

**[SOE LETTERHEAD]**

April 10, 1990

Mr. John T. Conway  
Chairman  
Defense Nuclear Facilities Safety Board  
600 E Street, NW, Suite 675  
Washington, D.C. 20004

Dear Mr. Conway:

Your letter dated February 22, 1990, forwarded recommendations regarding the training and qualifications of selected personnel involved in the operation of the Savannah River reactors. My response to the Board's recommendations is enclosed. Acknowledgement of Recommendation 90-1 by DOE.

I accept the Board's recommendations, the thrust of which is that reactor operations personnel must be properly qualified and have adequate training prior to reactor restart. Each of the Board's recommendations was carefully considered and specific actions taken to implement those recommendations are indicated in the enclosed. Where the Board's recommendations might be subject to differing interpretations, DOE has indicated the interpretation on which its response was based.

In accordance with 42 U.S.C. 2268d, DOE's responses to the Board's recommendations will be published in the Federal Register.

Sincerely,

*James D. Watkins*  
*Admiral, U.S. Navy (Retired)*

Enclosure

Response of the Secretary of Energy to Defense Nuclear Facilities Safety Board Recommendation 90-1, Restart of K, L, and P Reactors at DOE Savannah River Site, South Carolina  
Federal Register, Vol. 55, No. 72 13940

Recommendation a: That DOE determines and specify the qualifications that reactor plant operators and supervisors will be required to demonstrate before restart of the K, L and P reactors.

Response:DOE accepts this recommendation. Qualification requirements for the K, L and P reactor operators, senior reactor operators, and certified supervisors are specified in DOE Order 5480.6, "Safety of Department of Energy-Owned Nuclear Reactors" dated September 23, 1986. Order 5480.6 specifies that American Nuclear Standard ANS 3.1(1981) "Selection, Qualification and Training of Personnel for Nuclear Power Plants," shall be the basis for qualification and training requirements for reactor personnel and that the requirements of ANS 3.1 shall be selectively applied as appropriate to the specific facility. Site specific plans have already been developed at Savannah River to specify those qualification requirements that senior reactor operators and certified supervisors\*\*\* will be required to demonstrate before restart of the K, L, and P reactors, consistent with the Board's recommendations, are as follows:

- (a) Education: The minimum education level for senior reactor operators ant certified supervisors is a high school diploma unless otherwise approved by DOE on a case-by-case basis. In addition, at least one certified supervisor per shift must have a Bachelor of Science degree in an engineering or related science field.
- (b) Experience: Senior reactor operators must have 2 years of reactor experience, including 6 months on site. Certified supervisors must have 3 years of reactor experience, including 6 months on site. In addition, the Control Room supervisor must have a minimum of 6 weeks experience at the Savannah River Site (SRS) reactor operating at or above 20 percent rated power.
- (c) Training

Certified supervisor/senior reactor operatorHours

Fundamentals.....	242/146
Plant technology, systems and procedures.....	321/193
Operating practices.....	206/126
Industry experiences/modifications.....	34/34

- (1) Written examinations are administered in each area and a minimum passing grade of 80 percent is required.
- (2) Certified supervisors and senior reactor operators must also complete simulator training (164 hours) that consists of a program of manipulations intended to enhance proficiency including 2 evaluated reactor control manipulations within 6

months prior to restart.

- (3) The operators and supervisors must also complete an 80-hour, structured on-the-job training program designed to increase operator knowledge of plant systems and integrated systems operation. Additionally, certified supervisors and senior reactor operators will already have completed 1480 or 520 hours respectively, of on-the-job training as part of their initial certification training.
- (d) Medical: Personnel assigned to senior reactor operator or certified supervisory positions must meet the medical requirements specified in American National Standards Institute/American Nuclear Society (ANSI/ANS) 3.4, "Medical Certification and Monitoring of Personnel Requiring Operator license for Nuclear Power Plants."
- (e) Fitness for Duty: All employees of the contractor operating the SRC reactors, Westinghouse Savannah River Company (Westinghouse) and employees of subcontractors who have unescorted access to reactor facilities are subject to preemployment drug testing, for cause drug testing and random drug testing.

Certified supervisors and senior reactors operators demonstrate fulfillment of training qualifications by passing a combination of written exams, practical exams, oral and operating exams and simulator exercises prior to restart. The exams are administered by Westinghouse, but DOE reviews the examination process and the results. Additional information about DOE's review of the contractor's program is included below in response to recommendation c.

