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 FACIL:50-316 Donald C. Cook Nuclear Power Plant, Unit 2, Indiana & 05000316
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 MURLEY,T.E. NRC - No Detailed Affiliation Given

SUBJECT: Forwards description of integrated startup test program for review.

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Donald C. Cook Nuclear Plant Unit 2
Docket No. 50-316
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INTEGRATED STARTUP TESTING PROGRAM

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

ATTN: T. E. Murley

May 24, 1988

Dear Dr. Murley:

We are submitting, as Attachment 1 to this letter, the Donald C. Cook Nuclear Plant Unit 2 Integrated Startup Test Program for your review. The integrated startup test program describes in detail the tests that will be performed prior to and as a part of returning Unit 2 to safe operation following the Steam Generator Repair Project.

The integrated startup testing will be accomplished in three phases: Construction Testing Phase, Preoperational Testing Phase and Startup Testing Phase. Each phase will be integrated on a system basis with each phase consisting of a series of tests. These tests are described in Tables 1-1 and 1-2 of Attachment 1. These phases of testing, because of the nature of the modifications performed, may occur at different times within the project schedule and may overlap.

In order to allow us to meet our project schedule we would appreciate completion of your review by September 1, 1988. To assist your staff in their review of the integrated startup test program, we are available to provide any supplementary information they may require, in presentation or written format, at their convenience.

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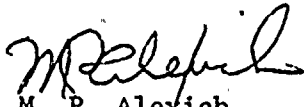
Dr. T. E. Murley

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This document has been prepared following Corporate procedures which incorporate a reasonable set of controls to ensure its accuracy and completeness prior to signature by the undersigned.

Sincerely,



M. P. Alexich
Vice President

edg

Attachment

cc: D. H. Williams, Jr.
W. G. Smith, Jr. - Bridgman
R. C. Callen
G. Bruchmann
G. Charnoff
NRC Resident Inspector - Bridgman
A. B. Davis - Region III

ATTACHMENT 1

DONALD C. COOK NUCLEAR PLANT UNIT 2 INTEGRATED STARTUP TESTING STEAM GENERATOR REPLACEMENT OUTAGE

TEST PHASES

The startup effort can be viewed as three testing phases: construction testing, preoperational testing, and startup testing. These testing phases will be integrated on a system basis with each phase consisting of a series of tests which are described below. It should be noted that these phases of testing, because of the nature of modifications performed, may occur at different times within the schedule and may overlap.

1. Construction Testing Phase

The tests in the construction testing phase are designed to provide assurance that construction and installation of equipment and components has been accomplished properly and in accordance with the requirements. These tests are generally prepared as a part of the work package but may include existing procedures referenced in the work package.

These tests consist of non-dynamic instrument, electrical, and mechanical tests for new or modified systems or components. The installed components and systems are tested and evaluated according to approved procedures. Construction tests are performed to assure the quality implementation of the modification. Any deficiencies, if found, will be corrected prior to satisfactory completion of these tests.

2. Preoperational Testing Phase

The tests in the Preoperational Testing Phase are designed to provide assurance that components and subsystems function safely within established design criteria. The preoperational testing of new or modified systems is conducted after successful completion of construction testing and prior to declaring a system operable. This test phase is generally conducted by the Plant operating staff, and has the dual purpose of verifying the adequacy of operating procedures on systems that were modified during the repair of the steam generators.

The Preoperational Phase Tests will be performed with the core off loaded. Therefore, Unit 2 will be considered to be in Mode 6, as defined in Section 3 of the Steam Generator Repair Report, during the preoperational phase test.

The sequence of the individual tests is scheduled with the normal outage scheduling methods.

The Preoperational Testing Phase consists of tests, adjustments, calibrations, and system operations necessary to assure that subsequent operation and/or testing can be safely undertaken. As an example, the hot primary system tests which are performed prior to reloading the core, include heatup of the primary system to operating temperature and pressure, thermal expansion checks of affected systems, and a primary system hydrostatic test.

Where performance of components or systems deviates from predicted results, further engineering evaluations, rework and/or retesting will be performed to resolve the discrepancies before the test is considered satisfactory. Components and/or systems which have to be modified as a result of the preoperational testing will be retested to verify acceptable performance. Preoperational testing, in accordance with approved procedures, is performed to verify as near as possible the performance of the systems under actual operating conditions. Table 1-1 of this attachment lists the preoperational phase tests.

3. Startup Testing Phase

The Startup Testing Phase is designed to provide assurance that systems which were previously demonstrated as functioning safely and the newly modified systems will safely function under normal operating and transient conditions, without significant reduction in the safety margin for the protection of public health and safety.

This phase will be similar to a normal refueling startup and will consist of tests such as; fuel handling equipment tests, containment leakrate tests, safeguards tests, low power physics tests, and power escalation tests. Table 1-2 of this attachment lists the Startup Phase Testing.

