inspection

Kairos' QAPD conforms to SRP Section 17.5, Subsection II.J, for establishing the necessary measures and governing procedures to implement inspections that ensure items, services, and activities affecting safety meet established requirements and conform to applicable documented specifications, instructions, procedures, and design documents. Types of inspections may include those verifications related to procurement, such as source, in-process, final, and receipt inspection, as well as construction, installation, maintenance, modification, in-service, and operations activities.

These types of inspections will be performed by properly qualified personnel independent of those who performed or directly supervised the work, and the inspection results will be documented.

Kairos' inspection program establishes measures for planning the inspections, such as measures for: (1) the party responsible for performing the inspection; (2) the application of hold points which require witnessing or inspecting; (3) the acceptance criteria for inspection; (4) the frequency of inspections; and (5) the identification of special tools required to perform the inspection. Inspection plans are based on: (1) the importance of the item to safety; (2) the complexity of the item; (3) the technical requirements to be met; and (4) the design specifications. Inspection information and results, such as rejection, acceptance criteria, re-inspection results, and the person(s) performing the inspection are documented. The documentation of this information is the responsibility of the inspector, reviewed by authorized personnel qualified to evaluate the technical adequacy of the inspection results, and controlled by instructions, procedures, and drawings.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 10, "Inspection," and Subparts 2.5, "Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete, Structural Steel, Soils, and Foundations for Nuclear Facilities," and 2.8, "Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Items for Nuclear Facilities," without further clarifications or exceptions. The NRC staff determined that Kairos' inspection controls as described above comply with the requirements of Criterion X, "Inspection," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.11 Test Control

Kairos' QAPD conforms to SRP Section 17.5, Subsection II.K, for establishing the necessary measures and governing procedures to demonstrate that items subject to the provisions of the QAPD will perform satisfactorily in-service, that the plant can be operated safely as designed, and that the operation of the plant, as a whole, is satisfactory. Test programs include criteria for determining when testing is required, such as proof tests before installation, pre-operational tests, post-maintenance tests, post-modification tests, in-service tests, and operational tests to demonstrate that performance of plant systems is in accordance with design. Test programs also include provisions to establish and adjust test schedules, and to maintain status for periodic or recurring tests. Tests are performed according to applicable procedures that include, consistent with the effect on safety: (1) instructions and prerequisites to perform the tests; (2) use of proper test equipment; (3) acceptance criteria; and (4) mandatory verification points as necessary to confirm satisfactory test completion. Test results are documented and evaluated by the organization performing the test and reviewed by a responsible authority to ensure that the test requirements have been satisfied. If acceptance criteria are not met, re-testing is performed as needed to confirm acceptability following correction of the system or equipment deficiencies that caused the failure.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 11, "Test Control," and Subpart 2.7, "Quality Assurance Requirements for Computer Software for Nuclear Facility Applications," without further clarifications or exceptions. The NRC staff determined that Kairos' testing controls as described above comply with the requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.12 Control of Measuring and Test Equipment

Kairos' QAPD conforms to SRP Section 17.5, Subsection II.L, for establishing the necessary measures and governing procedures to control the calibration, maintenance, and use of measuring and test equipment (M&TE) that provides data to verify acceptance criteria are met for information important to safe plant operation.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 12, "Control of Measuring and Test Equipment," without further clarifications or exceptions. The NRC staff determined that Kairos' controls for M&TE, as described above, comply with the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.13 Handling, Storage, and Shipping

Kairos' QAPD conforms to SRP Section 17.5, Subsection II.M, for establishing the necessary measures and governing procedures to control the handling, storage, packaging, shipping, cleaning, and preservation of test and irradiated items to prevent inadvertent damage or loss, and to minimize deterioration. Items are appropriately marked and labeled during packaging, shipping, handling, and storage to identify, maintain, and preserve the item's integrity and provide indication of the needs for special controls. Any special controls (e.g., shock absorbers, inert gas atmospheres, specific moisture content levels, and temperature levels) are provided when required. In addition, any special or additional handling, storage, shipping, cleaning, and preservation requirements are identified in the procurement documents. Special handling tools and equipment are controlled to ensure safe and adequate handling. These special tools and handling equipment are inspected and tested in accordance with procedures at specified time intervals or prior to use. Kairos' QAPD establishes housekeeping practices to account for conditions or environments that could affect the quality of SSCs within the plant.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 13, "Handling, Storage, and Shipping," without further clarifications or exceptions. Kairos' QAPD also commits, during the construction and operational phases of the plant, to conformance with NQA-1-2015, Subpart 2.1, "Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components for Nuclear Facilities," Subpart 2.2, "Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Facilities," Subpart 2.3, "Quality Assurance Requirements for Housekeeping at Nuclear Facilities," and Subpart 3.2-2.1, "Implementing Guidance for Part II, Requirement 2.1: Cleaning of Fluid Systems," with the following four alternatives and exceptions:

1. Subpart 2.1, Section 301, "Cleanness Classification," and 302, "Cleanness Class Criteria," establish criteria for classifying items into cleanness classes and requirements for each class. Instead of using the cleanness level system of Subpart 2.1, Kairos may establish cleanness requirements on a case-by-case basis, consistent with the other provisions of Subpart 2.1. Kairos establishes appropriate cleanliness controls for work on safety-related equipment to minimize introduction of foreign material and maintain system/component cleanliness throughout maintenance or modification activities, including documented verification of absence of foreign material prior to system closure.

The NRC staff determined that this proposed alternative is acceptable, on the basis that this alternative is consistent with the NRC staff guidance provided in SRP Section 17.5 and was approved previously in the NRC staff's SE for the Nuclear Management Company (NMC) QA TR dated March 24, 2005 (ADAMS Accession No. ML050700416).

2. Subpart 2.2, Section 201, "Classification of Items," establishes criteria for classifying items into protection levels. Instead of classifying items into protection levels during the operational phase, Kairos may establish controls for the packaging, shipping, handling, and storage of such items on a case-by-case basis with due regard for the item's complexity, use, and sensitivity to damage. Prior to installation or use, the items are inspected and

served as necessary to ensure that no damage or deterioration exists which could affect their function.

The NRC staff determined that this proposed alternative is acceptable, on the basis that this alternative is consistent with the NRC staff guidance provided in SRP Section 17.5 and was approved previously in the NRC staff's SE for the NMC QA TR dated March 24, 2005.

3. Subpart 2.2, Section 606, "Storage Records," requires written records be prepared containing information on personnel access. As an exception to this requirement, Kairos' documents establish controls for storage areas that describe those authorized to access areas and the requirements for recording access of personnel. However, these records of access are not considered quality records and will be retained in accordance with the administrative controls of the applicable plant.

The NRC staff determined that this proposed exception is acceptable, on the basis that these records do not meet the classification of a quality record as defined in NQA-1-2015, Requirement 17.

4. Subpart 2.3, Section 202, "Classification of Cleanness," requires the establishment of five zone designations for housekeeping cleanliness controls. Instead of the five-level zone designation, Kairos bases its control over housekeeping activities on a consideration of what is necessary and appropriate for the activity involved. The controls are implemented through procedures or instructions which, in the case of maintenance or modification work, are developed on a case-by-case basis. Factors considered in developing the procedures and instructions include cleanliness control, personnel safety, fire prevention and protection, radiation control, and security. The procedures and instructions make use of standard janitorial and work practices to the extent possible.

The NRC staff determined that this proposed alternative is acceptable, on the basis that this alternative is consistent with the NRC staff guidance provided in SRP Section 17.5 and was approved previously in the NRC staff's SE for the NMC QA TR dated March 24, 2005.

The NRC staff determined that Kairos' controls for handling, storage, and shipping as described above comply with the requirements of Criterion XIII, "Handling, Storage, and Shipping," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.14 Inspection, Test, and Operating Status

Kairos' QAPD conforms to SRP Section 17.5, Subsection II.N, for establishing the necessary measures and governing procedures to identify the inspection, test, and operating status of items and components subject to the provisions of the QAPD in order to maintain personnel and reactor safety and avoid inadvertent operation of equipment. Measures are provided for the verification of inspections, tests, and operating status to preclude bypassing of inspections or tests, or to preclude inadvertent operation. These measures require the inspection, test, or operating status be verified before release, fabrication, receipt, installation, test, or use. Temporary design modifications are controlled by procedures which incorporate the applicable requirements.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 14, "Inspection, Test, and Operating Status," without further clarifications or exceptions. The NRC staff determined that Kairos' inspection, test, and operating status controls as described above

comply with the requirements of Criterion XIV, "Inspection, Test, and Operating Status," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.15 Nonconforming Materials, Parts, or Components

Kairos' QAPD conforms to SRP Section 17.5, Subsection II.O, for establishing the necessary measures and governing procedures to control items, including services that do not conform to specified requirements, to prevent inadvertent installation or use. Controls provide for the identification, documentation, evaluation, segregation (when practical), and disposition of non-conforming items, and notification to affected organizations. Controls are also provided to address conditional release of non-conforming items for use with appropriate controls prior to resolution and disposition of the non-conformance, including maintaining identification of the item and documenting the basis for such release.

Non-conforming items are evaluated for impact on the operability of quality SSCs to ensure that the final condition does not adversely affect safety, operation, or maintenance of the item or service. Non-conforming items which are dispositioned "repair" or "use-as-is" are subject to design control measures commensurate with those applied to the original design. Non-conformance dispositions are reviewed for adequacy, analysis of quality trends, and reported to designated management.

Significant trends are reported to management in accordance with Kairos' procedures, regulatory requirements, and industry standards.

Kairos' QAPD provides for establishing the appropriate interfaces between the QAP for identification and control of nonconforming materials, parts, or components, and the non-QA reporting program in order to satisfy the requirements of 10 CFR Part 52, 10 CFR 50.55, "Conditions of construction permits, early site permits, combined licenses, and manufacturing licenses," and 10 CFR Part 21 during the design, construction, and operational phases.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 15, "Control of Nonconforming Items," without further clarifications or exceptions. The NRC staff determined that Kairos' controls for nonconforming materials, parts, or components as described above comply with the requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.16 Corrective Action

Kairos' QAPD conforms to SRP Section 17.5, Subsection II.P, for establishing the necessary measures and governing procedures to promptly identify, control, document, classify, and correct conditions adverse to quality. Kairos' QAPD provides for procedures to ensure that corrective actions are documented and initiated following the determination of conditions adverse to quality in accordance with regulatory requirements and applicable quality standards.

Reports of conditions adverse to quality are analyzed to identify trends. Significant conditions adverse to quality and significant adverse trends are documented and reported to responsible management. In the case of a significant condition adverse to quality, the cause is determined and actions to preclude recurrence are taken. In the case of suppliers working on safety-related activities, or other similar situations, Kairos may delegate specific responsibilities for corrective actions, but maintains responsibility for the effectiveness of corrective action measures.

Kairos' QAPD provides for establishing the appropriate interfaces between the QAP for corrective actions and the non-QA Reporting program in order to satisfy the requirements of 10 CFR Part 52, 10 CFR 50.55, and 10 CFR Part 21 during the design, construction, and operational phases.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 16, "Corrective Action," without further clarifications or exceptions.

The NRC staff determined that Kairos' corrective action controls as described above comply with the requirements of Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.17 Quality Assurance Records

Kairos' QAPD conforms to SRP Section 17.5, Subsection II.Q, for establishing the necessary measures to ensure that enough records of items and activities affecting quality are developed, reviewed, approved, issued, used, and revised to reflect completed work. The provisions of such procedures establish the scope of the records retention program for Kairos and include requirements for records administration including receipt, preservation, retention, storage, safekeeping, retrieval, access controls, user privileges, and final disposition.

Kairos' QAPD establishes measures to ensure that sufficient records of completed items and activities affecting quality are appropriately stored. The records and retention times are based on Regulatory Positions C.3.a.(1) and C.3.a.(2) of RG 1.28, Revision 5. In all cases where state, local, or other agencies have more restrictive requirements for record retention, Kairos' QAPD provides that those more restrictive requirements will be met.

When using optical disks for electronic records storage and retrieval systems, Kairos' QAPD conforms with the NRC guidance provided in NRC's GL 88-18, "Plant Record Storage on Optical Disks," Regulatory Issue Summary (RIS) 2000-18, "Guidance on Managing Quality Assurance Records in Electronic Media," and the associated Nuclear Information and Records Management Association, Inc. (NIRMA) Technical Guidelines (TG), including TG 11-2011, "Authentication of Records and Media," TG 15-2011, "Management of Electronic Records," TG 16-2011, "Software Configuration Management and Quality Assurance," and TG 21-2011, "Electronic Records Protection and Restoration."

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 17, "Quality Assurance Records," and the regulatory positions described in RG 1.28, Revision 5, without further clarifications or exceptions. The NRC staff determined that Kairos' controls for QA records as described above comply with the requirements of Criterion XVII, "Quality Assurance Records," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.1.18 Audits

Kairos' QAPD conforms to SRP Section 17.5, Subsection II.R, for establishing the necessary measures to implement audits to verify that activities covered by the QAPD are performed in conformance with the established requirements and performance criteria are met. The audit program is also reviewed for effectiveness as part of the overall audit process. Audits of suppliers of safety-related components and/or services are conducted as described in Section 3.1.7 of this SE.

Kairos' QAPD provides for conducting periodic audits to determine the adequacy of programs and procedures, and to determine if they are meaningful and comply with the overall QAPD. Audits are performed in such a manner as to ensure that an audit of all applicable QAP elements is completed for each functional area at least once each year or at least once during the life of the activity, whichever is shorter. The scope of the audit is determined by the quality status and safety importance of the activities being performed. Audits are conducted by trained personnel not having direct responsibilities in the area being audited and in accordance with preplanned and approved audit plans or checklists, under the direction of a qualified lead auditor and the cognizance Quality Assurance Manager.

Kairos' QAPD provides for all audit results to be documented and reviewed by responsible management. Management responds to all audit findings and initiates corrective actions where indicated. In addition, where corrective actions are indicated, a documented follow-up of the applicable areas through inspections, review, re-audits, or other appropriate means is conducted to verify the implementation and effectiveness of the assigned corrective actions.

Kairos' QAPD commits to the quality standards described in NQA-1-2015, Requirement 18, "Audits," and the regulatory positions described in RG 1.28, Revision 5, without further clarifications or exceptions. The NRC staff determined that Kairos' QA controls for audits as described above comply with the requirements of Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50, and therefore, are acceptable.

3.2 Non-Safety-Related SSC Quality Control

3.2.1 Non-Safety-Related SSCs With Special Treatment

Kairos' QAPD conforms to SRP Section 17.5, Paragraph II.U.1, for establishing necessary measures and governing procedures to address certain non-safety-related SSCs for which Appendix B to 10 CFR Part 50 is not applicable but are considered significant contributors to plant safety. Kairos' QAPD applies specific controls to those items in a selective manner to target characteristics or critical attributes that render the SSC a significant contributor to plant safety.

3.2.2 Non-Safety-Related SSCs Credited for Regulatory Events

In establishing the quality requirements for non-safety-related SSCs credited for regulatory events, Kairos' QAPD conforms to SRP Section 17.5, Paragraph II.U.2, as applicable to the KP-FHR, and Kairos Power commits to implement the following:

- Regulatory Position 1.7, "Quality Assurance," in RG 1.189, "Fire Protection for Nuclear Power Plants," Revision 3, for the fire protection system
- Part III, Section 1 of Kairos' QAPD, for implementing the quality requirements for the anticipated transient without scram (ATWS) equipment to the extent that any equipment have been identified to be important to safety in case of ATWS.
- Part III, Section 1 of Kairos' QAPD, for implementing the quality requirements for the station blackout (SBO) equipment to the extent that any equipment has been identified to be important to safety in case of SBO.

