PURDUE
UNIVERSITY

SCHOOL OF NUCLEAR ENGINEERING

Cindy Montgomery
U.S. NRC
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

August 28, 2017

SUBJECT: Submission of License Amendment Request, PUR-1, Docket 50-182 – Management Chain Change

Dear Ms. Montgomery,

This letter is a request to amend the PUR-1 license, Docket 50-182, to change the Organization Chart for Reactor Administration in the PUR-1 Technical Specifications. When reviewing the PUR-1 Safety Analysis Report as dated June 30, 2008 (ML 111890201) and the PUR-1 Technical Specifications as approved on October 31, 2016 (ML16267A001), the Level 1 designee is not consistent. This License Amendment seeks to rectify the issue and utilize an organizational structure to continue the safe operation of the PUR-1. Following consultation with both the Dean of Engineering and Head of the School of Nuclear Engineering, the Head has been selected as the most appropriate choice for the Level 1 designee. The Head has a greater familiarity with the operation of the facility which will result in a more productive dialogue between the Facility Director and the Head.

NUREG-1537, Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Format and Contact," Section 12.1.1, "Structure," states, in part, "The individual or group with legal responsibility for holding the reactor license... should be shown at the top of the organization." In compliance with this guidance, the Level 1 designee is listed at the top of the boxed region of Figure 6.1 in the Technical Specifications. To remain as consistent as possible with historic documentation, reporting chain above the Level 1 is also included. Additionally, it is noted that those of higher authority are listed nearer the top of the chart. This is illustrated in Figure 6.1. The proposed change is consistent with the guidance in ANS/ANSI 15.1 "The Development of Technical Specifications for Research Reactors" and ANS/ANSI 15.4 "Selection and Training of Personnel for Research Reactors."

School of Nuclear Engineering

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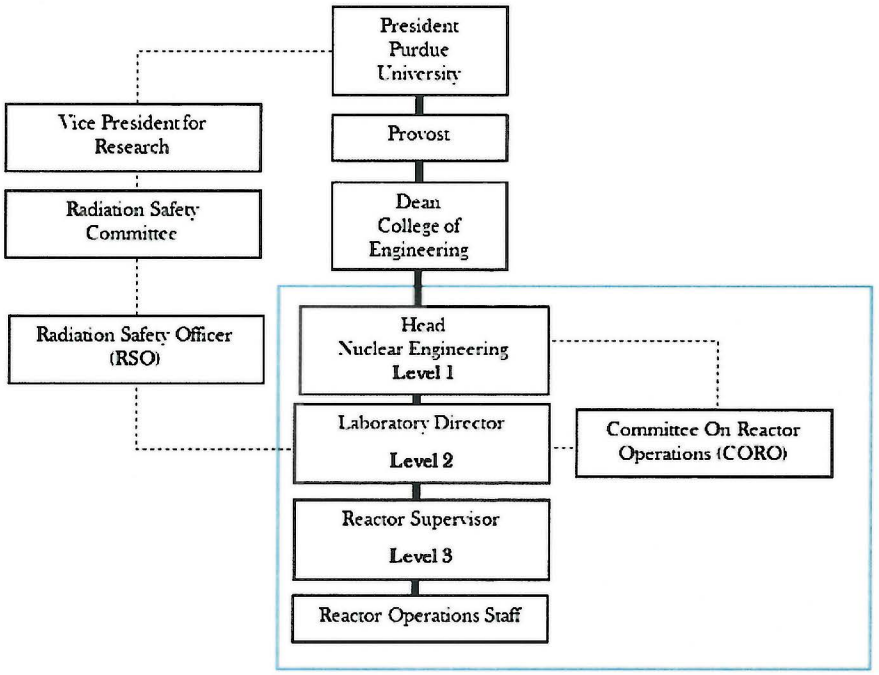


Figure 6.1: Organization Chart for Reactor Administration

The current head of the School of Nuclear Engineering is Dr. Seungjin Kim, the Laboratory Director is Dr. Robert Bean, and the Reactor Supervisor is Clive Townsend. The Committee On Reactor Operations will continue to be chaired by the RSO and the Head will appoint its other members, maintaining all prior voting requirements. Dr. Kim received his Ph.D. in Nuclear Engineering in 1999 and has extensive research experience.

The PUR-1 Reactor Operations Staff will respond in a timely manner to any questions or requests for additional information the NRC staff may have. The attached Technical Specifications reflect markup changes and the final document. Note that all pages will have Amendment No. 15 listed in the footer. Amendment No. 14 is reserved for other pending licensing action.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed on August 28, 2017.

Sincerely,

Clive Townsend
Reactor Supervisor
School of Nuclear Engineering
Purdue University