ORGANIZATIONAL RESPONSIBILITIES

The Steam Generator Repair Project Manager is responsible for conducting that portion of the outage directly related to replacing the steam generators, and restoring all components, systems, and structures to an original or modified status such that they are ready for preoperational tests.

The management and direction of the preoperational and startup testing effort is under the direct control of the Plant Manager. The Production Supervisor - Operations is responsible to the Plant Manager for managing, coordinating, and overseeing the overall outage and startup effort.

The Plant Manager has overall responsibility for the preparation and implementation of preoperational and startup test procedures. Administrative control for making changes to approved procedures are also provided in the existing plant procedures.

TABLE 1-1

PREOPERATIONAL PHASE TEST(1)

TITLE OF TEST	TEST OBJECTIVE
<u>SECONDARY SYSTEM HYDROSTATIC TESTS</u>	
Steam Generator (S/G) Secondary Side Integrity Test	To verify the integrity of secondary side and associated piping following the installation of the new steam generator lower assemblies as specified by ASME Standards for the system.
<u>HOT PRIMARY SYSTEM TESTS</u>	
RCS Hydrostatic Test	The pressure testing of the RCS will be performed at test pressures specified by the ASME standards for the system.
Process Instrumentation (Temperature, pressure, level, and flow instruments)	Plant equipment and instrumentation are calibrated, aligned and tested, as appropriate, in accordance with the Plant procedures.
Expansion and Restraints	During the heatup to operating temperature, selected points on components and piping of the Reactor Coolant System are checked at various temperatures to verify unrestricted expansion.
Pressurizer	During the course of the Plant heatup, the pressure controlling capability of the pressurizer will be demonstrated using normal plant operating procedure. The Pressurizer Safety Valves are tested to verify setpoints using existing Plant procedures prior to reinstallation.
Reactor Coolant Pumps and Motors	As the pumps and motors are placed in operation, routine preventive maintenance will be performed. The reactor coolant pumps will be placed in service using normal Plant operating procedures.
Steam Generators	The proper operation of the level indication of each steam generator is checked during heatup and at temperature using normal Plant operating procedure.

TABLE 1-1 (cont'd.)

TITLE OF TEST	TEST OBJECTIVE
<u>HOT PRIMARY SYSTEM TESTS (cont'd.)</u>	
Chemical Tests to Establish Water Quality	Water for Reactor Coolant System fill and makeup will be analyzed to ensure compliance with the requirements specified in the Plant procedures.
Steam Generator Safety Valves	The setpoint of safety valves will be verified by tests at appropriate pressure and temperature conditions in accordance with existing Plant procedures.
Residual Heat Removal System	The residual heat removal system's operation will be verified using normal operating and surveillance procedures.
Component Cooling Water (CCW) System Operational Check	The CCW will be placed in service to the components requiring CCW service as required.
Primary Sampling System	Primary sampling will be performed as required during the test to support the chemistry requirements.

Note: 1. The tests may not be performed in the same sequence as they are listed above.

TABLE 1-2

STARTUP PHASE TEST

TITLE OF TEST	TEST OBJECTIVE
<u>FUEL LOAD TESTS</u>	
Reactor Component Handling System (Polar Crane)	Routine testing will be performed on the polar crane during the construction phase of the steam generator repair project.
Refueling Equipment (Hand Tools, Power Equipment and Associated Protective Interlocks)	Prior to core loading, tests and checks will be performed in accordance with existing Plant procedures to demonstrate the operability of the fuel handling equipment and Fuel Transfer System.
Nuclear Instrumentation System (Source Range)	Nuclear instruments are aligned and operability will be verified using existing Plant procedures.
Area Radiation Monitor Tests	Prior to core loading, the Radiation Monitoring System alarms associated with core loading will be checked and the alarm setpoints verified.
Chemical and Volume Control System	Makeup and letdown operations will be conducted with the Chemical and Volume Control System to check the different modes of dilution and boration and to verify flow in the different modes. The adequacy of heat tracing to maintain the required boric acid concentration in solution will be verified. In addition, the ability to adequately sample will be demonstrated using existing Plant procedures. These evaluations will be accomplished using normal plant operating procedures.
Safety Injection System	The ability of the Safety Injection System to inject borated water into the Reactor Coolant System, will be verified during refueling cavity fill and by appropriate existing Plant surveillance testing.
Primary Chemistry Sampling	Prior to, during, and following core loading, primary sampling will be performed to verify that chemistry in the Reactor Coolant System is within Technical Specification limits.

TABLE 1-2 (cont'd.)