Prior to restart, DOE will conduct its own operational readiness review in order to verify that certified supervisors and senior reactor operators have the requisite skills and knowledge to assure safe operations. DOE personnel with experience in commercial nuclear training and operations and necessary SRS training will lead the review and will monitor pre-startup control room evolutions as well as simulator exercises.

Additionally, as discussed below in response to recommendation b, each shift crew is being supplemented by the addition of a certified supervisor (other than the control room supervisor) who has been qualified as a Shift Technical Engineer, and by the interim assignment of a Shift Advisor. These additions are being made to further augment the educational and experience level of each operating crew (see discussion under II.b. in the response to recommendation b.) The specific training and qualification requirements which have been developed for these two positions are as follows:

- (a) Shift Technical Engineer: (1) is a certified supervisor, (2) holds a four-year college degree in engineering, or related physical science, (3) has completed the supervisory certification training plus the following:

Topic	Hours
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Mathematics.....	60
Classical physics.....	24
Nuclear physics and reactor theory.....	120
Mechanical components.....	20
Process instrumentation.....	20
Heat transfer and fluid flow.....	70
Electrical science.....	20
Print reading.....	20
Safety envelope and bases.....	40
Accident and transient analyses.....	40
Chemistry.....	30
Material science.....	40
Radiation protection and health physics.....	40
Thermal and hydraulic science.....	24
Applied reactor physics.....	32
Charge and discharge operations.....	12
Reactor startup physics.....	12
Roles and lessons learned.....	4
Symptom based procedures.....	16
Limits and safety analysis.....	28
Total.....	712

- (b) Shift Advisor: is a holder of a license at a commercial reactor within the past 5 years, (2) completed a minimum of five years commercial nuclear experience, and (3) successfully completed SRS training as follows:

Hours

Introduction to reactor systems.....	40
Safety and emergency procedures.....	16
Health Protection.....	3
OSHA safety procedures.....	2

Qualification requirements for senior reactor operators and certified supervisors are currently implemented through the Westinghouse procedure DuPont Savannah Operating Procedure (DPSOP) 38, "Reactor Personnel Selection, Qualification, and Training Manual." This procedure is currently being revised to incorporate the qualification requirements described above which were developed for restart. Following revision, it will be submitted to DOE for approval.

For the longer term, Westinghouse is developing an enhanced certification program for future certified supervisors and senior reactor operators which will provide for additional training beyond that which is required for a safe restart. This program will take into consideration applicable commercial certification guidelines, commercial nuclear knowledge and abilities and current industry good practices. Specific milestones for this

program will be approved by DOE prior to restart. Westinghouse is also developing accredited training programs for other Savannah River plant personnel, such as maintenance personnel, instrumentation and control technicians and health physics personnel, comparable to corresponding accredited training programs in the commercial nuclear field.

Recommendation b: That DOE identify any differences between its approved qualifications and those prescribed by NRC for analogous positions in the civilian nuclear power field: that where differences, if any, exist, DOE identify any supplemental measures that have been adopted in view thereof:

Response: DOE accepts this recommendation and has identified the differences between its approved qualifications and those prescribed by the Nuclear Regulatory Commission in part I. Supplemental measures have been adopted and are discussed in part II below.

Acknowledgement of Recommendation 90-1 by DOE

- I. Qualifications for civilian nuclear power reactor operators and supervisors are specified in 10 CFR part 55 and in the American Nuclear Society standard, ANS 3.1--1981 "Selection, Qualification and Training of Personnel for Nuclear Power Plants" as modified by Regulatory Guide 1.8, 1987, "Qualification and Training of Personnel for Nuclear Power Plants." A comparison of qualification requirements for Savannah River senior reactor operators and certified supervisors (described in the response to recommendation a.) and the analogous positions in the commercial nuclear power field is as follows:
  - (a) Education: Both DOE and NRC programs require a high school diploma. DOE has added the requirement that at least one supervisor per shift have a Bachelor of Science degree in an engineering or related science field.
  - (b) Experience: For commercial reactor operators (analogous to SRS senior reactor operators), NRC requires 1 year reactor experience, including 6 months as a nonlicensed operator. SRS requires its operators to have 2 years reactor experience, including 6 months on site. NRC requires that nuclear reactor operators have an additional 2 years of power plant experience but does not require this experience to be nuclear experience. For senior nuclear reactor operators, NRC requires supervisors to have at last 4 years of power plant experience of which 2 years must be nuclear experience, including 3 months on-site and 6 weeks at a similar facility in operation at or above 20% rated power. The SRS implementation plan for DOE Order 5480.6 requires SRS control room supervisors to have at least 3 years nuclear experience, including 3 months on-site and 3 weeks experience at a SRS reactor facility operating at or above 20% rated power. NRC also requires senior reactor operators to have at least 1 year experience as a licensed reactor operator prior to becoming a licensed senior reactor operator.
  - (c) Training: Both NRC and DOE require completion of a training program consisting

of classroom. Simulator and on-the-job training. The technical training programs in the commercial industry are generally accredited by industry-sponsored organizations. A comparison of the typical amount of time (in hours) the NRC and DOE programs devote to different training modules follows:

Cert Trainer

Classroom Training:

Fundamentals.....	242	666	146	590
Plant tech., systems & proc	321	720	193	600
Operating practices.....	206	180	126	120
Simulator training.....	164	240	164	160
On-the-job Training.....	1560	960	600	480

Note: The Savannah River simulator training hours were established based on the complexity and scope of Savannah River plant systems.

- (d) Medical: Both NRC and DOE require compliance with the medical requirements specified in ANSI/ANS 3.4, "Medical Certification and Monitoring of Personnel Requiring Operator licenses for Nuclear Power, Plants."
- (e) Fitness for Duty: A detailed line by line comparison of DOE and NRC fitness for duty requirements has not been made, however the DOE program for drug testing to assure fitness of operators to safely operate the reactors includes preemployment, for cause, and random testing. DOE does not presently test for alcohol. NRC fitness for duty requirements include testing for alcohol.

II. The following supplemental measures will bolster SRS shift capabilities:

- (a) In order to ensure that adequate engineering fundamentals are present on shift, the function of Shift Technical Engineer (STE) has been added. The STE will perform functions comparable to the position of shift technical advisor in the commercial industry.
- (b) A Shift Advisor has been created to place an individual with commercial Senior Reactor Operator experience on shift in an advisory capacity to the shift manager. This position is an interim one that will be eliminated when satisfactory performance has been demonstrated by operations personnel. Both the Shift Advisor and the Shift Technical Engineer positions have been created in order to enhance composite shift experience and education.
- (c) An additional 22 individuals with prior commercial Senior Reactor Operator or navy nuclear experience will have completed initial certification training and will be put in various positions in the reactor operating organization with the goal that a number of these individuals will eventually become control room supervisors.

- (d) Changes to operating practices in excess of current DOE requirements will be implemented prior to restart in the areas of: logkeeping, shift turnover, control room demeanor, procedure compliance, event notification control of equipment status, equipment tagout and other aspects of plant operations. Guidelines developed for conduct of operations in commercial nuclear plants have been utilized in developing improved Savannah River practices in these areas.
- (e) DOE personnel with experience in reactor operations will continuously monitor restart activities until DOE is satisfied that improvements in the conduct of operations have been implemented.

III. Conclusions. In comparing the qualification of operators and supervisors at the SRS reactors with analogous requirements at commercial reactors, it is important to consider both the numbers of individuals assigned to a shift and the complexities and duties performed by shift personnel. In the commercial nuclear power industry, for a single nuclear reactor, there are 2 licensed senior reactor operators and 2 licensed reactor operators required to be on shift. These individuals perform all control room functions for the reactor plant and the secondary plant including power generation equipment. However, for each SRS reactor, 4 certified supervisors and 5 certified senior reactor operators will be assigned to each shift. The Shift Technical Engineer and Shift Advisor have been added to supplement Savannah River operational staffing.

Recommendation c: That DOE make a comprehensive review of the current level of qualification of each reactor operator and supervisor employing both written and oral examination so as to establish that the scope and content of the training program will achieve the knowledge prerequisite for restart.

Response: DOE accepts the recommendation that ongoing training efforts need to be continuously reviewed by DOE to ensure that the needed skills and knowledge are attained by reactor operations personnel. Beginning in November 1989 and continuing to the present, DOE and Westinghouse have reviewed each operating crew to ascertain if training objectives are being met. These reviews have focused on written exam results, oral exam results and crew performance during simulator evolutions. DOE personnel participating in these reviews have had extensive experience in the training and licensing of commercial nuclear operations personnel. DOE has also utilized individuals in these reviews who are currently certified by the NRC to conduct operator licensing examinations for commercial reactor operators, and who bring with them an understanding of commercial nuclear operator training and certification practices. Changes have been made to the training programs based on their input, as discussed below.

Acknowledgement of Recommendation 90-1 by DOE

Prior to restart, DOE and Westinghouse will jointly conduct comprehensive evaluations of certified supervisors and senior reactor operators to ensure that they can demonstrate the appropriate knowledges and abilities required for safe restart. The examinations are intended to be conducted in August 1990 in order to allow for proper development of the examinations and for completion of recent enhancements to the training program.