3.3 Regulatory Commitments

Kairos' QAPD conforms to SRP Section 17.5, paragraph II.V, as applicable to the KP-FHR, for establishing QAP commitments. Kairos commits to conform with the following NRC RGs and other QA standards (or acceptable alternatives) to supplement and support the QAP, as applicable:

- RG 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," Revision 4, dated June 2019. RG 1.8 provides guidance that is acceptable to the NRC staff regarding qualifications and training for nuclear power plant personnel.
- RG 1.28, "Quality Assurance Program Criteria (Design and Construction)," Revision 5, dated October 2017. RG 1.28 describes a method acceptable to the NRC staff for complying with the provisions of Appendix B to 10 CFR Part 50 with regards to establishing and implementing the requisite QAP for the design and construction of nuclear power plants. Kairos will implement Revision 5 to RG 1.28.
- RG 1.29, "Seismic Design Classification," Revision 5, dated July 2016. RG 1.29 defines light water reactor systems required to withstand a safe shutdown earthquake.
- RG 1.33, "Quality Assurance Program Requirements (Operation)," Revision 3, dated June 2013. RG 1.33 describes a method acceptable to the NRC staff for complying with the Commission's regulations with regard to overall QAP requirements for the operation phase of nuclear power plants.
- Commitments consistent with the regulatory positions of RG 1.37, "Quality Assurance Requirements for Cleaning of Fluids Systems and Associated Components of Water-Cooled Nuclear Power Plants," Revision 1 dated March 2007. The regulatory positions of this RG were addressed in NQA-1 Part II, Subpart 2.1 and subsequently accepted by RG 1.28. The staff evaluated the applicability of Subpart 2.1 as described in Section 3.1.13 of this SE.
- Commitments consistent with GL 89-02 and GL 90-05, as described above in Section 3.1.4 of this SE.
- ASME NQA-1-2015, "Quality Assurance Requirements for Nuclear Facility Applications," Part I, "Requirements for Quality Assurance Programs for Nuclear Facilities," and Part II, "Quality Assurance Requirements for Nuclear Facility Applications," as described above in Sections 3.1.1 through 3.1.18 of this SE.
- NEI 14-05A, "Guidelines for the Use of Accreditation in Lieu of Commercial Grade Surveys for Procurement of Laboratory Calibration and Test Services," Revision 1, as described in Section 3.1.7 of this SE.
- NIRMA TGs 11-2011, 15-2011, 16-2011, and 21-2011 as described in Section 3.1.17 of this SE.

Kairos provided for the Classification of SSCs in staff approved KP-FHR, "Risk-Informed Performance-Based Licensing Basis Development Methodology Topical Report," (Revision 1) dated November 23, 2020 (ADAMS Accession No. ML20328A230).

Kairos' QAPD satisfies 10 CFR 50.34(f)(3)(ii) by providing that the QA list required by Criterion II of Appendix B to 10 CFR Part 50 includes all SSCs important to safety.

Kairos' QAPD satisfies 10 CFR 50.34(f)(3)(iii)(D) by establishing criteria for determining QA programmatic requirements. Kairos' QAPD commits to conformance with ASME NQA-1-2015, as endorsed by RG 1.28, Revision 5 (see Section 3.3 above). Kairos' QAPD also commits to conformance with RG 1.33, Revision 3 (see Section 3.3 above) for operations phase specific QA requirements. The NRC staff determined that Kairos' QA controls as described in the QAPD conform to the staff's guidance in SRP Section 17.5 and comply with the requirements of Appendix B to 10 CFR Part 50, and therefore, are acceptable. Kairos' commitment to conformance with NQA-1 also satisfies 10 CFR 50.34(f)(3)(iii)(B) by establishing criteria for performing QA control functions at construction to the maximum extent feasible. Subpart 2.8, "Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Items for Nuclear Facilities," provides amplified requirements, in part, for inspection and testing during the construction phase and into operations. Subpart 2.8 requires material verification, receipt inspection, preinstallation verification, physical installation inspections, installation area inspections, post-installation inspections, inspections of work areas and the work in progress, pressure testing, and ensuring systems are cleaned and maintained once installed. This also includes inspection and testing during the preoperational phase of construction.

4.0 CONCLUSION

Kairos' QAPD delineates the policies, processes, and controls established by Kairos and associated implementing documents relative to U.S. domestic licensing requirements for nuclear power plants. Together, the QAP documents defined in the QAPD provide for control of Kairos' activities that affect the quality of safety-related nuclear plant SSCs and include all planned and systematic activities necessary to provide adequate confidence that such SSCs will perform satisfactorily in-service.

Kairos' QAPD may also be applied to certain equipment and activities that are not safety-related, but support safe plant operations, or where other NRC guidance establishes programmatic controls.

Kairos' QAPD conforms to the format of SRP Section 17.5. The NRC staff used the acceptance criteria of SRP Section 17.5 as the basis for evaluating the compliance of Kairos' QAPD with the provisions of 10 CFR 50.10(d)(3)(i), 10 CFR 50.34(a)(7), 10 CFR 50.34(b)(6)(ii), 10 CFR 50.34(f)(3)(ii) and (iii), 10 CFR 52.17(a)(1)(xi), 10 CFR 52.47(a)(19), 10 CFR 52.79(a)(25), 10 CFR 52.79(a)(27), 10 CFR 52.137(a)(19), and Appendix B to 10 CFR Part 50. On the basis of its review of the Kairos QAPD, the NRC staff concludes that:

- The Kairos QAPD adequately describes the authority and responsibility of management and supervisory personnel, performance and verification personnel, and self-assessment personnel, in relation to activities to which the Kairos QAP is applicable.
- The Kairos QAPD adequately provides for organizations and personnel to perform verification and self-assessment functions related to Kairos' activities that affect the quality of safety-related nuclear plant SSCs, as well as select non-safety-related SSCs, with these organizations and personnel having the authority and independence to conduct activities without undue influence from those directly responsible for costs and schedules.

- The Kairos QAPD adequately applies to activities and items that are important to safety.
- The Kairos QAPD adequately establishes controls that, when properly implemented, comply with the applicable requirements of 10 CFR Part 50, 10 CFR 50.34(f), 10 CFR Part 52, 10 CFR 50.55, Appendix B to 10 CFR Part 50, and 10 CFR Part 21, consistent with the criteria contained in SRP Section 17.5, as well as the relevant regulatory guidance.

Based on the review, as documented above, the NRC staff determined that Kairos' QAPD adequately describes Kairos' QAP. Accordingly, the NRC staff concludes that Kairos' QAP complies with the applicable NRC regulations and conforms with applicable industry standards and can be used by Kairos for activities associated with the design, construction, and operations of the Kairos Power Fluoride Salt-Cooled High Temperature Reactor.

5.0 REFERENCES

1. Letter from Peter Hastings, Vice President Regulatory Affairs and Quality, Kairos Power, to the NRC Document Control Desk, "Kairos Power LLC Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor Topical Report," dated May 15, 2020 (ADAMS Accession No. ML20136A414)
2. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 17.5, "Quality Assurance Program Description – Design Certification, Early Site Permit and New License Applicants," Revision 1, dated August 2015 (ADAMS Accession No. ML15037A441)
3. Letter from Peter Hastings, Vice President Regulatory Affairs and Quality, Kairos Power, to the NRC Document Control Desk, "Kairos Power, LLC - Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor Topical Report (Revision 1)," dated March 8, 2021 (ADAMS Accession No. ML21071A082)
4. Kairos Power, LLC - KP-TR-007-NP, "Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor Topical Report," Revision 1 (Non-Proprietary), dated March 2021 (ADAMS Accession No. ML21071A083)
5. Kairos Power, LLC - KP-TR-007-NP, "Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor Topical Report," Revision 2 (Non-Proprietary), dated April 2021 (ADAMS Accession No. ML21105A519)
6. Kairos Power, LLC - KP-TR-007-NP, "Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor Topical Report," Revision 3 (Non-Proprietary), dated April 2021 (ADAMS Accession No. ML21117A048)
7. Letter from Peter Hastings, Vice President Regulatory Affairs and Quality, Kairos Power, to the NRC Document Control Desk, "Kairos Power LLC - Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor Topical Report (Revision 2)," dated April 15, 2021 (ADAMS Accession No. ML21105A518)
8. Letter from Peter Hastings, Vice President Regulatory Affairs and Quality, Kairos Power, to the NRC Document Control Desk, "Kairos Power LLC - Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor Topical Report (Revision 3)," dated April 26, 2021 (ADAMS Accession No. ML21117A047)
9. American Society of Mechanical Engineers NQA-1-2015, "Quality Assurance Program Requirements for Nuclear Facility Applications," New York, NY, dated February 20, 2015
10. Regulatory Guide (RG) 1.28, "Quality Assurance Program Criteria (Design and Construction)," Revision 5, dated October 2017 (ADAMS Accession No. ML17207A293)

11. Revision 1 of NEI 14-05A, "Guidelines for the Use of Accreditation in Lieu of Commercial-Grade Surveys for Procurement of Laboratory Calibration and Test Services," dated September 2020 (ADAMS Accession No. ML20259B731)
12. Final Safety Evaluation by the Office of Nuclear Reactor Regulation for the Nuclear Energy Institute Technical Report NEI 14-05A, "Guidelines for the Use of Accreditation in Lieu of Commercial-Grade Surveys for Procurement of Laboratory Calibration and Test Services," Revision 1, February 19, 2021 (ADAMS Accession No. ML20322A019)
13. Approval of Nuclear Management Company Quality Assurance Topical Report dated March 24, 2005 (ADAMS Accession No. ML050700416)

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Date:

SECTION B



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Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor

Topical Report

Revision No. 3
Document Date: April 2021

Non-Proprietary

Quality Assurance Program for the Kairos Power Fluoride Salt-Cooled High Temperature Reactor			
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Revision	Description of Change	Date
0	Initial Issuance	May 2020
1	Supplement revision to address NRC questions discussed on 7/23/2020, 10/7/2020, 11/19/2020 and 2/5/2021.	March 2021
2	Supplement revision to address NRC questions discussed on 4/6/2021	April 2021
3	Supplement revision to address NRC questions discussed on 4/21/2021	April 2021

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EXECUTIVE SUMMARY

This topical report provides a description of the Kairos Power, LLC Quality Assurance Program (QAP) for the site-selection, design, construction, and operation of the Kairos Power Fluoride Salt-Cooled High Temperature Reactors (KP-FHR). The QAP has been prepared in accordance with the requirements of Title 10, Part 50 of the Code of Federal Regulations (10 CFR 50), “Domestic Licensing of Production and Utilization Facilities,” Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants” and ASME NQA-1-2015, “Quality Assurance Requirements for Nuclear Facility Applications” as endorsed by Regulatory Guide (RG) 1.28, Revision 5, “Quality Assurance Program Criteria (Design and Construction).” This topical report considered the guidance in NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition,” Section 17.5, and is based on the Nuclear Energy Institute (NEI) 11-04A, “Nuclear Generation Quality Assurance Program Description” template. Departures from the NEI 11-04A template were necessary in some instances to conform to the Nuclear Regulatory Commission endorsement of NQA-1-2015 in RG 1.28, Revision 5.

The scope of the QAP described in this topical report includes design, construction, and operation phase QA activities. Consistent with common licensing practice, text is written in the present tense, active voice, including discussions of activities and processes associated with a phased implementation of design, construction, and operation.

The topical report is divided into five parts:

- Introduction and Scope
- Quality Assurance Program Description (QAPD) Details
- Nonsafety-Related Structures, Systems, and Components (SSC) Quality Control
- Regulatory Commitments, and
- Additional Quality Assurance and Administrative Controls for the Plant Operational Phase

Kairos Power requests NRC review and approval of this topical report to be used to satisfy quality assurance requirements for use by nuclear power plant applications submitted in accordance with 10 CFR 50 and 10 CFR 52:

- Limited Work Authorizations (LWA) pursuant to 10 CFR 50.10(d)(3)(i)
- Construction Permit (CP) Applications pursuant to 10 CFR 50.34(a)(7)
- Operating License (OL) Applications pursuant to 10 CFR 50.34(b)(6)(ii)
- Early Site Permit (ESP) Applications pursuant to 10 CFR 52.17(a)(1)(xi)
- Design Certification (DC) Applications pursuant to 10 CFR 52.47(a)(19)
- Combined License (COL) Applications pursuant to 10 CFR 52.79(a)(25)
- Standard Design Approval (SDA) Applications pursuant to 10 CFR 52.137(a)(19)

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ABBREVIATIONS

Term	Abbreviation
ANS	American Nuclear Society
ASME	American Society of Mechanical Engineers
ATWS	Anticipated Transient Without Scram
CEO	Chief Executive Officer
CFR	Code of Federal Regulations
COL	Combined License
CP	Construction Permit
DC	Design Certification
ESP	Early Site Permit
FSAR	Final Safety Analysis Report
IEC	International Electrotechnical Commission
ILAC	International Laboratory Accreditation Cooperation
IRG	Independent Review Group
ISO	International Organization for Standardization
ITAAC	Inspections, Tests, Analyses, and Acceptance Criteria
KP	Kairos Power
KP-FHR	Kairos Power Fluoride Salt-Cooled High Temperature Reactor
LLC	Limited Liability Company
LWA	Limited Work Authorization
M&TE	Measurement & Test Equipment
MRA	Mutual Recognition Arrangement
NEI	Nuclear Energy Institute
NIRMA	Nuclear Information and Records Management Association
NRC	Nuclear Regulatory Commission
NUPIC	Nuclear Procurement Issues Corporation
OL	Operating License
QA/QC	Quality Assurance/Quality Control
QAP/QAPD	Quality Assurance Program/Quality Assurance Program Description
QAPD	Quality Assurance Program Description
RG	Regulatory Guide
RIS	Regulatory Issue Summary
SAR	Safety Analysis Report
SDA	Standard Design Approval
SBO	Station Black Out
SSC	Structures, Systems, and Components
TG	Technical Guide

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POLICY STATEMENT

Kairos Power shall design, procure, deliver, construct, and operate nuclear power plant(s) in a manner that will ensure the health and safety of the public and workers. These activities shall be performed in compliance with the requirements of the Code of Federal Regulations (CFR) and applicable laws and regulations of the state and local governments.

The Kairos Power Quality Assurance Program (QAP) is the Quality Assurance Program Description (QAPD) provided in this document and the associated implementing documents. Together they provide for control of Kairos Power activities that affect the quality of safety-related nuclear power plant structures, systems, and components (SSCs) and include all planned and systematic activities necessary to provide adequate confidence that such SSCs will perform satisfactorily in service. The QAPD may also be applied to certain equipment and activities that are not safety-related, but support safe plant operations, or where other NRC guidance establishes program requirements.

The QAPD is the top-level policy document that establishes the manner in which quality is to be achieved and presents Kairos Power's overall philosophy regarding achievement and assurance of quality. Implementing documents assign more detailed responsibilities and requirements and define the organizational interfaces involved in conducting activities within the scope of the QAP. Senior management establishes overall expectations for effective implementation of the quality assurance program and is responsible for obtaining the desired end result. Compliance with the QAPD and implementing documents is mandatory for personnel directly or indirectly associated with implementation of the Kairos Power QAP.


 Michael Laufer, Chief Executive Officer

03/05/2021

Date

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PART I. INTRODUCTION

SECTION 1 GENERAL

This topical report provides a description of the Kairos Power, LLC Quality Assurance Program (QAP) for the site selection, design, construction, and operation of the Kairos Power Fluoride Salt-Cooled High Temperature Reactor (KP-FHR).

