

December 2021

**REQUALIFICATION PROGRAM FOR THE GENERAL ELECTRIC
NUCLEAR TEST REACTOR**

A. OBJECTIVE

1. This requalification program is established to maintain the proficiency of licensed operators and senior operators through periodic training exercises, instruction periods, tests, and reviews covering those items and equipment which relate to the safe operation of the General Electric – Hitachi Nuclear Test Reactor (NTR) as recommended by the American National Standard, ANSI/ANS-15.4-2016, “Selection and Training of Personnel for Research Reactors”.
2. This requalification program for the NTR is intended to comply with the requirements of 10 CFR 55.59 and 10 CFR 55.21.
3. By definition, a candidate is a licensed NTR operator or licensed NTR senior operator.

B. PROGRAM DESCRIPTION

1. SCHEDULE

The NTR requalification program is a two-year continuous program. All licensed personnel are required to complete the program in a continuous period not to exceed 24 months in duration.

2. EXAMINATIONS

a. Biennial Written Examination

- 1) The written examination will be given biennially in the first calendar quarter. The examination will include a representative sample from among the following:
 - a. Fundamentals of reactor theory, including fission process, neutron multiplication, source effects, control rod effects, criticality indications, reactivity coefficients, and poison effects.
 - b. General design features of the core, including core structure, fuel assemblies, control rods, safety rods, reactor instrumentation, and coolant flow.
 - c. Mechanical components and design features of the reactor primary coolant system.
 - d. Secondary coolant and auxiliary systems that affect the facility.
 - e. Facility operating characteristics during steady state and transient conditions, including coolant chemistry; causes and effects of temperature, pressure and reactivity changes; and operating limitations and reasons for these operating characteristics.
 - f. Design, components, and functions of reactivity control mechanisms and instrumentation.
 - g. Design, components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.
 - h. Components, capacity, and functions of emergency systems.
 - i. Shielding and confinement design features, including access limitations.
 - j. Administrative, normal, abnormal, and emergency operating procedures for the facility.
 - k. Purpose and operation of radiation monitoring systems, including alarms and survey equipment.

- I. Radiological safety principles and procedures.
 - m. Procedures and equipment available for handling and disposal of radioactive materials and effluents.
 - n. Principles of heat transfer thermodynamics and fluid mechanics.
 - 2) In addition to 1) above, a Senior Reactor Operator will receive additional question(s) from the areas listed below. The SRO questions will include a representative sample from among the following:
 - a. Conditions and limitations in the facility license.
 - b. Facility operating limitations in the technical specifications and their bases.
 - c. NTR procedures required to obtain authority for design and operating changes in the facility.
 - d. Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions.
 - e. Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.
 - f. Procedures and limitations involved in alterations in core configuration and determination of various internal and external effects on core reactivity.
 - g. Fuel handling facilities, equipment, and procedures
 - 3) The examinations will be graded by the examination administrator. The results of the examination will be used to determine which of the lectures shall be attended by each candidate.
- b. Annual Operating Test
 - 1) The annual operating test at the NTR is administered during the first calendar quarter of each year. This test fulfills the requirements of 10 CFR 55.59.
 - 2) The operating test requires the candidate to demonstrate an understanding of and the ability to perform the actions necessary to accomplish a comprehensive sample of the following items:
 - a. Perform pre-startup procedures for the facility, including operation of those controls associated with plant equipment that could affect reactivity.
 - b. Manipulate the console controls as required to operate the facility between shutdown and designated power levels.

