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## **12 CONDUCT OF OPERATIONS**

### **12.1 Organization**

#### **12.1.1 Structure**

The NBSR is located on the grounds of the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland. The organization for the management and operation of the NBSR within the NIST Center for Neutron Research (NCNR) is shown in Figure 12.1. The Nuclear Regulatory Commission (NRC) operating license is issued to NIST. The NCNR is responsible for the management and operation of the NBSR.

The Senior Health Physicist is the head of the onsite Reactor Health Physics Group, which reports to the Director for Administration of NIST. This group works with Reactor Operations and Engineering and the researchers within the NCNR to minimize radiation exposures and address all radiological safety concerns. The Chief, Reactor Engineering provides engineering support to Reactor Operations. Health Physics, Reactor Operations, and Reactor Engineering coordinate in the areas of experiment safety, industrial safety, scheduling, and training. The two reactor advisory committees are the Safety Evaluation Committee (SEC) and the Safety Audit Committee (SAC). They provide the Director, NCNR with independent assessments of areas of facility operation as discussed below and as required by the Technical Specifications.

#### **12.1.2 Responsibility**

The Director, NCNR and the Chief Nuclear Engineer have line responsibility for the direction and operation of the reactor facility, including safeguarding the general public and facility personnel from radiation exposure and adhering to all requirements of the license. The Chief Nuclear Engineer reports directly to the Director, NCNR.

#### **12.1.3 Operations Staffing**

For reactor operation, the normal crew complement for a shift shall be three persons. The minimum crew complement for a shift shall be two persons, including at least one licensed senior reactor operator.

#### **12.1.4 Selection and Training of Personnel**

##### **12.1.4.1 Selection of Personnel**

The minimum qualifications with regard to education and experience of key supervisory personnel in Reactor Operations shall be as follows:

- Chief Nuclear Engineer. The Chief Nuclear Engineer must have a college degree or equivalent in specialized training and applicable experience, and at least 5 years experience in a responsible position in reactor operations or related fields, including at least 1 year experience in reactor facility management or supervision.
- Deputy Chief Nuclear Engineer. The Deputy Chief Nuclear Engineer must have a combined total of at least 7 years of college level education and/or nuclear reactor experience with at least 3 years experience in reactor operations or related fields. The person must be qualified to hold a Senior Reactor Operator (SRO) license.
- Reactor Supervisor. A Reactor Supervisor must have at least 4 years experience in reactor operations, including experience in the operation and maintenance of equipment and in the supervision of technicians and/or reactor operators. A Supervisor must have a high school education or the equivalent and formal training in reactor technology and reactor operations (An additional 2 years of experience may be substituted for education and formal training.) The Supervisor must also be qualified to hold a senior operator's license.

#### **12.1.4.2 Training and Requalification of Personnel**

The training program of the NCNR is structured to meet the guidelines of ANSI/ANS-15.4, "Selection and Training of Personnel for Research Reactors." The intent of the program is to ensure an organization and staff that is qualified for the operation of the reactor facility. It also provides an understanding of maintenance, research, and experimentation performed at the facility. The program addresses the existing facility and modifications to the facility. There is also training in the use of and interpretation of procedures, rules, and regulations. The training program includes classroom training, self study, on-the-job training, and written examinations. Records are maintained of training results.

SRO and Reactor Operator (RO) candidates participate in a thorough training program that includes lectures and study in many necessary areas, including: nuclear theory, reactor & systems' operations, instrumentation and control systems, engineered safety features, radiological safety and controls, facility regulatory compliance, Technical Specifications, and the applicable parts of Title 10 of the Code of Federal Regulations (CFR) pertaining to normal, abnormal, emergency, and administrative procedures and controls. Trainees also participate in: routine operation of the reactor and its associated systems, performance of reactor maintenance items, and refueling operations. This training culminates with the candidate obtaining an SRO or RO license from the U.S. Nuclear Regulatory Commission (NRC) in accordance with 10 CFR 55.