The Kairos Power Quality Assurance Program Description (QAPD) is the top-level policy document that establishes the quality assurance policy and assigns major functional responsibilities for all quality-related nuclear power plant activities conducted by or for Kairos Power. The QAPD describes the methods and establishes quality assurance (QA) and administrative control requirements that meet 10 CFR 50, Appendix B and 10 CFR 52. The QAPD is based on the requirements and guidance of ASME NQA-1-2015, "Quality Assurance Requirements for Nuclear Facility Applications," Parts I and II, with specific reference to selected Part III and Part IV sections, as identified in this document.

The QA Program (QAP) is defined by the NRC-approved regulatory document that describes the QA elements (i.e., the QAPD), along with the associated implementing documents. Procedures and instructions that control quality-related activities will be developed prior to commencement of those activities. Policies establish high-level responsibilities and authority for carrying out important administrative functions which are outside the scope of the QAPD. Procedures establish practices for certain activities which are common to all Kairos Power organizations performing those activities so that the activity is controlled and carried out in a manner that meets QAPD requirements. Procedures specific to a site, organization, or group establish detailed implementation requirements and methods, and may be used to implement policies or be unique to particular functions or work activities.

1.1 SCOPE/APPLICABILITY

The QAPD applies to design-phase, construction-phase, and operations-phase activities, including those in support of Standard Design Approval (SDA), Design Certification (DC), Early Site Permit (ESP), Limited Work Authorization (LWA), Construction Permit (CP), Operating License (OL), and/or Combined License (COL) activities affecting the quality and performance of safety-related nuclear power plant structures, systems, and components (SSCs), including, but not limited to:

Designing	Storing	Operating
Siting	Constructing	Maintaining
Procuring	Erecting	Repairing
Fabricating	Installing	Modifying
Cleaning	Inspecting	Refueling
Handling	Testing	Training
Shipping	Startup	
Receiving	Pre-operational activities (including ITAAC)	

Safety-related SSCs under the control of the QAPD are identified by design documents. The technical aspects of these items are considered when determining program applicability, including, as appropriate, the item's design safety function. The QAPD may be applied to certain activities where regulations other than 10 CFR 50 and 10 CFR 52 establish QA requirements for activities within their scope (not applicable for an ESP per 10 CFR 50.34(f)(3)(ii)).

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The policy of Kairos Power is to assure a high degree of availability and reliability of the nuclear plant(s) while ensuring the health and safety of its workers and the public. To this end, selected elements of the QAPD are also applied to certain equipment and activities that are not safety-related, but support safe, economic, and reliable plant operations, or where other NRC guidance establishes quality assurance requirements. Implementing documents establish program element applicability.

The definitions provided in ASME NQA-1-2015, Part I, Section 400, apply to select terms as used in this document.

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PART II. QUALITY ASSURANCE PROGRAM DESCRIPTION (QAPD) DETAILS

SECTION 1 ORGANIZATION

This section describes the Kairos Power organizational structure, functional responsibilities, levels of authority and interfaces for establishing, executing, and verifying QAPD implementation during design, construction, and operations phases. The organizational structure includes corporate/support/off-site and on-site functions for Kairos Power facilities including interface responsibilities for multiple organizations that perform quality-related functions. Implementing documents assign more specific responsibilities and duties, and define the organizational interfaces involved in conducting activities and duties within the scope of the QAPD. Management gives careful consideration to the timing, extent, and effects of organizational structure changes.

During design, Safety Assurance and Quality Management is responsible to size the Quality Assurance staff commensurate with the duties and responsibilities assigned. During construction and operations, this responsibility transitions to the Site Executive.

The responsibility for quality-related activities during design, construction, and operations phases are shown below:

Design Phase	Construction Phase	Operations Phase
<ul style="list-style-type: none"> • Technology Development • Engineering • Fabrication • Supply Chain • Safety Assurance and Quality 	<ul style="list-style-type: none"> • Construction • Engineering • Fabrication • Supply Chain • Construction Testing • Document Control and Other Support Services • QA/QC 	<ul style="list-style-type: none"> • Operations • Maintenance • Engineering • Supply Chain • Startup/Preop Testing • Document Control and Other Support Services • QA/QC

Design, engineering, environmental, and construction services may be provided to the Kairos Power organization by contractors in accordance with their QAPDs.

The following sections describe the reporting relationships, functional responsibilities, and authorities for functional organizations implementing and supporting the Kairos Power QA Program. The Kairos Power organization is shown in Figure II.1–1.

1.1 CHIEF EXECUTIVE OFFICER (CEO)

The CEO is responsible for all aspects of design, construction, and operations. The CEO is also responsible for all technical and administrative support activities provided by Kairos Power and contractors. The CEO directs Technology Development, Engineering, Supply Chain, Safety Assurance & Quality (during the design phase and for corporate support during construction and operations), and the Site Executive (during construction and operations) in fulfillment of their responsibilities.

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During all phases, QA management has access to the CEO as the most senior executive with overall responsibilities for Quality Assurance. QA management shall have the freedom and authority to raise issues, that cannot be resolved at lower levels, to the CEO for final decision.

1.2 DESIGN PHASE AND CORPORATE SUPPORT

The following functions report to the CEO during the design phase and during corporate/off-site support of construction and operations.

1.2.1 TECHNOLOGY DEVELOPMENT

Reports to the CEO and is responsible for fuel, coolant, and materials qualification and testing and associated design analysis, including modeling.

1.2.2 ENGINEERING DESIGN

Reports to the CEO and is responsible for engineering design and support services (including document control and records management).

1.2.3 FABRICATION

Reports to the CEO and is responsible for fabrication of components.

1.2.4 SUPPLY CHAIN

Reports to the CEO and is responsible for supply chain management (including supplier evaluation) and procurement.

1.2.5 SAFETY ASSURANCE AND QUALITY

Reports to the CEO and is responsible for nuclear safety assurance and the establishment and implementation of the Kairos Power QAPD.

The Quality Assurance function reports to the Safety Assurance and Quality function and is responsible for planning and performing activities to verify the development and effective implementation. Effective implementation includes, but is not limited to developing and maintaining the QAPD, evaluating compliance to QA Program requirements through audits and technical reviews, independent oversight of the implementation of quality activities, and ensuring that vendors providing quality services, parts, and materials to Kairos Power are meeting the requirements of 10 CFR 50, Appendix B through Kairos Power vendor audits, and managing Quality Assurance organization resources.

The QA function has sufficient independence from other Kairos Power priorities to bring forward issues affecting safety and quality and makes judgments regarding quality in all areas regarding Kairos Power design activities as appropriate. QA may make recommendations to management regarding improving the quality of work processes. If QA disagrees with any actions taken by the organization and is unable to obtain resolution, QA shall inform safety assurance and quality management and bring the matter to the attention of the CEO, who will determine the final disposition.

Figure II.1-1 reflects the QA function (within the Safety Assurance and Quality function) but with a “dotted line” relationship of directly to the CEO, irrespective of specific organizational structure.

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1.3 SITE EXECUTIVE

During construction and operations phases, the Site Executive reports to the CEO and is responsible for site related construction and operation activities. Transition from design phase to construction and operations phases occurs such that those positions required to support quality-related activities will retain their applicable responsibilities until it is deemed that they are no longer necessary.

1.3.1 CONSTRUCTION PHASE MANAGEMENT

Reports to the Site Executive and is responsible for construction activities, including construction, fabrication, engineering, supply chain, construction testing, document control and other support services, and QA/QC.

Construction Phase Management is staffed and has the appropriate authority required to perform quality-related construction activities. Interfaces between site/construction phase management and corporate support is defined in implementing procedures.

The Kairos Power Quality Assurance organization is responsible for independent oversight of the implementation of activities including but not limited to construction; engineering; procurement; and construction testing. QA is responsible for assuring compliance with regulatory requirements and procedures through audits and technical reviews; monitoring organizational processes to ensure conformance to commitments and licensing document requirements; and ensuring that vendors providing quality services, parts, and materials to Kairos Power are meeting the requirements of 10 CFR 50, Appendix B through NUPIC or Kairos Power vendor audits.

QA has sufficient independence from other Kairos Power construction priorities to bring forward issues affecting safety and quality and makes judgments regarding quality in all areas regarding Kairos Power construction activities as appropriate. QA may make recommendations to management regarding improving the quality of work processes. If QA disagrees with any actions taken by the organization and is unable to obtain resolution, QA shall inform Construction Phase Management, and bring the matter to the attention of the CEO, who will determine the final disposition.

1.3.2 OPERATIONS PHASE MANAGEMENT

Reports to the Site Executive and is responsible for plant operation activities, including operations, maintenance, engineering, supply chain, startup/preop testing, document control and other support services, and QA/QC.

Operations Phase Management is staffed and has the appropriate authority required to perform quality-related operations activities. It is anticipated that even after fuel load, construction activities will be ongoing. Those positions required to support these activities will retain their applicable construction/pre-operation responsibilities until it is deemed that they are no longer necessary. As the construction of systems (or portions thereof) is completed, control and authority (including oversight, configuration, and operations) is transferred from Construction Phase Management to the cognizant departments in the operational phase. During the transition, responsibilities will be clearly defined in instructions and procedures to ensure appropriate authority is maintained for each SSC.

No later than six months prior to fuel load of the unit, those positions which are identified for Operations will be staffed and have the appropriate authority required to perform operations activities.

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The Quality Assurance organization is responsible for independent oversight of the implementation of activities including but not limited to operations; maintenance; engineering; startup/preop testing, and procurement.

QA is responsible for assuring compliance with regulatory requirements and procedures through audits and technical reviews; monitoring organizational processes to ensure conformance to commitments and licensing document requirements; and ensuring that vendors providing quality services, parts, and materials to Kairos Power are meeting the requirements of 10 CFR 50, Appendix B through NUPIC or Kairos Power vendor audits.

QA has sufficient independence from other Kairos Power operation priorities to bring forward issues affecting safety and quality and makes judgments regarding quality in all areas regarding Kairos Power operations activities as appropriate. QA may make recommendations to management regarding improving the quality of work processes. If QA disagrees with any actions taken by the organization and is unable to obtain resolution, QA shall inform Operations Phase Management, and bring the matter to the attention of the CEO, who will determine the final disposition.

1.4 AUTHORITY TO STOP WORK

Quality Assurance and Quality Control Inspection personnel have the authority, and the responsibility, to stop work in progress which is not being done in accordance with approved procedures or where safety or SSC integrity may be jeopardized. This authority extends to off-site work performed by suppliers that furnish safety-related materials and services to Kairos Power.

1.5 QUALITY ASSURANCE ORGANIZATIONAL INDEPENDENCE

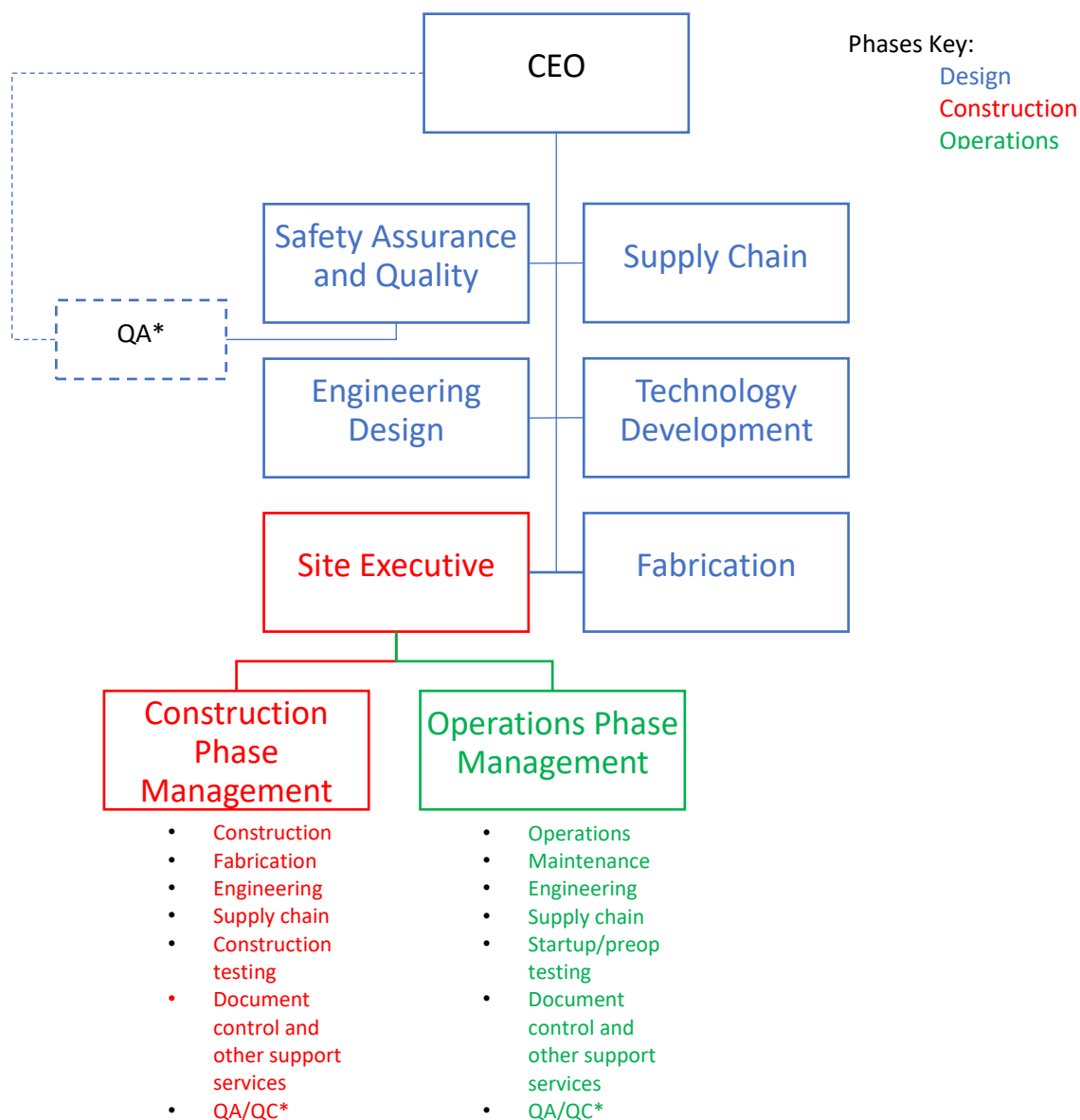
Independence shall be maintained between the organization(s) performing the checking (quality assurance and control) functions and the organizations performing the functions. This provision is not applicable to design review/verification.

1.6 NQA-1 COMMITMENT

In establishing its organizational structure, Kairos Power commits to compliance with NQA-1-2015, Requirement 1.

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Figure II.1-1 Kairos Power Functional Organization



** QA function has direct access to levels of management necessary to assure effective execution of the QA program irrespective of organizational structure*

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SECTION 2 QUALITY ASSURANCE PROGRAM

Kairos Power has established the necessary measures and governing procedures to implement the QAP as described in the QAPD for design phase activities and will establish necessary measures and governing procedures for construction and operations phase activities prior to beginning those activities. Kairos Power is committed to implementing the QAP in all aspects of work that are important to the safety of the nuclear plants as described and to the extent delineated in the QAPD. The QAP shall include monitoring activities against acceptance criteria in a manner sufficient to provide assurance that the activities important to safety are performed satisfactorily. Further, Kairos Power ensures through the systematic process described herein that its suppliers of safety-related equipment or services meet the applicable requirements of 10 CFR 50, Appendix B. Senior management is regularly apprised of the adequacy of implementation of the QAP through the audit functions described in Part II, Section 18.