- c. Identify annunciators and condition-indicating signals and perform appropriate remedial actions where appropriate.
 - d. Identify the instrumentation systems and the significance of facility instrument readings.
 - e. Observe and safely control the operating behavior characteristics of the facility.
 - f. Perform control manipulations required to obtain desired operating results during normal, abnormal, and emergency situations.
 - g. Safely operate the primary coolant system.
 - h. Safely operate the facility's auxiliary and emergency systems, including operation of those controls associated with plant equipment that could affect reactivity or the release of radioactive materials to the environment.
 - i. Demonstrate or describe the use and function of the facility's radiation monitoring systems, including fixed radiation monitors and alarms, portable survey instruments, and personnel monitoring equipment.
 - j. Demonstrate knowledge of significant radiation hazards, including permissible levels in excess of those authorized, and ability to perform other procedures to reduce excessive levels of radiation and to guard against personnel exposure.
 - k. Demonstrate knowledge of the emergency plan for the facility, including, as appropriate, the operator's or senior operator's responsibility to decide whether the plan should be executed and the duties under the plan assigned.
 - l. Demonstrate the knowledge and ability as appropriate to the assigned position to assume the responsibilities associated with the safe operation of the facility.
 - m. Demonstrate the candidate's ability to function within the control room in such a way that the facility licensee's procedures are adhered to and that the limitations in its license and amendments are not violated.
- 3) The operating test requires the candidate to demonstrate at the console a response to the following events at least once every two years (an SRO candidate may direct the activities of an RO candidate):
- a. A loss of core coolant flow.
 - b. A loss of a reactor safety system-scam channel.
 - c. Safety rod drop.

- d. Inability to drive a control rod.
 - e. Fuel clad failure or high activity in the reactor coolant or stack effluent monitor.
 - f. Reactor scram.
 - g. Nuclear instrument failure.
- 4) The operating test will consist of a minimum of 5 tasks covering a representative sample of topics from sections 2.b.2) and 2.b.3) above. The test will be administered orally in a plant walk-through and will include actual or simulated control panel rod manipulations and a discussion of the actions to be taken for emergency or abnormal conditions.
- 5) Four different types of tasks must be covered by those selected from 4) above. These types include:
- a. Reactivity task – normal operations such as reactor startup, shutdown, or a significant power change.
 - b. Abnormal event – instrument failure, radiation monitor alarm, or similar systems level problem.
 - c. Emergency event – building evacuation, high radiation levels, or similar personnel or radiological release issue.
 - d. Outside event – operator duties outside the control room, e.g. reactor cell work, irradiation samples,
- 6) Each task from 4) above will include a minimum of 2 questions to be asked at the completion of the task. Question characteristics should: 1) be associated with the task, 2) discriminate between RO and SRO duties, and 3) emphasize knowledge required for task performance or procedure use and compliance.
- c. Biennial Medical Examination
- 1) Licensed operators will be examined by a physician every 2 years.
 - 2) Form NRC-396 will be completed and signed to document the examination.

3. LECTURES

- a. The NTR Requalification Program requires training lectures covering the following applicable subject material where operator written examination results or facility operating experience indicate a knowledge deficiency:

- 1) Theory and Principles of Operation
- 2) General and Specific Plant Operating Characteristics
- 3) Plant Instrumentation and Control Systems
- 4) Reactor Safety System
- 5) Normal, Abnormal and Emergency Operating Procedures
- 6) Radiation Control and Safety
- 7) Technical Specifications and Applicable Portions of Title 10, Chapter 1, Code of Federal Regulations

In addition, extra classes also may be held if deemed necessary by the Requalification Administrator or the Manager, NTR.

- b. Lecture tests will be given at the completion of the lecture. The tests will consist of a minimum of five questions which will be prepared and given by the lecturer. Section 5.a defines a passing score.
- c. If a candidate does not receive an acceptable score, he will be furnished study guide materials. Within 30 days, (a) he must go to another lecture and retake the lecture test and receive greater than 80% on that lecture test, or (b) take a different written examination for that lecture subject of not less than 10 questions. The 10-question examination also requires a score of 80% or greater to be passing.
- d. For clarification, the 30-day period starts at the time notification of failure is given to the candidate.

4. ON-THE-JOB TRAINING

- a. Each licensed operator shall manipulate the controls of the reactor to remain familiar with the operating characteristics of the plant, and each licensed senior operator shall operate or direct the activities of licensed operators during plant control manipulations.
- b. At least one startup to 100 kW and one shutdown of the reactor must be performed by each candidate each calendar year. Directing the startup and shutdown will satisfy senior operator requirements.
- c. Newly issued and updated Standard Operating Procedures, scram reports, facility license changes, and design changes shall be routed to each candidate to keep them informed. An electronic file will be used to document each candidate's review.

d. Each candidate will review and acknowledge his review, in the designated electronic file, of abnormal and emergency procedures on an annual basis. Abnormal and emergency procedures which require such a review are:

- 1) Non-Reactor Emergencies
- 2) Abnormal Operation
- 3) Off-Normal Alarm Response
- 4) Seismic Activity

5. EVALUATION

a. The minimum acceptance score for each category of written examinations and the overall written and operating tests is 70%.

b. Written examination:

- 1) A candidate receiving a written examination score exceeding the threshold of section 5.a, may require no additional training.
- 2) Receiving less than an acceptable score on any section of the examination will require the candidate to attend a lecture on the subject matter contained in that section. See section 3, Lectures.
- 3) If a candidate receives less than an acceptable overall score, they will be excluded from performing licensed activities and be required to complete an accelerated requalification program before being reinstated. This accelerated program will be tailored to the needs of the individual. Successful completion of the program and passing a written examination similar to the biennial examination with an overall acceptable score, is required before reinstatement. The Manager, NTR, shall notify the candidate when they can resume performance of licensed activities.

c. Operating test:

- 1) If a candidate's level of knowledge on any section of the test is considered to be deficient, they will be required to study material on that section. They must then demonstrate to the satisfaction of the examiner that they have gained sufficient knowledge in the deficient areas.
- 2) If a candidate receives less than an acceptable overall score, they will be excluded by the Manager, NTR, from licensed activities. They then will be required to complete an

accelerated requalification program before being reinstated. This accelerated program will be tailored to the needs of the individual, i.e., self-study, lectures, etc. Successful completion of the program and passing an operating test similar to the annual test with an overall acceptable score, is required before reinstatement. The Manager, NTR, shall notify the candidate when they can resume performance of licensed activities.

6. RECORDS

- a. Records of the NTR requalification program will consist of an individual training folder for each candidate containing:
 - 1) copies of written examinations, operating tests, and additional training received
 - 2) All answers given by the individual on written requalification examinations, annual operating tests, and required lecture tests.
- b. All individual records will be retained until the candidate's license is renewed.
- c. A Requalification Program "Master Year" folder will contain records of on-the-job training as delineated in section 4 above.

7. ACTIVE STATUS

Licensed personnel who have not been actively performing the functions of a licensed operator or licensed senior operator for a minimum of 4 hours per calendar quarter will be recertified before resuming licensed activities.

Recertification will be performed by the NTR Manager, the Requalification Program Administrator, or a designated alternate.

The recertification shall assure that the qualifications and status of the candidate are current and valid and that the candidate has completed a minimum of six hours of licensed operator functions under the direction of a qualified individual holding the same or higher license. The six hours must include a complete tour of the facility.

C. PROGRAM ADMINISTRATION

1. Every two years, the Manager, NTR will designate a Requalification Program Administrator. They must have an NTR operator's license and will have the following responsibilities.
 - a. Develop, administer, and grade the biennial written examinations in accordance with the criteria in this program.
 - b. Schedule all examinations, lectures, and tests.
 - c. Assign instructors.
 - d. Review and approve lectures and lecture tests. Grade lecture tests and submit for retention.
 - e. Develop, administer, and grade the annual operating tests in accordance with the criteria in this program. This task may be delegated to another licensed operator to ensure no operator is exempted from completing an annual operating test for more than one consecutive year.
 - f. Document all training for retention in individual training files.
 - g. Assure records are being retained in accordance with this program.
 - h. Report on the effectiveness and status of the program to the Manager, NTR.
 - i. Recommend changes as necessary to maintain an effective program.
2. Manager, NTR will have the following responsibilities:
 - a. Develop, administrate, and maintain an effective and compliant Requalification Program for licensed reactor operators and licensed senior reactor operators at the NTR.
 - b. Maintain all training records (see Section 6) for all licensed personnel.
3. Licensed personnel that generate or administer these examinations and tests shall be exempt from taking the specific respective examinations and tests. The Manager, NTR will ensure that developing, administering, and grading the biennial written examination and the annual operating test, will be rotated amongst the licensed operators such that no licensee fails to be tested for more than one consecutive test cycle.
4. Changes which alter the scope, time allotted, or frequency in conducting the parts of the Program must be submitted for review and approval by the Nuclear Regulatory Commission prior to implementation.