Dr. Chung Miang
Dean
College of Engineering
Purdue University

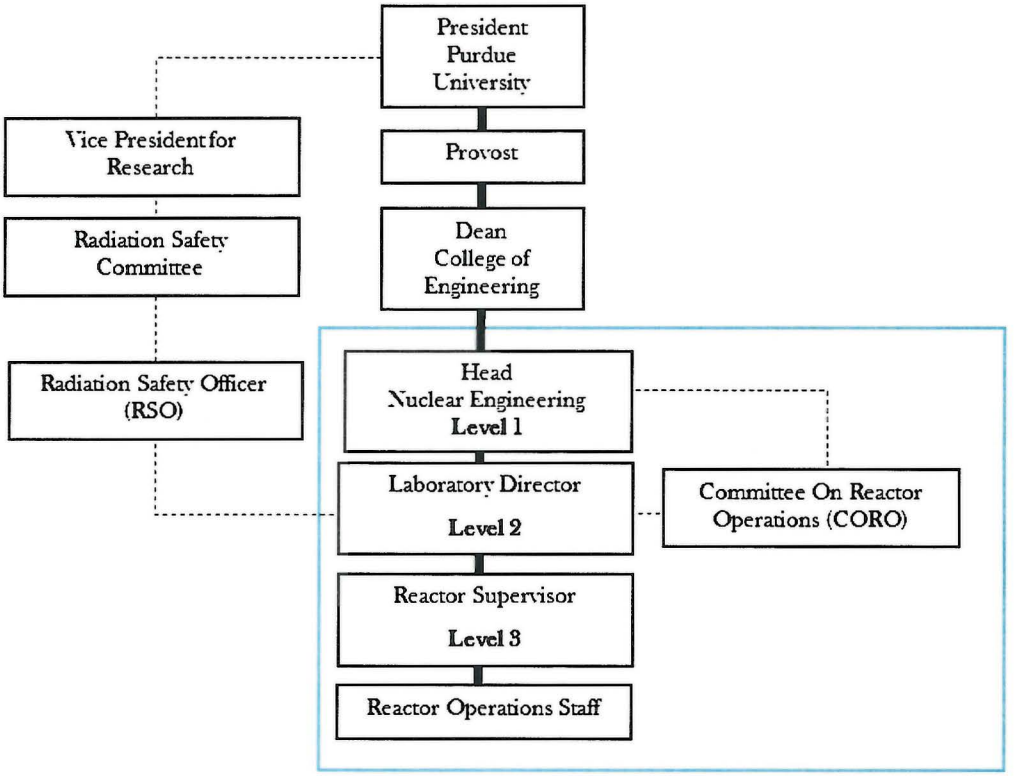
Dr. Seungjin Kim
Head
School of Nuclear Engineering
Purdue University

Attachments: PUR-1 Technical Specifications – Amendment No. 15

6. ADMINISTRATIVE CONTROLS

6.1 Organization

The PUR-1 Facility is managed and run by members of the university's College of Engineering, specifically the School of Nuclear Engineering. ~~The Dean of the College of Engineering~~The Head of the School of Nuclear Engineering shall be the final authority on all PUR-1 matters. The Laboratory Director is responsible to the ~~Dean~~ Head for the administration and proper and safe operation of the facility. Figure 6.1 shows the administration chart for the PUR-1. The Committee on Reactor Operations advises the director of the PUR-1 on all matters or policy pertaining to safety. The Radiological Safety Officer provides advice concerning personnel and radiological safety and provides technical assistance and review in the area of radiation protection.



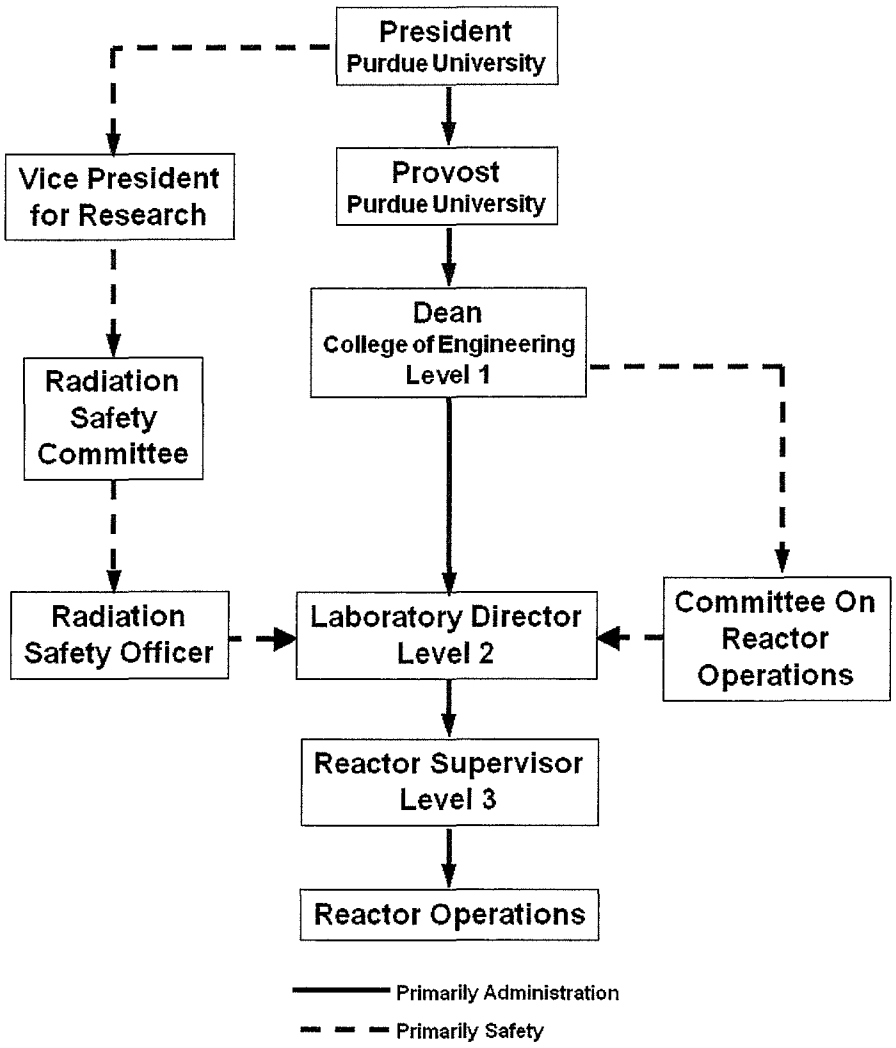


Figure 6.1: Organization Chart for Reactor Administration

a. Structure

1. A line management organizational structure provides for personnel who shall administrate and operate the reactor facility.

2. The ~~Dean~~ Head and the Facility Director shall have line management responsibility for adhering to the PUR-1 license and Technical Specifications and for safeguarding the public and facility personnel from undue radiation exposure.