The objective of the QAP is to assure that Kairos Power's nuclear generating plants are designed, constructed, and operated in accordance with governing regulations and license requirements. The program is based on the requirements of ASME NQA-1-2015, "Quality Assurance Requirements for Nuclear Facility Applications," as further described in this document. The QAP applies to those quality-related activities that involve the functions of safety-related structures, systems, and components (SSCs) associated with the design, fabrication, construction, and testing of the SSCs of the facility and to the managerial and administrative controls to be used to assure safe operations. Examples of ESP, CP/OL, or COL program safety-related activities include, but are not limited to, site-specific engineering related to safety-related SSCs, site geotechnical investigations, site engineering analysis, seismic analysis, and meteorological analysis. A list or system that identifies SSCs and activities to which this program applies is maintained at the appropriate facility. Design documents are used as the basis for this list. Cost and scheduling challenges must be addressed; however, they do not prevent proper implementation of the QAP.

As described in Part III of the QAPD, specific program controls are applied to nonsafety-related SSCs that are significant contributors to plant safety, for which 10 CFR 50, Appendix B, is not applicable. The specific program controls, consistent with applicable sections of the QAPD, are applied to those items in a select manner, targeted at those characteristics or critical attributes that qualifies the SSC as a significant contributor to plant safety. (This paragraph and Part III do not apply to ESP related activities.)

Delegated responsibilities may be performed under a supplier's or principal contractor's QAP, provided that the supplier or principal contractor has been approved as a supplier in accordance with the Kairos Power QAP. Periodic audits and assessments of supplier QA programs are performed to assure compliance with the supplier's or principal contractor's QAPD and implementing procedures. In addition, routine interfaces with the supplier's personnel provide added assurance that quality expectations are met.

For the ESP, CP/OL, and/or COL applications, the QAPD applies to those activities that can affect either directly or indirectly the safety-related site characteristics or analysis of those characteristics. In addition, the QAPD applies to engineering activities that are used to characterize the site or analyze that characterization.

New nuclear plant construction will be the responsibility of Kairos Power 's construction organization. Detailed engineering specifications and construction procedures will be developed to implement the QAPD prior to commencement of preconstruction (ESP) and/or construction (CP/COL) activities.

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Examples of Limited Work Authorization (LWA) activities that could impact safety-related SSCs include impacts of construction to existing facilities and, for construction of a new plant, the interface between nonsafety-related and safety-related SSCs and the placement of seismically designed backfill. (This requirement does not apply to ESP or operations related activities.)

In general, the program requirements specified herein are detailed in implementing procedures that are either Kairos Power implementing procedures, or supplier implementing procedures governed by a supplier quality assurance program.

A grace period of 90 days may be applied to provisions that are required to be performed on a periodic basis, unless otherwise noted. Annual evaluations and audits that must be performed on a triennial basis are examples where the 90 day general period could be applied. The grace period does not allow the "clock" for a particular activity to be reset forward. The "clock" for an activity is reset backwards by performing the activity early. Audit schedules are based on the month in which the audit starts.

2.1 RESPONSIBILITIES

Personnel who work directly or indirectly for Kairos Power are responsible for achieving acceptable quality in the work covered by the QAPD. This includes the activities delineated in Part I, Section 1.1. Kairos Power personnel performing verification activities are responsible for verifying the achievement of acceptable quality. Activities governed by the QAPD are performed as directed by documented instructions, procedures, and drawings that are of a detail appropriate for the activity's complexity and effect on safety. Instructions, procedures and drawings specify quantitative or qualitative acceptance criteria as applicable or appropriate for the activity, and verification is against these criteria. Provisions are established to designate or identify the proper documents to be used in an activity, and to ascertain that such documents are being used. Quality Assurance is responsible to verify that processes and procedures comply with QAPD and other applicable requirements, that such processes or procedures are implemented, and that management appropriately ensures compliance.

2.2 DELEGATION OF WORK

Kairos Power retains and exercises the responsibility for the scope and implementation of an effective QAP. Positions identified in Part II, Section 1, may delegate all or part of the activities of planning, establishing, and implementing the program for which they are responsible to others, but retain the responsibility for the program's effectiveness. Decisions affecting safety are made at the level appropriate based upon their nature and effect, with technical advice or review as appropriate.

2.3 SITE-SPECIFIC SAFETY-RELATED DESIGN BASIS ACTIVITIES

Site-specific safety-related design basis activities are defined as those activities, including sampling, testing, data collection, and supporting engineering calculations and reports, that will be used to determine the bounding physical parameters of the site. Appropriate quality assurance measures are applied. (This paragraph does not apply to operations activities.)

2.4 PERIODIC REVIEW OF THE QUALITY ASSURANCE PROGRAM

Management of those organizations implementing the QA program, or portions thereof, shall assess the adequacy of that part of the program for which they are responsible to assure its effective implementation at least once each year or at least once during the life of the activity, whichever is shorter.

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However, the period for assessing QA programs during the operational phase may be extended to once every two years. (This requirement does not apply to non-operations activities.)

2.5 ISSUANCE AND REVISION TO QUALITY ASSURANCE PROGRAM

Changes to the QAPD are evaluated by Quality Assurance to ensure that such changes do not degrade safety for previously approved quality assurance controls specified in the QAPD. New revisions to the document will be reviewed, at a minimum, by Kairos Power Quality Assurance and approved by Safety Assurance and Quality.

Regulations require that the Final Safety Analysis Report (FSAR) include, among other things, the managerial and administrative controls to be used to assure safe operation, including a discussion of how the applicable requirements of 10 CFR 50, Appendix B will be satisfied. In order to comply with this requirement, the FSAR references the QAPD and, as a result, the requirements of 10 CFR 50.54(a) are satisfied by and apply to the QAPD.

2.6 PERSONNEL TRAINING AND QUALIFICATIONS

Personnel assigned to implement elements of the QAPD shall be capable of performing their assigned tasks. To this end, Kairos Power establishes and maintains formal indoctrination, training, and qualification as necessary for personnel performing, verifying, or managing activities within the scope of the QAPD to achieve initial proficiency, maintain proficiency, and adapt to technology changes, method, or job responsibilities. The indoctrination, training, and qualification programs are commensurate with scope, complexity, and importance of the activities; and include or address the following, as appropriate:

- Education, experience, and proficiency of the personnel receiving training
- General criteria, technical objectives, requirements of applicable codes and standards, regulatory commitments, company procedures, and quality assurance program requirements
- On-the-job training, if direct hands-on applications or experience is needed to achieve and maintain proficiency.

Plant and support staff minimum qualification requirements are as delineated in the unit Technical Specifications. Other qualification requirements may be established but will not reduce those required by Technical Specifications. (This paragraph does not apply to non-operations activities.)

Sufficient managerial depth is provided to cover absences of incumbents. When required by code, regulation, or standard, specific qualification and selection of personnel is conducted in accordance with those requirements as established in the applicable Kairos Power procedures. Indoctrination includes the administrative and technical objectives, requirements of the applicable codes and standards, and the QAPD elements to be employed. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implement a systematic approach to training. (This paragraph does not apply to non-operations activities.)

Records of personnel training and qualification are maintained.

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The minimum qualifications of Quality Assurance Management are that they hold an engineering or related science degree and a minimum of four years of related experience including two years of nuclear power plant experience, one year of supervisory or management experience, and one year of the experience is in performing quality verification activities. Special requirements shall include management and supervisory skills and experience or training in leadership, interpersonal communication, management responsibilities, motivation of personnel, problem analysis and decision making, and administrative policies and procedures. Individuals who do not possess these formal education and minimum experience requirements should not be eliminated automatically when other factors provide sufficient demonstration of their abilities. These other factors are evaluated on a case-by-case basis and approved and documented by senior management.

The minimum qualifications for the individuals responsible for supervising QA or QC personnel is that each has a high school diploma or equivalent and has a minimum of one year of experience performing quality verification activities. Individuals who do not possess these formal education and experience requirements should not be eliminated automatically when other factors provide sufficient demonstration of their abilities. These other factors are evaluated on a case-by-case basis and approved and documented by senior management.

The minimum qualifications of individuals that are part of the Quality Assurance organization responsible for planning, implementing, and maintaining the programs for the QAPD are that each has a high school diploma or equivalent and has a minimum of one year of related experience. Individuals who do not possess these formal education and minimum experience requirements should not be eliminated automatically when other factors provide sufficient demonstration of their abilities. These other factors are evaluated on a case-by-case basis and approved and documented by senior management.

2.7 NQA-1 COMMITMENT / EXCEPTIONS

In establishing qualification and training programs, Kairos Power commits to compliance with NQA-1-2015, Requirement 2 with the following clarifications and exceptions:

- For Section 302, Inspection and Test, Kairos Power commits to the use of Subpart 3.1-2.3 guidance.
- Kairos Power follows Section 301 for qualification of nondestructive examination personnel, except that Kairos Power will follow the applicable standard cited in the version(s) of Section III and Section XI of the ASME Boiler and Pressure Vessel Code approved by the NRC for use at Kairos Power sites for the scope of activities governed by these cited standards.
- Section 401 (g) requires the date of certification expiration be included on the qualification record. Kairos Power considers the certification expiration date to be the date from the certification or recertification date plus the certification interval time and its inclusion on the qualification record is optional.

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SECTION 3 DESIGN CONTROL

Kairos Power has established and implements a process to control the design, design changes, and temporary modifications (e.g., temporary bypass lines, electrical jumpers and lifted wires, and temporary setpoints) of items that are subject to the provisions of the QAPD. The design process includes provisions to control design inputs, outputs, changes, interfaces, records, and organizational interfaces within Kairos Power and with suppliers. Use of legacy data will be performed in accordance with NQA-1-2015, Part IV, Subpart 4.2.3, Guidance on Qualification of Existing Data. These provisions assure that design inputs (such as design bases and the performance, regulatory, quality, and quality verification requirements) are correctly translated into design outputs (such as analyses, specifications, drawings, procedures, and instructions) so that the final design output contains or references appropriate acceptance criteria that can be related to the design input in sufficient detail to permit verification by inspection and test, as required. Design change processes and the division of responsibilities for design-related activities are detailed in Kairos Power and supplier procedures. Changes to design inputs, final designs, and field changes, and temporary and permanent modifications to operating facilities are justified and subject to design control measures commensurate with those applied to the original design. The design control program includes interface controls necessary to control the development, verification, approval, release, status, distribution, and revision of design inputs and outputs. Design changes and disposition of nonconforming items as "use as is" or "repair" are reviewed and approved by the Kairos Power design organization or by other organizations so authorized by Kairos Power.

Design documents are reviewed by individuals knowledgeable in QA to ensure the documents contain the necessary QA requirements (This paragraph does not apply to ESP activities, pursuant to NUREG-0800, Section 17.5, Acceptance Criterion C.8).

3.1 DESIGN VERIFICATION

Kairos Power design processes provide for design verification to ensure that items, computer programs, and activities subject to the provisions of the QAPD are suitable for their intended application, consistent with their effect on safety. Design changes are subjected to these controls, which include verification measures commensurate with those applied to original plant design.

Design verifications are performed by competent individuals or groups other than those who performed the original design but who may be from the same organization. The verifier shall not have taken part in the selection of design inputs, the selection of design considerations, or the selection of a singular design approach, as applicable. This verification may be performed by the originator's supervisor provided the supervisor did not specify a singular design approach, rule out certain design considerations, and did not establish the design inputs used in the design, or if the supervisor is the only individual in the organization competent to perform the verification. If the verification is performed by the originator's supervisor, the justification of the need is documented and approved in advance by management.

The extent of the design verification required is a function of the importance to safety of the item or computer program under consideration, the complexity of the design, the degree of standardization, the state-of-the-art, and the similarity with previously proven designs. This includes design inputs, design outputs, and design changes. Design verification procedures are established and implemented to assure that an appropriate verification method is used, the appropriate design parameters to be verified are

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chosen, the acceptance criteria are identified, and the verification is satisfactorily accomplished and documented. Verification methods may include, but are not limited to, design reviews, alternative calculations, and qualification testing. Testing used to verify the acceptability of a specific design feature demonstrates acceptable performance under conditions that simulate the most adverse design conditions expected for the item's intended use.

Kairos Power normally completes design verification activities before the design outputs are used by other organizations for design work, and before they are used to support other activities such as procurement, or construction. When such timing cannot be achieved, the design verification is completed before relying on the item to perform its intended design or safety function.

3.2 DESIGN RECORDS

Kairos Power maintains records sufficient to provide evidence that the design was properly accomplished. These records include the final design output and any revisions thereto, as well as record of the important design steps (e.g., calculations, analyses and computer programs) and the sources of input that support the final output.

Plant design drawings reflect the properly reviewed and approved configuration of the plant.

3.3 COMPUTER APPLICATION AND DIGITAL EQUIPMENT SOFTWARE

The QAPD governs the development, procurement, testing, maintenance, control, and use of computer applications and digital equipment software when used in safety-related applications and designated nonsafety-related applications. Computer program acceptability is pre-verified or the results verified with the design analysis for each application. Pre-verified computer programs are controlled using a software configuration management process. Kairos Power and suppliers are responsible for developing, approving, and issuing procedures, as necessary, to control the use of such computer application and digital equipment software. The procedures require that the application software be assigned a proper quality classification and that the associated quality requirements be consistent with this classification. Each application software and revision thereto is documented and approved by authorized personnel. The QAPD is also applicable to the administrative functions associated with the maintenance and security of computer hardware where such functions are considered essential in order to comply with other QAPD requirements such as QA records.

3.4 SETPOINT CONTROL

Instrument and equipment setpoints that could affect nuclear safety shall be controlled in accordance with written instructions. As a minimum, these written instructions shall:

- Identify responsibilities and processes for reviewing, approving, and revising setpoints and setpoint changes.
- Ensure that setpoints and setpoint changes are consistent with design and accident analysis requirements and assumptions.
- Provide for documentation of setpoints, including those determined operationally.
- Provide for access to necessary setpoint information for personnel who write or revise plant procedures, operate or maintain plant equipment, develop or revise design documents, or develop or revise accident analyses. (This subsection does not apply to ESP activities.)

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3.5 NQA-1 COMMITMENT

In establishing its program for design control and verification, Kairos Power commits to compliance with NQA-1-2015 Requirement 3, Subpart 2.7 for computer software, NQA-1-2015, Requirement 3, Subpart 2.14 for Quality Assurance requirements for commercial grade items and services, and Subpart 2.20 for subsurface investigation requirements (Subpart 2.20 does not apply to operations activities.)

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SECTION 4 PROCUREMENT DOCUMENT CONTROL

Kairos Power has established the necessary measures and governing procedures to assure that purchased items, computer programs, and services are subject to appropriate quality and technical requirements. Procurement document changes shall be subject to the same degree of control as utilized in the preparation of the original documents. These controls include provisions such that:

- Where original technical or quality assurance requirements cannot be determined, an engineering evaluation is conducted and documented by qualified staff to establish appropriate requirements and controls to assure that interfaces, interchangeability, safety, fit, and function, as applicable, are not adversely affected or contrary to applicable regulatory requirements.
- Applicable technical, regulatory, administrative, quality, and reporting requirements (such as specifications, codes, standards, tests, inspections, special processes, and 10 CFR 21) are invoked for procurement of items and services. 10 CFR 21 requirements for posting, evaluating, and reporting will be followed and imposed on suppliers when applicable. Applicable design bases and other requirements necessary to assure adequate quality shall be included or referenced in documents for procurement of items and services. To the extent necessary, procurement documents shall require suppliers to have a documented QA program that is determined to meet the applicable requirements of 10 CFR 50, Appendix B, as appropriate to the circumstances of procurements (or the supplier may work under Kairos Power approved QA program).

Reviews of procurement documents shall be performed by personnel who have access to pertinent information and who have an adequate understanding of the requirements and intent of the procurement documents.