The NRC-approved NCNR operator requalification program describes the manner in which licensed operators maintain their licenses. The requalification program provides broad training to operators to ensure their continued proficiency and to correct any possible weaknesses. It is administered over a two year period and includes scheduled lectures and a biennial examination.

It also includes required document reviews, hours of licensed activity, medical certification, and record keeping.

Individuals who are not licensed operators and are to be issued permanent dosimetry will also undergo training. This training includes radiological safety, access controls, evacuation procedures, industrial safety, facility tours, and familiarization with the applicable sections of 10 CFR 19. Refresher training will be completed every two years.

Researcher and users of the NCNR facility also receive training appropriate to their needs. This includes training in radiation safety, occupational safety, security, beam tube operation, and reactivity issues associated with experiments and the reactor. This training will be completed biennially.

### **12.1.5 Radiation Safety**

The Health Physics (HP) organization is independent of the line operations organization and reports to upper management at NIST, as shown in Figure 12.1. The Reactor Health Physics Group is supervised by the Senior Health Physicist. The Group has been delegated the responsibility to maximize radiation safety and implement the principles of ALARA. The radiation protection program for the NCNR is staffed with professional health physicists as well as health physics technicians. The program meets the guidelines of ANSI/ANS 15.11-1987, Radiation Protection at Research Reactor Facilities. The Group conducts training and indoctrinations for personnel assigned to the facility and for visitors to the facility. They ensure compliance with 10 CFR Parts 19 and 20. Health Physics works closely with Reactor Operations, Engineering, researchers and users, and management. A Health Physics representative serves on the Safety Evaluation Committee (SEC), and the HP staff provides necessary and timely information to assist the Director, NCNR and the Chief Nuclear Engineer in carrying out their responsibilities under the NRC license.

The Health Physics staff has a responsibility to bring safety issues to the attention of NIST management, the SEC, or the SAC as needed.

## **12.2 Review and Audit Activities**

### **12.2.1 The Safety Evaluation Committee (SEC)**

The SEC provides the NCNR with a method for the independent review of the safety aspects of reactor operations. The SEC assists the Director, NCNR in evaluating reactor operational activities, improving the quality of reactor operational programs and recommending corrective actions for problem areas.

The SEC shall be composed of at least four (4) senior technical personnel who collectively provide a broad spectrum of expertise in reactor technology, e.g. nuclear, electrical and mechanical engineering and radiation protection.

The SEC members shall be appointed by the Director, NCNR. At least two (2) members shall be from the NCNR staff and one (1) member shall be from the Health Physics Group. The SEC quorum shall be three members. The NCNR director may appoint alternates to serve during the absence of regular members.

The SEC shall meet semiannually during reactor operations and as circumstances warrant. Written records of the proceedings, including any recommendations or concurrences, shall be maintained. The SEC shall report directly to the Director, NCNR.

The SEC shall review the following:

- (1) Proposed changes to the NBSR facility equipment or procedures when such changes have safety significance, or involve an amendment to the facility license, a change in the Technical Specifications incorporated in the facility license or a change pursuant to the applicable criteria 10 CFR 50.59.
- (2) Proposed tests or experiments significantly different from any previously reviewed or which involve a change pursuant to the applicable criteria of 10 CFR 50.59.
- (3) Determine whether proposed changes or reactor tests or experiments have been adequately evaluated and documented and provide recommendations for action.
- (4) Review the circumstances of all reportable occurrences and violations of Technical Specifications and the measures taken to prevent a recurrence and provide recommendations for action.

## **12.2.2 The Safety Audit Committee (SAC)**

The Safety Audit Committee (SAC) shall be composed of three (3) senior technical personnel who collectively provide a broad spectrum of expertise in reactor technology. The Committee members shall be appointed by the Director, NIST Center for Neutron Research. Members of the SAC shall not be regular employees of NIST. At least two (2) members shall pass on any report or recommendation of the Committee. The SAC shall meet annually and as required. The Committee shall audit the NBSR facility operations and the performance of the SEC. The SAC shall report in writing to the Director, NIST Center for Neutron Research.