This evaluation will include performance-based written, oral and operating examinations which include Job Performance Measures (JPM) and Individual Safety Critical Tasks (ISCT). The examinations will be based on approved "knowledges and Abilities," written and oral examination questions and simulator scenarios. Examiners for these evaluations will include peer evaluators from other reactors on site (i.e. P and L reactors for K plant, K and L for P, etc.) and selected instructors.

This examination Program will be modeled after the requalification examination program being conducted jointly by the NRC and licensed facilities at commercial nuclear plants. A SRS Specific Knowledges and Abilities (K/A) Catalog will be developed, validated and approved. Standards of performance for both knowledge and ability will be established prior to the examination. This process will focus on safety related skills and knowledges as well as the ability to use tools of the job, such as procedures, piping and instrumentation diagrams (P&ID's), technical specifications and other controlled references. Results of the examinations will be used to define areas where training must be upgraded either prior to restart or as part of the long term continuing training programs. Results of these examinations will also be used to support management decisions so as to ensure that composite crews have the requisite skills for safe restart Information on individual weaknesses will be referred to the Training Department for use in tutoring or upgrading training, as necessary.

Recommendation d: That the reactor plant operator and supervisor training programs be modified as necessary to take account of the required qualifications and the current status of knowledge and experience of the operators and supervisors as indicated above.

Response: DOE accepts this recommendation and has taken the following actions to implement it. Based upon ongoing DOE and Westinghouse reviews of the training program, it has been concluded that two areas require strengthening. Specifically, operators and supervisors need increased knowledge in the area of reactor fundamentals and reactor systems and components. Specific initiatives to address these needs include:

- (1) Fifteen different "Theory Primers" addressing reactor components, reactor theory, chemistry and Thermodynamics are being developed to provide basic supplementary knowledge of reactor fundamentals and theory, to stimulate operator interest, and to facilitate self-study.
- (2) The ongoing training program will give high priority to fundamentals training, reactor theory training and reactor systems training. These courses are thought to be the most beneficial and logical basis for a long-term program. The course material for this training is still under development. The course will involve approximately 120 classroom or simulator hours covering such topics as refueling, start-up testing and initial operations, technical specifications and reactor theory/reactor physics. These courses will be conducted during the first 3 cycles of continuing training.
- (3) To promote operator self-study, a "Fundamentals Test Out" program has been implemented. This program provides a financial incentive for operations personnel to use



self-study material in the areas of mathematics and physics by providing a financial payment to personnel who successfully complete an exam based on the self-study material.

- (4) A two-phase testing program is being employed to identify individuals with a low probability of successfully completing the training program and performing to expected standards and to establish a baseline for input to continuing training. Phase I includes on-going job-specific performance evaluations for those persons who receive low scores on written or oral exams. Individuals not successful during the Phase I program will be provided remedial training to improve their skills and then they will be retested. Phase II identifies weaknesses in the level of operator knowledge in mathematics and science in order to supplement the continuing training program accordingly. This phase will be completed prior to June 1, 1990.

Recommendation e: That DOE accelerate implementation of a configuration management program to help assure that as-built drawings of safety related systems are available for training of operators and supervisors in procedures and for discipline of operations (e.g. valve line-ups).

Response: Based on the assumption that by "configuration management" the Board means that set of procedures and controls used to ensure that the as-built configuration of the plant is reflected in appropriate drawings, procedures and other documents, DOE accepts this recommendation. Westinghouse has recently accelerated efforts in this area and will develop accurate operational flow diagrams for all reactor safety systems prior to restart. These diagrams will be used by operations personnel to establish equipment and system lockouts and valve lineups, conduct trouble shooting, and perform other systems related activities. Prior to restart, the operations staff will be trained in the use of the appropriate diagrams needed for these applications.

Recommendation f: That the operators and supervisors be qualified in use of the revised procedures that will be in place for normal operations and for emergency situations.

Response: DOE accepts this recommendation. A deliberate program to train operations personnel on the revised procedures is an integral part of the restart training program. Westinghouse requires procedure revisions to be reviewed by reactor supervisors, control room supervisors and building operators on a monthly basis. In addition, the Westinghouse training department receives new procedures as well as proposed procedure revisions from the other departments to ensure that procedure changes are properly incorporated in the training program, including the simulator.

Written examinations, oral examinations, simulator examinations and control room operation will be used to demonstrate prior to restart that personnel are qualified in the use of revised normal and emergency procedures. DOE will participate with Westinghouse in the evaluation of these examinations and will conduct an independent overview of control room practices.