4.1 NQA-1 COMMITMENT / EXCEPTIONS

In establishing controls for procurement, Kairos Power commits to compliance with NQA-1-2015, Requirement 4, with the following clarifications and exceptions:

- With regard to service performed by a supplier, Kairos Power procurement documents may allow the supplier to work under the Kairos Power QAP, including implementing procedures, in lieu of the supplier having its own QAP.
- Section 300 and 400 of Requirement 4 require the review of technical and Quality Assurance Program requirements of procurement documents prior to award of a contract and for procurement document changes. Kairos Power may satisfy this requirement through the review of the procurement specification, when the specification contains the technical and quality assurance requirements of the procurement.

Procurement documents for Commercial Grade Items that will be procured by Kairos Power for use as safety-related items shall contain technical and quality requirements such that the procured item can be appropriately dedicated in accordance with the Kairos Power QAPD, Part II, Section 7, "Control of Purchased Material, Equipment, and Services."

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SECTION 5 INSTRUCTIONS, PROCEDURES, AND DRAWINGS

Kairos Power has established the necessary measures and governing procedures to ensure that activities affecting quality are prescribed by and performed in accordance with instructions, procedures, or drawings of a type appropriate to the circumstances and which, where applicable, include quantitative or qualitative acceptance criteria to implement the QAP as described in the QAPD. Such documents are prepared and controlled according to Part II, Section 6. In addition, means are provided to disseminate to the staff instructions of both general and continuing applicability, as well as those of short-term applicability. Provisions are included for reviewing, updating, and canceling such procedures.

5.1 PROCEDURE ADHERENCE

Kairos Power's policy is that procedures are followed, and the requirements for use of procedures have been established in administrative procedures. Where procedures cannot be followed as written, provisions are established for making changes in accordance with Part II, Section 6. Requirements are established to identify the manner in which procedures are to be implemented, including identification of those tasks that require: (1) the written procedure to be present and followed step-by-step while the task is being performed, (2) the user to have committed the procedure steps to memory, (3) verification of completion of significant steps, by initials or signatures or use of check-off lists. Procedures that are required to be present and referred to directly are those developed for extensive or complex jobs where reliance on memory cannot be trusted, tasks that are infrequently performed, and tasks where steps must be performed in a specified sequence.

In cases of emergency, personnel are authorized to depart from approved procedures when necessary to prevent injury to personnel or damage to the plant. Such departures are recorded describing the prevailing conditions and reasons for the action taken.

5.2 PROCEDURE CONTENT

The established measures address the applicable content of procedures as described in the Introduction to Part II of NQA-1-2015. In addition, procedures governing tests, inspections, operational activities and maintenance will include as applicable, initial conditions and prerequisites for the performance of the activity.

5.3 NQA-1 COMMITMENT

In establishing procedural controls, Kairos Power commits to compliance with NQA-1-2015, Requirement 5.

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SECTION 6 DOCUMENT CONTROL

Kairos Power has established the necessary measures and governing procedures to control the preparation, issuance, and revision of documents that specify quality requirements or prescribe how activities affecting quality, including organizational interfaces, to ensure that correct documents are employed. The following controls, including electronic systems used to make documents available, are applied to documents and changes thereto:

- Identification of controlled documents
- Specified distribution of controlled documents for use at the appropriate location
- A method to identify the correct document (including revision) to be used and control of superseded documents
- Identification of individuals responsible for controlled document preparation, review, approval, and distribution
- Review of controlled documents for adequacy, completeness, and approval prior to distribution
- A method to ensure the correct documents are being used
- A method to provide feedback from users to improve procedures and work instructions
- Coordinating and controlling interface documents and procedures

The types of documents to be controlled include:

- Drawings such as design, fabrication, construction, installation, and as-built drawings
- Engineering calculations
- Design specifications
- Purchase orders and related documents
- Vendor-supplied documents
- Audit, surveillance, and quality verification/inspection procedures
- Inspection and test reports
- Instructions and procedures for activities covered by the QAPD including design, construction, installation, operating (including normal and emergency operations), maintenance, calibration, and routine testing
- Technical specifications
- Nonconformance reports and corrective action reports

During the operational phase, where temporary procedures are used, they shall include a designation of the period of time during which it is acceptable to use them.

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6.1 REVIEW AND APPROVAL OF DOCUMENTS

Documents are reviewed for adequacy by qualified persons other than the preparer. During the ESP or construction phase, procedures for design, construction, and installation are also reviewed by the organization responsible for quality verification to ensure quality assurance measures have been appropriately applied. (This requirement does not apply to operations activities.) The documented review signifies concurrence.

During the operational phase, documents affecting the configuration or operation of the station as described in the SAR are screened to identify those that require review by an Independent Review Group prior to implementation as described in Part V, Section 2.2.

To ensure effective and accurate procedures during the operational phase, applicable procedures are reviewed, and updated as necessary, based on the following conditions:

- Following any modification to a system
- Following an unusual incident, such as an accident, significant operator error, or equipment malfunction
- When procedure discrepancies are found
- Prior to use if not used in the previous two years
- Results of QA audits conducted in accordance with Part II, Section 18.1 (This section does not apply to non-operations activities.)

Prior to issuance or use, documents including revisions thereto, are approved by the designated authority. A listing of all controlled documents identifying the current approved revision, or date, is maintained so personnel can readily determine the appropriate document for use.

6.2 CHANGES TO DOCUMENTS

Changes to documents, other than those defined in implementing procedures as minor changes, are reviewed and approved by the same organizations that performed the original review and approval unless other organizations are specifically designated. The reviewing organization has access to pertinent background data or information upon which to base their approval.

Where temporary procedure changes are necessary during the operational phase, changes that clearly do not change the intent of the approved procedure may be implemented provided they are approved by two members of the staff knowledgeable in the areas affected by the procedures. (This requirement does not apply to non-operations activities.)

Minor changes to documents, such as inconsequential editorial corrections, do not require that the revised documents receive the same review and approval as the original documents. To avoid a possible omission of a required review, the type of minor changes that do not require such a review and approval and the persons who can authorize such a classification shall be clearly delineated in implementing procedures.

6.3 NQA-1 COMMITMENT

In establishing provisions for document control, Kairos Power commits to compliance with NQA-1-2015, Requirement 6.

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SECTION 7 CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES

Kairos Power has established the necessary measures and governing procedures to control purchased items and services to assure conformance with specified requirements. Such control provides for the following as appropriate: source evaluation and selection, evaluation of objective evidence of quality furnished by the supplier, source inspection, audit, and examination of items or services.

7.1 ACCEPTANCE OF ITEM OR SERVICE

Kairos Power establishes and implements measures to assess the quality of purchased items and services, whether purchased directly or through contractors, at intervals and to a depth consistent with the item or service importance to safety, complexity, quantity, and the frequency of procurement. Verification actions include testing, as appropriate, during design, fabrication, construction, and operation activities. Verifications occur at the appropriate phases of the procurement process, including, as necessary, verification of activities of suppliers below the first tier.

Measures to assure the quality of purchased items and services include the following, as applicable:

- Items are inspected, identified, and stored to protect against damage, deterioration, or misuse.
- Prospective safety-related items and service suppliers are evaluated to assure only qualified suppliers are used. Qualified suppliers are audited on a triennial basis. In addition, if a subsequent contract or a contract modification significantly changes the scope, methods, or controls performed by a supplier, an audit of the changes is performed, thus starting a new triennial period.
- Kairos Power may utilize audits conducted by outside organizations for supplier qualification provided that the scope and adequacy of the audits meet Kairos Power requirements. Documented annual evaluations are performed for qualified suppliers to assure they continue to provide acceptable products and services. Industry programs, such as those applied by ASME, Nuclear Procurement Issues Corporation (NUPIC) during construction or operation phases, or other established utility groups, are used as input or the basis for supplier qualification whenever appropriate. The results of the reviews are promptly considered for effect on a supplier's continued qualification and adjustments made as necessary (including corrective actions, adjustments of supplier audit plans, and input to third party auditing entities, as warranted). In addition, results are reviewed periodically to determine if, as a whole, they constitute a significant condition adverse to quality requiring additional action.
- Provisions are made for accepting purchased items and services, such as source verification, receipt inspection, pre and post-installation tests, certificates of conformance, and document reviews (including Certified Material Test Report/Certificate). Acceptance actions/documents should be established by the Purchaser with appropriate input from the Supplier and be completed to ensure that procurement, inspection, and test requirements, as applicable, have been satisfied before relying on the item to perform its intended safety function.

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- Controls are imposed for the selection, determination of suitability for intended use (critical characteristics), evaluation, receipt, and acceptance of commercial-grade services or items to assure they will perform satisfactorily in service in safety-related applications.
- If there is insufficient evidence of implementation of a QA program, the initial evaluation is of the existence of a QA program addressing the scope of services to be provided. The initial audit is performed after the supplier has completed sufficient work to demonstrate that its organization is implementing a QA program.
- Legacy technical information to be used in safety-related SSC design shall be qualified as defined in NQA-1-2015, Part IV, subpart 4.2.3.

7.2 NQA-1 COMMITMENT / EXCEPTIONS

In establishing controls for purchased items and services, Kairos Power commits to compliance with NQA-1-2015, Requirement 7, with the following clarifications and exceptions:

- Kairos Power considers that other 10 CFR Parts 50 and 52 licensees, Authorized Nuclear Inspection Agencies, National Institute of Standards and Technology, or other State and Federal agencies which may provide items or services to the Kairos Power plants are not required to be evaluated or audited.
- When purchasing commercial grade calibration or testing services from a laboratory holding accreditation by an accrediting body recognized by the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA), a commercial grade survey need not be performed provided each of the following conditions are met:
 - A documented review of the laboratory's accreditation is performed and includes a verification of the following:
 1. The calibration or test laboratory holds accreditation by an accrediting body recognized by the ILAC MRA. The accreditation encompasses ISO/IEC 17025: 2017, "General Requirements for the Competence of Testing and Calibration Laboratories."
 2. For procurement of calibration services, the published scope of accreditation for the calibration laboratory covers the needed measurement parameters, ranges, and uncertainties.
 3. For procurement of testing services, the published scope of accreditation for the test laboratory covers the needed testing services including test methodology and tolerances/uncertainty.
 4. The laboratory has achieved accreditation based on an on-site accreditation assessment by the selected accrediting body within the past 48 months. The laboratory's accreditation cannot be based on two consecutive remote accreditation assessments.
 - The purchase order documents require that:
 1. The laboratory must provide the service in accordance with their accredited ISO/IEC-17025:2017 program and scope of accreditation.

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2. Reporting as-found calibration data in the certificate of calibration when calibrated items are found to be out-of-tolerance (*for calibration services only*).
 3. Identifying in the certificate of calibration, the equipment/standards used to perform the calibration (*for calibration services only*).
 4. The testing or calibration service supplier shall not subcontract the service to any other supplier.
 5. Notifying the customer of any condition that adversely impacts the laboratory's ability to maintain the scope of accreditation.
 6. Performance of the services listed on the order is contingent on the laboratory's accreditation having been achieved through an on-site accreditation assessment by the accrediting body within the past 48 months.
 7. Additional technical and quality requirements, as necessary, based upon a review of the procured scope of services, which may include, but are not necessarily limited to, tolerances, accuracies, ranges, and industry standards.
- It is validated, at receipt inspection, that the laboratory's documentation certifies that:
 1. The contracted calibration or test service has been performed in accordance with their ISO/IEC-17025:2017 program, and has been performed within their scope of accreditation, and
 2. The purchase order's requirements are met.
 - In establishing commercial grade item requirements, Kairos Power commits to compliance with NQA-1-2015, Requirement 7, Section 700 and Subpart 2.14, with the following clarification:
 - For commercial grade items, quality verification requirements are established and described in Kairos Power documents to provide the necessary assurance an item will perform satisfactorily in service. The Kairos Power documents address determining the critical characteristics that ensure an item is suitable for its intended use, technical evaluation of the item, receipt requirements, and quality evaluation of the item.
 - Kairos Power will assume 10 CFR 21 reporting responsibility for all items that Kairos Power dedicates as safety-related.

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SECTION 8 IDENTIFICATION AND CONTROL OF MATERIALS, PARTS, AND COMPONENTS

Kairos Power has established the necessary measures and governing procedures to identify and control items to prevent the use of incorrect or defective items. This includes controls for consumable materials and items with limited shelf life. The identification of items is maintained throughout fabrication, erection, installation, and use so that the item can be traced to its documentation, consistent with the item's effect on safety. Identification locations and methods are selected so as not to affect the function or quality of the item.

8.1 NQA-1 COMMITMENT

In establishing provisions for identification and control of items, Kairos Power commits to compliance with NQA-1-2015, Requirement 8.

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SECTION 9 CONTROL OF SPECIAL PROCESSES

(This section does not apply to ESP and DC activities, pursuant to NUREG-0800, Section 17.5, Acceptance Criterion I.)

Kairos Power has established the necessary measures and governing procedures to assure that special processes that require interim process controls to assure quality, such as welding, heat treating, and nondestructive examination, are controlled. These provisions include assuring that special processes are accomplished by qualified personnel using qualified procedures and equipment. Personnel are qualified and special processes are performed in accordance with applicable codes, standards, specifications, criteria or other specially established requirements. Special processes are those where the results are highly dependent on the control of the process or the skill of the operator, or both, and for which the specified quality cannot be fully and readily determined by inspection or test of the final product.

9.1 NQA-1 COMMITMENT

In establishing measures for the control of special processes, Kairos Power commits to compliance with NQA-1-2015, Requirement 9.

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SECTION 10 INSPECTION

Kairos Power has established the necessary measures and governing procedures to implement inspections that assure items, services, and activities affecting safety meet established requirements and conform to applicable documented specifications, instructions, procedures, and design documents. Inspection may also be applied to items, services, and activities affecting plant reliability and integrity. Types of inspections may include those verifications related to procurement, such as source, in-process, final, and receipt inspection, as well as construction, installation, maintenance, modification, in-service, and operations activities. Inspections are carried out by properly qualified persons independent of those who performed or directly supervised the work. Inspection results are documented.

10.1 INSPECTION PROGRAM

The inspection program establishes inspections (including surveillance of processes), as necessary to verify quality: (1) at the source of supplied items or services, (2) in-process during fabrication at a supplier's facility or at Kairos Power facilities, (3) for final acceptance of fabricated and/or installed items during construction, and (4) upon receipt of items for a facility, as well as (5) during maintenance, modification, in-service, and operating activities.

The inspection program establishes requirements for planning inspections, such as the group or discipline responsible for performing the inspection, where inspection hold points are to be applied, determining applicable acceptance criteria, the frequency of inspection to be applied, and identification of special tools needed to perform the inspection. Inspection planning is performed by personnel qualified in the discipline related to the inspection and includes qualified inspectors or engineers. Inspection plans are based on, as a minimum, the importance of the item to the safety of the facility, the complexity of the item, technical requirements to be met, and design specifications. Where significant changes in inspection activities for the facilities are to occur, management responsible for the inspection programs evaluate the resource and planning requirements to ensure effective implementation of the inspection program.

Inspection program documents establish requirements for performing the planned inspections, and documenting required inspection information such as rejection, acceptance, and re-inspection results, and the person(s) performing the inspection.

Inspection results are documented by the inspector, reviewed by authorized personnel qualified to evaluate the technical adequacy of the inspection results, and controlled by instructions, procedures, and drawings.

10.2 INSPECTOR QUALIFICATION

Kairos Power has established qualification programs for personnel performing quality inspections. The qualification program requirements are described in Part II, Section 2. These qualification programs are applied to individuals performing quality inspections regardless of the functional group where they are assigned.

10.3 NQA-1 COMMITMENT / EXCEPTIONS

In establishing inspection requirements, Kairos Power commits to compliance with NQA-1-2015, Requirement 10 and Subparts 2.5 and 2.8 for establishing appropriate inspection requirements.