## **12.3 Procedures**

### **12.3.1 Written Procedures**

Written procedures shall be provided and utilized for the following:

- (1) Normal startup, operation, and shutdown of major components and systems (These procedures shall include applicable check-off lists and instructions as

- required); Operator action necessary to correct specific equipment malfunctions and emergencies;
- (2) Emergency conditions involving the potential or actual release of radioactivity;
  - (3) Radiation and radioactive contamination control;
  - (4) A site emergency plan delineating the action to be taken in the event of emergency conditions and accidents that result in, or could lead to, the release of radioactive materials in quantities that could endanger the health and safety of employees or the public (periodic evacuation drills for facility personnel shall be conducted to ensure that facility personnel are familiar with the emergency plan); and Handling of irradiated and unirradiated fuel elements.

### **12.3.2 Scope**

Written procedures are used by personnel to accomplish specific tasks under normal, abnormal, and emergency conditions. The procedure system at NCNR is arranged into several groupings as follows: Administrative Rules, Operating and Refueling Procedures, Annunciator Procedures, Emergency Procedures, Technical Specifications (TS), Surveillance Procedures, Health Physics Procedures, and Good Work Practice Guides for Users/ Researchers. Within these groupings, the following types of activities are addressed by the specific procedures:

- (1) Startup, operation, and shutdown of major systems and components;
- (2) Operator action necessary to correct specific equipment malfunctions and emergencies;
- (3) Emergency conditions involving the potential or actual release of radioactivity, radiation and radioactive contamination control;
- (2) A site emergency plan delineating the action to be taken in the event of emergency conditions and accidents that result in, or could lead to, the release of radioactive materials in quantities that could endanger the health and safety of employees or the public (periodic evacuation drills for facility personnel shall be conducted to ensure that facility personnel are familiar with the emergency plan.); and
- (3) Handling of irradiated and unirradiated fuel elements.

### **12.3.3 Procedure Development and Change**

Those procedures specified in the technical specifications and major changes to those procedures, before being effective, shall be reviewed by the Safety Evaluation Committee (SEC) and approved in writing by the Chief, Reactor Operations and Engineering, or his Deputy. Changes, which do not significantly change the original intent of a procedure, may be approved by the Chief, Reactor Operations, or his Deputy.

## **12.4 Required Actions**

### **12.4.1 Action to be Taken in the Event a Safety Limit is Exceeded**

If a safety limit is exceeded, the reactor shall be shut down and reactor operations shall not be resumed without authorization by the NRC. The NRC shall be notified in accordance with the Technical Specifications, section 6.5. A complete analysis of the circumstances leading to and resulting from the situation with recommendations to prevent recurrence, shall then be submitted to the NRC.

### **12.4.2 Action to be Taken if a Limiting Safety System Setting is Exceeded or a Limiting Condition of Operation is Violated**

Reactor conditions shall be returned to normal or the reactor shall be shutdown. If it is necessary to shut down the reactor to correct the occurrence, operations shall not be resumed unless authorized by the Chief, Reactor Operations, or his Deputy. The occurrence shall be reported to the Chief, Reactor Operations, or his Deputy, and to the NRC if required by Technical Specifications section 6.4. The occurrence shall be reviewed by the SEC at their next scheduled meeting.

### **12.4.3 Action to be Taken in the Event of a Reportable Occurrence**

All reportable occurrences shall be promptly reported to the Chief, Reactor Operations or his Deputy.

All reportable occurrences shall be reported to the NRC in accordance with Technical Specifications, section 6.5. All reportable occurrences shall be reviewed by the SEC.

Reportable Occurrences shall include, but not necessarily be limited to the following:

- Operation with actual safety system settings less conservative than limiting safety system settings specified in Technical Specifications.
- Operation in violation of limiting conditions for operation, unless prompt remedial action is taken.
- An uncontrolled or unanticipated significant reactivity change.
- An uncontrolled or unanticipated significant release of radioactivity from the site.
- An engineered safety system component malfunction or other component or system malfunction which could or threatens to render the affected system incapable of performing its intended safety function.
- Major degradation of one of the several boundaries which are designed to contain the radioactive materials resulting from the fission process.
- An observed inadequacy in the implementation of major administrative or major procedural controls, such that the inadequacy causes or could have caused the existence or development of an unsafe condition with regard to reactor operation.