3. Management Levels:

a) Level 1: ~~Dean of the College of Engineering~~Head of the School of Nuclear Engineering: Responsible for the PUR-1.

b) Level 2: PUR-1 Facility Director: Responsible for reactor facility operation and shall report to Level 1.

c) Level 3: Reactor Supervisor: Responsible for the day-to-day operation of the PUR-1 including shift operation and shall report to Level 2.

d) Level 4: Reactor Operating Staff: Licensed reactor operators and senior reactor operators and trainees. These individuals shall report to Level 3.

e) The reporting structure of Figure 6.1 is such that those personnel below shall report up and those personnel listed above may communicate down.

4. Committee on Reactor Operations (CORO):

The CORO shall be responsible to the licensee for providing an independent review and audit of the safety aspects of the PUR-1.

b. Responsibility

Responsibility for the safe operation of the reactor facility shall be in accordance with the line organization established in Section 6.1.a. In all instances, responsibilities of one level may be assumed by designated alternates or by higher levels, conditional upon appropriate qualifications.

The reactor facility shall be under the direct control of the Reactor Supervisor, a Senior Reactor Operator, or Reactor Operator (RO). The RO shall be responsible for ensuring that all operations are conducted in a safe manner and within the limits prescribed by the facility license, procedures and requirements of the Radiation Safety Officer and the CORO.

c. Staffing

1. The minimum staffing when the reactor is not secured shall be as follows:

a) At least two individuals shall be present at the facility complex and shall consist of at least a licensed reactor operator and a second person capable of calling 911. Unexpected absence for as long as 2 hours to accommodate a personal emergency are acceptable provided immediate action is taken to obtain a replacement. During periods when the reactor is not secured, it shall be under the direct control the of the reactor operator;

b) During periods of reactor maintenance the two individuals who shall be

present at the facility complex shall consist of a licensed senior reactor operator and a second individual capable of calling 911.

c) A licensed reactor operator or senior reactor operator shall be in the reactor room;

d) A Senior Reactor Operator shall be readily available for emergencies or on call (the individual can be rapidly reached by phone or radio and is within 30 minutes or 15 miles of the reactor facility); and

e) A list of reactor facility personnel by name and telephone number shall be readily available for use in the reactor room. The list shall include:

i. Senior Reactor Operator on Call,
ii. Radiation Safety Officer
iii. Other operations personnel, as deemed by the Facility Director

2. Events requiring the presence at the facility of the senior reactor operator:

a) Initial startup and approach to power,

b) A Senior Reactor Operator shall direct any loading or unloading of fuel or control rods within the reactor core region,

c) A senior reactor operator shall direct the recovery from an unplanned shutdown, unscheduled shutdown, or unplanned power reduction of more than 5%.

d. Selection and Training of Personnel

The selection and training of operations personnel shall be in accordance with the following:

1. Responsibility: The Reactor Supervisor is responsible for the selection, training, and requalification of the facility reactor operators and senior reactor operators.

2. Selection: The selection of operations personnel shall be consistent with the standards related to selection in ANSI/ANS-15.4-2007

3. Training Program: The Training Program shall be consistent with the standards related to training in ANSI/ANS-15.4-2007.

4. Requalification Program: The Requalification Program shall be consistent with the standards related to requalification in ANSI/ANS-15.4-2007.

6.2 Review and Audit

a. Committee on Reactor Operations (CORO)

The CORO shall be comprised of at least 3 voting members knowledgeable in fields which relate to Nuclear Safety. One of these members, the Radiation Safety Officer, will serve as the Chair. If the Chair is unable to attend one or a number of committee meetings, then the Chair may designate a committee member as Chair *pro tem*. The members are appointed by the ~~Dean of the College of Engineering~~Head of the School of Nuclear Engineering to serve three year terms. It is expected that the members will be reappointed each term as long as they are willing to serve so that their experience and familiarity with the past history of the PUR-1 will not be lost to the committee.

b. CORO Charter and Rules

The operations of the CORO shall be in accordance with a written charter, including provisions for:

1. Meeting Frequency: The CORO shall meet annually at intervals not to exceed 15 months. (Note: The facility license requires a meeting at least once per year and as frequently as circumstances warrant consistent with effective monitoring of facility activities);

2. Quorum: A quorum shall be comprised of not less than one-half of the voting membership where the operating staff does not constitute a majority;

3. Voting Rules: On matters requiring a vote, if only a quorum is present a unanimous vote of the quorum shall be required; otherwise a majority vote shall be required;

4. Subcommittees: The Chair may appoint subcommittees comprised of members of the CORO to perform certain tasks. Subcommittees or members of the CORO may be authorized to act for the committee; and

5. Meeting Minutes: The Chair shall designate one individual to act as recording secretary. It shall be the responsibility of the secretary to prepare the minutes which shall be distributed to the CORO, including the ~~Dean of the College of Engineering~~Head of the School of Nuclear Engineering, within three months. The CORO shall review and approve the minutes of the previous meetings. A complete file of the meeting minutes shall be maintained by the Chair of the CORO and by the Facility Director.

c. CORO Review Function

The review responsibilities of the CORO or a designated subcommittee shall include, but are not limited to the following:

1. Review and evaluation of determinations of whether new tests or

experiments and proposed changes to equipment, systems, or procedures can be made under 10 CFR 50.59 or would require a change in Technical Specifications or license conditions;

2. Review of new procedures, major revisions of procedures, and proposed changes in reactor facility equipment or systems which have significant safety impact to reactor operations;

3. Review of new experiments or classes of experiments that could affect reactivity or result in the release of radioactivity;

4. Review of proposed changes to the Technical Specifications and U.S. NRC issued license;

5. Review of the PUR-1 radiation protection program;

6. Review of violations of Technical Specifications, U.S. NRC issued license, and violations of internal procedures or instructions having safety significance;