TITLE OF TEST	TEST OBJECTIVE
<u>LEAK RATE TESTS</u>	
Containment Test	Integrated leakrate tests will be performed in accordance with the established Plant program on the requirements of Technical Specifications.
<u>INTEGRATED SAFEGUARDS TESTS(1)</u>	
Engineered Safety Features	The Engineered Safety Features logic matrices will be tested to demonstrate operability, proper logic, redundancy and coincidence in accordance with Technical Specification requirements and schedule.
Emergency Power Systems	The automatic starting and loading of the emergency diesel generators will be demonstrated as part of the Safeguards testing.
Containment Isolation Systems	The operation of actuation systems and components used for containment isolation will be verified as part of the Safeguards testing.
Auxiliary Feedwater System	Automatic operation of pumps and valves will be verified as part of the Safeguards testing.
Safety Injection System	Automatic operation of pumps and valves will be verified as part of the Safeguards testing.
Residual Heat Removal System	Automatic operation of pumps and valves will be verified as part of the Safeguards testing.
Containment Spray System	Automatic operation of pumps and valves will be verified as part of the Safeguards testing.
Service Water System	Automatic operation of pumps and valves will be verified as part of the Safeguards testing.

TABLE 1-2 (cont'd.)

TITLE OF TEST	TEST OBJECTIVE
<u>INTEGRATED SAFEGUARDS TESTS (cont'd.)</u>	
Control Room Ventilation Isolation System	Automatic initiation of control Room Emergency Ventilation System into the recirculation mode will be verified as part of the Safeguards testing.
Steam Line Isolation	Operation of isolation valves will be verified as part of the Safeguards testing.
<u>CRITICALITY AND LOW POWER PHYSICS TESTS</u>	
Reactor Protection System	Prior to criticality, this system will be tested to demonstrate operability, proper logic, redundancy and coincidence. The operability of the protection channels will be verified using Plant procedures.
Nuclear Instrumentation (Excore)	Prior to criticality, all channels will be checked to verify high level trip functions, and alarm setpoints.
Control Rod Systems Tests	<p data-bbox="865 1205 1471 1415">The ability of the system to move rods in the proper sequence both singly and as groups will be verified. Also the alarm and inhibit functions will be tested and the setpoints verified to specific values.</p> <p data-bbox="865 1461 1471 1709">At hot standby conditions, the drop times of full length rods will be tested. The drop time is measured from the release of the rod until the rod enters the top of the dashpot. This time will be verified to be less than the maximum value specified in the Technical Specifications.</p> <p data-bbox="865 1755 1471 1992">During Rod Control System tests, the Position Indication System will be aligned to provide rod movement indication. At hot standby conditions, individual rod positions will be calibrated to within tolerances specified in existing Plant procedures.</p>
A. Rod Control System	
B. Rod Drop Tests	
C. Rod Position Indication	

TABLE 1-2 (cont'd.)

TITLE OF TEST	TEST OBJECTIVE
<u>CRITICALITY AND LOWER POWER PHYSICS TESTS (cont'd.)</u>	
RCS Flow	Prior to criticality, the RCS Flow and RTD Bypass Loop Flow will be verified using existing Plant procedures.
Steam Generator Blowdown System Test	Blowdown will be verified using normal Plant operating procedures.
Initial Criticality	The objective is to bring the reactor critical from the Plant hot standby condition. Prior to start of rod withdrawal, the nuclear instrumentation will be aligned, checked, and conservative reactor trip setpoints made per existing Plant procedures. At preselected points during rod withdrawal, data will be taken and inverse count rate plots made to enable extrapolation to the expected critical rod position. Initial criticality and low power physics tests will be performed in accordance with existing Plant procedures to verify core design parameters.
<u>FULL POWER OPERATION TESTS</u>	
Power Level Escalation	Normal Post Refueling Technical Specification required testing will apply for power level escalation.
Power Conversion System (Turbine Generator)	
A. Vibration Frequency and Amplitude	When the main turbine is rolled, using normal plant operating procedures, vibration levels will be continuously monitored and alarmed when excessive vibration is indicated. (Turbine vibrations are also monitored throughout the Power Escalation Program.) Major equipment (e.g., feedwater pumps and condensate pumps) will be operated as they become available and are observed, using normal plant operating procedures, for indications of excessive vibration.

TABLE 1-2 (cont'd.)

TITLE OF TEST	TEST OBJECTIVE
B. Feedwater and Feedwater Control System	During power level escalation, the ability of the Feedwater Pumps and Control System to maintain level in the steam generators will be verified using normal Plant operating procedures.
C. Steam Generator Makeup Water and Chemical Treatment	The Makeup System to the steam generator is expected to remain operational. The Chemical Treatment System will be checked when chemicals are added to the Condensate or Feedwater System.

Note: (1) Safeguards system tests will be conducted on designated trains in accordance with technical specification requirements and schedule.