## **12.5 Reports**

In addition to the requirement of applicable regulations, and in no way substituting therefore, reports shall be made to the NRC as follows:

1. A report not later than the following working day to the NRC Project Manager (by telephone or email) and a written report within two weeks (United States Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555) of:
  - a. Violations of safety limits;
  - b. Reportable occurrences as defined in Section 6.7; and
  - c. Releases of radioactivity from the site above the permissible limits specified in Appendix B, Table II, 10 CFR 20.
2. A written report within 30 days (United States Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555) of:
  - a. Significant changes in the facility organization; and
  - b. Significant changes in the transient or accident analyses described in the Safety Analysis Report, as amended
3. An annual operating report (in writing to the United States Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555) providing the following information:
  - a. A narrative summary of reactor operating experience, including the energy produced by the reactor (in megawatt hours);
  - b. Unscheduled shutdowns, including corrective action, if any, taken to preclude recurrence;
  - c. Tabulation of major preventive and corrective maintenance operations performed having safety significance;
  - d. Tabulation of major changes in the facility, procedures, tests, and experiments, carried out without prior approval by the NRC pursuant to 10 CFR 50.59;
  - e. A summary of the nature and amount of radioactive material released into the sewer system and radioactive effluents discharged to the environs beyond the effective control of the NCNR; the summary should include, to the extent practicable, an estimate of individual radionuclides present in the effluent;
  - f. The results of environmental surveys performed; and
  - g. A summary of significant exposures received by facility personnel and visitors.

## **12.6 Records**

In addition to the records required by applicable regulations, the licensee shall maintain the following records for a period of at least 1 year.

- (1) Records of all safety or safety-related equipment maintenance activities, violations of Technical Specifications, reportable occurrences and those technical and safety considerations supporting the recommendations of the Safety Evaluation Committee, including action taken responsive to such recommendations.
- (2) Records and logs of reactor operations.
- (3) Records of principal maintenance activities.
- (4) Records of surveillance activities performed in accordance with Section 5 of Technical Specifications.

## **12.7 Emergency Planning**

An NRC approved Emergency Plan for the NCNR contains a detailed description of the Emergency Organization, the Emergency Support Organization, emergency classifications, responses, and equipment. Provisions have also been made for the treatment of contaminated or injured personnel. The NCNR Emergency Plan follows the NRC-approved guidance of ANSI/ANS 15.16.

## **12.8 Security Planning**

An NRC approved Security Plan for the NCNR contains measures necessary to prevent or minimize the results of an unauthorized act at the facility. The NCNR security plan complies with the requirements of 10 CFR 73.67. This information is separately documented in the NRC-approved Safeguards Plan, the NIST implementing procedures on physical and fuel security, and recently issued NRC orders related to safeguards and security.

## **12.9 Quality Assurance**

An established program following the guidelines of ANS 15.8, "Quality Assurance Program Requirements for Research Reactors" is in the administrative rules and procedures for the NBSR.

## **12.10 Operator Training and Requalification**

An NRC-approved Operator Requalification Program is in place at the NCNR. This Program contains a detailed description of the requirements for administration, content, schedule, examination, document review, performance of licensed activities, and training to be met by the facility and the licensed ROs and SROs for the purpose of maintaining valid licenses. The NCNR selection, training and qualification of reactor personnel is in accordance with NRC-approved guidance of ANS 15.4.