7. Review of operating abnormalities having safety significance;

8. Review of reportable occurrences listed in Section 6.6.a and 6.6.b of these Technical Specifications; and

9. Review of audit reports.

d. CORO Audit Function

The audit function shall include selective (but comprehensive) examination of operating records, logs, and other documents. Discussions with cognizant personnel and observation of operations should be used also as appropriate. In no case shall the individual immediately responsible for an area perform an audit in that area. Audits shall include but are not limited to the following:

1. Facility operations, including radiation protection, for conformance to the Technical Specifications, applicable license conditions, and standard operating procedures: at least every 12 months (interval between audits not to exceed 15 months);

2. The results of action taken to correct those deficiencies that may occur in the reactor facility equipment systems, structures, or methods of operations that affect reactor safety: at least once every 12 months (interval between audits not to exceed 15 months);

3. The retraining and requalification program for the operating staff: at least once every other calendar year (interval between audits not to exceed

30 months);

4. The reactor facility emergency plan and implementing procedures: at least once every other calendar year (interval between audits not to exceed 30 months); and

5. The reactor facility security plan and implementing procedures: at least once every other calendar year (interval between audits not to exceed 30 months).

   Deficiencies uncovered that affect reactor safety shall immediately be reported to the ~~Dean of the College of Engineering~~Head of the School of Nuclear Engineering (Level 1 Management). A written report of the findings of the audit shall be submitted to the ~~Dean of the College of Engineering~~Head of the School of Nuclear Engineering (Level 1 Management) and the review and audit group members within 3 months after the audit has been completed.

e. Audit of ALARA Program

The Chair of the CORO or designated alternate (excluding anyone whose normal job function is within the operating staff) shall conduct an audit of the reactor facility ALARA program annually. The auditor shall transmit the results of the audit to the CORO at the next scheduled meeting for its review and approval.

6.3 Radiation Safety

The Radiation Safety Officer shall be responsible for implementing the radiation safety program for the PUR-1. The requirements of the radiation safety program are established in 10 CFR 20. The Program should use the guidelines of the ANSI/ANS-15.11-1993; R2004, "Radiation Protection at Research Reactor Facilities."

6.4 Procedures

Written operating procedures shall be prepared, reviewed, and approved before initiating any of the activities listed in this section. The procedures shall be reviewed and approved by the Facility Director, the CORO, and shall be documented in a timely manner. Procedures shall be adequate to ensure the safe operation of the reactor but shall not preclude the use of independent judgment and action should the situation require such. Operating procedures shall be used for the following items:

a. Startup, operation, and shutdown of the reactor;

b. Fuel loading, unloading, and movement within the reactor;

c. Control rod removal or replacement;

d. Routine maintenance of the control rod, drives and reactor safety and interlock systems or other routine maintenance of major components of systems that could have an effect on reactor safety;

e. Surveillance checks, calibrations, and inspections of reactor instrumentation and controls, control rod drives, area radiation monitors, facility air monitors, the central exhaust system and other systems as required by the Technical Specifications;

f. Administrative controls for operations, maintenance, and conduct of irradiations and experiments, that could affect reactor safety or core reactivity;

g. Implementation of required plans such as emergency or security plans;

h. Radiation protection program to maintain exposures and releases as low as reasonably achievable (ALARA);

i. Use, receipt, and transfer of by-product material, if appropriate; and

j. Surveillance procedures for shipping radioactive materials.

6.5 Experiment Review and Approval

Approved experiments shall be carried out in accordance with established and approved procedures.

a. All new experiments or class of experiments shall be reviewed by the CORO as required by TS 6.2.c and implementation approved in writing by the Facility Director or designated alternate.

b. Substantive changes to previously approved experiments shall be made only after review by the CORO and implementation approved in writing by the Facility Director or designated alternate.

6.6 Required Actions

a. Action to be Taken in the Event of a Safety Limit Violation

1. The reactor shall be shut down and reactor operation shall not be resumed until authorized by the U.S. NRC;

2. An immediate notification of the occurrence shall be made to the CORO Chair and the Facility Director, and reports shall be made to the U.S. NRC in accordance with Section 6.7.b of these specifications; and

3. A report shall be prepared which shall include:

   a) Applicable circumstances leading to the violation including, when known, the cause and contributing factors,

   b) Effect of the violation upon reactor facility components, systems, or structures and on the health and safety of personnel and the public,

   c) Corrective action to be taken to prevent recurrence.

   This report shall be submitted to the CORO for review and then submitted to the U.S. NRC when authorization is sought to resume operation of the reactor.

b. Action to be Taken in the Event of a Reportable Occurrence Other Than A Safety Limit Violation

   1. PUR-1 staff shall return the reactor to normal operating via the approved PUR-1 procedure or shut down conditions. If it is necessary to shut down the reactor to correct the occurrence, operations shall not be resumed unless authorized by the Facility Director or a designated alternate;

   2. The Facility Director or designated alternate shall be notified and corrective action taken with respect to the operations involved;

   3. The Facility Director or designated alternate shall notify the CORO Chair who shall arrange for a review by the CORO;

   4. A report shall be made to the CORO which shall include an analysis of the cause of the occurrence, efficacy of corrective action, and recommendations for measures to prevent or reduce the probability of recurrence; and

   5. A report shall be made to the U.S. NRC in accordance with Section 6.7.b of these specifications.

6.7 Reports

a. Annual Operating Report

An annual report covering the operation of the reactor facility during the previous calendar year shall be submitted to the NRC before March 31 of each year providing the following information:

1. A narrative summary of (1) reactor operating experience (including

experiments performed), (2) changes in facility design, performance characteristics, and operating procedures related to reactor safety and occurring during the reporting period, and (3) results of surveillance tests and inspections;