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SECTION 11 TEST CONTROL

Kairos Power has established the necessary measures and governing procedures to demonstrate that items subject to the provisions of the QAPD will perform satisfactorily in service, that the plant can be operated safely and as designed, and that the coordinated operation of the plant as a whole is satisfactory. These programs include criteria for determining when testing is required, such as proof tests before installation, pre-operational tests, post-maintenance tests, post-modification tests, in-service tests, and operational tests (such as surveillance tests required by Plant Technical Specifications), to demonstrate that performance of plant systems is in accordance with design. Programs also include provisions to establish and adjust test schedules, and to maintain status for periodic or recurring tests. Tests are performed according to applicable procedures that include, consistent with the effect on safety: (1) instructions and prerequisites to perform the tests, (2) use of proper test equipment, (3) acceptance criteria, and (4) mandatory verification points as necessary to confirm satisfactory test completion. Test results are documented and evaluated by the organization performing the test and reviewed by a responsible authority to assure that the test requirements have been satisfied. If acceptance criteria are not met, re-testing is performed as needed to confirm acceptability following correction of the system or equipment deficiencies that caused the failure.

The initial start-up test program is planned and scheduled to permit safe fuel loading and start-up; to increase power in safe increments; and to perform major testing at specified power levels. If tests require the variation of operating parameters outside of their normal range, the limits within which such variation is permitted will be prescribed. The scope of the testing demonstrates, insofar as practicable, that the plant is capable of withstanding the design transients and accidents. For new facility construction, the suitability of facility operating procedures is checked to the maximum extent possible during the pre-operational and initial start-up test programs. (This does not apply to ESP activities.)

Except for computer program testing, which is addressed in Part II, Section 11.1, tests are performed and results documented in accordance with applicable technical and regulatory requirements, including those described in the Technical Specifications and SAR. Test programs ensure appropriate retention of test data in accordance with the records requirements of the QAPD. Personnel that perform or evaluate tests are qualified in accordance with the requirements established in Part II, Section 2.

11.1 NQA-1 COMMITMENT FOR COMPUTER PROGRAM TESTING

Kairos Power establishes and implements provisions to assure that computer software used in applications affecting safety is prepared, documented, verified and tested, and used such that the expected output is obtained and configuration control maintained. To this end Kairos Power commits to compliance with the requirements of NQA-1-2015 Requirement 11 Section 400 and Subpart 2.7 to establish the appropriate provisions in addition to the commitment to NQA-1-2015, Requirement 3.

11.2 NQA-1 COMMITMENT

In establishing provisions for testing, Kairos Power commits to compliance with NQA-1-2015, Requirement 11.

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SECTION 12 CONTROL OF MEASURING AND TEST EQUIPMENT

Kairos Power has established the necessary measures and governing procedures to control the calibration, maintenance, and use of measuring and test equipment (M&TE) that provides data to verify acceptance criteria are met or information important to safe plant operation. The provisions of such procedures cover equipment such as indicating and actuating instruments and gages, tools, reference and transfer standards, and nondestructive examination equipment. The suppliers of commercial-grade calibration services are controlled as described in Part II, Subsection 7.2.

12.1 INSTALLED INSTRUMENT AND CONTROL DEVICES

For the operational phase of the facilities, Kairos Power has established and implements procedures for the calibration and adjustment of instrument and control devices installed in the facility. The calibration and adjustment of these devices is accomplished through the facility maintenance programs to ensure the facility is operated within design and technical requirements. Appropriate documentation will be maintained for these devices to indicate the control status, when the next calibration is due, and identify any limitations on use of the device. This paragraph does not apply to ESP activities.

12.2 NQA-1 COMMITMENT/EXCEPTIONS

In establishing provisions for control of measuring and test equipment, Kairos Power commits to compliance with NQA-1-2015, Requirement 12.

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SECTION 13 HANDLING, STORAGE, AND SHIPPING

(Section 13 does not apply to DC activities, pursuant to NUREG-0800, Section 17.5, Acceptance Criterion M.)

Kairos Power has established the necessary measures and governing procedures to control the handling, storage, packaging, shipping, cleaning, and preservation of items to prevent inadvertent damage or loss, and to minimize deterioration. These provisions include specific procedures, when required to maintain acceptable quality of the items important to the safe operations of the plant. Items are appropriately marked and labeled during packaging, shipping, handling, and storage to identify, maintain, and preserve the item's integrity and indicate the need for special controls. Special controls (such as containers, shock absorbers, accelerometers, inert gas atmospheres, specific moisture content levels, and temperature levels) are provided when required to maintain acceptable quality.

Special or additional handling, storage, shipping, cleaning, and preservation requirements are identified and implemented as specified in procurement documents and applicable procedures. Where special requirements are specified, the items and containers (where used) are suitably marked.

Special handling tools and equipment are used and controlled as necessary to ensure safe and adequate handling. Special handling tools and equipment are inspected and tested in accordance with procedures at specified time intervals or prior to use.

Operators of special handling and lifting equipment are experienced or trained in the use the equipment. During the operational phase, Kairos Power establishes and implements controls over hoisting, rigging, and transport activities to the extent necessary to protect the integrity of the items involved, as well as potentially affected nearby structures and components (This requirement does not apply to non-operations activities.) Where required, Kairos Power complies with applicable hoisting, rigging and transportation regulations and codes.

13.1 HOUSEKEEPING

Housekeeping practices are established to account for conditions or environments that could affect the quality of structures, systems, and components within the plant. This includes control of cleanliness of facilities and materials, fire prevention and protection, disposal of combustible material and debris, control of access to work areas, and protection of equipment, as well as radioactive contamination control, and storage of solid radioactive waste. Housekeeping practices help assure that only proper materials, equipment, processes, and procedures are used and that the quality of items is not degraded. Necessary procedures or work instructions, such as for electrical bus and control center cleaning, and cleaning of control consoles, and radioactive decontamination are developed and used. (This paragraph does not apply to ESP or construction activities.)

13.2 NQA-1 COMMITMENT/EXCEPTIONS

In establishing provisions for handling, storage, and shipping, Kairos Power commits to compliance with NQA-1-2015, Requirement 13. Kairos Power also commits, during the construction and operational phase of the plant, to compliance with the requirements of NQA-1-2015, Subpart 2.1, Subpart 2.2, Subpart 2.3, and Subpart 3.2-2.1, with the following clarifications and exceptions (this commitment and the following clarifications and exceptions do not apply to ESP activities):

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NQA-1-2015, Subpart 2.1

- Subpart 2.1, Section 301 and 302 establish criteria for classifying items into cleanliness classes and requirements for each class. Instead of using the cleanliness level system of Subpart 2.1, Kairos Power may establish cleanliness requirements on a case-by-case basis, consistent with the other provisions of Subpart 2.1. Kairos Power establishes appropriate cleanliness controls for work on safety-related equipment to minimize introduction of foreign material and maintain system/component cleanliness throughout maintenance or modification activities, including documented verification of absence of foreign material prior to system closure.

NQA-1-2015, Subpart 2.2

- Subpart 2.2, Section 201 establishes criteria for classifying items into protection levels. Instead of classifying items into protection levels during the operational phase, Kairos Power may establish controls for the packaging, shipping, handling, and storage of such items on a case-by-case basis with due regard for the item's complexity, use, and sensitivity to damage. Prior to installation or use, the items are inspected and serviced as necessary to assure that no damage or deterioration exists which could affect their function.
- Subpart 2.2, Section 606, "Storage Records:" This section requires written records be prepared containing information on personnel access. As an alternative to this requirement, Kairos Power documents establish controls for storage areas that describe those authorized to access areas and the requirements for recording access of personnel. However, these records of access are not considered quality records and will be retained in accordance with the administrative controls of the applicable plant.

NQA-1-2015, Subpart 2.3

- Subpart 2.3, Section 202 requires the establishment of five zone designations for housekeeping cleanliness controls. Instead of the five-level zone designation, Kairos Power bases its control over housekeeping activities on a consideration of what is necessary and appropriate for the activity involved. The controls are implemented through procedures or instructions which, in the case of maintenance or modification work, are developed on a case-by-case basis. Factors considered in developing the procedures and instructions include cleanliness control, personnel safety, fire prevention and protection, radiation control, and security. The procedures and instructions make use of standard janitorial and work practices to the extent possible.

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SECTION 14 INSPECTION, TEST, AND OPERATING STATUS

(This section does not apply to DC and ESP activities, pursuant to NURGE-0800, Section 17.5, Acceptance Criterion N.)

Kairos Power has established the necessary measures and governing procedures to identify the inspection, test, and operating status of items and components subject to the provisions of the QAPD in order to maintain personnel and reactor safety and avoid inadvertent operation of equipment. Where necessary to preclude inadvertent bypassing of inspections or tests, or to preclude inadvertent operation, these measures require the inspection, test, or operating status be verified before release, fabrication, receipt, installation, test or use. These measures also establish the necessary authorities and controls for the application and removal of status indicators or labels.

In addition, temporary design changes (temporary modifications), such as temporary bypass lines, electrical jumpers and lifted wires, and temporary trip-point settings, are controlled by procedures that include requirements for appropriate installation and removal, independent/concurrent verifications, and status tracking.

Administrative procedures also describe the measures taken to control altering the sequence of required tests, inspections, and other operations. Review and approval for these actions is subject to the same control as taken during the original review and approval of tests, inspections, and other operations.

14.1 NQA-1 COMMITMENT

In establishing measures for control of inspection, test and operating status, Kairos Power commits to compliance with NQA-1-2015, Requirement 14.

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SECTION 15 NONCONFORMING MATERIALS, PARTS, OR COMPONENTS

Kairos Power has established the necessary measures and governing procedures to control items, including services that do not conform to specified requirements to prevent inadvertent installation or use. Instructions require that the individual discovering a nonconformance identify, describe, and document the nonconformance in accordance with the requirements of Part II, Section 16. Controls provide for identification, documentation, evaluation, segregation when practical, and disposition of nonconforming items, and for notification to affected organizations. Controls are provided to address conditional release of nonconforming items for use on an at-risk basis prior to resolution and disposition of the nonconformance, including maintaining identification of the item and documenting the basis for such release. Conditional release of nonconforming items for installation requires the approval of the designated management. Nonconformances are corrected or resolved prior to depending on the item to perform its intended safety function. Nonconformances are evaluated for impact on operability of quality structures, systems, and components to assure that the final condition does not adversely affect safety, operation, or maintenance of the item or service. Nonconformances to design requirements dispositioned repair or use-as-is are subject to design control measures commensurate with those applied to the original design. Nonconformance dispositions are reviewed for adequacy, analysis of quality trends, and reports provided to the designated management. Significant trends are reported to management in accordance with Kairos Power procedures, regulatory requirements, and industry standards.

15.1 INTERFACE WITH THE REPORTING PROGRAM

Kairos Power has appropriate interfaces between the QAP for identification and control of nonconforming materials, parts, or components and the non-QA Reporting Program to satisfy the requirements of 10 CFR 52, 10 CFR 50.55 and/or 10 CFR 21 during ESP/CP/COL design and construction and 10 CFR 21 during operations.

15.2 NQA-1 COMMITMENT

In establishing measures for nonconforming materials, parts, or components, Kairos Power commits to compliance with NQA-1-2015, Requirement 15.

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SECTION 16 CORRECTIVE ACTION

Kairos Power has established the necessary measures and governing procedures to promptly identify, control, document, classify, and correct conditions adverse to quality. Kairos Power procedures assure that corrective actions are documented and initiated following the determination of conditions adverse to quality in accordance with regulatory requirements and applicable quality standards. Kairos Power procedures require personnel to identify known conditions adverse to quality. When complex issues arise where it cannot be readily determined if a condition adverse to quality exists, Kairos Power documents establish the requirements for documentation and timely evaluation of the issue. Reports of conditions adverse to quality are analyzed to identify trends. Significant conditions adverse to quality and significant adverse trends are documented and reported to responsible management. In the case of a significant condition adverse to quality, the cause is determined and actions to preclude recurrence are taken.

In the case of suppliers working on safety-related activities, or other similar situations, Kairos Power may delegate specific responsibilities for corrective actions but Kairos Power maintains responsibility for the effectiveness of corrective action measures.

16.1 INTERFACE WITH THE REPORTING PROGRAM

Kairos Power has appropriate interfaces between the QAP for corrective actions and the non-QA Reporting Program to satisfy the requirements of 10 CFR 52, 10 CFR 50.55 and/or 10 CFR 21 during ESP/CP/COL design and construction, and 10 CFR 21 during operations.

16.2 NQA-1 COMMITMENT

In establishing provisions for corrective action, Kairos Power commits to compliance with NQA-1-2015, Requirement 16.

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SECTION 17 QUALITY ASSURANCE RECORDS

Kairos Power has the necessary measures and governing procedures to ensure that sufficient records of items and activities affecting quality are developed, reviewed, approved, issued, used, and revised to reflect completed work. The provisions of such procedures establish the scope of the records retention program for Kairos Power and include requirements for records administration, including receipt, preservation, retention, storage, safekeeping, retrieval, access controls, user privileges, and final disposition.

17.1 RECORD RETENTION

Measures are established that ensure that sufficient records of completed items and activities affecting quality are appropriately stored. Records of activities for design, engineering, procurement, construction, inspection and test, installation, pre-operation, startup, operations, maintenance, modification, and audits and their retention times are defined in appropriate procedures. The records and retention times are based on Regulatory Position C.3.a.(1) and C.3.a.(2) of Regulatory Guide 1.28, Revision 5 for design, construction, and initial start-up. Retention times for operational phase records are based on construction records that are similar in nature. In all cases where state, local, or other agencies have more restrictive requirements for record retention, those requirements will be met.

17.2 ELECTRONIC RECORDS

When using optical disks for electronic records storage and retrieval systems, Kairos Power complies with the NRC guidance in Generic Letter 88-18, "Plant Record Storage on Optical Disks." Kairos Power will manage the storage of QA Records in electronic media consistent with the intent of RIS 2000-18 and associated NIRMA Guidelines TG 11-2011, TG15-2011, TG16-2011, and TG21-2011.

17.3 NQA-1 COMMITMENT/EXCEPTIONS

In establishing provisions for records, Kairos Power commits to compliance with NQA-1-2015, Requirement 17, and regulatory positions stated in Regulatory Guide 1.28, Revision 5, October 2017.

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SECTION 18 AUDITS

Kairos Power has established the necessary measures and governing procedures to implement audits to verify that activities covered by the QAPD are performed in conformance with the established requirements and performance criteria are met. The audit programs are themselves reviewed for effectiveness as a part of the overall audit process.

18.1 PERFORMANCE OF AUDITS

Internal audits of selected aspects of, design, construction and operating phase activities are performed with a frequency commensurate with safety significance and in a manner which assures that audits of safety-related activities are completed. During early activities, audits will focus on areas including, but not limited to, design, site investigation, procurement, and corrective action. Functional areas of an organization's QA program for auditing include, at a minimum, verification of compliance and effectiveness of implementation of internal rules, procedures (e.g., operating, design, procurement, maintenance, modification, refueling, surveillance, test, security, radiation control procedures, and the emergency plan), Technical Specifications, regulations and license conditions, programs for training, retraining, qualification and performance of operating staff, corrective actions, and observation of performance of operating, refueling, maintenance, and modification activities, including associated record keeping.

The audits are scheduled on a formal preplanned audit schedule and in a manner to provide coverage and coordination with ongoing activities, based on the status and importance of the activity. Additional audits may be performed as deemed necessary by management. The scope of the audit is determined by the quality status and safety importance of the activities being performed. These audits are conducted by trained personnel not having direct responsibilities in the area being audited and in accordance with preplanned and approved audit plans or checklists, under the direction of a qualified lead auditor and the cognizance of Quality Assurance responsible for the day to day program as documented in Part II, Section 1.