## **12.11 Startup Plan**

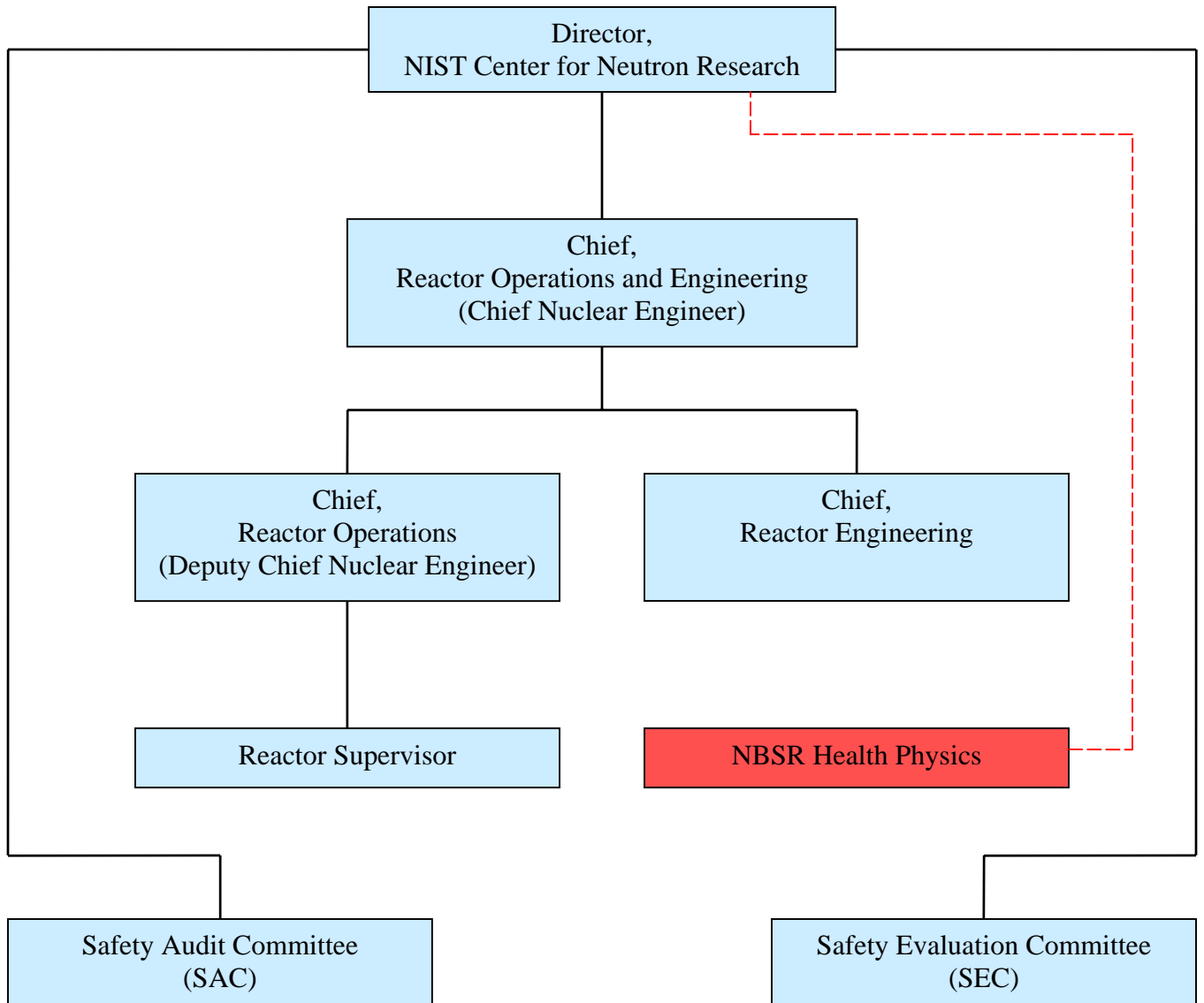
A startup plan is required for a new facility and for license amendments authorizing modifications that require verification of operability before normal operations are resumed. The

NCNR has been operating successfully for many years and is not submitting such modifications with this version of the SAR. Therefore, no startup plan is included. If such changes are requested in the future, a startup plan will be developed and submitted.

## **12.12 Environmental Reports**

These reports may be found in NBSR 16.

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——— Administrative Reporting Channels.  
 - - - - - Recommendations and Technical Advice.

**Figure 12.1: Organization for the Management and Operation of the Reactor Facility.**