2. Tabulation of the energy output of the reactor, hours reactor was critical, and the cumulative total energy output since initial criticality;

3. The number of unscheduled shutdowns and inadvertent scrams, including, where applicable corrective action to preclude recurrence;

4. Discussion of the major maintenance operations performed during the period, including the effect, if any, on the safety of the operation of the reactor and the reasons for any corrective maintenance required;

5. A brief description, including a summary of the safety evaluations of changes in the facility or in procedures and of tests and experiments carried out pursuant to Section 50.59 of 10 CFR Part 50;

6. A summary of the nature and amount of radioactive effluents released or discharged to the environs beyond the effective control of the licensee as measured at or before the point of such release or discharge. The summary shall include to the extent practicable an estimate of individual radionuclides present in the effluent. If the estimated average release after dilution or diffusion is less than 25% of the concentration allowed or recommended, a statement to this effect is sufficient:

   a) Liquid Waste (summarized on a monthly basis)

      i. Radioactivity discharged during the reporting period.

         I. Total radioactivity released (in Curies),

         II. The effluent concentration used and the isotopic composition if greater than 1×10^{-7} µCi/cc for fission and activation products,

         III. Total radioactivity (in Curies), released by nuclide during the reporting period based on representative isotopic analysis, and

         IV. Average concentration at point of release (in µCi/cc) during the reporting period.

      ii. Total volume (in gallons) of effluent water (including dilution) during periods of release.

   b) Airborne Waste (summarized on a monthly basis)

      i. Radioactivity discharged during the reporting period (in Curies) for:

I. ^{41}Ar, and

II. Particulates with half-lives greater than eight days.

c) Solid Waste

i. The total amount of solid waste transferred (in cubic feet),

ii. The total activity involved (in Curies), and

iii. The dates of shipment and disposition (if shipped off site).

7. A summary of radiation exposures received by facility personnel and visitors, including dates and time where such exposures are greater than 25% of that allowed or recommended; and

8. A description and summary of any environmental surveys performed outside the facility.

b. Special Reports

In addition to the requirements of applicable regulations, reports shall be made to the NRC Document Control Desk and special telephone reports of events should be made to the Operations Center as follows:

1. There shall be a report not later than the following working day by telephone and confirmed in writing by fax or similar conveyance to the NRC Headquarters Operation Center, and followed by a written report that describes the circumstances of the event and sent within 14 days to the U.S. Nuclear Regulatory Commission, Attn: Document Control Desk, Washington, DC 20555, of any of the following:

a) Violation of safety limit (see TS 6.6.a);

b) Any release of radioactivity from the site above allowed limits; and

c) Any of the following:

i. Operation with actual safety system settings for required systems less conservative than the limiting safety system settings specified in the technical specifications.

ii. Operation in violation of limiting conditions for operation established in the technical specifications.

iii. A reactor safety system component malfunction that renders or could

render the reactor safety system incapable of performing its intended safety function. If the malfunction or condition is caused by maintenance, then no report is required.

Note: Where components or systems are provided in addition to those required by the technical specifications, the failure of the extra components or systems is not considered reportable provided that the minimum numbers of components or systems specified or required perform their intended reactor safety function.

iv. An unanticipated or uncontrolled change in reactivity greater than $0.006\ \Delta k/k$.

v. Abnormal and significant degradation in reactor fuel or cladding, or both, coolant boundary, or confinement boundary (excluding minor leaks).

vi. An observed inadequacy in the implementation of administrative or procedural controls such that the inadequacy causes or could have caused the existence or development of an unsafe condition with regard to reactor operations.

2. A written report within 30 days to the U.S. Nuclear Regulatory Commission, Attn: Document Control Desk, Washington, DC, 20555, of:

   a) Permanent changes in the facility organization involving Level 1 and Level 2; and

   b) Significant changes in the transient or accident analysis as described in the Safety Analysis Report.

6.8 Records

Records of facility operations in the form of logs, data sheets, or other suitable forms shall be retained for the period indicated as follows:

a. Records to be Retained for a Period of at Least Five Years or for the Life of the Component Involved if Less Than Five Years

   1. Normal reactor facility operation (but not including supporting documents such as checklists, log sheets, etc. which shall be maintained for a period of at least one year),

   2. Principal maintenance operations,

   3. Reportable occurrences,

   4. Surveillance activities required by the Technical Specifications,

5. Reactor facility radiation and contamination surveys where required by applicable regulations,

6. Experiments performed with the reactor,

7. Fuel inventories, receipts, and shipments,

8. Approved changes in operating procedures, and

9. Records of meeting and audit reports of the CORO.

b. Records to be Retained for at Least One Certification Cycle

Records of retraining and requalification of licensed operations personnel shall be maintained at all times the individual is employed or until the license is renewed.

c. Records to be Retained for the Lifetime of the Reactor Facility

1. Gaseous and liquid radioactive effluents released to the environs,

2. Radiation exposure for all personnel monitored,

3. Drawings of the reactor facility, and

4. Reviews and reports pertaining to a violation of the safety limit, the limiting safety system setting, or a limiting condition of operation.

6. ADMINISTRATIVE CONTROLS

6.1 Organization

The PUR-1 Facility is managed and run by members of the university's College of Engineering, specifically the School of Nuclear Engineering. The Head of the School of Nuclear Engineering shall be the final authority on all PUR-1 matters. The Laboratory Director is responsible to the Head for the administration and proper and safe operation of the facility. Figure 6.1 shows the administration chart for the PUR-1. The Committee on Reactor Operations advises the director of the PUR-1 on all matters or policy pertaining to safety. The Radiological Safety Officer provides advice concerning personnel and radiological safety and provides technical assistance and review in the area of radiation protection.