Kairos Power is responsible for conducting periodic internal audits to determine the adequacy of programs and procedures (by representative sampling), and to determine if they are meaningful and comply with the overall QAPD.

The results of each audit are reported in writing to the responsible Senior Executive responsible for the Quality Assurance program, or designee, as appropriate. Additional internal distribution is made to other concerned management levels and to management of the internal audited organizations or activities in accordance with approved procedures.

Management responds to all audit findings and initiates corrective action where indicated. Where corrective action measures are indicated, documented follow-up of applicable areas through inspections, review, re-audits, or other appropriate means is conducted to verify implementation of assigned corrective action.

Audits of suppliers of safety-related components and/or services are conducted as described in Part II, Subsection 7.1.

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18.2 INTERNAL AUDITS

Internal audits of organization and facility activities, conducted prior to placing the facility in operation, should be performed in such a manner as to assure that an audit of all applicable QA program elements is completed for each functional area at least once each year or at least once during the life of the activity, whichever is shorter.

Internal audits of activities, conducted after placing the facility in operation, should be performed in such a manner as to assure that an audit of all applicable QA program elements is completed for each functional area within a period of two years. Internal audit frequencies of well established activities, conducted after placing the facility in operation, may be extended one year at a time beyond the above two-year interval based on the results of an annual evaluation of the applicable functional area and objective evidence that the functional area activities are being satisfactorily accomplished. The evaluation should include a detailed performance analysis of the functional area based upon applicable internal and external source data and due consideration of the impact of any functional area changes in responsibility, resources, or management. However, the internal audit frequency interval should not exceed a maximum of four years. If an adverse trend is identified in the applicable functional area, the extension of the internal audit frequency interval should be rescinded and an audit scheduled as soon as practicable.

During the operational phase audits are performed at a frequency commensurate with the safety significance of the activities and in such a manner to assure audits of all applicable QA program elements are completed within a period of two years. These audits will include, as a minimum, activities in the following areas:

- The conformance of facility operation to provisions contained within the Technical Specifications and applicable license conditions including administrative controls.
- The performance, training, and qualifications of the facility staff.
- The performance of activities required by the QAPD to meet the criteria of 10 CFR 50, Appendix B.
- The Fire Protection Program and implementing procedures. A fire protection equipment and program implementation inspection and audit are conducted utilizing either a qualified off-site licensed fire protection engineer or an outside qualified fire protection consultant.
- Other activities and documents considered appropriate by the Site Executive.

Audits may also be used to meet the periodic review requirements of the code for the Security, Emergency Preparedness, and Radiological Protection programs within the provisions of the applicable code. This requirement does not apply to non-operations activities.

Internal audits include verification of compliance and effectiveness of the administrative controls established for implementing the requirements of the QAPD; regulations and license provisions; provisions for training, retraining, qualification, and performance of personnel performing activities covered by the QAPD; corrective actions taken following abnormal occurrences; and, observation of the performance of construction, fabrication, operating, refueling, maintenance, and modification activities including associated record keeping.

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18.3 NQA-1 COMMITMENT

In establishing the independent audit program, Kairos Power commits to compliance with NQA-1-2015, Requirement 18 and the applicable regulatory positions stated in Regulatory Guide 1.28, Revision 5.

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PART III. NONSAFETY-RELATED STRUCTURES, SYSTEMS, AND COMPONENTS (SSC) QUALITY CONTROL

SECTION 1 NONSAFETY-RELATED WITH SPECIAL TREATMENT

Specific program controls are applied to nonsafety-related SSCs with special treatment, for which 10 CFR 50, Appendix B is not applicable, that are relied on to perform safety-significant functions. The specific program controls consistent with applicable sections of the QAPD are applied to those items in a selected manner, targeted at those characteristics or critical attributes with safety-significant functions.

The following clarify the applicability of the QA Program to the nonsafety-related SSCs with special treatment and related activities, including the identification of exceptions to the QA Program described in Part II, Sections 1 through 18 taken for nonsafety-related SSCs with special treatment.

1.1 ORGANIZATION

The verification activities described in this part may be performed by the Kairos Power line organization. The QA organization described in Part II is not required to perform these functions.

1.2 QUALITY ASSURANCE PROGRAM

Kairos Power QA requirements for nonsafety-related SSCs are established in the QAPD and appropriate procedures. Suppliers of these SSCs or related services describe the quality controls applied in appropriate procedures. A new or separate QA program is not required.

1.3 DESIGN CONTROL

Kairos Power has design control measures to ensure that the contractually established design requirements are included in the design. These measures ensure that applicable design inputs are included or correctly translated into the design documents, and deviations from those requirements are controlled. Design verification is provided through the normal supervisory review of the designer's work.

1.4 PROCUREMENT DOCUMENT CONTROL

Procurement documents for items and services obtained by or for Kairos Power include or reference documents describing applicable design bases, design requirements, and other requirements necessary to ensure component performance. The procurement documents are controlled to address deviations from the specified requirements.

1.5 INSTRUCTIONS, PROCEDURES, AND DRAWINGS

Kairos Power provides documents such as, but not limited to, written instructions, plant procedures, drawings, vendor technical manuals, and special instructions in work orders, to direct the performance of activities affecting quality. The method of instruction employed provides an appropriate degree of guidance to the personnel performing the activity to achieve acceptable functional performance of the SSC.

1.6 DOCUMENT CONTROL

Kairos Power controls the issuance and change of documents that specify quality requirements or prescribe activities affecting quality to ensure that correct documents are used. These controls include review and approval of documents, identification of the appropriate revision for use, and measures to preclude the use of superseded or obsolete documents.

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1.7 CONTROL OF PURCHASED ITEMS AND SERVICES

Kairos Power employs measures, such as inspection of items or documents upon receipt or acceptance testing, to ensure that all purchased items and services conform to appropriate procurement documents.

1.8 IDENTIFICATION AND CONTROL OF PURCHASED ITEMS

Kairos Power employs measures where necessary, to identify purchased items and preserve their functional performance capability. Storage controls take into account appropriate environmental, maintenance, or shelf life restrictions for the items.

1.9 CONTROL OF SPECIAL PROCESSES

Kairos Power employs process and procedure controls for special processes, including welding, heat treating, and nondestructive testing. These controls are based on applicable codes, standards, specifications, criteria, or other special requirements for the special process.

1.10 INSPECTION

Kairos Power uses documented instructions to ensure necessary inspections are performed to verify conformance of an item or activity to specified requirements or to verify that activities are satisfactorily accomplished. These inspections may be performed by knowledgeable personnel in the line organization. Knowledgeable personnel are from the same discipline and have experience related to the work being inspected.

1.11 TEST CONTROL

Kairos Power employs measures to identify required testing that demonstrates that equipment conforms to design requirements. These tests are performed in accordance with test instructions or procedures. The test results are recorded, and authorized individuals evaluate the results to ensure that test requirements are met.

1.12 CONTROL OF MEASURING AND TEST EQUIPMENT

Kairos Power employs measures to control M&TE use, and calibration and adjustment at specific intervals or prior to use.

1.13 HANDLING, STORAGE, AND SHIPPING

Kairos Power employs measures to control the handling, storage, cleaning, packaging, shipping, and preservation of items to prevent damage or loss and to minimize deterioration. These measures include appropriate marking or labels, and identification of any special storage or handling requirements.

1.14 INSPECTION, TEST, AND OPERATING STATUS

Kairos Power employs measures to identify items that have satisfactorily passed required tests and inspections and to indicate the status of inspection, test, and operability as appropriate.

1.15 CONTROL OF NONCONFORMING ITEMS

Kairos Power employs measures to identify and control items that do not conform to specified requirements to prevent their inadvertent installation or use.

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1.16 CORRECTIVE ACTION

Kairos Power employs measures to ensure that failures, malfunctions, deficiencies, deviations, defective components, and nonconformances are properly identified, reported, and corrected.

1.17 RECORDS

Kairos Power employs measures to ensure records are prepared and maintained to furnish evidence that the above requirements for design, procurement, document control, inspection, and test activities have been met.

1.18 AUDITS

Kairos Power employs measures for line management to periodically review and document the adequacy of the process, including taking any necessary corrective action. Audits independent of line management are not required. Line management is responsible for determining whether reviews conducted by line management or audits conducted by any organization independent of line management are appropriate. If performed, audits are conducted and documented to verify compliance with design and procurement documents, instructions, procedures, drawings, and inspection and test activities. Where the measures of this part (Part III) are implemented by the same programs, processes, or procedures as the comparable activities of Part II, the audits performed under the provisions of Part II may be used to satisfy the review requirements of this Section (Part III, Section 1.18).

SECTION 2 NONSAFETY-RELATED STRUCTURES, SYSTEMS, AND COMPONENTS CREDITED FOR REGULATORY EVENTS

The following criteria apply to fire protection (10 CFR 50.48), anticipated transients without scram (ATWS) (10 CFR 50.62), the station blackout (SBO) (10 CFR 50.63) SSCs that are not safety-related:

- Kairos Power implements quality requirements for the fire protection system in accordance with Regulatory Position 1.7, "Quality Assurance," in Regulatory Guide 1.189, "Fire Protection for Nuclear Power Plants," Revision 3.
- Kairos Power implements the quality requirements for nonsafety-related, safety significant ATWS equipment in accordance with Part III, Section1.
- Kairos Power implements quality requirements for nonsafety-related, safety significant SBO equipment in accordance with Part III, Section1.

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PART IV. REGULATORY COMMITMENTS

NRC REGULATORY GUIDES AND QUALITY ASSURANCE STANDARDS

This section identifies the NRC Regulatory Guides (RG) and the other quality assurance standards which have been selected to supplement and support the Kairos Power QAPD. Kairos Power identifies the extent of conformance with these RG and quality assurance standards as described below or within applicable license application documents submitted in accordance with 10 CFR 50 (e.g., LWA, CP, OL) and 10 CFR 52 (e.g., ESP, DC, COL, SDA), as applicable. Commitment to a particular RG or standard does not constitute a commitment to other RGs or standards that may be referenced therein.

REGULATORY GUIDES

Regulatory Guide 1.8, Rev. 4, June 2019, Qualification and Training of Personnel for Nuclear Power Plants

Regulatory Guide 1.8 provides guidance that is acceptable to the NRC staff regarding qualifications and training for nuclear power plant personnel. Kairos Power will implement Revision 4 to Regulatory Guide 1.8.

Regulatory Guide 1.28, Rev. 5, October 2017, Quality Assurance Program Criteria (Design and Construction)

Regulatory Guide 1.28 describes a method acceptable to the NRC staff for complying with the provisions of Appendix B with regard to establishing and implementing the requisite quality assurance program for the design and construction of nuclear power plants.

Kairos Power will implement this guidance and will identify exceptions to the applicable regulatory position guidance provided in this regulatory guide in applicable license applications (e.g., safety analysis reports).

Regulatory Guide 1.29, Rev. 5, July 2016 - Seismic Design Classification

Regulatory Guide 1.29 defines light water reactor systems required to withstand a safe shutdown earthquake (SSE). Kairos Power will identify conformance with the applicable regulatory position guidance provided in this regulatory guide in applicable license applications (e.g., safety analysis reports).

Regulatory Guide 1.33, Rev. 3, June 2013, Quality Assurance Program Requirements (Operations)

Regulatory Guide 1.33 describes a method acceptable to the NRC staff for complying with the Commission's regulations with regard to overall quality assurance program requirements for the operation phase of nuclear power plants. Kairos Power will implement this guidance and will identify exceptions to the applicable regulatory position guidance provided in this regulatory guide in applicable license applications (e.g., safety analysis reports).

STANDARDS

ASME NQA-1-2015 - Quality Assurance Requirements for Nuclear Facility Applications

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Kairos Power commits to NQA-1-2015, Parts I and II, as described in Parts II and V of this document with specific identification of exceptions or clarification. Kairos Power commits to NQA-1-2015, and Parts III and IV only as specifically noted in Parts II and V of this document.

Nuclear Information and Records Management Association, Inc. (NIRMA) Technical Guides (TGs)

Kairos Power commits to NIRMA TGs as described in Part II, Section 17.

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PART V. ADDITIONAL QUALITY ASSURANCE AND ADMINISTRATIVE CONTROLS FOR THE PLANT OPERATIONAL PHASE

Kairos Power includes the requirements of Section 5 that follow when establishing the necessary measures and governing procedures for the operational phase of the plant. Implementation of the additional controls in this section shall apply 30 days prior to initial fuel load for COL holders in accordance with 10 CFR 50.54(a)(1) and 90 days prior to initial fuel load for construction permit holders.

SECTION 1 DEFINITIONS

Kairos Power uses the definitions of terms as provided in Section 400 of the Introduction of NQA-1-2015 in interpreting the requirements of NQA-1 and the other standards to which the QAPD commits. In addition, definitions are provided for the following terms not covered in NQA-1:

administrative controls: rules, orders, instructions, procedures, policies, practices, and designations of authority and responsibility

experiments: performance of plant operations carried out under controlled conditions in order to establish characteristics or values not previously known

independent review: review completed by personnel not having direct responsibility for the work function under review regardless of whether they operate as a part of an organizational unit or as individual staff members (see review)

nuclear power plant: any plant using a nuclear reactor to produce electric power, process steam, or provide space heating

on-site operating organization: on-site personnel concerned with the operation, maintenance and certain technical services

operating activities: work functions associated with normal operation and maintenance of the plant, and technical services routinely assigned to the on-site operating organization

operational phase: that period of time during which the principal activity is associated with normal operation of the plant. This phase of plant life is considered to begin formally with commencement of initial fuel loading, and ends with plant decommissioning

review: a deliberately critical examination, including observation of plant operation, evaluation of assessment results, procedures, certain contemplated actions, and after-the-fact investigations of abnormal conditions

supervision: direction of personnel activities or monitoring of plant functions by an individual responsible and accountable for the activities they direct or monitor

surveillance testing: periodic testing to verify that safety related structures, systems, and components continue to function or are in a state of readiness to perform their functions

system: an integral part of nuclear power plant comprising components which may be operated or used as a separate entity to perform a specific function

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SECTION 2 REVIEW OF ACTIVITIES AFFECTING SAFE PLANT OPERATION

2.1 ONSITE OPERATING ORGANIZATION REVIEW

The Kairos Power onsite organization employs reviews, both periodic and as situations demand, to evaluate plant operations and plan future activities. The important elements of the reviews are documented and subjects of potential concern for the independent review described below are brought to the attention of Operations Phase Management. The reviews are part of the normal duties of plant supervisory personnel in order to provide timely and continuing monitoring of operating activities in order to assist Operations Phase Management in keeping abreast of general plant conditions and to verify that day-to-day operations are conducted safely in accordance with the established administrative controls. Operations Phase Management ensures the timely referral of the applicable matters discussed in the reviews to appropriate management and independent reviewers.

2.2 INDEPENDENT REVIEW

Activities occurring during the operational phase shall be independently reviewed on a periodic basis. The independent review program shall be functional prior to initial core loading. The independent review function performs the following:

- Reviews proposed changes to the facility as described in the safety analysis report (SAR). An Independent Review Group (IRG) also verifies that changes do not adversely affect safety and if a technical specification change or NRC review is required.
- Reviews proposed tests and experiments not described in the SAR prior to implementation. Verifies the determination of whether changes to proposed tests and experiments not described in the SAR require a technical specification change or license amendment.
- Reviews proposed technical specification changes and license amendments relating to nuclear safety prior to NRC submittal and implementation, except in those cases where the change is identical to a previously approved change.
- Reviews violations, deviations, and events that are required to be reported to the NRC. This review includes the results of investigations and recommendations resulting from such investigations to prevent or reduce the probability of recurrence of the event.
- Reviews any matter related to nuclear safety that is requested by the Site Executive or Operations Phase Management or any Independent Review Group member.
- Reviews corrective actions for significant conditions adverse to quality.
- Reviews internal audit reports.
- Reviews the adequacy of the internal audit program every 24 months.