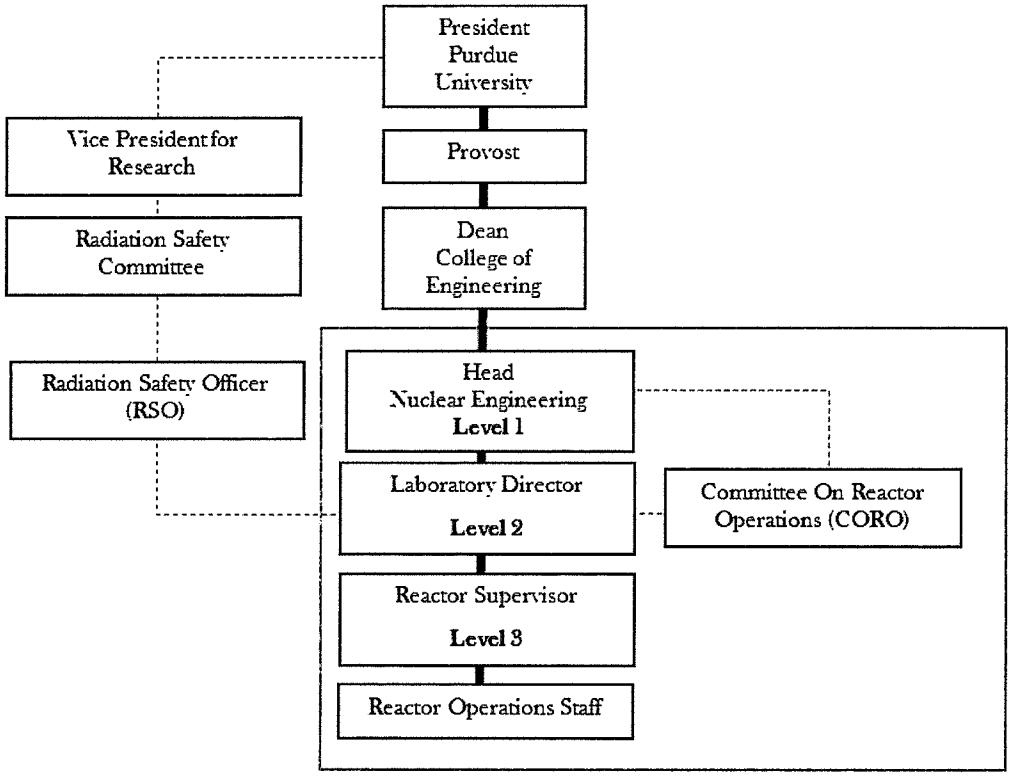


Figure 6.1: Organization Chart for Reactor Administration

a. Structure

1. A line management organizational structure provides for personnel who shall administrate and operate the reactor facility.

2. The Head and the Facility Director shall have line management responsibility for adhering to the PUR-1 license and Technical Specifications and for safeguarding the public and facility personnel from undue radiation exposure.

3. Management Levels:

   a) Level 1: Head of the School of Nuclear Engineering: Responsible for the PUR-1.

   b) Level 2: PUR-1 Facility Director: Responsible for reactor facility operation and shall report to Level 1.

   c) Level 3: Reactor Supervisor: Responsible for the day-to-day operation of the PUR-1 including shift operation and shall report to Level 2.

   d) Level 4: Reactor Operating Staff: Licensed reactor operators and senior reactor operators and trainees. These individuals shall report to Level 3.

   e) The reporting structure of Figure 6.1 is such that those personnel below shall report up and those personnel listed above may communicate down.

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   The CORO shall be responsible to the licensee for providing an independent review and audit of the safety aspects of the PUR-1.

b. Responsibility

   Responsibility for the safe operation of the reactor facility shall be in accordance with the line organization established in Section 6.1.a. In all instances, responsibilities of one level may be assumed by designated alternates or by higher levels, conditional upon appropriate qualifications.

   The reactor facility shall be under the direct control of the Reactor Supervisor, a Senior Reactor Operator, or Reactor Operator (RO). The RO shall be responsible for ensuring that all operations are conducted in a safe manner and within the limits prescribed by the facility license, procedures and requirements of the Radiation Safety Officer and the CORO.

c. Staffing

   1. The minimum staffing when the reactor is not secured shall be as follows:

      a) At least two individuals shall be present at the facility complex and shall consist of at least a licensed reactor operator and a second person capable of calling 911. Unexpected absence for as long as 2 hours to accommodate a personal emergency are acceptable provided immediate action is taken to obtain a replacement. During periods when the reactor is not secured, it shall be under the direct control the of the reactor operator;

b) During periods of reactor maintenance the two individuals who shall be present at the facility complex shall consist of a licensed senior reactor operator and a second individual capable of calling 911.

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e) A list of reactor facility personnel by name and telephone number shall be readily available for use in the reactor room. The list shall include:

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d. Selection and Training of Personnel

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2. Selection: The selection of operations personnel shall be consistent with the standards related to selection in ANSI/ANS-15.4-2007

3. Training Program: The Training Program shall be consistent with the standards related to training in ANSI/ANS-15.4-2007.

4. Requalification Program: The Requalification Program shall be consistent with the standards related to requalification in ANSI/ANS-15.4-2007.

6.2 Review and Audit

a. Committee on Reactor Operations (CORO)

The CORO shall be comprised of at least 3 voting members knowledgeable in fields which relate to Nuclear Safety. One of these members, the Radiation Safety Officer, will serve as the Chair. If the Chair is unable to attend one or a number of committee meetings, then the Chair may designate a committee member as Chair *pro tem*. The members are appointed by the Head of the School of Nuclear Engineering to serve three year terms. It is expected that the members will be reappointed each term as long as they are willing to serve so that their experience and familiarity with the past history of the PUR-1 will not be lost to the committee.

b. CORO Charter and Rules

The operations of the CORO shall be in accordance with a written charter, including provisions for:

1. Meeting Frequency: The CORO shall meet annually at intervals not to exceed 15 months. (Note: The facility license requires a meeting at least once per year and as frequently as circumstances warrant consistent with effective monitoring of facility activities);

2. Quorum: A quorum shall be comprised of not less than one-half of the voting membership where the operating staff does not constitute a majority;

3. Voting Rules: On matters requiring a vote, if only a quorum is present a unanimous vote of the quorum shall be required; otherwise a majority vote shall be required;

4. Subcommittees: The Chair may appoint subcommittees comprised of members of the CORO to perform certain tasks. Subcommittees or members of the CORO may be authorized to act for the committee; and

5. Meeting Minutes: The Chair shall designate one individual to act as recording secretary. It shall be the responsibility of the secretary to prepare the minutes which shall be distributed to the CORO, including the Head of the School of Nuclear Engineering, within three months. The CORO shall review and approve the minutes of the previous meetings. A complete file of the meeting minutes shall be maintained by the Chair of the CORO and by the Facility Director.

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experiments and proposed changes to equipment, systems, or procedures can be made under 10 CFR 50.59 or would require a change in Technical Specifications or license conditions;

2. Review of new procedures, major revisions of procedures, and proposed changes in reactor facility equipment or systems which have significant safety impact to reactor operations;

3. Review of new experiments or classes of experiments that could affect reactivity or result in the release of radioactivity;

4. Review of proposed changes to the Technical Specifications and U.S. NRC issued license;

5. Review of the PUR-1 radiation protection program;

6. Review of violations of Technical Specifications, U.S. NRC issued license, and violations of internal procedures or instructions having safety significance;

7. Review of operating abnormalities having safety significance;

8. Review of reportable occurrences listed in Section 6.6.a and 6.6.b of these Technical Specifications; and

9. Review of audit reports.

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4. The reactor facility emergency plan and implementing procedures: at least once every other calendar year (interval between audits not to exceed 30 months); and

5. The reactor facility security plan and implementing procedures: at least once every other calendar year (interval between audits not to exceed 30 months).

   Deficiencies uncovered that affect reactor safety shall immediately be reported to the Head of the School of Nuclear Engineering (Level 1 Management). A written report of the findings of the audit shall be submitted to the Head of the School of Nuclear Engineering (Level 1 Management) and the review and audit group members within 3 months after the audit has been completed.

e. Audit of ALARA Program

The Chair of the CORO or designated alternate (excluding anyone whose normal job function is within the operating staff) shall conduct an audit of the reactor facility ALARA program annually. The auditor shall transmit the results of the audit to the CORO at the next scheduled meeting for its review and approval.

6.3 Radiation Safety

The Radiation Safety Officer shall be responsible for implementing the radiation safety program for the PUR-1. The requirements of the radiation safety program are established in 10 CFR 20. The Program should use the guidelines of the ANSI/ANS-15.11-1993; R2004, "Radiation Protection at Research Reactor Facilities."

6.4 Procedures

Written operating procedures shall be prepared, reviewed, and approved before initiating any of the activities listed in this section. The procedures shall be reviewed and approved by the Facility Director, the CORO, and shall be documented in a timely manner. Procedures shall be adequate to ensure the safe operation of the reactor but shall not preclude the use of independent judgment and action should the situation require such. Operating procedures shall be used for the following items:

a. Startup, operation, and shutdown of the reactor;

b. Fuel loading, unloading, and movement within the reactor;

c. Control rod removal or replacement;

d. Routine maintenance of the control rod, drives and reactor safety and interlock systems or other routine maintenance of major components of systems that could have an effect on reactor safety;

e. Surveillance checks, calibrations, and inspections of reactor instrumentation and controls, control rod drives, area radiation monitors, facility air monitors, the central exhaust system and other systems as required by the Technical Specifications;

f. Administrative controls for operations, maintenance, and conduct of irradiations and experiments, that could affect reactor safety or core reactivity;

g. Implementation of required plans such as emergency or security plans;

h. Radiation protection program to maintain exposures and releases as low as reasonably achievable (ALARA);

i. Use, receipt, and transfer of by-product material, if appropriate; and

j. Surveillance procedures for shipping radioactive materials.

6.5 Experiment Review and Approval

Approved experiments shall be carried out in accordance with established and approved procedures.

a. All new experiments or class of experiments shall be reviewed by the CORO as required by TS 6.2.c and implementation approved in writing by the Facility Director or designated alternate.

b. Substantive changes to previously approved experiments shall be made only after review by the CORO and implementation approved in writing by the Facility Director or designated alternate.

6.6 Required Actions

a. Action to be Taken in the Event of a Safety Limit Violation

1. The reactor shall be shut down and reactor operation shall not be resumed until authorized by the U.S. NRC;

2. An immediate notification of the occurrence shall be made to the CORO Chair and the Facility Director, and reports shall be made to the U.S. NRC in accordance with Section 6.7.b of these specifications; and

3. A report shall be prepared which shall include:

a) Applicable circumstances leading to the violation including, when known, the cause and contributing factors,

b) Effect of the violation upon reactor facility components, systems, or structures and on the health and safety of personnel and the public,

c) Corrective action to be taken to prevent recurrence.