Independent Review Group

A formally established group functions as an Independent Review Group (IRG). In discharging its review responsibilities, the IRG keeps safety considerations paramount when opposed to cost or schedule considerations. The IRG performs its functions in the following manner:

- An Independent Review Group is assigned independent review responsibilities and reports to the Site Executive.

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- The Independent Review Group is composed of no less than 5 persons; no more than a minority of members are from the on-site operating organization.
For example, at least 3 of the 5 members must be from off-site if there are 5 members on the group. A minimum of the chairman or alternative chairman and 2 members must be present for all meetings.
- During the period of initial operation, meetings are conducted no less frequently than once per calendar quarter. Afterwards meetings are conducted no less than twice a year.
- Results of the meeting are documented and recorded.
- Consultants and contractors are used for the review of complex problems beyond the expertise of the off-site/on site independent review group.
- Persons on the Independent Review Group are qualified as follows:

Chairman of the Independent Review Group

Education: Baccalaureate in engineering or related science

Minimum experience: Six (6) years combined managerial and technical support

Independent Review Group members

Education: Baccalaureate in engineering or related science for those personnel required to review problems in nuclear power plant operations, nuclear engineering, chemistry and radiochemistry, metallurgy, non-destructive testing, instrumentation and control, radiological safety, mechanical engineering or electrical engineering.

High school diploma for those independent review personnel required to review problems in administrative control and quality assurance practices, training, and emergency plans and related procedures and equipment.

Minimum experience: Five (5) years experience in their own area of responsibility (nuclear power plant operations, nuclear engineering, chemistry and radiochemistry, metallurgy, non-destructive testing, instrumentation and control, radiological safety, mechanical engineering, and electrical engineering, administrative control and quality assurance practices, training, and emergency plans and related procedures and equipment).

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SECTION 3 OPERATIONAL PHASE PROCEDURES

The following is a description of the various types of procedures used by Kairos Power to govern the design, operation, and maintenance of its nuclear generating plants. Kairos Power follows the guidance of Regulatory Guide 1.33 in identifying the types of activities that should have procedures or instructions to control the activity. Each procedure shall be sufficiently detailed for a qualified individual to perform the required function without direct supervision, but need not provide a complete description of the system or plant process.

3.1 FORMAT AND CONTENT

Procedure format and content may vary from one location to the other; however, procedures include the following elements as appropriate to the purpose or task to be described.

Title/Status

Each procedure is given a title descriptive of the work or subject it addresses, and includes a revision number and/or date and an approval status.

Purpose/Statement of Applicability/Scope

The purpose for which the procedure is intended is clearly stated (if not clear from the title). The systems, structures, components, processes or conditions to which the procedure applies are also clearly described.

References

Applicable references, including reference to appropriate Technical Specifications, are required. References are included within the body of the procedure when the sequence of steps requires other tasks to be performed (according to the reference) prior to or concurrent with a particular step.

Prerequisites/Initial Conditions

Prerequisites/initial conditions identify independent actions or procedures that must be accomplished and plant conditions which must exist prior to performing the procedure; including prerequisites applicable to only a specific portion of a procedure.

Precautions

Precautions alert the user to those important measures to be used to protect equipment and personnel, including the public, or to avoid an abnormal or emergency situation during performance of the procedure. Cautionary notes applicable to specific steps are included in the main body of the procedure and are identified as such.

Limitations and actions

Limitations on the parameters being controlled and appropriate corrective measures to return the parameter to the normal control band are specified.

Main body

The main body of the procedure contains the step-by-step instructions in the degree of detail necessary for performing the required function or task.

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Acceptance criteria

The acceptance criteria provide the quantitative or qualitative criteria against which the success or failure (as of a test-type activity) of the step or action would be judged.

Checklists

Complex procedures utilize checklists which may be included as part of the procedure or appended to it.

3.2 PROCEDURE TYPES

Procedure types may vary from one location to the other based on scope of activities; however, procedures are developed in each of the following categories.

Administrative Control Procedures

These include administrative procedures, directives, policies, standards, and similar documents that control the programmatic aspects of facility activities. These administrative documents ensure that the requirements of regulatory and license commitments are implemented. Several levels of administrative controls are applied ranging from those affecting the entire Company to those prepared at the implementing group level. These documents establish responsibilities, interfaces, and standard methods (rules of practice) for implementing programs. In addition to the administrative controls described throughout this QAPD, instructions governing the following activities are provided:

Operating Orders/Procedures

Instructions of general and continuing applicability to the conduct of business to the plant staff are provided. Examples include, but are not limited to, job turnover and relief, designation of confines of control room, definition of duties of operators and others, transmittal of operating data to management, filing of charts, limitations on access to certain areas and equipment, shipping and receiving instructions. Provisions are made for periodic review and updating of these documents, where appropriate.

Special Orders

Management instructions, which have short-term applicability and require dissemination, are issued to encompass special operations, housekeeping, data taking, publications and their distribution, plotting process parameters, personnel actions, or other similar matters. Provisions are made for periodic review, updating, and cancellation of these documents, where appropriate.

Plant Security and Visitor Control

Procedures or instructions developed to supplement features and physical barriers designed to control access to the plant and, as appropriate, to vital areas within the plant. Information concerning specific design features and administrative provisions of the plant security program is confidential and thus accorded limited distribution. The security and visitor control procedures consider, for example, physical provisions, such as: fences and lighting; lock controls for doors, gates and compartments containing sensitive equipment; and provisions for traffic and access control. Administrative provisions, such as: visitor sign-in and sign-out procedures; escorts and badges for

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visitors; emphasis on inspection, observation and challenging of strangers by operating crews; and a program of pre-employment screening for potential employees are also considered.

Temporary Procedures

Temporary procedures may be used to direct operations during testing, refueling, maintenance, and modifications to provide guidance in unusual situations not within the scope of the normal procedures. These procedures ensure orderly and uniform operations for short periods when the plant, a system, or a component of a system is performing in a manner not covered by existing detailed procedures or has been modified or extended in such a manner that portions of existing procedures do not apply. Temporary Procedures include designation of the period of time during which they may be used and are subject to the procedure review process as applicable.

Engineering Procedures

These documents provide instructions for the preparation of engineering documents, engineering analysis, and implementation of engineering programs. This includes activities such as designs; calculations; fabrication, equipment, construction, and installation specifications; drawings; analysis and topical reports; and testing plans or procedures. They include appropriate references to industry codes and standards, design inputs, and technical requirements.

Configuration Management Procedures

These documents provide instructions for the responsibility and authority for functions that affect the configuration of the facility including activities such as operations, design, maintenance, construction, licensing, and procurement. Kairos Power shall establish and document a time or event when configuration management shall be established for the facility.

Installation Procedures

These documents provide instructions for the installation of components generally related to new construction and certain modification activities. They include appropriate reference to industry standards, installation specifications, design drawings, and supplier and technical manuals for the performance of activities. These documents include provisions, such as hold or witness points, for conducting and recording results of required inspections or tests. These documents may include applicable inspection and test instructions subject to the requirements for test and inspection procedures below.

System Procedures

These documents contain instructions for energizing, filling, venting, draining, starting up, shutting down, changing modes of operation, and other instructions appropriate for operations of systems related to the safety of the plant. Actions to correct off-normal conditions are invoked following an operator observation or an annunciator alarm indicating a condition which, if not corrected, could degenerate into a condition requiring action under an emergency procedure. Separate procedures may be developed for correcting off-normal conditions for those events where system complexity may lead to operator uncertainty. Appropriate procedures will also be developed for the fire protection program.

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Start-up Procedures

These documents contain instructions for starting the reactor from cold or hot conditions and establishing power operation. This includes documented determination that prerequisites have been met, including confirmation that necessary instruments are operable and properly set; valves are properly aligned, necessary system procedures, tests and calibrations have been completed; and required approvals have been obtained.

Shutdown Procedures

These documents contain guidance for operations during controlled shutdown and following reactor trips, including instructions for establishing or maintaining hot shutdown/standby or cold shutdown conditions, as applicable. The major steps involved in shutting down the plant are specified, including instructions for such actions as monitoring and controlling reactivity, load reduction and cooldown rates, sequence for activating or deactivating equipment, requirements for prompt analysis for causes of reactor trips or abnormal conditions requiring unplanned controlled shutdowns, and provisions for decay heat removal.

Power Operation and Load Changing Procedures

These documents contain instructions for steady-state power operation and load changing. These type documents include, as examples, provisions for use of control rods, chemical shim, coolant flow control, or any other system available for short-term or long-term control of reactivity, making deliberate load changes, responding to unanticipated load changes, and adjusting operating parameters.

Process Monitoring Procedures

These documents contain instructions for monitoring performance of plant systems to assure that core thermal margins and coolant quality are maintained in acceptable status at all times, that integrity of fission product barriers is maintained, and that engineered safety features and emergency equipment are in a state of readiness to keep the plant in a safe condition if needed. Maximum and minimum limits for process parameters are appropriately identified. Operating procedures address the appropriate nature and frequency of this monitoring.

Fuel Handling Procedures

These documents contain instructions for core alterations, accountability of fuel and partial or complete refueling operations that include, for example, continuous monitoring of neutron flux throughout core loading, periodic data recording, audible annunciation of abnormal flux increases, and evaluation of core neutron multiplication to verify safety of loading increments. Procedures are also provided for receipt and inspection of new fuel, and for new and spent fuel movement. Fuel handling procedures include prerequisites to verify the status of systems required for fuel handling and movement; inspection of replacement fuel and control rods; designation of proper tools, proper conditions for spent fuel movement, proper conditions for fuel cask loading and movement; and status of protective instrumentation. These procedures provide requirements for fuel movement, rules for minimum operable instrumentation, actions for response to fuel damage, verification of shutdown margin, communications associated with, criteria for, and verification of fuel movement, and documentation of fuel locations.

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Maintenance Procedures

These documents contain instructions in sufficient detail to permit maintenance work to be performed correctly and safely, and include provisions, such as hold or witness points, for conducting and recording results of required inspections or tests. These documents may include applicable inspection or test instructions subject to the requirements for test and inspection procedures below. Appropriate referencing to other procedures, standards, specifications, or supplier manuals is provided. When not provided through other documents, instructions for equipment removal and return to service, and applicable radiation protection measures (such as protective clothing and radiation monitoring) will be included. Additional maintenance procedure requirements are addressed in NQA-1-2015, Subpart 2.18, Section 202, Procedures.

Radiation Control Procedures

These documents contain instructions for implementation of the radiation control program requirements necessary to meet regulatory commitments, including acquisition of data and use of equipment to perform necessary radiation surveys, measurements and evaluations for the assessment and control of radiation hazards. These procedures provide requirements for monitoring both external and internal exposures of employees, utilizing accepted techniques; routine radiation surveys of work areas; effluent and environmental monitoring in the vicinity of the plant; radiation monitoring of maintenance and special work activities, and for maintaining records demonstrating the adequacy of measures taken to control radiation exposures to employees and others.

Calibration and Test Procedures

These documents contain instructions for periodic calibration and testing of instrumentation and control systems, and for periodic calibration of measuring and test equipment used in activities affecting the quality of these systems. These documents provide for meeting surveillance requirements and for assuring measurement accuracy adequate to keep safety-related parameters within operational and safety limits.

Chemical and Radiochemical Control Procedures

These documents contain instructions for chemical and radiochemical control activities and include: the nature and frequency of sampling and analyses; instructions for maintaining coolant quality within prescribed limits; and limitations on concentrations of agents that could cause corrosive attack, foul heat transfer surfaces, or become sources of radiation hazards due to activation. These documents also provide for the control, treatment and management of radioactive wastes, and control of radioactive calibration sources.

Emergency Operating Procedures

These documents contain instructions for response to potential emergencies so that a trained operator will know in advance the expected course of events that will identify an emergency and the immediate actions that are taken in response. Format and content of emergency procedures are based on NUREG and Owner's Group(s) guidance that identify potential emergency conditions and require such procedures to include, as appropriate, a title, symptoms to aid in identification of the nature of the emergency, automatic actions to be expected from protective systems, immediate operator actions for operation of controls or confirmation of automatic actions, and subsequent

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operator actions to return the reactor to a normal condition or provide for a safe extended shutdown period under abnormal or emergency conditions.

Emergency Plan Implementing Procedures

These documents contain instructions for activating the Emergency Response Organization and facilities, protective action levels, organizing emergency response actions, establishing necessary communications with local, state and federal agencies, and for periodically testing the procedures, communications and alarm systems to assure they function properly. Format and content of such procedures are such that requirements of each facility's NRC approved Emergency Plan are met.

Test and Inspection Procedures

These documents provide the necessary measures to assure quality is achieved and maintained for the nuclear facilities. The instructions for tests and inspections may be included within other procedures, such as installation and maintenance procedures, but will contain the objectives, acceptance criteria, prerequisites for performing the test or inspection, limiting conditions, and appropriate instructions for performing the test or inspection, as applicable. These procedures also specify any special equipment or calibrations required to conduct the test or inspection and provide for appropriate documentation and evaluation by responsible authority to assure test or inspection requirements have been satisfied. Where necessary, hold or witness points are identified within the procedures and require appropriate approval for the work to continue beyond the designated point. These procedures provide for recording the date, identification of those performing the test or inspection, as-found condition, corrective actions performed (if any), and as-left condition, as appropriate for the subject test or inspection.

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SECTION 4 CONTROL OF SYSTEMS AND EQUIPMENT IN THE OPERATIONAL PHASE

Permission to release systems and equipment for maintenance or modification is controlled by designated operating personnel and documented. Measures, such as installation of tags or locks and releasing stored energy, are used to ensure personnel and equipment safety. When entry into a closed system is required, Kairos Power has established control measures to prevent entry of extraneous material and to assure that foreign material is removed before the system is reclosed.

Administrative procedures require the designated operating personnel to verify that the system or equipment can be released and determine the length of time it may be out of service. In making this determination, attention is given to the potentially degraded degree of protection where one subsystem of a redundant safety system is not available for service. Conditions to be considered in preparing equipment for maintenance include, for example: shutdown margin; establishment of a path for decay heat removal; temperature and pressure of the system; valves between work and hazardous material; venting, draining and flushing; entry into closed vessels; hazardous atmospheres; handling hazardous materials; and electrical hazards.

When systems or equipment are ready to be returned to service, designated operating personnel control placing the items in service and document its functional acceptability. Attention is given to restoration of normal conditions, such as removal of jumpers or signals used in maintenance or testing, or actions such as returning valves, breakers or switches to proper start-up or operating positions from "test" or "manual" positions. Where necessary, the equipment placed into service receives additional surveillance during the run-in period.

Independent verifications, where appropriate, are used to ensure that the necessary measures have been implemented correctly. The minimum requirements and standards for using independent verification are established in company documents.

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SECTION 5 PLANT MAINTENANCE

Kairos Power establishes controls for the maintenance or modification of items and equipment subject to this QAPD to ensure quality at least equivalent to that specified in original design bases and requirements, such that safety-related structures, systems and components are maintained in a manner that assures their ability to perform their intended safety function(s). Maintenance activities (both corrective and preventive) are scheduled and planned so as not to unnecessarily compromise the safety of the plant.

In establishing controls for plant maintenance, Kairos Power commits to compliance with NQA-1-2015, Subpart 2.18, with the following clarifications:

- Where Subpart 2.18 refers to the requirements of ANS-3.2, it shall be interpreted to mean the applicable standards and requirements established within the QAPD.
- Section 203 requires cleanliness during maintenance to be in accordance with Subpart 2.1. The commitment to Subpart 2.1 is described in the QAPD, Part II, Section 13.2.