This report shall be submitted to the CORO for review and then submitted to the U.S. NRC when authorization is sought to resume operation of the reactor.

b. Action to be Taken in the Event of a Reportable Occurrence Other Than A Safety Limit Violation

1. PUR-1 staff shall return the reactor to normal operating via the approved PUR-1 procedure or shut down conditions. If it is necessary to shut down the reactor to correct the occurrence, operations shall not be resumed unless authorized by the Facility Director or a designated alternate;

2. The Facility Director or designated alternate shall be notified and corrective action taken with respect to the operations involved;

3. The Facility Director or designated alternate shall notify the CORO Chair who shall arrange for a review by the CORO;

4. A report shall be made to the CORO which shall include an analysis of the cause of the occurrence, efficacy of corrective action, and recommendations for measures to prevent or reduce the probability of recurrence; and

5. A report shall be made to the U.S. NRC in accordance with Section 6.7.b of these specifications.

6.7 Reports

a. Annual Operating Report

An annual report covering the operation of the reactor facility during the previous calendar year shall be submitted to the NRC before March 31 of each year providing the following information:

1. A narrative summary of (1) reactor operating experience (including experiments performed), (2) changes in facility design, performance

characteristics, and operating procedures related to reactor safety and occurring during the reporting period, and (3) results of surveillance tests and inspections;

2. Tabulation of the energy output of the reactor, hours reactor was critical, and the cumulative total energy output since initial criticality;

3. The number of unscheduled shutdowns and inadvertent scrams, including, where applicable corrective action to preclude recurrence;

4. Discussion of the major maintenance operations performed during the period, including the effect, if any, on the safety of the operation of the reactor and the reasons for any corrective maintenance required;

5. A brief description, including a summary of the safety evaluations of changes in the facility or in procedures and of tests and experiments carried out pursuant to Section 50.59 of 10 CFR Part 50;

6. A summary of the nature and amount of radioactive effluents released or discharged to the environs beyond the effective control of the licensee as measured at or before the point of such release or discharge. The summary shall include to the extent practicable an estimate of individual radionuclides present in the effluent. If the estimated average release after dilution or diffusion is less than 25% of the concentration allowed or recommended, a statement to this effect is sufficient:

   a) Liquid Waste (summarized on a monthly basis)

      i. Radioactivity discharged during the reporting period.

         I. Total radioactivity released (in Curies),

         II. The effluent concentration used and the isotopic composition if greater than 1×10^{-7} µCi/cc for fission and activation products,

         III. Total radioactivity (in Curies), released by nuclide during the reporting period based on representative isotopic analysis, and

         IV. Average concentration at point of release (in µCi/cc) during the reporting period.

      ii. Total volume (in gallons) of effluent water (including dilution) during periods of release.

   b) Airborne Waste (summarized on a monthly basis)

      i. Radioactivity discharged during the reporting period (in Curies) for:

I. ^{41}Ar, and

II. Particulates with half-lives greater than eight days.

c) Solid Waste

i. The total amount of solid waste transferred (in cubic feet),

ii. The total activity involved (in Curies), and

iii. The dates of shipment and disposition (if shipped off site).

7. A summary of radiation exposures received by facility personnel and visitors, including dates and time where such exposures are greater than 25% of that allowed or recommended; and

8. A description and summary of any environmental surveys performed outside the facility.

b. Special Reports

In addition to the requirements of applicable regulations, reports shall be made to the NRC Document Control Desk and special telephone reports of events should be made to the Operations Center as follows:

1. There shall be a report not later than the following working day by telephone and confirmed in writing by fax or similar conveyance to the NRC Headquarters Operation Center, and followed by a written report that describes the circumstances of the event and sent within 14 days to the U.S. Nuclear Regulatory Commission, Attn: Document Control Desk, Washington, DC 20555, of any of the following:

a) Violation of safety limit (see TS 6.6.a);

b) Any release of radioactivity from the site above allowed limits; and

c) Any of the following:

i. Operation with actual safety system settings for required systems less conservative than the limiting safety system settings specified in the technical specifications.

ii. Operation in violation of limiting conditions for operation established in the technical specifications.

iii. A reactor safety system component malfunction that renders or could

render the reactor safety system incapable of performing its intended safety function. If the malfunction or condition is caused by maintenance, then no report is required.

Note: Where components or systems are provided in addition to those required by the technical specifications, the failure of the extra components or systems is not considered reportable provided that the minimum numbers of components or systems specified or required perform their intended reactor safety function.

iv. An unanticipated or uncontrolled change in reactivity greater than $0.006\ \Delta k/k$.

v. Abnormal and significant degradation in reactor fuel or cladding, or both, coolant boundary, or confinement boundary (excluding minor leaks).

vi. An observed inadequacy in the implementation of administrative or procedural controls such that the inadequacy causes or could have caused the existence or development of an unsafe condition with regard to reactor operations.

2. A written report within 30 days to the U.S. Nuclear Regulatory Commission, Attn: Document Control Desk, Washington, DC, 20555, of:

   a) Permanent changes in the facility organization involving Level 1 and Level 2; and

   b) Significant changes in the transient or accident analysis as described in the Safety Analysis Report.

6.8 Records

Records of facility operations in the form of logs, data sheets, or other suitable forms shall be retained for the period indicated as follows:

a. Records to be Retained for a Period of at Least Five Years or for the Life of the Component Involved if Less Than Five Years

   1. Normal reactor facility operation (but not including supporting documents such as checklists, log sheets, etc. which shall be maintained for a period of at least one year),

   2. Principal maintenance operations,

   3. Reportable occurrences,

   4. Surveillance activities required by the Technical Specifications,

5. Reactor facility radiation and contamination surveys where required by applicable regulations,

6. Experiments performed with the reactor,

7. Fuel inventories, receipts, and shipments,

8. Approved changes in operating procedures, and

9. Records of meeting and audit reports of the CORO.

b. Records to be Retained for at Least One Certification Cycle

Records of retraining and requalification of licensed operations personnel shall be maintained at all times the individual is employed or until the license is renewed.

c. Records to be Retained for the Lifetime of the Reactor Facility

1. Gaseous and liquid radioactive effluents released to the environs,

2. Radiation exposure for all personnel monitored,

3. Drawings of the reactor facility, and

4. Reviews and reports pertaining to a violation of the safety limit, the limiting safety system setting, or a limiting condition of operation.